

# Federalism and Accountability with Distorted Election Choices

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## Abstract

We analyse the implications of the interaction of distorted election choices with the architecture of government for the accountability of politicians. Contrasting centralized with decentralized political systems, we show that centralisation is likely to result in *higher* accountability, if election choices are subject to small random distortions. Furthermore, we provide equity and efficiency arguments that uniform policies in centralized systems are likely to result in the better overall performance of politicians and in more equal performance across regions.

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## 1 Introduction

In a decentralised democratic political system politicians are accountable to their local electorate. In a centralised system, a politician is accountable to the electorate of all jurisdictions (s)he is governing. This difference triggers the question whether one should expect the level of political accountability to

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be higher or lower under a centralized or a decentralized system. In general, an individual jurisdiction is less likely to be pivotal in changing the outcome of centralized elections in a multi-jurisdiction setting. Seabright (1996) and Persson and Tabellini (2000, chapter 9) have built a strong argument on this insight that decentralisation is likely to increase accountability.

The present paper shows, that this argument is reversed, if election choices are distorted by random factors, at least as long as such random factors are not too important compared to actual performance. Thus, the multiple responsibility of politicians towards several regions in a centralised system must not necessarily reduce accountability. Under plausible circumstances of slightly distorted election choices accountability will actually be *higher* under a centralised regime.

Election choices are often not only guided by pure retrospective performance evaluation. Random factors play a major role regarding the re-election chances of an incumbent politician, even if (s)he has performed well. Examples of such random factors are natural or economic events outside the control and responsibility of the incumbent politician, political scandals, the looks of the opposition candidate, etc. Such random factors are distorting re-election choices, and this affects the level of accountability that can be sustained by repeated interaction between politicians and the electorate. The key question of the present paper is how these effects interact with the architecture of government.

Our analysis uses a simple framework of retrospective voting. Once a politician is elected, he (or she) is in office for some time and may use or abuse the resources that come along with the office. As the mechanism to induce good policy choices by elected politicians we consider the re-election threat.<sup>1</sup> When election and re-election of politicians is a repeated game, in which the time horizon of the politician is uncertain, this opens up for tacit collusion and for credible trigger strategies that retrospectively punish politicians who did not behave accountably.<sup>2</sup> We add an additional factor to this

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<sup>1</sup>Other options to induce good policies are to appoint politicians whose own goals are fully aligned with the preferences of their constituency. However, along policy dimensions that involve a moral hazard problem this is not a realistic option, and the institutional design should allow for some mechanism that disciplines politicians. Complete contracts with punishment clauses are another theoretical option that, however, is difficult to implement in practice.

<sup>2</sup>The evidence on voting behavior is very much in line with a model that considers the accountability problem as a repeated game in which voters reward politicians who behaved

relationship between the electorate and the politician: Bad luck. Politicians sometimes fail or become extremely unpopular even if they make decisions that are ex-ante optimal from the point of view of the voters. Thus, whether a politician is re-elected is partially the result of his own policy decisions, or his accountability, but partially the re-election decision is outside his control. The problem with such outcomes is that it generates a possibly small, but positive probability for accountable politicians to be not re-elected. For an infinitely repeated interaction, such exogenous risks of break-down of tacit collusion reduce the scope of policy outcomes that can be implemented as equilibria in infinitely repeated games. The exogenous risk of an accountable and able politician of not being re-elected will generally negatively affect the most favorable equilibrium outcome that can be sustained through potentially infinitely repeated play, and should reduce the maximum accountability that can be sustained by tacit collusion.

We first work out what is the most favorable equilibrium in a simple framework with only one voter and one politician, and what is the implication of the possibility of bad luck for the maximum accountability of the politician. We then ask how the degree of decentralization affects this equilibrium outcome. We show that a government that makes decisions for many regions and needs to be reelected by a majority of regions can be induced to perform better and to behave more in the interest of their constituency than separate, independent governments of many regions, provided that the quantitative effect of bad luck is sufficiently small. A unitary country with centralized governance structures may be governed by politicians who behave more accountably, particularly on issues that voters care much about.

The intuition for this result is as follows. Each jurisdiction is less likely to be pivotal for re-election under the centralized regime than under the decentralized regime in our setting. Because each region has a lower impact on the overall re-election, distorted re-election outcomes in one particular region are less likely to cause a well-performing incumbent to be voted out of office. An incumbent only needs to form a winning majority across regions. As we can show, if the exogenous factors are relatively unimportant, formation of a winning majority becomes more likely as the number of jurisdictions increases. Thus, pooling the random factors across jurisdictions in

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accountable in the past, and punish politicians who did not. There is also considerable empirical evidence on the role of retrospective voting (Norpoth 1996, Lewis-Beck and Stegmaier 2000, Kousser 2004)

the centralised system has the potential to reduce the threat of being voted out of office for exogenous factors. This increases the benefits of staying in office, gives accordingly more leverage to voters, and increases the level of accountability.

We also provide two arguments for uniform provision of public goods in the centralized system. First, uniformity may be desirable for reasons of interregional equity. In a centralized system which allows for discriminatory treatment across regions and with a voting rule that conditions on overall performance, accountability is only determined according to the aggregate level of public good provision, but will not depend on the regional distribution of public goods. Thus, while the average public good provision can be increased under such a regime compared to a decentralized system, some regions may end up with a lower provision level than under the decentralized regime. Second, if regions condition their voting behavior only on the provision level in their own region, non-uniform provision under the centralized regime enable incumbents to play different regions off against each other. This tends to reduce accountability. However, the fact that election choices are distorted prevents a total loss of accountability in this case, contrary to a situation without such distortions, where accountability would be completely lost.

Retrospective voting and accountability have been considered by Austen-Smith and Banks (1989) and by Ferejohn (1986). Our approach is closely related to the latter contribution, although we consider a full information setting. Furthermore, Ferejohn (1986) did neither address the question of centralized versus decentralised electoral control, nor did he consider the possibility of distorted election choices, the two main elements that drive our key results.

There are other aspects of decentralisation that affect accountability. Benchmarking and yardstick competition are important for democratic control of politicians, as in Besley and Case (1995). Moreover, we only consider the incentive effects of elections. As has been stressed by Besley and Smart (2003), elections not only have an incentive function, but also a selection function. We do not address selection here and we refer to Hindricks and Lockwood (2005) for a study of the interaction of the degree of centralisation and the incentive and selection effects jointly. Similarly, further important considerations for the relative benefits of the degree of political centralisation is the interaction of lobbying and state capture with the organizational structure of the state, as discussed, for instance, in Wärneryd (1998), and

Bardhan and Mokherjee (2000), but we also abstract from these issues.

The structure of the paper is as follows. First, in section 2, we describe the bare bones of accountability in a framework with infinitely repeated interaction and distorted re-election choices. We focus on stationary equilibria with simple trigger strategies in a full information framework. We then apply this framework to the problem of comparing fully decentralized and fully centralized government in section 3. Section 4 considers the centralized regime with uniform public good provision and section 5 the centralized regime with discriminatory provision. Section 6 discusses the results and concludes.

## 2 The Framework

Consider a country that consists of  $n$  identical and independent regions. We study accountability of politics in several governance regimes for this country, ranging from fully decentralized to fully centralized regimes. First we study the political equilibrium in a single, representative region if this region is governed completely independently from all other regions, as the solution to this problem will carry over to the case of multiple, completely independent regions, and also serves as a building block for other types of governance.

Let there be an infinite sequence of periods,  $t = 0, 1, 2, \dots$ . In each period  $t$ , a player is the incumbent politician at the beginning of the period. This player has an exogenously given period budget that is normalized and equal to 1 in all periods and allocates this budget between two purposes. One purpose is useful from the perspective of the voters and can be seen as a publicly provided good. The amount used for this purpose is  $g_t \in [0, 1]$ . The other purpose can be thought of as simple diversion of public revenue for goods and activities that do not benefit the voters at all. This can be projects that yield ego-rents to the politician but are useless for the voter, or, in the most simple case, a money transfer to the incumbent's Swiss bank account. The amount of resources used for these purposes is  $1 - g_t$ .

There is one single voter in the region. In a given period  $t$  this voter has to decide whether to re-elect the incumbent politician, or to replace him by another politician. If the politician is reelected in  $t$ , he becomes the incumbent politician in period  $t + 1$ . If not, then a new agent is chosen. The old politician disappears and receives an exogenous period payoff in all future periods that is equal to 0. The new politician inherits all information which the previous politician had, and has the same preferences. He is chosen from

a set of politicians who do not belong to the set of voters and cannot make any payoff relevant choice unless they have been elected and are the current incumbent politicians. The voter observes  $g_t$  and knows all previous choices  $g_0, \dots, g_{t-1}$  when voting at  $t$ . Both the voter and any incumbent politician also know the election choices and election outcomes in previous periods.

Voting outcomes are based on two components. The first component is called *election choice*. Election choices are denoted  $e_0, e_1, \dots, e_{t-1}$ , with  $e_i \in \{0, 1\}$  and can be interpreted as referring to whether the voter plans to reelect (1), or not reelect (0) an incumbent politician in period  $i$ . Further, the reelection is disturbed by possible other factors. More formally and precisely, let the choice of  $e_i = 0$  always lead to a change in office and to the appointment of a new politician. However, if the voter chooses  $e_i = 1$ , let the effective election outcome be  $\theta_i e_i$ , where  $\theta_i$  is a random variable with  $\theta_i \in \{0, 1\}$  and  $\text{prob}(\theta_i = 0) \equiv q$ , for all periods  $i$ . Intuitively  $\theta_i$  may reflect the fact that, with some probability, the election outcome is dominated by an issue other than the politician's public provision decision, where we assume that whether this other issue becomes relevant is not under the control of the active players in the game. Examples for this could be events like a media scandal based on true or faked evidence of things that happened a long time ago, or an extreme popularity bonus for a rival politician. For simplicity,  $\theta_i$  and  $\theta_k$  are assumed to be stochastically independent for all periods  $i \neq k$ . As discussed, also  $\theta_i$  becomes observable at the very end of period  $i$  for all, the voters and the politician. For notational convenience we denote the re-election probability in period  $t$  as  $p_t = p_t(e_t, q)$ .

A pure strategy of the voter in period  $t$  is a sequence of mappings  $e_{t+i} : H^{t+i} \times [0, 1] \rightarrow \{0, 1\}$ , where  $H^{t+i}$  is the set of possible histories  $h^{t+i}$  at period  $t+i$ ,  $i = 0, 1, \dots$ , with a history described as  $h^t = ((g_0, \dots, g_{t-1}), (e_0, \dots, e_{t-1}), (\theta_0, \dots, \theta_{t-1}))$ , and the interval  $[0, 1]$  is the set of possible public good provision  $g_{t+i}$  in period  $t+i$  for  $i = 0, 1, 2, \dots$ . Note that the history implicitly also tells what is the sequence of politicians, and how many of them have been in office for how long, and recall that any new incumbent is identical to any other politician in all respects except for the time period when being elected into office. The incumbent politician at  $t$  also observed the history of public provisions, election outcomes and random disturbances described by  $h^t$ . A pure strategy for the incumbent politician is a sequence of mappings  $g_{t+i} : H^{t+i} \rightarrow [0, 1]$  for  $i = 0, 1, \dots$ .

Finally we consider the payoffs of the voter and of politicians. The payoff of the voter depends only on the series of public good outcomes, and the

voter's period payoff is  $g_t$ . Accordingly, the value of the objective function of a voter at period  $t$  is

$$V_t = \sum_{i=0}^{\infty} \delta^i g_{t+i} \quad (1)$$

where  $\delta$  is an exogenous and time invariant discount factor  $\delta \in (0, 1)$ . Similarly, the payoff of the politician for a given infinite series of pairs of outcomes  $(g_t, e_t)$  equals the discounted sum of resources  $1 - g_{t+i}$  which he used for purposes that are useful only to the politician. Accordingly, for a politician who is in power in period  $t$ , the present value of his overall payoff as a function of future appropriation and voting decisions is

$$\Pi_t = (1 - g_t) + \delta(1 - g_{t+1})p_t + \delta^2(1 - g_{t+2})p_t p_{t+1} + \dots$$

In what follows we consider stationary equilibria in pure strategies in the infinitely repeated game. Stationarity is defined here by the property that the equilibrium path of  $g_t = g^*$  and constant over time. We will focus on the class of equilibria in which the voter chooses a simple trigger strategy which is characterized by the property that he punishes the politician if  $g_t \neq g^*$  and always reelects a politician in a period in which  $g_t = g^*$ . This can be justified as we will show that these strategies are also maximum punishment strategies in the context here. The following holds:

**Proposition 1** *Any public good level  $g^* \leq (1 - q)\delta$  can be sustained as a stationary equilibrium choice of incumbent politicians in the voting-appropriation game in which the voter applies a simple trigger strategy. In this class of equilibrium the politician is re-elected in each period with probability  $(1 - q)$  and a politician stays in office for  $\frac{1}{q}$  periods on average in this equilibrium. The equilibrium in this class that maximizes the voter's payoff has  $g^* = (1 - q)\delta$ .*

**Proof.** For a proof, consider the following candidate equilibrium. The voter follows a simple trigger strategy: he reelects the politician in period  $t$  if and only if  $g_t = g^* \leq (1 - q)\delta$ , and does not reelect the incumbent politician but appoints a new politician in all other cases. Any incumbent politician always chooses  $g_t = g^*$ . Relying on the one-stage deviation principle<sup>3</sup>, we confirm that this behavior is superior to one-stage deviations for both players.

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<sup>3</sup>This principle applies in the context here, since the game we consider is an infinite horizon game with observed actions in which future payoffs are discounted and per-period payoffs are bounded, cf. Fudenberg and Tirole (1993, p.108-110).

Consider first the incumbent politician. If he deviates in period  $t$  and chooses some  $g_t \neq g^*$ , he receives a period payoff that is equal to  $1 - g_t$ . However, he is not reelected, and has a period payoff of zero in all future periods. Hence, the maximum the politician can obtain by deviating from  $g^*$  in period  $t$  is obtained for a choice  $1 - g_t = 1$ . A necessary and sufficient condition for non-optimality of a deviation therefore is

$$1 \leq (1 - g) + \sum_{i=1}^{\infty} \delta^i (1 - q)^i (1 - g) \quad (2)$$

and this can be transformed into  $(1 - g) \geq 1 - (1 - q)\delta$ .

Consider now one stage deviations for the voter in period  $t$ . Given the assumed equilibrium play in periods  $t+i$ , the voter is fully indifferent whether to reelect the politician in period  $t$  or whether to appoint another politician, regardless of the observed  $g_t$ . Accordingly, a deviation from the candidate equilibrium choice in period  $t$  is not profitable for the voter. Together with the optimality of  $g_t = g^*$  for the politician, this shows that the candidate equilibrium is indeed an equilibrium.

Condition (2) also shows that  $g^* = (1 - q)\delta$  determines the smallest amount that is repeatedly appropriated by the incumbent politician that is compatible with the assumption that the politician does not prefer to deviate. The equilibrium re-election probability  $(1 - q)$  follows from the equilibrium strategies, and the average duration a politician in office is obtained using the equilibrium election strategies as  $1 + (1 - q) + (1 - q)^2 + \dots = \frac{1}{q}$ . ■

Proposition 1 characterizes a natural class of equilibrium that relates closely to simple trigger-strategy equilibria in games of price wars, such as in Green and Parker (1984). Politicians are not reelected in the equilibrium for reasons of exogenous noise, despite the fact that the player who is punished does not deviate from the stationary collusive action. The risk of "being punished" without having deviated from the collusive equilibrium action reduces the payoff for both the politician and the voter. The equilibrium amount of resources allocated to public provision of potentially useful goods is smaller than in the absence of the possibility of a negative disturbance of the election outcome,  $\theta_t = 0$ . Hence, the risk of  $\theta_t = 0$  reduces the accountability of the politician in the equilibrium. This is evident from

$$\frac{\partial g^*}{\partial q} = -\delta < 0. \quad (3)$$

In what follows we consider the implications of a centralized or decentralized governance structure for the accountability of politicians.

### 3 Fully decentralized governance

Consider first a country that is fully decentralized. It consists of  $n$  independent regions  $j$ . In each region, the governance structure is of the format that has just been described, with a given period budget of size 1, one incumbent politician in each period who chooses  $g_{jt} \in [0, 1]$  in period  $t$ , one voter who chooses  $e_{jt}$  in period  $t$ , and a random disturbance of the election outcome. We assume that the random disturbance factors  $\theta_{jt}$  that transform  $e_i$  into the election outcome  $\theta_i e_i$  are stochastically independent not only across periods, but also across regions. Proposition 1 describes the accountability that can be achieved with this governance structure by simple trigger strategies in each of the  $n$  regions, and, as a straightforward application of Proposition 1, we can state:

**Proposition 2** *Maximum accountability in the fully decentralized country in a stationary equilibrium with simple trigger strategies by voters is described by  $g_{jt} = g^* = \delta(1 - q)$ . The average number of periods in which a politician stays in office is  $1/q$ .*

Note that many of the assumptions we make to describe full decentralization map Oates' (1972) and Tiebout's (1956) ideas about fiscal federalism. The correspondence principle applies: the tax revenue is generated within a region and expended for purposes that only benefit the citizens in this region, and there are no interregional fiscal externalities in terms of taxes or public provision of goods. Also, the decision maker is elected by the constituency in this region. Further, the single-voter assumption maps a regional structure with a homogenous constituency which may be the result of self-selection into homogenous regions, or the outcome of suitable definition of regions.

### 4 Centralized governance with uniformity

In a next step we consider a country in which the  $n$  regions are governed by one single politician who is the incumbent of a centralized government. We will assume that this incumbent is (re-)elected by voters from all regions. For

simplicity, we continue to assume that there is precisely one voter/vote from each region. The intuitive meaning of this assumption is that we consider regions that are homogenous inside, but where there is heterogeneity between regions, and the way we describe the electoral system, we take this feature to its limit. Of course, the assumption maps actual centralized government and its (re-)election more or less adequately. For the US presidency elections, the mapping may be quite close, as the system turns all votes from a state into a single vote either for one or the other candidate. To avoid discussion of ties, we further assume that  $n$  is an uneven number of regions.

The central politician must allocate a budget of size  $n$  in each period. The politician must choose  $g_{jt}$  for each region, and we will consider two distinct regimes. In this section, we consider the *uniformity regime*, in which  $g_{it} = g_{jt} \equiv g_t$  must hold for all  $i, j = 1, \dots, n$ . Note that imposing uniformity of public provision across regions resembles the classic assumption made by Oates (1972). Alternatively, the politician may have some discretion about how much to spend on public provision and how much to keep for other purposes for each region separately; i.e., in this *discriminatory regime*, the incumbent politician in period  $t$  chooses the vector  $\mathbf{g}_t \equiv (g_{1t}, \dots, g_{nt})$ . We consider this discriminatory regime in section 5. The provision decision is followed by the voting decision  $e_{jt}$  in each region. Depending on this decision and the outcomes of  $\theta_{jt}$ , the vote from region  $j$  is  $e_{jt}\theta_{jt}$ .

As there are  $n$  voters, one in each region, with centralised provision, the history of the game at period  $t$  when the incumbent politician makes his uniform provision decision is  $h^t = ((g_0, g_1, \dots, g_{t-1}), (\mathbf{e}_0, \mathbf{e}_1, \dots, \mathbf{e}_{t-1}), (\boldsymbol{\theta}_0, \boldsymbol{\theta}_1, \dots, \boldsymbol{\theta}_{t-1}))$ , where  $\mathbf{e}_\tau$  denotes a vector  $(e_{1\tau}, \dots, e_{n\tau})$ , with  $\tau = 1, 2, \dots, t-1$  and  $\boldsymbol{\theta}_\tau$  denotes a vector  $(\theta_{1\tau}, \dots, \theta_{n\tau})$  with  $\tau = 1, 2, \dots, t-1$ . Accordingly, a strategy for the incumbent politician in period  $t$  is a sequence of mappings  $g_{t+i} : H^{t+i} \rightarrow [0, 1]$ , where  $H^{t+i}$  is the set of all feasible histories in period  $t+i$ ,  $i = 0, 1, \dots$ . Similarly, a strategy for the voter in region  $j$  is a sequence of mappings  $e_{jt+i} : H^{t+i} \times [0, 1] \rightarrow \{0, 1\}$ . The objective functions of the voters in region  $j$  at period  $t$  is

$$V_{jt} = \sum_{i=0}^{\infty} \delta^i g_{t+i}$$

analogously to (1). Noting that now the re-election probability can depend on the number of regions, i.e.,  $p_t = p_t(\mathbf{e}_t, q, n)$ , the payoff of the incumbent politician in the centralized country with uniformity is

$$\Pi_t = n[(1 - g_t) + \delta(1 - g_{t+1})p_t + \delta^2 q^2(1 - g_{t+2})p_t p_{t+1} + \dots].$$

The politician who governs the whole country is reelected in period  $t$  if the majority of votes  $e_{jt}\theta_{jt}$  turns out to be favorable, i.e., if

$$\sum_{j=1}^n e_{jt}\theta_{jt} \geq \frac{n+1}{2}. \quad (4)$$

We can now state the main proposition on the *centralized regime with uniformity*.

**Proposition 3** *Any public provision  $g^*$  can be sustained as a stationary equilibrium in the centralized economy in the uniformity regime for which the condition*

$$g^* \leq \delta \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k$$

*is fulfilled. In this class of equilibrium the incumbent politician is re-elected in a given period with probability  $\sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k$ . Public provision in this equilibrium is higher (lower) than public provision in the fully decentralized case if  $q < (>)\frac{1}{2}$ .*

**Proof.** Consider the following candidate equilibrium. The central politician always chooses

$$g^* = \delta \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k.$$

For all regions  $j$ , the voter in region  $j$  chooses  $e_{jt} = 1$  if  $g_{jt} = g^*$  and  $e_{jt} = 0$  otherwise. As period payoffs are bounded absolutely from above and below by 0 and  $n$  for the politician and by 0 and 1 for the voter of a region, and as  $0 < \delta < 1$ , the one-stage deviation principle applies. It is therefore sufficient to consider one stage deviations. For the politician, any deviation reduces his reelection probability to zero. The deviation that maximizes his payoff is  $g_{jt} = 0$ . This choice yields a payoff equal to  $n$ , and this deviation is weakly inferior if

$$n \leq \frac{n(1-g^*)}{1-\delta\chi(n)}, \quad (5)$$

where

$$\chi(n) = \text{prob}\left(\sum_{j=1}^n \theta_{jt} \geq \frac{n+1}{2}\right) = \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k. \quad (6)$$

Turn to the voter of region  $j$ . If the effort that was provided is described by  $g_{jt} = g^*$  in all regions, the candidate equilibrium choice is  $e_{jt} = 1$ . Deviating from this choice may still re-elect the same politician into the central government, or may elect a different politician into office. Given the candidate equilibrium continuation play, this deviation does not increase the voter's payoff. Similarly, if  $g_{kt} \neq g^*$  in at least one region  $k$ , the candidate equilibrium action is to vote  $e_{jt} = 0$  for all voters in all regions. However, deviating from this choice and possibly re-electing the incumbent politician will not change the payoff given the candidate equilibrium play in future periods. This shows that the candidate equilibrium is, indeed, an equilibrium.

Note further that the public provision that can be sustained in this stationary equilibrium is higher than in the decentralized equilibrium if

$$\sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k > 1-q. \quad (7)$$

General results derived by Uhlmann (1966) imply that

$$\sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k = \frac{1}{2},$$

so that (7) will be fulfilled if  $q < 1/2$ . ■

Proposition 3 shows that, in the uniformity regime, a simple symmetric trigger strategy by all regions can sustain an equilibrium in which the politician's accountability is higher than in the decentralized equilibrium. We note that this will be the case, if additional factors outside the politicians' control are relatively unimportant. If random factors that will destroy the re-election possibilities for outside reasons are relatively important, the centralised solution will result in a lower level of accountability.

The intuition of the result is as follows. If region-specific random factors are relatively unimportant in each single region, an increase in the number of regions implies that it will be more likely for the incumbent to find support by a majority of regions. The reelection uncertainty in each region reduces in the aggregate. This reduces the possibility of losing office in the future and the value of staying in power increases. To stay in office, politicians are happy with a lower fraction of private benefits. Thus, because holding office becomes more valuable in the centralised system, voters have more leverage

to control politicians by voting them out of office. Note that this is not a scale effect: the result does not depend on the total amount of funds that are at the politician's disposal in each given period. The effect stems from the possibility of forming winning majorities with changing jurisdictions. Therefore, if the random component in the voting outcome is sufficiently small, it will wash out with an increase in the number of regions / voters. However, if the random component is very large, the effect reverses. If it is very likely that voters turn against the incumbent for exogenous reasons, and if this effect is idiosyncratic, then, with an increase in the number of voters, it becomes more and more likely that the majority of voters votes the incumbent out of office, independent of their conscious decision making as regards whether the politician behaved accountably in the respective period or not. More generally, we can show the following comparative static result:

**Proposition 4** *If  $q < \frac{1}{2}$  then  $g^*$  increases in the number of regions, and if  $q > \frac{1}{2}$  then  $g^*$  decreases in the number of regions.*

**Proof.** We need to show that the probability of winning a majority of votes from the regions is increasing in the number of regions  $n$ , if  $q < 1/2$ . Thus we need to show that

$$\sum_{k=0}^{\frac{n+2-1}{2}} \binom{n+2}{k} (1-q)^{n+2-k} q^k > \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k \text{ if } q < 1/2.$$

However, this follows from

$$\begin{aligned} & \sum_{k=0}^{\frac{n+1}{2}} \binom{n+2}{k} (1-q)^{n-k+2} q^k \\ = & \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k + \binom{n}{\frac{n+1}{2}} \left[ (1-q)^{\frac{n+3}{2}} q^{\frac{n+1}{2}} - (1-q)^{\frac{n+1}{2}} q^{\frac{n+3}{2}} \right] \end{aligned}$$

as the second term on the right hand side

$$\binom{n}{\frac{n+1}{2}} \left[ (1-q)^{\frac{n+3}{2}} q^{\frac{n+1}{2}} - (1-q)^{\frac{n+1}{2}} q^{\frac{n+3}{2}} \right] > 0, \text{ if } (1-q) > q, \quad (8)$$

or, equivalently, if  $q < \frac{1}{2}$ . ■

The intuition follows from the intuition of proposition 3. As the number of regions increases, it becomes easier to form a majority combination of regions that are not affected by the potential negative distortion of the reelection decision, if the probability of such a distortion is low. If it is high, it becomes less likely to form such a majority, which accordingly reduces public good provision levels.

We could think of many more complex strategies applied by voters to further increase the accountability of the incumbent politician. However, this turns out not to be necessary. Credible threats that imply stronger punishment allow, generally, for more cooperation between the politician and the electorate to be sustainable. Voters can always replace the politician with a perfect substitute. The most the incumbent can hurt the electorate is to provide no public goods at all and then be replaced. On the other hand, there is no stronger punishment for voters other than to send the politician home in our framework, which guarantees him zero payoffs for the future. Thus, the Nash threats we consider already have the maximum possible punishment in the present framework and, hence, no other credible threat exists that could enhance cooperation between the electorate and the politicians in the repeated game.

The key assumption that causes this outcome is that the noise or disturbance  $\theta_{i\tau}$  that turns a positive reelection choice into the election outcome is, to some degree, idiosyncratic to the region. It seems to be natural to assume that regions differ in their perceptions about politicians' ability, charisma or other characteristics that affect the vote that comes from a particular region.<sup>4</sup> That these random influences on the re-election decision are not correlated across regions may also be backed up by the standard sorting argument in federalism. People select themselves into different jurisdictions according to their preferences. It seems natural to assume that the random factors affecting people with different preferences are largely uncorrelated. Finally, we considered the benchmark case of stochastic independence of  $\theta_{i\tau}$  across regions and across periods. This was mainly for simplicity. A more

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<sup>4</sup>An additional observation that strengthens this perspective regards the role of the media in election campaigns. While at the local or regional level the diversity of the media may be limited, because there may only be one or relatively few important local newspapers or radio and TV stations, this is less likely to be the case across different regional constituencies, where different voters are likely to be influenced by different media. Clearly, the media play a decisive role for random factors that decide actual election outcomes.

realistic assumption would be that there is some, but not perfect correlation across regions. As long as some of the noise washes out in the aggregate decision if there are more votes that need to be aggregated, then this effect will make centralized governance regimes more accountable than fully decentralized governance regimes.

## 5 Centralized system with non-uniform provision

We now replace the uniformity assumption by the following centralized but *discriminatory regime*: the incumbent in period  $t$  receives a budget of size  $n$  and can choose  $\mathbf{g}_t = (g_{1t}, g_{2t}, \dots, g_{nt})$  with  $g_{jt} \in [0, n]$  for all  $j = 1, 2, \dots, n$ , and  $\sum_{j=1}^n g_{jt} \leq n$ , for all periods  $t$ . The history of the game at period  $t$  when the incumbent politicians make their provision decisions is  $h^t = ((\mathbf{g}_0, \mathbf{g}_1, \dots, \mathbf{g}_{t-1}), (\mathbf{e}_0, \mathbf{e}_1, \dots, \mathbf{e}_{t-1}), (\boldsymbol{\theta}_0, \boldsymbol{\theta}_1, \dots, \boldsymbol{\theta}_{t-1}))$ , where  $\mathbf{g}_\tau = (g_{1\tau}, g_{2\tau}, \dots, g_{n\tau})$ ,  $\mathbf{e}_\tau = (e_{1\tau}, e_{2\tau}, \dots, e_{n\tau})$ , and  $\boldsymbol{\theta}_\tau = (\theta_{1\tau}, \theta_{2\tau}, \dots, \theta_{n\tau})$ , for  $\tau = 0, 1, \dots, t-1$ . The payoff of an incumbent politician is now

$$\Pi_t = \sum_{j=1}^n (1 - g_{jt}) + \delta p_t \sum_{j=1}^n (1 - g_{jt+1}) + \delta^2 p_t p_{t+1} \sum_{j=1}^n (1 - g_{jt+2}) + \dots$$

Accordingly, a strategy for the politician is a sequence of mappings  $\mathbf{g}_{t+i} : H^{t+i} \rightarrow [0, 1]^n$ , where  $H^{t+i}$  is the set of all feasible histories in period  $t+i$ ,  $i = 0, 1, \dots$ . Similarly, a strategy for the voter in region  $j$  is a sequence of mappings  $e_{jt+i} : H^{t+i} \times [0, 1]^n \rightarrow \{0, 1\}$ . Again, we are looking for maximum accountability that can be achieved in this regime in a stationary equilibrium in pure strategies.

**Proposition 5** *Any public provision  $\mathbf{g} = (g_1, g_2, \dots, g_n)$  can be sustained as a stationary equilibrium in the centralized economy for which the condition*

$$\sum_{j=1}^n g_j \leq n\delta \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k$$

*is fulfilled. In this class of equilibrium the politician is re-elected in any given period with probability  $\sum_{i=0}^{\frac{n-1}{2}} \binom{n}{i} (1-q)^{n-i} q^i$ , and public provision is higher (lower) than public provision in the fully decentralized case if  $q < (>) \frac{1}{2}$ .*

**Proof.** Consider the following candidate equilibrium. The central politician always chooses  $\mathbf{g}^*$  with

$$\Sigma_{j=1}^n g_j^* = n\delta \sum_{k=0}^{\frac{n-1}{2}} \binom{n}{k} (1-q)^{n-k} q^k.$$

For all regions  $j$ , the voter in region  $j$  chooses  $e_{jt} = 1$  if  $\Sigma_{j=1}^n g_{jt} = \Sigma_{j=1}^n g_j^*$  and  $e_{jt} = 0$  otherwise. Again, the one-stage deviation principle applies. For the politician, any deviation in period  $t$  reduces his reelection probability to zero. The deviation that maximizes his payoff is  $\Sigma_{j=1}^n g_{jt} = 0$ . This choice yields a payoff equal to  $n$ , and this deviation is weakly inferior if

$$n \leq \frac{n - \Sigma_{j=1}^n g_j^*}{1 - \delta\chi(n)}, \quad (9)$$

where  $\chi(n)$  is again given by (6). Comparing the numerator of (9) with (5) shows that  $ng^*$  is simply replaced by  $\Sigma_{j=1}^n g_j^*$ .

Turn to the voter of region  $j$ . If the overall provision is described by  $\Sigma_{j=1}^n g_j^*$ , the candidate equilibrium choice is  $e_{jt} = 1$ . Deviating from this choice may still re-elect the same politician into the central government, or may elect a different politician into office. But given the candidate equilibrium continuation play, this deviation does not change the voter's payoff. Similarly, if  $\Sigma_{j=1}^n g_{jt} \neq \Sigma_{j=1}^n g_j^*$ , the candidate equilibrium action is to vote  $e_{jt} = 0$  for all voters in all regions. Deviating from this choice and possibly re-electing the incumbent politician will also not change the payoff given the candidate equilibrium play in future periods. This shows that the candidate equilibrium is, indeed, an equilibrium.

Parallel to the argument in the proof of proposition 3 we can show that aggregate public provision that can be sustained in this stationary equilibrium is higher than in the decentralized equilibrium if  $q < 1/2$ . ■

The proof of Proposition 5 follows lines parallel to the proof of Proposition 3. The voters in region  $j$  know the full history of the game, and not only the public provision in their own region, and their trigger strategy depends on the provision that takes place in all regions. This makes the voters in the discriminatory regime as powerful as in the uniformity regime and yields the same amount of accountability. In particular, the same uniform stationary equilibrium that maximizes accountability in the uniformity regime remains sustainable in the discriminatory regime. The trigger strategies of regions

depend on the full set of public provisions that take place in all regions, in the equilibrium for which the total sum of public provisions is largest this total sum is the same in the uniformity regime and in the discriminatory regime. It is not feasible for the incumbent politician to increase the sum that he can appropriate over and above  $n - \sum_{j=1}^n g_j^*$ , for instance, by selecting only some subset of regions and basing his reelection on preferential treatment of these regions. Note also that Proposition 5 does not state that  $g_j^*$  is uniform in the equilibrium with maximum accountability. Maximum accountability is an aggregate measure, and may go along with uneven public provisions across regions. A constitutional uniformity requirement could therefore well be based on considerations of interregional equity.

The assumption that the voter of region  $j$  uses a trigger strategy that depends not only on the public provision experienced in region  $j$ , but also on the public provision in all other regions may be natural in the uniformity regime, as the provisions are identical in all regions by construction. It is a stronger assumption in the context of the discriminatory regime. It is therefore important to assess how a weaker assumption may reduce the maximum accountability that can be obtained by infinitely repeated interaction. We focus on the case in which the voter in each region can condition his own voting decision on the history of provisions that he received in his region only. We impose this restriction but sustain the assumption of complete information,<sup>5</sup> the additional restriction on strategies being that mappings  $e_{jt+i} : H_j^{t+i} \times [0, 1]^n \rightarrow \{0, 1\}$ ,  $i = 0, 1, \dots$ , that are constant with respect to all components of  $h^{t+i}$  except for the values of  $g_{j0}, g_{j1}, \dots, g_{jt+i}$ .

Suppose a stationary equilibrium exists and is characterized by a provision vector  $\mathbf{g}_t = \mathbf{g} = (g_1, g_2, \dots, g_n)$ , and, without loss of generality, assume that the regions are numbered in a way such that  $0 \leq g_1 \leq g_2 \leq \dots \leq g_n$ . Suppose that the voter in each region applies the following trigger strategy:  $e_{it} = 1$  if  $g_{it} = g_i$ , and  $e_{it} = 0$  otherwise. What would be the best stationary reply for an incumbent in period 0? Note first that any vector  $(\hat{g}_1, \dots, \hat{g}_n)$  with components  $\hat{g}_i \notin \{0, g_i\}$  is suboptimal, as it is dominated by replacing  $\hat{g}_i$  with 0 in this vector. Next, note that any vector  $\hat{\mathbf{g}}$  is suboptimal that has  $\hat{g}_i = 0$  and  $\hat{g}_{i+j} = g_{i+j} > 0$ , unless  $g_i = g_{i+1} \dots = g_{i+j}$ , as it is dominated by a vector that has  $\hat{g}_i = g_i$  and  $\hat{g}_{i+j} = 0$  and that is identical with  $\hat{\mathbf{g}}$  along all other components. Further, any vector that has a positive number

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<sup>5</sup>Accounting for incomplete information yields a rather different framework with type dependent histories, Bayesian updating and belief formation.

of strictly positive components with this number being smaller than  $\frac{n+1}{2}$  is also suboptimal, as it is strictly dominated by  $\hat{\mathbf{g}} = \mathbf{0}$ . In short, the optimal stationary reply to the stationary strategy of the voters must be either  $\hat{\mathbf{g}} = \mathbf{0}$ , or a vector of provisions that is positive only in its  $n - k \geq (n + 1)/2$  components and provides exactly  $\hat{g}_i = g_i$  in these components. The re-election probability of the politician depends on the choice of this vector, and this probability is equal to

$$\chi(n - k) \equiv \sum_{s=0}^{\text{integer}(\frac{n+1-k}{2})} \binom{n-k}{s} (1-q)^{(n-k)-s} q^s. \quad (10)$$

Here,  $\text{integer}(\frac{n+1-k}{2})$  denotes the largest integer that is smaller or equal to  $(n - k)/2$ , and we assume implicitly for  $n - k$  being even that the incumbent politician is elected if he obtains exactly half of the votes.<sup>6</sup> The incumbent politician's optimal reply to the voters' trigger strategies with respect to  $(g_1, \dots, g_n)$  is a provision vector  $(g_1, g_2, \dots, g_{n-k}, 0, \dots, 0)$  such that  $k$  is

$$k^{DC}(\mathbf{g}) \equiv \arg \max_{k \in \{0, 1, \dots, \frac{n-1}{2}, n\}} \Pi(k), \text{ where } \Pi(k) = \begin{cases} \frac{n - \sum_{j=1}^{n-k} g_j}{1 - \delta \chi(n-k)} & \text{for } k \in \{0, \dots, \frac{n-1}{2}\} \\ n & \text{for } k = n \end{cases}$$

We can now use this insight to show the following proposition:

**Proposition 6** *Let  $ng^*$  be the maximum provision that can be sustained in a stationary equilibrium with uniform provision and unconstrained trigger strategies. The maximum provision that can be sustained as a stationary equilibrium with discriminatory provision and trigger strategies that condition only on current provision in the voter's own region (short: DC-equilibrium) is at most  $ng^*$ , and for  $n$  sufficiently large it is smaller than  $ng^*$ .*

**Proof.** The first part of the proof follows from Proposition 5. Suppose a higher value of total provision than  $ng^*$  could be implemented. For this stationary equilibrium to be (weakly) superior to a choice of  $g_i = 0$  for all  $i = 1, \dots, n$ , the re-election probability of the politician had to be higher than in the equilibrium in Proposition 5, but this is incompatible with  $e_{it} = 1$  for all  $i$  and all  $t$  in the equilibrium in Proposition 5.

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<sup>6</sup>This is a tie-breaking rule that does not affect our results qualitatively.

For the second part of the proposition note first that any DC equilibrium must also fulfill the condition

$$n \leq \frac{n - \sum_{j=1}^{n-k^{DC}} g_j^{DC}}{1 - \delta\chi(n - k^{DC})} \quad (11)$$

Compare the maximum  $\sum_{i=1}^{i=n-k^{DC}} g_i^{DC}$  that fulfills 11 for any given  $k^{DC}$ . Note that this maximum is equal to  $ng^*$  for  $k^{DC} = 0$ , and strictly smaller for all  $k^{DC} > 0$ , as  $\chi(n - k^{DC})$  is strictly decreasing in  $k^{DC}$ . It is therefore sufficient to show that  $\mathbf{g} = (g_1, \dots, g_n)$  with  $\sum_{i=1}^{i=n-k} g_i = ng^*$  and  $k = 0$  is not an DC-equilibrium if  $n$  is sufficiently large.

Suppose  $g = (g_1, \dots, g_n)$  is a provision vector that can be sustained as an DC-equilibrium with  $\sum_{i=1}^{i=n-k^{DC}} g_i = ng^*$  and  $k^{DC} = 0$ . Then, by appropriately numbering of regions in ascending order of provisions, it holds that  $g_n \geq g^*$ . Consider the incumbent politician who chooses between provisions  $\mathbf{g}$  and  $\check{\mathbf{g}} = (g_1, g_2, \dots, g_{n-1}, 0)$ . The respective payoffs are

$$\Pi(n) = \frac{n - ng^*}{1 - \delta\chi(n)}$$

and

$$\check{\Pi}(n-1) \geq \frac{n - (n-1)g^*}{1 - \delta\chi(n-1)} \quad (12)$$

The right-hand side in (12) is higher than  $\Pi(n)$  if

$$g^* > \frac{n\delta[\chi(n-1) - \chi(n)]}{[1 - \delta\chi(n-1) + n\delta[\chi(n-1) - \chi(n)]]}.$$

Note that  $\lim_{n \rightarrow \infty} \{\chi(n-1)\} = \lim_{n \rightarrow \infty} \{\chi(n)\} = 1$  and, hence,

$$\lim_{n \rightarrow \infty} \left\{ \frac{n\delta[\chi(n-1) - \chi(n)]}{[1 - \delta\chi(n-1) + n\delta[\chi(n-1) - \chi(n)]]} \right\} = 0,$$

but  $\lim_{n \rightarrow \infty} g^*(n) = \delta > 0$ . Accordingly, for sufficiently large  $n$ , the incumbent politician prefers  $\check{\mathbf{g}}$  to  $\mathbf{g}$ . ■

The level of accountability that can be sustained in a symmetric equilibrium is lower in the discriminatory provision equilibrium than in situations in which each regions conditions its strategy on the incumbents track record in all regions. Intuitively, since regions only condition their behavior on their

local provision levels, the regions as a whole lose leverage against the incumbent. The incumbent in turn does not depend on all regions to build a nationwide majority, but can consider dropping some regions all together, and still find a majority of favorite votes under this setting.

The finding is related to the result derived by Ferejohn (1986) on the relationship between an incumbent politician and a non-homogenous electorate. Wrede (2006) makes a related argument in favor of uniform provision in a federal system. Both Ferejohn (1986) and Wrede (2006) find that the competition between multiple voters can result in a total loss of accountability, which, applied to the context with homogenous regions, would even imply zero provision levels for all regions. It is important to note, however, that the underlying mechanism in their papers is very different. In our framework the levels of  $g_i$  or  $\mathbf{g}$  which voters find acceptable or not are given from the outset and not the outcome of a bidding process between voters/regions. The politician does not have the option to approach the different voters and negotiate these levels. If the politician has this option, given that he needs only a simple majority of votes, he can stage a competition between the voters and "buy" a given number of votes  $m < n$ . As there are more voters than needed, Bertrand competition can drive down  $g_i$ , and the politician and the voters may settle for very low values of  $g_i$ . Whether this type of bargaining can take place is an empirical matter, and is not an option in our framework. If this option is introduced, it exhibits a further reason for lower accountability of decentralized structures. This reason adds to, but is different from, the reason that we concentrate on here.

## 6 Conclusion

We have shown that centralisation can actually result in higher accountability, if the exogenous probability of a negative distortion of the re-election choice is relatively small. Arguably, this is a reasonable assumption, since the election choice is likely to be dominated by the "hard facts", in particular the way in which the politician has conducted his office. The pooling of potentially distorted votes in the centralized system increases the likelihood that politicians that deliver public goods to citizens actually get rewarded with an additional term in office. This implies that the rents per term in office can be reduced to make the politician indifferent between grabbing today and losing office or staying on.

Previous theoretical work that addressed the relationship between the degree of centralisation of government and the level of political accountability has typically found a monotone positive relationship between decentralisation and accountability. Our results point in the opposite direction, at least for the case of uniform provision. We should conclude that the relationship between decentralisation and accountability is potentially more involved than previously thought and potentially non-monotone.

We have derived our results in a setting in which regions differ with respect to the shock that potentially distorts their re-election choice. However, the mechanism we have identified appears to be important even in a broader sense, since other kinds of shocks that affect the interaction between the incumbent politician and the electorate can have similar effects.

We also found strong arguments for uniform provision levels in centralised systems. First, if voters in each region base their retrospective voting on the provision level in all regions, the maximum level of public good provision can be sustained is defined only in the aggregate. This implies that there could be strong distributional imbalances in the equilibrium. Thus, there is a good reason for uniform distribution for reasons of interregional equity, even in a situation, in which all regions are *ex ante* identical. Second, if voters in each region base their retrospective voting only on the level of public good provision in their region, the discriminatory regime will result in reduced accountability. Of course, in our setting all regions were identical and there is therefore no inherent costs of uniform treatment of all regions. In reality, regions are likely to be asymmetric and therefore there may exist reasons for having differentiated policies towards them. If such benefits are strong, it may be preferable to move to a decentralized system, since a centralized discriminatory regime tends to reduce accountability.

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