Devolving the Productivity Puzzle: Tax Autonomy and Political Incentives

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Abstract

Devolving tax-raising powers to lower levels of government is often argued to better align the actions of politicians with the wishes of voters. We study whether this kind of tax autonomy can bring about productivity-enhancing policies as well. In our model this kind of productive investment boosts the devolved tax base, and as such creates additional (political) resources for lower-level politicians. These resources can then be used to target voters with specific interests, where strategies can vary from standard 'pork barrel' spending to tapping into regional identities or nationalist undercurrents. Productive investment thus allows local politicians to improve their chances of re-election in two ways: not just by improving their reputation, but also by targeting voters. Because of this disciplining mechanism – and given a sufficient amount of rent-seeking politicians capable of targeting voters – extending subnational tax autonomy unambiguously adds to investment and voter welfare.

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1 Introduction

In most countries public provision is to some degree devolved to lower levels of government. One of the advantages of this kind of 'devolution' is that it can make politicians more accountable, in the sense that policy choices are better aligned with voter preferences.[1] The argument relies on the interplay of transparency and incentives. Devolution means policies are brought 'closer' to voters, so that policy information becomes more available and relevant. As a result, incumbent politicians are more easily rewarded, or punished, for their policies. But the way in which these policies are financed matters as well. To different degrees, lower-level governments lack the means to fully fund their own policies, and hence also rely on grants received from higher levels. Indeed, own revenue-raising covers on average just 60% of lower-level spending across OECD countries.[2] This is likely to affect political incentives as well, which will be our focus here.

We study the accountability effects of devolving tax authority *alongside* public functions in a political agency model. This allows us to derive more general conditions for decentralisation to improve welfare, also via policies that increase productivity. In our model, lower-level politicians face specific fiscal and political incentives *because* taxes are decentralised, which can drive even rent-seekers to implement growth-enhancing reforms. They would do so to generate additional (political) resources, with which they can target the specific interests of certain subgroups of voters in the standard 'pork barrel' sense, but also cater to interregional competition or outright nationalism. Since this improves their chances of re-election, it is in their own interest to invest in regional growth and boost tax revenues. Such a self-reinforcing 'fiscal interest' story then complements the standard accountability argument, which relies on improved transparency only.

Indeed, the most common argument in favour of decentralising tax instruments is that it also provides better information about the quality of politicians, by directly linking lower-level spending to revenue raising (Boadway and Tremblay, 2012).[3] The fact that voters in neighbouring jurisdictions would pay more or less taxes for comparable public services thus becomes a kind of yardstick, by which the performance of one's own politicians can be sized up.[4] For this kind of interregional 'yardstick competition' to work, however, a number of restrictive assumptions need to hold. First, information about taxes and public provision in

[1] Seabright (1996) was first to define this kind of political accountability as the "probability that the welfare of a given lower-level jurisdiction determines the election of its government".

[2] Own calculations for 2012:http://www.oecd.org/tax/federalism/oecdfiscaldecentralisationdatabase.htm).

[3] For evidence on the positive impact of local tax autonomy on accountability, see Faguet (2004) for Bolivia and Columbia, Geys et al. (2010) for Germany, Boetti et al. (2012) for Italy, and Paler (2013) for Indonesia.

[4] See Besley and Case (1995), Bordignon et al. (2003), Allers and Elhorst (2005), Bosch and Solé-Ollé (2007) or Revelli and Tovmo (2007) for evidence on yardstick competition.

other jurisdictions has to be widely accessible, which will be less the case when inter-regional mobility is low and media outlets are locally centered. Even if this is the case, secondly, public provision has to be comparable across jurisdictions as well, with similar cost drivers moving simultaneously through time. Third, this kind of scrutiny cannot reach the point where political discipline is undermined rather than strengthened. Since chances are higher that corruption is found out in an increasingly transparent system, bad politicians may indeed prefer to steal even more rather than try to win re-election. If the pool of candidates consists mostly of bad politicians, this brings about a perfect storm: bad politicians siphon off more rents, are voted out more often, and in their place comes exactly the same type of politician who does exactly the same thing.[5]

Importantly, improved transparency is not the only possible effect of decentralised tax autonomy. Abstracting from yardstick competition in our model, we generalise the approach of Weingast (1995, 2009) who makes a case for *fiscal incentives*. The crux of our argument is that if a policy measure boosts regional growth and productivity, this is likely to affect the tax base of e.g. personal income, business, or property taxes positively at some point as well. A certain degree of devolved tax autonomy thus allows localities to tap into this expansion of the local tax base. Rent-seeking politicians will then be tempted to pursue this prospect of growing revenues for two reasons. First, the additional resources can be captured for short term rent extraction. Second, they can be used to target the specific interests of voters, hence improving re-election probabilities and future rent-seeking returns. In both cases, however, it is in the politician's own "fiscal interest" to invest in growth-enhancing policies. A virtuous cycle is thus set in motion, where the right investment policies lead to additional tax revenues which, in turn, lead to more of these policies. The disciplining features of such a fiscal feedback loop can be expected to boost voter welfare, especially in the case described above where the pool of candidates consists mostly of bad politicians, and yardstick competition is likely to fail.[6]

Taking up a political agency perspective, our theoretical contribution will be to micro-found the fiscal incentives of subnational politicians described above. Our model of incomplete information spans two time-periods, allows for benevolent as well as rent-seeking types of politicians unobserved by voters, and is applicable to multi-tiered forms of government. Importantly, growth-enhancing policies – such as productive investment or business-friendly

[5]This is more likely to occur when discount rates and/or short-term rents are high. See also Besley and Smart (2007) for a theoretical examination of this channel.

[6]See also Qian and Weingast (1997) and Weingast (2014). Jin et al. (1999, 2005) present evidence on the Chinese case, where the marginal retention rate can be directly identified. Kappeler et al. (2013) conduct a cross-country study focusing on public productive investment, confirming the fiscal interest story. Gadenne (2017) shows that Brazilian municipalities invest more in education investment when their tax capacity increases.

regulatory efforts – bring about additional tax revenues and political resources, which can be used to target specific voters.[7] We furthermore introduce two types of voters, coined 'valence' and 'priority' voters. Both types of voters agree on the importance of a *valence* issue – which in the political science literature is defined as any policy item capturing general prosperity – but the degree to which they do so differs.[8] Valence voters mostly favour politicians investing in the valence issue which, in our case, will be the investment in economic performance central to the fiscal interest story.[9] Inversely, priority voters lean more towards politicians targeting their specific interests, which could be anything. Targeting these interests can thus take the form of standard pork-barrel spending, which is well-described in the literature.[10] It could also apply to a broader targeting strategy where, even though the material gains of productive investment – and hence the additional tax revenues to finance specific pet projects – have yet to materialise, their future promise is enough to win over the priority vote. This can be thought of as borrowing political capital against the future to cater to special interests in the present. Future growth could also be cast as a more regionalist narrative, focusing on the relative fiscal stance of the region – and hence its prestige – within the federation, which is promised to improve because of growing own tax revenues. The latter strategy could then be used to target voters who prioritise the interests of their own region, or identify strongly with their region and its characteristics.

What we find is that rent-seeking incumbents now have two reasons to invest in the valence issue of economic prosperity. First, improving their reputation to win over more valence voters as in Besley and Smart (2007), and second, raising the political capital through tax revenues to target priority voters. The degree to which this second strategy improves re-election probabilities however, hinges on the composition of the voting population, as well as the targeting effectiveness and credibility of the incumbents. Indeed, the more priority voters there are to be won over, and the easier it is to target respective subgroups of priority voters, the more pronounced the fiscal incentives will be. Higher degrees of tax autonomy will generate more political resources available for targeting, hence improving its effectiveness. The credibility of the incumbent party to target certain specific subgroups, such as e.g. regional nationalists, will strongly depend on its earlier political stance and affect the targeting success rate as well. All of these elements are then shown to work towards a favourable outcome of less rent diversion, less political turnover, and more discipline.

[7] Contrary to the windfall rents discussed in Brollo et al. (2013), these additional revenues will never be sufficiently large to attract ever more rent-seeking candidates to the pool of politicians standing for office.

[8] See e.g. Stokes (1963) or Green (2007) for an application of the valence concept in the presence of party competition.

[9] As also argued by Cadot et al. (2006) infrastructure investment is not a policy issue drawing on the partisanship of voters, and thus rarely pits different parts of the electorate against each other.

[10] Roberson (2008),

Furthermore, we show that this disciplining effect is related to the institutional setup of a country. It is stronger in a unitary setting, where all of public provision is kept at the center. The reason is that, depending on the voting rule in place, an incumbent central government only needs to win the elections in a pivotal amount of its constituencies.[11] Translated to our setting, this means it would only need to introduce growth-enhancing policies in a pivotal subset of its constituencies to improve its chances of re-election.[12] The fact that productive investment thus becomes less costly for a rent-seeking central government, simply because it can extract more rents overall, is then shown to be mutually reinforcing with the fiscal incentives described above.[13] However, in the more realistic setting where public functions are partially decentralised and a sufficient amount of politicians is rent-seeking, expanding decentralised tax autonomy unambiguously boosts voter welfare.

Compared to the more general accountability reasoning lastly, where the valence issue could be anything, our approach delimits welfare-enhancing policies to economically productive policies. If we relax this assumption, rent-seeking politicians would mainly push through productive investment to spend the additional revenues on whatever the valence issues in question are, as well as on vote targeting as before. However, in this case productive investment no longer automatically improves the incumbent's reputation, which is not very realistic. An innovation of our model is precisely that public investment is implicitly valued *both* by voters and rent-seekers, albeit for different reasons. Voters value it because it improves overall welfare, whilst rent-seeking incumbents value it because it improves their reputation.

Related Literature

By modelling tax autonomy as a channel through which the disciplining effect of elections manifests itself in a federal constellation, we contribute to the political agency literature which studies the incentives of local or state politicians. Seabright (1996) pioneered this strand of research by focusing solely on rent-seeking politicians, and hence, on the improved disciplining effect of decentralising public functions only. Persson and Tabellini (2002a) widen this purely moral hazard-based approach employing a career-concerns model where some selection of competent politicians does occur, but this is done independently from the level of government at which politicians operate. Our model complements these approaches by

[11] Coined by Lockwood (2006) as the 'reduced pivot-probability effect', the underlying mechanism was first introduced Seabright (1996).

[12] Of course, this argument is mostly relevant for the purely 'pork barrel' oriented strategies, where spending is directed or promised to certain subgroups directly, rather than used to turn regional sentiment into electoral advantage, which would be a less credible strategy if pursued by the central government.

[13] The reason is that the pooling strategy of rent-seekers, where maximum rent diversion is postponed to later time periods to signal benevolence, is less costly for a central government than for a subnational government in this case. Indeed, a central government can extract maximum rents in its non-pivotal constituencies, and will therefore tend to be more disciplined.

focusing on the revenue side of fiscal federalism instead of on the expenditure side, and of course by introducing the fiscal and political benefits of productive investment.

Moreover, the model adds to this literature by allowing for different selection and discipline intensities on the central and state level. The reason is that incumbents have multiple strategies at their disposal, of which the effectiveness differs depending on the level of government. In this sense, our model is closest to the work of Hindriks and Lockwood (2009), which also builds on the signalling framework of Besley and Smart (2007), and where rent-seeking politicians exploit asymmetrically available information to mimic their benevolent counterparts as well. However, whereas Besley and Smart (2007) do not consider multi-tiered settings, and Hindriks and Lockwood (2009) only study a fully decentralised setting where lower-levels of government are entirely self-financed, our setup allows for every degree of lower-level tax autonomy. From this perspective, the model we present can be seen as mirroring Joanis (2014), who studies the accountability implications of shared public functions between levels of government, instead of shared taxation in our case.

For this reason, our model also adds to the literature on the partial decentralisation of taxation in a federation. In both Brueckner (2009), Borge et al. (2014) and Bellofatto and Besfamille (2018), partial decentralisation is defined as a situation in which lower-level governments are fully financed by the central government, but have full autonomy over public expenditures. Comparing the limit cases of tax decentralisation in a Tiebout (1956) model, both of the former find that welfare improves after moving from full centralisation to partial decentralisation. The latter specifically consider the trade-off between administrative and fiscal state capacity, and show that the presence of sufficiently low levels of administrative capacity is a necessary condition for full decentralisation dominance. Our model not only introduces elections and an agency dimension to this perspective, but also considers the entire range of local tax autonomy in between both limit cases. In this vein we are closest to Peralta (2012), who employs the same limit cases as Brueckner (2009) in an agency model which abstracts from fiscal incentives and probabilistic voting – to find that disciplining effects are weaker when taxes are fully decentralised. Our model then fills in the blanks between both limit cases, where the variation in local tax autonomy is crucial to studying the importance of fiscal incentives.

The remainder of this paper is organised in the standard fashion. In Section 2.1 we set out our fiscal incentives approach in further detail, and introduce the economic and political environment of the model. In Section 2.3 we discuss the information available to the main decision-makers, namely voters and politicians, and define the timing of their decisions. Section 3 then considers a decentralised equilibrium within a federal constellation, whilst Section 4 sizes up the main implications in terms of voter welfare of such a fiscal regime. In

Section A of the appendix lastly, we consider a unitary setting instead, and compare both regimes.

2 The Model

We model a federal economy with two levels of government, and an odd number $n \geq 3$ of lower-level jurisdictions referred to as states. We consider two time periods $t = 1, 2$, with elections held in between both periods. Once elected, each state government decides on a growth-enhancing policy G_i in its state i and in each time period, after observing unit costs θ_i of productive investment. Unit costs can be high (H) or low (L), are fully correlated across regions, and independently and identically distributed in each time period.[14] The probability of costs coming in at their highest level is defined as $\Pr(\theta_i = H) = q_i$.

The spectrum of voters $[0, \bar{n_i}]$ in each state is normalised to 1, with each voter deriving the same utility from productive investment G_i but enjoying subgroup specific utility U_i^s related to other kinds of public provision. Consequently, when a state government invests G_i financed by tax collections T_i in any time period t, its voters incur welfare level W_i, defined as

$$W_i = G_i - \mu_i C_i(T_i) + \mathbb{E}\, U_i^s(G_i), \tag{1}$$

with the individual cost of taxation $C_i(.)$ a strictly convex and increasing function, and μ_i a tax related scaling factor.[15] The spectrum of voters consists of two subgroups (s), *valence* voters ($s = v$) and *priority* voters ($s = p$). Valence voters only derive utility from the public good G_i, so that $U_i^v = 0$, whilst priority voters may derive even more utility from other policies which they consider highly indispensable. Such policies can range from the environment, poverty reduction, accessible health care, effective education or pork-barrel pet projects, but have in common utility ϕ_i they add to priority voters' welfare when successfully implemented, which occurs with probability $\eta(G_i)$. We assume this additional utility $U_i^p = \eta(G_i)\phi_i$ is of such a large degree $\phi_i >> G_i - \mu_i C_i(T_i)$ that the provision of G_i only plays a part in the incumbent evaluation of valence voters. Similar to models of political partisanship used in Besley and Burgess (2001), Besley (2007) or Besley et al. (2010) where a fixed share of voters value party ideology over incumbent performance, priority voters always give priority to their specific interests, and whether or not incumbents have taken these into account. The actual share of priority voters is assumed to be a random variable Ω_t^i, which is independent and identically distributed across time periods $t = 1, 2$. We measure the importance of the priority vote by

[14] Since G_i captures growth-enhancing policies such as productive investment or incentive schemes attracting private investment, unit costs can realistically by assumed more or less the same across a federation.

[15] Following Besley and Smart (2007), a rise in μ_i could capture an intensification of tax competition, the electoral passage of a (constitutional) restriction on the tax base or tax instrument, or technological and administrative complications in tax collection.

the expected share of priority voters $\omega_i = \mathbb{E}\,\Omega_t^i$.[16] The valence voters will then be expected to occupy a share $1 - \omega_i$ of the voting spectrum.

2.1 The Institutional Environment

We consider an institutional setting where state governments can only partially rely on own tax revenues t_i to finance the total costs of public provision $\theta_i G_i$, and are co-financed by use of grants t_f transferred by the federal government. This kind of 'partial decentralisation' is denoted by $\nu_i \in [0, 1]$, which expresses the extent to which states are able to raise tax revenues out of either a co-occupied tax base shared between federal and state governments ($0 < \nu < 1$), or a fully decentralised tax base ($\nu = 1$). Total tax collections $T_i = t_f + t_i$ not only finance public spending $\theta_i G_i$ lastly, but also cover any potential diversion of rents r_i by rent-seeking politicians, so that

$$T_i = \theta_i G_i + r_i, \tag{2}$$

where the amount of rents r_i denotes the level of public revenues siphoned off for private, socially unproductive purposes such as personal consumption, campaign finance, or rewarding cronies.[17]

A state government consists of a group of like-minded politicians of *identical* type $x_i \in \{b, g\}$, either of the 'good' type (g), or the 'bad' type (b). The good kind of politician is a token benevolent leader, choosing G_i in each period to maximize voter welfare, and hence drawing no satisfaction from rents diverted from public spending r_i. Consequently, optimising (1), the level of local public goods set by a benevolent state government enjoying full tax autonomy so that $\nu_i = 1$ will be

$$G_i^{\theta_i}(\theta_i, \mu_i) = \arg\max\,[G_i - \mu_i C_i(\theta_i G_i) + \mathbb{E}\,U_i^s(G_i)], \tag{3}$$

with $T_i^{\theta_i}(\theta_i, \mu_i) = \theta_i G_i^{\theta_i}(\theta_i, \mu_i)$ the resulting level of tax collections financing the total cost of optimised public provision $G_i^{\theta_i}$. However, and crucially, state public provision can also be financed both by state taxation t_i as well as federal taxes t_f covering a grant, which means total tax collections following from (3) should be written as $T_i^{\theta_i} = t_f^{\theta_i} + t_i^{\theta_i}$. Regarding the decision-making of the federal government, we assume it is a benevolent first mover which can observe the unit costs θ_i of public provision, but does not know the type of the local incumbent governments. It can therefore only optimise its federal grants based on the

[16] This is similar to Boffa et al. (2016), where an identical random process defines the amount of informed voters in the voting population, rather than the amount of voters with specific interests as is the case here.

[17] This definition of rents, given by e.g. Lockwood (2006) or Besley and Smart (2007), can also be interpreted as political 'slacking' in Seabright (1996) or Alesina and Tabellini (2008). Politicians then earn 'ego rents' from holding office, but also incur a 'cost' of having to provide an amount of public goods to attain their position, with r_i the difference between the two. Since rent-seekers will minimise this latter cost, they fail to work diligently in their constituents' interests.

unit cost of provision. Following (3), it deduces the optimal level of tax collections $T_i^{\theta_i}$, to which it subsequently applies the tax autonomy factor $\nu_i \in [0,1]$ to determine the size of tax collections and, indirectly, of the federal grant as $t_f^{\theta_i} = (1-\nu_i)T_i^{\theta_i}$. The federal grant thus adjusts fully to shocks in the unit cost of public provision θ_i. This corresponds with the kind of needs-based federal grants often found in multi-tiered countries in the field, where grant formulae incorporate a variety of local cost- or needs-based drivers.[18] Similarly, a benevolent state government also solves (3) to arrive at $T_i^{\theta_i}$, and sets the level of its tax collections at $t_i^{\theta_i} = \nu_i T_i^{\theta_i}$. Importantly, the degree of tax autonomy ν_i allows for the entire spectrum between full tax autonomy and fully dependent lower levels of government, widening the perspective of 'partial decentralisation' studied by Borge et al. (2014) and Brueckner (2009) where only the limit cases are studied, albeit in a non-agency setting. Lastly, plugging (3) into (1), we can write voter welfare following from the decisions of a benevolent state government as $W_i^g(\theta_i, \mu_i)$. Unsurprisingly, both $G_i^{\theta_i}$ and W_i^g are decreasing in μ_i, since a higher marginal cost of taxation has benevolent politicians set lower taxes, resulting in lower levels of public provision.

Unlike benevolent state politicians, bad politicians behave strategically by maximising rents r_i^1 in period 1 as well as discounted rents $\beta\sigma_i r_i^2$ in period 2, with β the discount rate and σ_i the probability of an incumbent government being re-elected in state i. This re-election rule, as well as the decision-making of a rent-seeking incumbent government regarding t_i, r_i and G_i in both periods, will be set out in Section 3.[19] We also assume there to be a maximum level X_i of state tax collections – and thus also of rent diversion – that can be imposed on voters, where $T_i \in [0, X_i]$ and $X_i > T_i^L$.

2.2 Vote Targeting

We assume the incumbent government can target its policies to the specific needs of a significant amount of priority voters, which strengthens its re-election probabilities with these groups. The government can undertake these 'priority policies' using additional (political) resources Y_i, which become available during its first term in office if it invests in growth-enhancing projects or regulation, mainly via the channel of tax revenues. In the case of pork-barrel spending projects, this relationship is straightforward as revenues are directly used to finance new spending. The additional resources Y_i can be seen as strictly political as well, however, in which case actual revenues may still be forthcoming, but its mere promise is sufficient to win

[18] See Boadway and Shah (2007) for a discussion of the various forms of non-discretionary grant formulae based on regional cost- or needs-based drivers.

[19] Note also that we have, in effect, set $\beta = 0$ for benevolent politicians. As discussed in Lockwood (2005), assuming that benevolent politicians are fully myopic delivers a unique and stable equilibrium in the signalling game we will set up in the following sections.

over voters. The promise of financing pet projects in the future once the revenues materialise in later periods then suffices to convince voters to re-elect the incumbent party. In this line of reasoning, there may also a subgroup of voters interested in the *general* economic prosperity of their region, of which future tax revenues can be perceived as a proxy. These concerns may be more pronounced if an equalisation mechanism is in place, laying bare the relative positions of the receiving and contributing regions. The incumbent party can then capitalise on this interregional reputational competition by promising growing tax returns in the future, especially when nationalist sentiments are strongly centered on the regional level.

Since we have defined the valence good G_i to encompass growth-enhancing measures, we then assume these generate additional (political) resources Y_i as follows

$$Y_i(G_i) = \nu_i R_i(G_i), \tag{4}$$

where R_i is a strictly concave, increasing function with $R_i(0) = 0$, which expresses the degree to which the incumbent party in region i is capable of turning productive investment G_i into (future) fiscal revenues, and hence, into the political resources which can be used for targeting. This will depend on the political entrepreneurship and expertise of each incumbent party in question, and on its former policy positions. A well-organised government can for example be expected to invest in the proper growth-projects with a high return, and will be capable of selling its targeting strategy to voters more effectively if it has invested in keeping communication channels open. A party which has always advocated regional autonomy and even independence will be better placed to pursue a targeting strategy geared towards politically weaponising the importance of growing tax revenues, as a sign of regional competence and superiority, or even as a tool to pursue more autonomy. In any case, the degree of tax autonomy ν_i in (4) will be vital, since the share of tax revenues a state government gets to retain logically depends on the extent of its tax autonomy. This rather generic approach allows us to consider a wide variety of revenue-raising instruments, ranging from property taxes to business taxes or personal income taxes, through which short- or medium term shifts in regional economic growth can affect state revenues.[20]

So far we have covered what can be considered the supply side of targeting certain subgroups of voters. Incorporating the demand side then requires a matching process, which we assume carries a certain risk of breaking down, as it is often unclear what a specific subgroup's priorities are ex-ante. We thus assign probabilities to the event of capturing a share

[20] As in e.g. Keen and Marchand (1997) or Hindriks et al. (2008), productive public inputs could also be modelled as contributing directly to state revenues through a tax on capital earnings. Since we do not focus on inefficient over- or underproduction of public provision however, this specific approach would leave our results unchanged.

$\eta \in [0,1] \lessgtr \frac{1}{2}$ of the priority vote when using additional revenues Y_i for targeting as

$$\eta\left[Y_i\left(G_i\right)\right] = \begin{cases} \frac{1}{2} + \chi & \text{with } \rho\left[Y_i\left(G_i\right)\right] \\ \frac{1}{2} - \chi & \text{with } 1 - \rho\left[Y_i\left(G_i\right)\right], \end{cases} \tag{5}$$

where $\rho(Y_i)$ is increasing in Y_i, and $\rho(0) = \frac{1}{2}$. The density of specific priorities and subgroups that can be targeted – denoted by $\frac{1}{2} < (1-\chi) < 1$ – makes targeting less effective, but will also make failing strategies less detrimental as each strategy will apply to a smaller number of voters. The intuition here is that in the for example the extreme case where $\chi = 0$, which we exclude in the model, incumbents would face an indeterminable mass of priorities, so that winning over the priority vote through targeting essentially becomes a coin toss. However, as the number of priorities becomes manageable, the chance $\rho(Y_i)$ that targeting is successful starts to depend positively on the resources Y_i that are spent on priority policies.

In short, (5) expresses the fiscal interest mechanism in full effect. The more the incumbent state government invests in market enhancing policies or infrastructure G_i, the higher its additional resources Y_i, and as a result, the easier to win over a majority share $\eta = \frac{1}{2} + \chi$ of the priority vote ω_i.[21] What we have implicitly assumed here is that all additional revenues are used for targeting of some sort, and not for potential rent-seeking. We do so without much loss of generality, as is shown in Section A.1 of the appendix where this assumption is relaxed.

Adding to the realism and applicability of the model lastly, we also apply a probabilistic framework to the decision making of the valence voters. We assume that valence voters care about a second policy dimension, orthogonal to the valence issue G_i. Following Persson and Tabellini (2002b) or Boffa et al. (2016), this second issue captures any remaining preferences that voters may have regarding politicians, such as their personal likability or party ideology. These preferences can be decomposed into an aggregate shock δ_i and an idiosyncratic shock γ_i^j, which are both independent and identically across voters j. This introduction of a degree of riskiness on the government's side regarding its chances of re-election by the valence voters is necessary for the fiscal incentives to take effect in all possible scenarios. Suppose for example that a majority of the voting population can be counted in the valence voter camp, which as we will see below means the incumbent government will always be re-elected if it sets the benevolent policy. Without probabilistic voting, the fiscal interest mechanism would then lose all of its appeal to rent-seekers since re-election is assured.

[21] As we illustrate in Section A.1 of the appendix, the fact that a majority share of the priority voters can be won over in (5), is not a restrictive assumption, it simply makes the model more intuitive as explained above. Our findings go through as long as spending more revenue on targeting improves the probability of winning over more priority voters.

2.3 Information and Timing

At the end of period 1, an election is held in each state where one group of politicians challenges the group in office. The group winning the majority of votes wins the election. Whether the incumbent politicians at the beginning of period 1, as well as the challengers, are of the good type g or the bad type b is defined by independent draws from an identical distribution. With a probability $\Pr(x_i = g) = \pi_i$, a group of politicians – incumbent or challenger – in a given state i will be benevolent. The ensuing game between incumbent state politicians and voters is then defined as follows.

At the beginning of period 1, the type $x_i \in \{b, g\}$ of the group of incumbent politicians is drawn for each state i. These incumbents then observe the unit costs of public provision θ_i and their federal grant $t_f^{\theta_i}$, after which they decide on state taxation t_i, rents r_i, and public goods G_i. Ahead of the elections the voters observe the amount of public goods G_i provided in their state, as well as the collected taxes t_i and t_f to finance public spending. The unit costs θ_i of public provision however, together with the type of both the incumbent and challenging state politicians, remain unobserved. However, both the probability q_i that unit costs θ_i are high and the probability π_i that politicians are benevolent, are common knowledge, together with the probability $\rho_i(G_i)$ to win a majority share of priority voters after investing G_i. After the elections, the elected group of politicians again sets G_i and r_i. Since there are no elections after period 2, even newly-elected challengers can be considered "lame ducks" whose actions will not be influenced by electoral pressure.

Clearly, since the actual type of politicians as well as the rents essentially remain hidden from the voter's eye, the game described above has a distinct structure of incomplete information. To figure out whether the incumbent is benevolent or not, the only option open to valence voters is to scrutinize incumbent performance during period 1, and weigh their -as such- updated beliefs about the incumbents' type against their prior beliefs about the challengers. We elaborate on the resulting perfect Bayesian equilibria in the following sections.

Notice lastly how – contrary to the career-concerns models developed by Persson and Tabellini (2002b) – politicians can be good or bad in our model, and are equally competent to produce the desired amount of public goods at either unit cost $\theta_i \in \{H, L\}$. Politicians are fully aware of this competence ex-ante, in stead of ex post as in Persson and Tabellini (2002b), and are as a result able to hide their true type from the voters. In such a signalling model rent-seeking politicians thus have multiple strategies at their disposal, allowing for a broad study of the extent to which fiscal incentives alter these strategies. Lastly, the setup provides politicians with the strategic instrument crucial to the fiscal interest story: the tax

rate. In most career-concerns models contrarily, public revenues are assumed fixed.

3 Equilibrium

We solve the game of incomplete information described above to obtain a unique Bayes-Nash equilibrium in each of the member states of the federation, by applying backward induction. We therefore start with period 2, and turn first to the interaction between state politicians and valence voters.

As there are no elections following period 2, the group of politicians in office in that period will no longer be constrained by electoral discipline. Good behaviour will never lead to re-election and future rents, which has bad politicians divert the maximum amount of rents $r_i = X_i$ in period 2. Given its federal grant $t_f^{\theta_i}$, a bad incumbent government thus sets its state taxes t_i in such a way that maximum tax collections $T_i = t_f^{\theta_i} + t_i = X_i$ are diverted away from public provision, so that $G_i = 0$ as a result. Inversely, good politicians never divert rents, set $r_i = 0$ in period 2, and consequently sets $t^{\theta_i} = \nu_i T_i^{\theta_i}$ following (3) as explained earlier.

Since second-period strategies are the same for bad incumbents or bad challengers alike, i.e. extracting full rents, the best strategy for valence voters is to weed out as many bad politicians they can during the elections. Their sequentially rational voting rule will as a result be to re-elect the incumbent government of period 1 if they think this group is more likely to be benevolent than the challengers. In other words, if the *posterior* probability Π_i they ascribe to the incumbents being benevolent surpasses the *prior* probability π_i of the challengers, they re-elect the incumbents. The voter's posterior beliefs will thus inevitably be based on incumbent performance during period 1 only, and follow from the equilibrium strategies of first-period incumbents.

Focusing on these first-period strategies subsequently, a benevolent state government again simply maximises voter welfare following (3), and chooses t^{θ_i} so that public provision and total tax collections are equal to (G_i^H, T_i^H) with probability q_i, or (G_i^L, T_i^L) with probability $(1-q_i)$, as before. Logically then, it follows that in any perfect Bayesian equilibrium voter posterior beliefs will assign probability zero to the incumbent being of the good type at any *other* information set (G_i, T_i), observed in period 1. Naturally, voter beliefs are not restricted by Bayes' rule at nodes not reached in equilibrium. Since the good type's actions are pinned down by (3), we do impose the minimal restriction on out-of-equilibrium beliefs that $\Pr(g|T_i) = 0$ if $(G_i, T_i) \neq (G_i^{\theta_i}, T_i^{\theta_i})$. At any such information set the valence voter elects the challengers, and rationally expects other valence voters to do the same.

Since voter beliefs are common knowledge, three possible strategies remain for a rent-seeking incumbent government deciding on first-period tax collection, where t_i is set so that

$T_i \in (T_i^L, T_i^H, X_i)$ are the only spending levels observed with positive probability on the equilibrium path. In the latter case the bad incumbents claim the maximum rent $r_i = X_i$ as in period 2, revealing their true type b and as such 'separating' from the good politicians. In the first two cases on the other hand, incumbents undertake at least some degree of public investment to hide their true type and to signal benevolent behaviour, thus trying to mix in or 'pool' with the benevolent politicians. The reason for this masquerade is the re-election motive, in full effect when the sum total of expected rents over both periods outweighs maximum rents $r_i = X_i$ to be extracted in period 1, so that

$$r_i + \beta\sigma_i X_i > X_i, \tag{6}$$

where we have replaced rents r_i in period 2 with the maximum value of X_i as well, which is the equilibrium strategy of bad incumbent politicians in period 2 as described earlier. Now, to fully interpret expression (6), we need to formalise the probability of re-election σ_i as well as the decision on rents r_i, for which the unit costs of public provision, $\theta_i \in (L, H)$ are crucial. Suppose the bad incumbents face low unit costs L in period 1. By setting tax collections t_i so that $T_i^{\theta_i} = T_i^H$, and providing the corresponding amount of public goods G_i^H, they are able to siphon off rents to the extent of $\widehat{r}_i = (H - L)G_i^H$. Indeed, in this case $T_i^H = LG_i^H + (H - L)G_i^H = G_i^H$, which voters still accept as an information set potentially offered by a benevolent government. Inversely, when $\theta_i = H$, the latter 'pooling' strategy does not pay any rents in period 1 since $\widehat{r}_i = (H - H)G_i^H = 0$, so that the incumbent government cannot divert rents without revealing its type. In such a situation the separating strategy of extracting maximum rents X_i always dominates the pooling strategy, as $r_i = X_i$ exceeds expected second-period rents $\beta\sigma_i X_i$ to be gained after re-election. For exactly the same reasons, valence voters always re-elect the incumbent group after observing (G_i^L, T_i^L) in period 1, so that in any equilibrium we get that

$$\Pr(g|T_i^L) = 1. \tag{7}$$

Indeed, also in this case rent-seeking incumbents would choose the separating strategy $r_i = X_i$, as it doesn't pay off to try to get re-elected, which is known to voters. Arriving at voter posterior beliefs based on the observation (G_i^H, T_i^H) subsequently, is more intricate. Sure enough, valence voters know of the risk that a group of bad politicians might pretend to be benevolent in order to improve its re-election chances, and will include this risk when updating their prior beliefs. They therefore assign probability λ_i to the pooling strategy, such that

$$\lambda_i = \Pr(T_i = T_i^H|\theta_i = L,\, x_i = b). \tag{8}$$

Based on all available information, and using Bayes' rule, valence voters can then infer the posterior probability that first-period tax collections T_i^H were levied by benevolent incumbent

politicians as

$$\Pr(g|T_i^H) \equiv \Pi_i = \frac{\pi_i q_i}{\pi_i q_i + (1-\pi_i)(1-q_i)\lambda_i}, \tag{9}$$

which allows us to derive Lemma 1 below, keeping in mind that only valence voters really care about the provision of G_i as explained above.[22]

Lemma 1. *Given the posterior voter beliefs $Pr(g|T_i^H) = \Pi_i$ defined in (9), and assuming that $q_i > \frac{1}{2}$, the valence voter will always re-elect the incumbent when observing first period public provision of G_i^H at a tax level T_i^H, as in this case we always have that $\Pi_i > \pi_i$.*

Suppose now an incumbent government of bad politicians would only have to worry about winning over valence voters. Its first-period strategies would then be straightforward at this point. If first-period unit costs θ_i are low, and given Lemma 1, incumbent politicians will face a re-election probability of $\sigma_i = 1$ if they provide G_i^H at a total tax take of T_i^H. From (6), we then deduce that the pooling strategy to set $\widehat{r}_i = (H-L)G_i^H$ will always be more beneficial than full rent extraction $r_i = X_i$ in period 1, if and only if

$$\widehat{r}_i^1 + \beta\sigma_i X_i > X_i. \tag{10}$$

If condition (10) does not hold however, or in the case that unit costs come out on the high side and $\theta_i = H$, bad incumbents will always separate and reveal their type. Their probability of re-election σ_i is reduced to zero because of this.

Moreover, and still focusing on valence voters, the latter not only base their voting decisions on incumbent performance as captured by Lemma 1, but also on the ideologies or likeability of both competing groups of politicians. Specifically, a given valence voter j is defined to re-elect the incumbent group of politicians if

$$\Pi_i > \pi_i + \gamma_i^j + \delta_i, \tag{11}$$

thus expanding the previous condition $\Pi_i > \pi_i$ for valance voters to re-elect the incumbent government after observing (G_i^H, T_i^H). As in Persson and Tabellini (2002b), the ideological policy dimension comes in through both terms on the right side of (11), where γ_i^j is an individual-specific parameter capturing voter j's *individual* ideological bias towards incumbents and candidates, which can take on negative as well as positive values. Voters for whom $\gamma_i^j = 0$ are ideologically neutral, whilst voters where $\gamma_i^j < 0$ are ideologically biased in favor of the incumbent government, and vice versa. We assume γ_i^j is uniformly distributed on the interval $\left[-\frac{1}{2}, \frac{1}{2}\right]$. Second, the parameter δ_i reflects the *aggregate* popularity of both political

[22] Following Hindriks and Lockwood (2009), we assume that $q_i > 1/2$ in all states. This rules out the hybrid equilibrium derived by Besley and Smart (2007), which was proven unstable in the Cho-Kreps sense by **?**.

groupings across the population as a whole, which can also be positive or negative and is again uniformly distributed, but now on the interval $\left[-\frac{1}{2\xi}, \frac{1}{2\xi}\right]$.[23]

As discussed above however, and crucially, the voting population does not simply consist of valence voters. Priority voters also influence the probability of re-election σ_i in (10) which, in turn, alters first-period incumbent strategies as well. This is where the fiscal interest mechanism comes into play, and where outcomes become less clear-cut as a result. As expressed by (4), incumbent politicians will generate additional revenues Y_i by providing a certain level of market-enhancing public goods G_i, which will be used to finance priority policies. Since this means they will pull in a larger share of the total vote, as defined by (5), rent-seeking incumbents will now be tempted to influence their probability of re-election in two ways: by pretending to be benevolent as before, and by winning over groups of priority voters. Since a government of bad incumbents will never set $\left(G_i^L, T_i^L\right)$, as this would violate (10), we focus on the probability σ_i of re-election when the incumbent sets $\left(G_i^H, T_i^H\right)$.

Building on the totality of our framework, we can then derive the overall probability of re-election σ_i in Lemma 2.

Lemma 2. *When the incumbent group of politicians provides a level of public goods G_i^H at a tax level T_i^H, and with $\alpha_i = \frac{\omega_i\left(2\rho\left[Y_i\left(G_i^H\right)\right]-1\right)\chi}{(1-\omega_i)} \geqq 0$, its re-election probability σ_i of winning a majority share κ_i of both priority as well as valence voters, is given by*

$$\Pr\left[\kappa_i \geqq \frac{1}{2}\right] = \sigma_i\left(\alpha_i + (\Pi_i - \pi_i)\right) = \begin{cases} 1 & \text{if } \alpha_i + (\Pi_i - \pi_i) > \frac{1}{2\xi} \\ \frac{1}{2} + \xi\left[\alpha_i(Y_i, \chi, \omega_i) + (\Pi_i - \pi_i)\right] & \text{Otherwise} \\ 0 & \text{if } \alpha_i + (\Pi_i - \pi_i) < -\frac{1}{2\xi}. \end{cases} \tag{12}$$

Now, it is precisely through $\alpha_i(Y_i(G_i, \nu_i), \omega_i, \chi)$ in (12) that the fiscal interest mechanism affects the likelihood of re-election σ_i, a process where the additional revenues Y_i and the degree of priority voting ω_i and tax autonomy ν_i. This process plays out alongside the reputational effect on re-election probability, captured by $(\Pi_i - \pi_i)$ in (12), which is due to the Bayesian updating process discussed at length above.[24] For a good understanding, suppose now the probability of re-election expressed by (12) lies between zero and one. Before discussing the channels operating through α_i in proposition 1 below, and plugging (12) into (10), we first derive the necessary condition for a bad incumbent to set (G_i^H, T_i^H) – in other words, opt for the pooling strategy – which is

$$\widehat{r}_i^1 + \beta\sigma_i\left(\alpha_i(Y_i, \chi, \omega_i) + (\Pi_i - \pi_i)\right) X_i > X_i, \tag{13}$$

[23] Both distributional assumptions facilitate closed form solutions. For a discussion of their generalisation, we refer to Persson and Tabellini (2002b).

[24] See Besley (2007) for an overview of agency models using this kind of Bayesian updating, and the reputation effects on which they rely.

and where, using (8) and (9), Π_i is defined in the latter expression by setting $\lambda_i = 1$ since voters know a rent-seeking incumbent will opt precisely for the pooling strategy if (13) holds. In other words, if the sum total of expected rents characterised by the left hand side of (13) – to be extracted after re-election – exceeds the rents on the right hand side – to be captured in period 1 after choosing the separating strategy of $r_i = X_i$ – the incumbents will always mimic the benevolent politicians in the hope of being re-elected, and thus choose the pooling strategy. In any other case they separate, and are voted out. We summarise in Lemma 3.

Lemma 3. *As long as* $\widehat{r}_i^1 + \beta\sigma_i\left(\alpha_i + (\Pi_i - \pi_i)\right) X_i > X_i$*, a rent-seeking incumbent government will always choose the pooling strategy, i.e. set* $\left(G_i^H, T_i^H\right)$ *when* $\theta_i = L$*. They separate otherwise, and extract the full rent* $r_i = X_i$*.*

What we learn from Lemma 3 and Proposition 1, is that the mere presence of priority voters provides bad incumbents with a second incentive to invest in the valence issue of economic growth, aside from pure reputation building. Indeed, without priority voters (12) would reduce to the usual trade-off between reputational gains $(\Pi_i - \pi_i)$ – achieved by the incumbents after setting (G_i^H, T_i^H) – and popularity shocks δ_i. With priority voters on the other hand, the positive feedback loop of fiscal incentives results in more politicians choosing for the pooling strategy rather than simply separating, as their re-election probability receives a boost because of the targeting channel captured by (5).

This equilibrium clearly hinges on condition (13), and the probability of re-election σ_i which, compared to a setting without priority voters, in turn depends on α_i as defined by Lemma 2 and touched upon above. We investigate in Proposition 1.

Proposition 1. *Suppose growth-enhancing policies* G_i *lead to additional state revenues* Y_i*. Rent-seeking incumbents can then improve their chances of re-election* σ_i *by introducing exactly such policies, using the additional revenues to win over more priority voters through targeting. The extent to which they will do so, depends on*

1. *The degree of tax autonomy* ν_i*: the more (political) resources can be retained, the more priority votes can be won over via targeting;*

2. *The share of priority voters* ω_i*: as the share of priority voters grows, targeting proves a more reliable buffer against popularity shocks.*

3. *The capacity to convert productive investment into resources* $R(G_i)$*: as the share of priority voters grows, targeting proves a more reliable buffer against popularity shocks.*

4. *The density of priorities and subgroups* χ_i*: as the share of priority voters grows, targeting proves a more reliable buffer against popularity shocks.*

5. *The marginal cost of public funds μ_i: a lower marginal cost of taxation implies higher levels of G_i^H and higher revenues Y_i, which again makes targeting more effective.*

Corollary 1. *A higher share of priority voters ω_i marked by a higher density of priorities χ_i improves political discipline.*

Corollary 2. *A higher capacity to convert productive investment into resources $R(G_i)$ and higher levels of tax autonomy ν_i improves political discipline*

Proposition 1 disentangles the channels operating through $\alpha_i(Y_i(G_i, \nu_i), \omega_i, \chi)$, and as such lays bare the fiscal interest mechanism behind the pooling strategy of setting (G_i^H, T_i^H), and the targeting this allows for. First, a higher degree of tax autonomy ν_i, and thus a higher state retention rate of any increase of tax revenues as shown by (4), boosts the impact of targeting efforts as can be seen in (5). Indeed, more additional revenues Y_i will be generated in this case, so that the probability to win over a majority of the priority vote follows suit. Secondly, if the electorate consists of proportionally more priority voters, rent-seeking incumbents will be quicker to use targeting as a safety net against risky popularity shocks δ_i. As the sheer mass of priority voters rises, the more targeting will pay off in terms of re-election. Third, lower marginal costs of public funds μ_i and the resulting higher level of G_i^H not only enlarge potential pooling rents $\widehat{r}_i$ as in Besley and Smart (2007), but also bring about larger additional revenues Y_i as can be seen in (4). The latter effect also strengthens the effectiveness of targeting as expressed by (5). To summarise, and following Lemma 3, all three effects described above improve political discipline by making it more likely for (13) to hold, so that rent-seeking incumbents will more often choose the pooling strategy in period 1, rather than separating by extracting maximum rents.

Importantly, this framework is generalised in Section A.1 of the appendix by allowing for bad politicians to extract the additional revenues Y_i as rents as well, instead of only using these for targeting. Also, we include these revenues as a potential source of rents in period 2, since growth-enhancing investment is likely to yield structural increases in tax revenues. We prove that, under realistic assumptions and without much loss of generality, Lemma 1, Lemma 2, Lemma 3 and Proposition 1 also apply in this more general setting.

4 Welfare Analysis

To size up the welfare effects of decentralising tax autonomy, as discussed above in Section 3, we first need to describe voter welfare levels in several relevant, or counterfactual, situations. In this light, we first of all write expected – per-period – voter welfare in a scenario where a

benevolent government of type g is in office as

$$EW_i^g(\mu_i) = q_i W_i^g(H, \mu_i) + (1 - q_i) W_i^g(L, \mu_i), \tag{14}$$

with q_i the probability that the unit costs of public provision are high, or $\theta_i = H$, and W_i^g voter welfare following from the decisions of a benevolent state government, as defined above. Next, in a scenario where the incumbent government is rent-seeking – and consequently of type b – and where this government would furthermore *always* extract the full rent X_i, we can tease out per-period welfare from (1) above as

$$W_i^b(\mu_i) = -\mu_i C_i(X_i), \tag{15}$$

since in this case no public goods G_i are provided, so that W_i^b defined in (15) does not depend on the unit cost of provision θ_i. Combining (14) and (15), we can then define per period expected voter welfare in a scenario where an *unknown* type of government is in office but where, if bad, the incumbent government again always separates by extracting the maximum rent, as follows

$$W_i^0 = \pi_i EW_i^g(\mu_i) + (1 - \pi_i) W_i^b(\mu_i), \tag{16}$$

with π_i the probability that a politician is good, as specified earlier. Now, in order to compare different political constellations in terms of welfare, we need a benchmark scenario. In this light, we use a baseline welfare level similar to the benchmark used in Hindriks and Lockwood (2009), given by

$$\bar{W}_i = W_i^0 + \beta \left(\pi_i EW_i^g(\mu_i) + (1 - \pi_i) W_i^0 \right). \tag{17}$$

Our benchmark $\bar{W}_i$ thus stretches out across two time periods, and captures expected voter welfare in a baseline scenario where all politicians are potentially re-elected, but bad politicians nevertheless choose for the separating strategy. As a result, the probability of separation in this scenario is equal to the probability $(1-\pi_i)$ that politicians are bad, which is multiplied by W_i^0 on the left hand side of (17). Indeed, the rent-seeking government is in this case replaced by good politicians setting welfare according to (14) with probability π_i, or by bad politicians providing only (15) with probability $(1 - \pi_i)$. The sum of both possibilities is expressed by W_i^0 in (16).

Now, given this latter definition of $\bar{W}_i$, and moving on to the scenario we used in previous sections where rent seekers can also choose for the pooling strategy, we can write expected welfare EW_i^D in the decentralised setting discussed in Section 3, as

$$EW_i^D(\mu_i) = \bar{W}_i + \lambda_i(1 - \pi_i)(1 - q) \left(\Delta_i^d - \beta \pi_i \Delta_i^s \right). \tag{18}$$

What (18) captures is that, if an incumbent government is of the bad type and were to pool rather than separate – which can now occur with probability $\lambda_i(1 - \pi_i)(1 - q)$ – expected

voter welfare $EW_i^D(\mu_i)$ will diverge from the baseline scenario $\bar{W}_i$ in two important ways. First, voters would face a 'selection loss' in period 2. They would miss out on the welfare they otherwise would have gained if the same government would have separated, and would furthermore have been replaced by benevolent politicians with probability π_i. Measured by this counterfactual scenario, the present value of the second-period welfare loss returns as $\beta\pi_i\Delta_i^s$ in (18), with $\Delta_i^s = EW_i^g(\mu_i) - W_i^b(\mu_i)$ the gap between counterfactual welfare $EW_i^g(\mu_i)$ in such a scenario in period 2, and welfare $W_i^b(\mu_i)$ if the government pools and is re-elected. Second, voters also enjoy a 'discipline benefit' in period 1. Because the group of bad incumbents exerts fiscal restraint rather than diverting the maximum rent, voters attain a welfare level of $W_i^g(H, \mu_i)$ instead of $W_i^b(\mu_i)$, as expressed by $\Delta_i^d = W_i^g(H, \mu_i) - W_i^b(\mu_i)$ in (18).

What emerges in this second scenario in other words, and similar to Besley and Smart (2007), is the relative importance of the selection effects vis-à-vis the disciplining effects of an election. If the pool of politicians mostly consists of benevolent politicians, strengthening the selection effect -here through increased separation with decentralisation- serves voter welfare more than improving discipline, and vice versa. Indeed, since pooling incumbents will eventually divert maximum rents in a future term, replacing bad incumbents as soon as possible is welfare-improving if a sufficient amount of benevolent alternatives is at hand. Unsurprisingly then, a similar trade-off between selection and discipline effects presents itself when a change in the re-election probabilities δ_i of incumbent politicians leads to a shift in equilibrium strategies. We analyse the welfare effects of such a shift in Proposition 2, focusing on the decentralised setting where -following Proposition 3- the impact of changes in δ_i will be highest.

Proposition 2. *Rent-seeking politicians facing a higher probability of re-election, either through an increase in tax autonomy ν_i or a larger share of priority voters ω_i, will be quicker to pool. If the quality of politicians is sufficiently low -such that $\pi_i < \frac{\Delta_i^d}{\beta\Delta_i^s}$- these gains in discipline always improve voter welfare, and vice versa.*

Naturally, Proposition 2 also implies that when a large share of politicians turns out to be benevolent, so that $\pi_i \geqq \frac{\Delta_i^d}{\beta\Delta_i^s}$, improved discipline will in fact undermine voter welfare. In this case, the degree to which voters value the selection effect denoted by $\beta\pi_i\Delta_i^s$ in (18) rises, as a larger weight is ascribed to the selection loss Δ_i^s as opposed to the discipline benefit Δ_i^d. Also, and importantly, what is omitted in Proposition 2 is the effect of a change in the marginal cost of taxation μ_i on voter welfare. The reason is that, although such a shift will also alter the probabilities of re-election for incumbent politicians, a general welfare effect also comes into play via (3). A separate analysis in Corollary 3 is therefore in order.

Corollary 3. *If the quality of politicians is low, so that* $\pi_i < \frac{\Delta_i^d}{\Delta_i^s \beta}$*, rising marginal costs of taxation unambiguously curtail voter welfare as more bad incumbents decide to separate. Inversely, when* $\frac{\Delta_i^d}{\Delta_i^s \beta} \geqq \pi_i$*, voter welfare may increase as discipline subsides. These welfare shifts are more pronounced in a setting with priority voters.*

Contrary to common knowledge, and also pointed out by Besley and Smart (2007), increasing the inefficiency of a tax system through the marginal cost of taxation does not necessarily pay off in terms of voter welfare. Tax competition for example, which is thought to improve discipline and reign in rent-seeking, can in fact lead to the opposite outcome here. Driving up μ_i leads to lower rents r_i^1 and lower probabilities of re-election for incumbents, as specified in proposition 1, and thus to more separation. If most politicians standing for office are also rent-seeking, voter welfare decreases as a result. The latter welfare effect is compounded by the fiscal interest mechanism, especially in a fully decentralised setting where the effect of the changing re-election probabilities is highest.

5 Conclusion

Decentralising tax authority to lower-level jurisdictions in a federation is often argued to improve the accountability of local politicians. In this paper, we derived the necessary conditions for tax autonomy to bring about local growth-enhancing policies -as the fiscal incentives approach of Weingast (2009) would predict- and investigate whether this mechanism is indeed beneficial to voter welfare. In this sense, we are first to model a multi-tiered, political agency setting where policy outcomes feed back into revenue flows, which indeed keeps rent-seeking politicians in line.

What we find is that everything hinges on the quality of the pool of politicians voters can choose from, as well as on the composition of the voting population itself and the institutional setting. If most voters do not have specific concerns and only care about economic growth, rent-seeking politicians will be hard pressed to improve their chances of re-election through pork-barrel targeting. Indeed, the more priority voters, the more the fiscal incentives will come into effect, and the less rents are diverted. However, we show that this 'disciplining' effect is stronger still in a unitary setting where all of public provision is kept at the center. The reason is the 'reduced pivot-probability effect', coined by Lockwood (2006) and first introduced by Seabright (1996), where single jurisdictions become less pivotal in ensuring the re-election of a central government. Investing in a bare minimum of constituencies then suffices for a central government to be re-elected, making it more attractive for bad politicians to opt for this strategy of postponing maximum rent extraction.

Discipline will be more effective at the center in other words, *despite* the built-in fiscal incentives which are in fact mutually reinforcing in this case. When offered the choice between fiscal regimes consequently, voters would only prefer decentralisation if politicians are less likely to be rent-seeking to begin with, so that selection is needed more than discipline. Nevertheless, *given* a certain degree of decentralisation and a sufficient amount of rent-seeking politicians, shoring up discipline via sharper fiscal incentives is more effectively done at the lower level of government. Expanding local tax autonomy will in this case unambiguously boost voter welfare.

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Appendix A Extensions

A.1 Immediate and Future Rent-Seeking

The implicit assumption behind Lemma 1, Lemma 2, Lemma 3 and Proposition 1 is that the bad incumbents will always use the additional revenue gains Y_i to cater to the priority vote, and thus improve their re-election chances σ_i. We thus assume this will be more beneficial than simply diverting away these additional revenues as rents, so that

$$\widehat{r}_i^1 + Y_i + \beta_i\sigma_i\left(\Pi_i - \pi_i\right)X_i < \widehat{r}_i^1 + \beta_i\sigma_i\left(\alpha_i + \left(\Pi_i - \pi_i\right)\right)X_i, \tag{19}$$

keeping in mind that $\alpha_i(G_i^H, \chi, \omega_i) = 0$ when no additional revenue Y_i is invested in the priority vote, because $\rho(Y_i = 0) = \frac{1}{2}$. To generalise the model we drop this latter assumption and introduce a second decision variable $\varepsilon_i \in [0, 1]$, denoting the amount of additional revenue bad incumbents will divert as rents, so that (13) can be written as

$$\widehat{r}_i^1 + (1-\varepsilon_i)Y_i(\nu_i, G_i^H) + \beta\sigma_i\left(\alpha_i(\varepsilon_i Y_i(\nu_i, G_i^H), \chi, \omega_i) + \left(\Pi_i^H - \pi_i\right)\right)Z_i^H > X_i, \tag{20}$$

where we have also added the additional revenues $Y_i^H = \nu_i R_i(G_i^H)$ as a source of potential rents in period 2 so that $Z_i^H = X_i + Y_i^H$, since revenues following from growth enhancing policies are likely to stretch into the medium term future.

Zooming in on (20) firstly, we see that only point 2 of proposition V.1 depends on the decision of the bad politicians to at least invest a positive amount (i.e. set $\varepsilon_i > 0$) of the additional revenues on the priority vote. Since Y_i only concerns additional revenues and X_i constitutes maximum tax revenues, we can make the assumption that they will do so under realistic parameter values, without much loss of generality. The choice of ε_i furthermore, can be thought of as a first move in a sequential game where G_i is set in a second stage, and (20) is maximised w.r.t. ε_i in a first stage using this information.

Second, and importantly, in this more general framework an extra complication emerges, since now bad politicians may very well decide to invest in the valence good even when rents $\widehat{r}_i^1$ are equal to zero. Two additional assumptions therefore need to be made in order to replicate the results derived in the main text:

$$(1-\varepsilon_i)Y_i(\nu_i, G_i^H) + \beta\sigma_i\left(\alpha_i(\varepsilon_i Y_i(\nu_i, G_i^H), \chi, \omega_i) + \left(\Pi_i^H - \pi_i\right)\right)Z_i^H \leq X_i, \tag{21}$$

and,

$$\begin{aligned}\widehat{r}_i^1 + (1-\varepsilon_i)Y_i(\nu_i, G_i^H) + \beta\sigma_i\left(\alpha_i(\varepsilon_i Y_i(\nu_i, G_i^H), \chi, \omega_i) + \left(\Pi_i^H - \pi_i\right)\right)Z_i^H > \\ (1-\varepsilon_i)Y_i(\nu_i, G_i^L) + \beta\sigma_i\left(\alpha_i(\varepsilon_i Y_i(\nu_i, G_i^L), \chi, \omega_i) + \left(\Pi_i^L - \pi_i\right)\right)Z_i^L \quad ,\end{aligned} \tag{22}$$

with $Z_i^L = X_i + Y_i^L$, and for any ε_i. Condition (21) implies that investing in growth enhancing policies does not pay off without also being able to extract the standard rents $\widehat{r}_i^1$, which will

be especially true if $Y(G_i) < \widehat{r}_i^1 \ \forall G_i$. Again, because Y_i concerns additional revenue, and $\widehat{r}_i^1$ applies to total public spending, this is realistic. Condition (22) moreover, says that upon observing a cost shock $\theta_i = H$, extracting rents $\widehat{r}_i^1$ in period 1 always outperforms the strategy of investing a higher amount of G_i^L in order to receive more additional revenues Y_i. If $Y(G_i) < \widehat{r}_i^1$ and since $R_i(G_i)$ was defined as strictly concave, this is feasible as well. Based on all available information, and using Bayes' rule, valence voters now infer the posterior probability that first-period tax collections $T_i^{H,L}$ were levied by benevolent incumbent politicians as

$$\Pr(g|T_i^H) = \Pi_i^H = \frac{\pi_i q_i}{\pi_i q_i + (1-\pi_i)\left\{(1-q_i)\lambda_i^r + q_i \lambda_i^H\right\}}, \tag{23}$$

$$\Pr(g|T_i^L) = \Pi_i^L = \frac{\pi_i (1-q_i)}{\pi_i (1-q_i) + (1-\pi_i)(1-q_i)\lambda_i^L}, \tag{24}$$

where λ_i^r is given by (8), whilst λ_i^L and λ_i^H are defined by

$$\lambda_i^L = \Pr(T_i = T_i^L | \theta_i = L,\, x_i = b), \tag{25}$$

$$\lambda_i^H = \Pr(T_i = T_i^H | \theta_i = H,\, x_i = b). \tag{26}$$

Now, since voters assign probabilities $\lambda_i^L = \lambda_i^H = 0$ whenever conditions (21) and (20) are jointly satisfied under the counterfactual scenario where $\lambda_i^H = \lambda_i^L = \lambda_i^r = 1$, this more general framework reduces to the approach set out in the main text, since in this case Π_i^H collapses to (9), and Π_i^L to (7).

A.2 Centralisation: Comparison of Fiscal Regimes

Suppose now that instead of having n different state governments deciding on public provision in their own state, a central government decides on the full set of regional policies. This also implies that tax autonomy ν_i will be equal to zero in each state, since all public functions are centralised. Second-period strategies remain unchanged for both types of politicians in this scenario: a benevolent central government would still optimise (3) for each state i, and a government of bad politicians would still extract maximum rents $r_i = X_i$. As a result, valence voters again only look at first-period policies when casting their vote, and since a benevolent central government also optimises (3) in period 1, he or she again ascribes probability $\Pr(g|T_i) = 0$ to any situation where $(G_i, T_i) \neq (G_i^{\theta_i}, T_i^{\theta_i})$. At any such information set consequently, and in any perfect Bayesian equilibrium, the valence voter elects the challengers.

The optimal strategy for a government of bad incumbents in period 1 however, is different from what we had under decentralisation in Section 3. This is because, depending on the electoral system in place, a central government usually does not need to win a majority of the votes in all of its constituencies to be re-elected. This increases the degrees of freedom of

a central government to win re-election. As pointed out by Seabright (1996), the probability that a certain constituency is pivotal in the electoral outcome decreases once we move from a system of decentralised political entities, to a unitary constellation comprised of many constituencies.

Since each of the political entities under decentralisation encompasses only a limited number – or just one – of these latter constituencies, decentralised governments have less room for manoeuvre to convince voters with policies that are tailored to these constituencies. Translated to our fiscal interest story here, a central government would only need to introduce growth-enhancing policies in a pivotal amount of its constituencies to improve its chances of being returned to office. A local government does not have this option. Either it invests in its regional economy, or it does not. Following Hindriks and Lockwood (2009) we apply a simple electoral rule here, where the central government only has to obtain a majority in $m = (n+1)/2$ states to be re-elected. Consequently, the pooling strategy of mimicking the benevolent politicians when $\theta_i = H$ becomes more attractive, as $\left(G_i^H, T_i^H\right)$ only needs to be set in m pivotal states, whilst the full rent can now be extracted in $(n-m)$ states in period 1 as well. We derive the equilibrium consequences of this kind of 'selective pooling'[25] in Lemma 4.

Lemma 4. *A central government of bad incumbents chooses the pooling strategy in* $m = (n+1)/2$ *of* n *symmetric states, i.e. sets* $\left(G_i^H, T_i^H\right)$ *when* $\theta_i = H$*, if and only if*

$$\frac{m}{n\sigma_i\left(\alpha_{ic} + (\Pi_i - \pi_i)\right)}\left(1 - \frac{\widehat{r}_i^1}{X_i}\right) < \beta. \tag{27}$$

It separates otherwise, and extracts full rents $nr_i^2 = nX_i$*.*

As we show in the proof of Lemma 4 in the appendix, the trade-off captured by (27) is nothing more than condition (13) solved for β, albeit under the assumption of perfectly symmetric states, and adjusted for selective pooling as well as the fact that in a centralised setting we have that $\nu_i = 0$, which alters α_i.[26] Indeed, by setting $m = n$ and $\alpha_{ic} = \alpha_i$, Lemma 4 collapses to Lemma 3 in re-arranged form. In both cases the cost of fiscal restraint $\left(1 - \frac{\widehat{r}_i^1}{X_i}\right)$ – i.e. of not extracting the full rent X_i in period 1 – is weighed against the relative *value* of re-election and maximum rent extraction in period 2, as measured by the discount factor β. The larger the difference between β and $\left(1 - \frac{\widehat{r}_i^1}{X_i}\right)$, the more attractive it becomes for incumbent politicians to strive for re-election by choosing the pooling strategy in period 1. Indeed, in this case fiscal restraint in period 1 becomes less costly since the pooling rents

[25] Hindriks and Lockwood (2009) coined the term, and were first to introduce Seabright's 'reduced pivot probability' mechanism to Besley and Smart's (2007) political agency framework, which, therefore, allows for different selection as well as discipline effects depending on the level of government.

[26] The proof of Proposition 3 below provides further insight in the adjusted α_{ic} under centralisation.

$\widehat{r}_i$ edge closer to the maximum rent X_i, whilst the latter becomes more valuable in period 2 because of the higher discount factor.

A higher probability σ_i of re-election logically reinforces this process, which can be seen on the left hand side of (27). If we define $\beta_i^C \equiv \frac{m}{n\sigma_i(.)}\left(1 - \frac{\widehat{r}_i^1}{X_i}\right)$ as the threshold value on the discount factor β, above which bad incumbents start choosing for the pooling strategy, we see that β_i^C is pushed downwards if σ_i goes up. This improves discipline, since rent-seeking incumbents will now opt for the pooling strategy in more cases, i.e., conditional on a larger set of β values. This is also implicitly expressed by Proposition 1, where the fiscal incentives captured by α_i result in a higher re-election probability σ_i if rent-seekers choose for the pooling strategy, which has the same effect on discipline and turnover. However, what distinguishes Lemma 4 from the decentralised case in Section 3, is the 'selective pooling' effect expressed by $\frac{m}{n}$ in (27). We elaborate in Proposition 3.

Proposition 3. *The disciplining effect of elections will be weaker under decentralisation, since selective pooling is possible once public provision is fully centralised, and is reinforced by the fiscal incentives mechanism. However, given decentralisation, shoring up discipline via sharper fiscal incentives is more effectively done at the state level.*

Compared to a decentralised setting, and similar to Hindriks and Lockwood (2009), we thus find that the option of 'selective pooling' in a centralised setting leads to more discipline, since a rent-seeking central government will choose for the pooling strategy more easily. Since it consequently refrains from the separating strategy more often, it will be voted out of office less, which mitigates political turnover.

The proposition also underscores the impact of fiscal incentives in this respect, which adds to the literature. Indeed, the fact that the probability of re-election σ_i is endogenous to (pork-barrel) targeting by use of additional revenues Y_i – captured by the fiscal incentives underlying α_i in (12) of lemma 2 – positively interacts with the disciplining gains of selective pooling as we can see on the left hand side of (61). However, once a decentralised constellation is *given*, endogenous election probabilities can considerably improve local discipline on the margin. Indeed, in any of the scenarios described in Proposition 1 - an increase in the retention rate ν_i, a larger share of priority voters ω_i, or smaller marginal costs of taxation μ_i – the resulting rise in σ_i will lead to a more pronounced decrease of the right hand side of (61), compared to a similar uptick of σ_i under centralisation on the left hand side. As a result, the threshold value for bad incumbents to choose the pooling strategy will drop more sharply at the state level in the decentralised case.

Put differently, *given* the decentralisation of certain public functions, extending the degree of tax autonomy ν_i will more effectively improve political discipline compared to attempts to

boost the retention rate in a centralised setting. Also, when deciding on which tax bases to decentralise, choosing tax base which induce less tax competition – and thus incurs a smaller marginal cost μ_i – will have a similarly positive effect on political discipline. Reducing tax competition drives up the amount of G_i^H which can be invested as we explained above, yet its beneficial impact on the effectiveness of targeting, and thus on the attractiveness of pooling, plays out more in a decentralised setting. the probability of being re-elected by means of targeting. Of course, the question remains what Proposition 1 and Proposition 3 mean in terms of voter welfare.

A.3 Centralisation: Welfare Analysis

Using the same reasoning as in Section 4, we can write voter welfare in a centralised constellation as

$$EW_i^C(\mu_i) = \bar{W}_i + \lambda_i(1-\pi_i)(1-q)\left(\frac{m}{n}\Delta_i^d - \beta\pi_i\Delta_i^s\right). \tag{28}$$

Comparing (28) and (18), a first difference lies in the benefits from pooling. Whereas in a decentralised setting the benefits would be reaped in all n states, selective pooling of the central government limits the benefits to m states. Second, and following Proposition 3, the pooling probabilities λ_i will also differ in both political regimes. We formalise this comparison in Proposition 4.

Proposition 4. *Depending on the threshold value for incumbents to pool, introduced in Lemma 4, we can distinguish between the following welfare scenarios:*

1. *If* $\beta \leqq \frac{m}{n\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)$, $EW_i^D = EW_i^C$,
2. *If* $\frac{m}{n\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right) < \beta \leqq \frac{1}{\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)$, $EW_i^D > EW_i^C \Leftrightarrow \pi_i > \frac{m}{n}\frac{\Delta_i^d}{\beta\Delta_i^s}$,
3. *If* $\frac{1}{\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right) < \beta$, $EW_i^D > EW_i^C$.

As a result, a decentralised system can only potentially Pareto-dominate a centralised framework if a sufficiently large fraction of politicians is benevolent, so that $\pi_i > \frac{m}{n}\frac{\Delta_i^d}{\beta\Delta_i^s}$.

Focusing first on scenario 1 and 3 in Proposition 4, where equilibrium strategies are aligned across fiscal regimes, we see that welfare nevertheless diverges between centralisation and decentralisation in scenario 3. When incumbents are certain to choose the pooling strategy in both regimes in other words, voters are better off when decision making is decentralised. The selective pooling reflex of centralised government is at play here, undermining the full potential of an outcome where the pooling strategy would be chosen in each state. In scenario 2 of the proposition electoral strategies do differ between fiscal regimes, as incumbents pool

in a centralised system but separate under decentralisation. Voter welfare now depends on the 'quality' of the pool of politicians voters can choose from. Characterised by a threshold value of $\bar{\pi}_i = \frac{m}{n}\frac{\Delta_i^d}{\beta\Delta_i^s} > 0$, decentralisation only improves voter welfare when the quality of politicians is sufficiently high, so that $\pi_i > \bar{\pi}_i$.

What emerges in this second scenario in other words, and similar to Besley and Smart (2007), is the relative importance of the selection effects vis-à-vis the disciplining effects of an election. If the pool of politicians mostly consists of benevolent politicians, strengthening the selection effect -here through increased separation with decentralisation- serves voter welfare more than improving discipline, and vice versa. Indeed, since pooling incumbents will eventually divert maximum rents in a future term, replacing bad incumbents as soon as possible is welfare-improving if a sufficient amount of benevolent alternatives is at hand.

Appendix B Proofs

Proof of Lemma 1. The valence voter will always re-elect the incumbent after observing first period public provision of G_i^H when his posterior beliefs Π_i outweigh his prior beliefs π_i:

$$\Pr(g|T_i^H) = \Pi_i = \frac{\pi_i q_i}{\pi_i q_i + (1-\pi_i)(1-q_i)\lambda_i} > \pi_i. \tag{29}$$

Solving (29) for λ_i we get that

$$\Pi_i > \pi_i \Leftrightarrow \frac{q_i}{(1-q_i)} > \lambda_i, \tag{30}$$

which, since $\lambda_i \in [0,1]$, will always be the case as long as $q_i > \frac{1}{2}$. □

Proof of Lemma 2. Let us first look at a 'swing' valence voter s whose ideological bias makes him indifferent between the two parties so that, after observing $\left(G_i^H, T_i^H\right)$ in period 1 and using (11), we know that for this voter

$$\gamma_i^s = \Pi_i - \pi_i - \delta_i. \tag{31}$$

All valence voters j with $\gamma_i^j \leqq \gamma_i^s$ thus prefer the incumbent grouping of politicians, since in this case it is always true that $\Pi_i > \pi_i + \delta_i + \gamma_i^s$. Consequently, given our distributional assumptions on γ_i, and using (5), the incumbent group can expect to win an *overall* vote share κ_i after setting $\left(G_i^H, T_i^H\right)$ in period 1 of

$$\kappa_i = \omega_i \,\mathbb{E}\left(\eta\left[Y_i\left(G_i\right)\right]\right) + (1-\omega_i)\left(\gamma_i^s + \frac{1}{2}\right), \tag{32}$$

keeping in mind that ω_i denotes the share of priority voters in the total voting population, and that as a result, $(1-\omega_i)$ captures the valence voters' share. Plugging (32) into (31), we

then obtain

$$\kappa_i = \omega_i \mathbb{E}\left(\eta\left[Y_i\left(G_i\right)\right]\right) + \left(1-\omega_i\right)\left(\Pi_i - \pi_i - \delta_i + \frac{1}{2}\right), \tag{33}$$

so that we can also write out the probability of winning a majority of the overall vote share as

$$\Pr\left[\kappa_i \geqq \frac{1}{2}\right] = \Pr\left[\omega_i \mathbb{E}\left(\eta\left[Y_i\left(G_i\right)\right]\right) + \left(1-\omega_i\right)\left(\Pi_i - \pi_i - \delta_i + \frac{1}{2}\right) \geqq \frac{1}{2}\right]. \tag{34}$$

Using (5), we can further derive the expected share that can be won of the priority vote by providing G_i^H, which gives us

$$\mathbb{E}\left(\eta\left[Y_i\left(G_i\right)\right]\right) = \rho\left[Y_i\left(G_i\right)\right]\left(\frac{1}{2}+\chi\right) + \left(1-\rho\left[Y_i\left(G_i\right)\right]\right)\left(\frac{1}{2}-\chi\right) = \left(2\rho\left[Y_i\left(G_i\right)\right]-1\right)\chi + \frac{1}{2} > 0, \tag{35}$$

which, plugged into (34) yields

$$\text{Prob}\left[\kappa_i \geqq \frac{1}{2}\right] = \underset{\delta_i}{\text{Prob}}\left[\frac{\omega_i\left(2\rho\left[Y_i\left(G_i\right)\right]-1\right)\chi}{\left(1-\omega_i\right)} + \left(\Pi_i - \pi_i\right) \geqq \delta_i\right], \tag{36}$$

so that, setting $\frac{\omega_i(2\rho[Y_i(G_i)]-1)\chi}{(1-\omega_i)} = \alpha_i$,[27] we get

$$\Pr\left[\kappa_i \geqq \frac{1}{2}\right] = \underset{\delta_i}{\text{Prob}}\left[\alpha_i + \left(\Pi_i - \pi_i\right) \geqq \delta_i\right]. \tag{37}$$

Using (37), and given our distributional assumptions on δ_i, the probability for the group of incumbents of winning the elections then becomes

$$\Pr\left[\kappa_i \geqq \frac{1}{2}\right] = \sigma_i\left(\alpha_i + \left(\Pi_i - \pi_i\right)\right) = \begin{cases} 1 & \text{if } \alpha_i + \left(\Pi_i - \pi_i\right) > \frac{1}{2\xi} \\ \frac{1}{2} + \xi\left(\alpha_i + \left(\Pi_i - \pi_i\right)\right) & \text{Otherwise} \\ 0 & \text{if } \alpha_i + \left(\Pi_i - \pi_i\right) < -\frac{1}{2\xi}. \end{cases} \tag{38}$$

□

Proof of Proposition 1. From Section 2.1 we know that $Y_i{=}\nu_i R_i(G_i)$, where $R_i(0) = 0$. Since $\rho(Y_i = 0) = \frac{1}{2}$, and focusing on the expression for α_i given in Lemma 2

$$\alpha_i = \frac{\omega_i\left(2\rho\left[Y_i\left(G_i\right)\right]-1\right)\chi}{\left(1-\omega_i\right)}, \tag{39}$$

we know from (39) that $\alpha_i = 0$ when $G_i = 0$. Moreover, because $\frac{dY_i(G_i,\nu_i)}{dG_i} > 0$ and $\rho(Y_i)$ is increasing in Y_i, we have that $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{dG_i} > 0$ and $\alpha_i(G_i,\nu_i,\omega_i,\chi) > 0$ for all other possible values of $G_i, \nu_i, \omega_i, \chi$, given that states enjoy some degree of tax autonomy $\nu_i \in]0,1]$. From (39) we also learn that $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{d\nu_i} > 0, \frac{dR(G_i)}{dG_i} > 0$, $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{d\chi_i} > 0$ and $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{d\omega_i} > 0$,

[27] It should be noted that, in case (5) would not be centered around half of the priority vote but rather a certain share S, we would have that $\frac{\omega_i\left(2\rho[Y_i(G_i)]-1-(S-\frac{1}{2})\right)\chi}{(1-\omega_i)} = \alpha_i$. Clearly, the added parameter values $(S-\frac{1}{2})$ will not alter the dynamics of the model, as they are exogenous.

which, together with the fact that $\alpha_i(G_i, \nu_i, \omega_i, \chi) > 0$ when $G_i = G_i^H$ as shown above, proves points 1) to 4) of Proposition 1 as higher values of α_i increase the probability that condition (13) holds, which can be seen in (12) or lemma 2. Likewise, since lower marginal costs of public funds μ_i translate into higher public provision G_i^H following (1), and $\widehat{r}_i = (H - L)G_i^H$, we know that $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{d\mu_i} > 0$ and $\frac{d\widehat{r}_i(G_i)}{d\mu_i} > 0$, which proves point 3) of proposition 1 since both a higher r_i and α_i increase the probability that condition (13) holds. □

Proof of Proposition 2. Focusing on an increase of ν_i or ω_i, and thus limiting our attention to a rise in
$\sigma_i\left(\alpha_i(G_i, \nu_i, \omega_i, \chi) + (\Pi_i - \pi_i)\right)$ only, we have that

$$\frac{1}{\sigma_i\left(\alpha_i^{'} + (\Pi_i - \pi_i)\right)}\left(1 - \frac{\widehat{r}_i^{1\prime}}{X_i}\right) = \beta_i^{D\prime} < \beta_i^D = \frac{1}{\sigma_i\left(\alpha_i + (\Pi_i - \pi_i)\right)}\left(1 - \frac{\widehat{r}_i^{1}}{X_i}\right), \tag{40}$$

where β_D and $\beta_D^{'}$ again denote the triggering values for the incumbents to pool, but now before and after a shift in ν_i or ω_i respectively. This upwards shift leads to higher levels of $\alpha_i(G_i, \nu_i, \omega_i, \chi)$ as proven in proposition 1, which we mark out in (40) as $\alpha_i' > \alpha_i$. Since σ_i denotes a probability furthermore and $\frac{d\sigma_i}{d\alpha_i} > 0$ following lemma V.2, the direction of the inequality sign in (40) follows. Turning now to welfare effects, we write post-increase welfare as

$$EW_i^{D'}(\mu_i) = \bar{W}_i + \lambda_i^{D'}(1 - \pi_i)(1 - q)\left(\Delta_i^d - \beta\pi_i\Delta_i^s\right), \tag{41}$$

with $\lambda_i^{D'}$ the altered pooling probabilities after the increase. Subtracting (18) from (41), we then derive the potential welfare gains of an increase in ν_i or ω_i as

$$\frac{EW_i^{D'}(\mu_i) - EW_i^D(\mu_i)}{(1 - \pi_i)(1 - q)} = \left(\lambda_i^{D'} - \lambda_i^D\right)\left(\Delta_i^d - \beta\pi_i\Delta_i^s\right). \tag{42}$$

Using lemma 3 and (40), we can once more distinguish three scenarios using the triggering value of pooling. First, when $\frac{1}{\sigma_i(\alpha_i')}\left(1 - \frac{\widehat{r}_i^{1\prime}}{X_i}\right) \geqq \beta$, incumbents will separate in the decentralised as well as the decentralised setting, so that $\lambda_i^D = \lambda_i^{D'} = 0$ and (42) will be equal to zero. Inversely, when $\frac{1}{\sigma_i(\alpha_i)}\left(1 - \frac{\widehat{r}_i^{1}}{X_i}\right) < \beta$, pooling strategies are aligned so that $\lambda_i^D = \lambda_i^{D'} = 1$ and (42) is again equal to zero. Lastly, when $\frac{1}{\sigma_i(\alpha_i')}\left(1 - \frac{\widehat{r}_i^{1\prime}}{X_i}\right) < \beta \leqq \frac{1}{\sigma_i(\alpha_i)}\left(1 - \frac{\widehat{r}_i^{1}}{X_i}\right)$, pooling strategies will be different before and after the shift in ν_i or ω_i. Where incumbents would have separated before the rise in re-election probabilities, they will now keep on pooling so that $\lambda_i^D = 0$ and $\lambda_i^{D'} = 1$. Welfare gains after the increase then become

$$\frac{EW_i^{D'}(\mu_i) - EW_i^D(\mu_i)}{(1 - \pi_i)(1 - q)} = \left(\Delta_i^d - \beta\pi_i\Delta_i^s\right), \tag{43}$$

which will only be positive when $\pi_i < \frac{\Delta_i^d}{\beta\Delta_i^s}$. Again, for β sufficiently large and since $\Delta_i^s > \Delta_i^d$, we have that $0 < \bar{\pi}_i < 1$. □

Proof of Corollary 3. Taking the total derivative of (18) with respect to μ_i, we obtain

$$\begin{aligned}\frac{dEW_i^D(\mu_i)}{d\mu_i} &= \frac{d\bar{W}_i(\mu_i)}{d\mu_i} + \frac{\partial\lambda_i}{\partial\mu_i}(1-\pi_i)(1-q)\left(\Delta_i^d - \beta\pi_i\Delta_i^s\right) \\ &\quad +\lambda_i(1-\pi_i)(1-q)\left(\frac{\partial W_i^g(H,\mu_i)}{\partial\mu_i} + C_i(X_i) - \beta\pi_i\left(\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} + C_i(X_i)\right)\right),\end{aligned} \tag{44}$$

with,

$$\frac{d\bar{W}_i(\mu_i)}{d\mu_i} = \frac{dW_i^0(\mu_i)}{d\mu_i} + \beta\left(\pi_i\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} + (1-\pi_i)\frac{dW_i^0(\mu_i)}{d\mu_i}\right) < 0, \tag{45}$$

$$\frac{dW_i^0(\mu_i)}{d\mu_i} = \pi_i\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} - (1-\pi_i)C_i(X_i) < 0, \tag{46}$$

and,

$$\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} = q\frac{\partial W_i^g(H,\mu_i)}{\partial\mu_i} + (1-q)\frac{\partial W_i^g(L,\mu_i)}{\partial\mu_i} < 0, \tag{47}$$

$$\frac{\partial W_i^b(\mu_i)}{\partial\mu_i} = -C_i(X_i) < 0. \tag{48}$$

Define $\mu_i = \bar{\mu}_i$ as the value of μ_i for which (13) binds, so that

$$\widehat{r}_i^1(\mu_i) + \beta\sigma_i\left(\alpha_i(G_i,\nu_i,\chi,\omega_i) + (\Pi_i - \pi_i)\right)X_i = X_i. \tag{49}$$

Since $\frac{d\widehat{r}_i^1(\mu_i)}{d\mu_i} < 0$ and $\frac{d\sigma_i}{d\mu_i} < 0$ as specified in proposition 1, we obtain for all values $\mu_i < \bar{\mu}_i$ that

$$\widehat{r}_i^1(\mu_i) + \beta\sigma_i\left(\alpha_i(G_i,\nu_i,\chi,\omega_i) + (\Pi_i - \pi_i)\right)X_i > X_i, \tag{50}$$

or that $\frac{1}{\sigma_i(\alpha_i)}\left(1 - \frac{\widehat{r}_i^1}{X_i}\right) < \beta$. From lemma 3 we then find that in the resulting pooling equilibrium $\frac{\partial\lambda_i}{\partial\mu_i} = 0$, and $\lambda_i = 1$. This allows us to write (44) as

$$\begin{aligned}\frac{dEW_i^D(\mu_i)}{d\mu_i} &= \frac{d\bar{W}_i(\mu_i)}{d\mu_i} \\ &\quad +(1-\pi_i)(1-q)\left(\frac{\partial W_i^g(H,\mu_i)}{\partial\mu_i} + C_i(X_i) - \beta\pi_i\left(\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} + C_i(X_i)\right)\right),\end{aligned} \tag{51}$$

which, plugging in (45) and (46), and collecting terms, yields

$$\begin{aligned}\frac{dEW_i^D(\mu_i)}{d\mu_i} &= \pi_i\left(1+\beta+\beta q-\beta q\pi_i\right)\frac{\partial EW_i^g(\mu_i)}{\partial\mu_i} \\ &\quad -(1-\pi_i)\left(\left(q+\beta(1-\pi_i)+\beta(1-q)\pi_i\right)C_i(X_i) - (1-q)\frac{\partial W_i^g(H,\mu_i)}{\partial\mu_i}\right) = \Psi_i,\end{aligned} \tag{52}$$

where, using (47) and (48), we know that $\Psi_i < 0$. Inversely, when $\mu_i \geqq \bar{\mu}_i$, we get that

$$\widehat{r}_i^1(\mu_i) + \beta\sigma_i\left(\alpha_i(G_i,\nu_i,\chi,\omega_i) + (\Pi_i - \pi_i)\right)X_i \leqq X_i. \tag{53}$$

From lemma 3 we know that when $\beta \leqslant \frac{1}{\sigma_i(\alpha_i)}\left(1 - \frac{\widehat{r}_i^1}{X_i}\right)$ results in a separating equilibrium where $\frac{\partial\lambda_i}{\partial\mu_i} = 0$ and $\lambda_i = 0$. We can then write (44) simply as

$$\frac{dEW_i^D(\mu_i)}{d\mu_i} = \frac{d\bar{W}_i(\mu_i)}{d\mu_i} < 0. \tag{54}$$

In the neighbourhood of $\bar{\mu}_i$ lastly, we know a value $\mu_i \lesssim \bar{\mu}_i$ exists for which a marginal increase implies a shift from the pooling to the separating equilibrium according to lemma 3, so that $\frac{\partial \lambda_i}{\partial \mu_i} = -1$ and $\lambda_i = 1$. From (44), and using (52), we now obtain

$$\frac{dEW_i^D(\mu_i)}{d\mu_i} = \Psi_i - (1-\pi_i)(1-q)\left(\Delta_i^d - \beta \pi_i \Delta_i^s\right), \tag{55}$$

which will only be positive if and only if

$$(1-\pi_i)(1-q)\left(\Delta_i^d - \beta \pi_i \Delta_i^s\right) < \Psi_i. \tag{56}$$

Since we know from (52) that $\Psi_i < 0$, this implies that $\frac{\Delta_i^d}{\Delta_i^s \beta} < \pi_i$ is a necessary condition for (56) to hold. The last part of the corollary is proven by considering a discrete jump of μ_i rather than thinking on the margin. As proven in proposition 2, any discrete jump in μ_i – as well as the resulting change in the threshold value of β_i defining the interval where politicians switch equilibrium strategies – will be larger if α_i is larger too, since $\frac{d\sigma_i}{d\alpha_i} > 0$, and thus the more priority voters in the population as $\frac{d\alpha_i(G_i,\nu_i,\omega_i,\chi)}{d\omega_i} > 0$. This proves the last part of the proposition. □

Proof of Lemma 4. A central government of bad incumbents will provide G_i^H when $\theta_i = H$ in $m = (n+1)/2$ states needed to win the election – in other words, opt for the selective pooling strategy – if for that specific set of m states the following inequality is the largest

$$\sum_i^m \widehat{r}_i^1 + \sum_i^n X_i - \sum_i^m X_i + \beta \sum_i^n \sigma_i \left(\alpha_i + (\Pi_i - \pi_i)\right) X_i > \sum_i^n X_i. \tag{57}$$

Since the unit costs of public provision θ_i are assumed fully correlated across states, pooling in $m = (n+1)/2$ states thus maximises the incumbent government's changes of re-election as well as its rents across both time periods. If no subset of $m = (n+1)/2$ states can be found which satisfies (57), the government will extract the total $\sum_i^n X_i$ maximum rents in each state, thus choosing to separate. Reworking (57) then gives us

$$\sum_i^m m\left(\widehat{r}_i^1 - X_i\right) > -\beta \sum_i^n \sigma_i \left(\alpha_i + (\Pi_i - \pi_i)\right) X_i, \tag{58}$$

or, solving for β,

$$\frac{\sum_i^m \left(X_i - \widehat{r}_i^1\right)}{\sum_i^n \sigma_i \left(\alpha_i + (\Pi_i - \pi_i)\right) X_i} < \beta. \tag{59}$$

To gain in simplicity, and to make the proof of proposition 2 in the main text more tractable, we assume states are perfectly symmetric in what follows. Collecting terms, we can then write (60) to obtain

$$\frac{m}{n\sigma_i \left(\alpha_i + (\Pi_i - \pi_i)\right)} \left(1 - \frac{\widehat{r}_i^1}{X_i}\right) < \beta, \tag{60}$$

where the fact that the denominator is smaller compared to a scenario where the central government would follow an 'unselective' pooling strategy, also emerges. □

Proof of Proposition 3. With β_i^C the threshold above which rent-seekers choose to separate in the centralised case, and with β_i^C its counterpart under decentralisation, we know that

$$\frac{m}{n\sigma_i\left(\alpha_{ic}+(\Pi_i-\pi_i)\right)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)\equiv\beta_i^C<\beta_i^D\equiv\frac{1}{\sigma_i\left(\alpha_i+(\Pi_i-\pi_i)\right)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right), \tag{61}$$

since $\frac{m}{n}<1$, $\widehat{r}_i^1\leqq X_i$, σ_i is a probability and $\alpha_i<\alpha_{ic}$. The latter inequality holds because $\nu_i=0$, which yields a higher value of α_i as expressed by (39) since $Y_i{=}(1-\nu_i)R_i(G_i)$ with centralisation, and $\rho(Y_i)$ is increasing in Y_i. In any case, what we learn from (61) is that the threshold value for bad incumbents to pool is as a result lower in the centralised case, since $\beta_i^C<\beta_i^D$, which proves the first part of proposition 1. Suppose now that $\sigma_i\left(\alpha_i+(\Pi_i-\pi_i)\right)$ increases under any of the possible scenarios given in proposition 1. The amount by which β_i^C drops as a result, will then always be only $\frac{m}{n}$'th of the amount by which β_i^D would drop. Increasing the probability of re-election thus boosts discipline more in the decentralised case. □

Proof of Proposition 4. Subtracting (28) from (18), we can write the potential welfare gains of decentralisation as

$$\frac{EW_i^D(\mu_i)-EW_i^C(\mu_i)}{(1-\pi_i)(1-q)}=\left(\lambda_i^D-\lambda_i^C\right)\left(\Delta_i^d-\beta\pi_i\Delta_i^s\right)+\lambda_i^C\left(1-\frac{m}{n}\right)\Delta_i^d, \tag{62}$$

with λ_i^D and λ_i^C the pooling probabilities under decentralisation and centralisation respectively. Following Lemma 4 and Proposition 3, we distinguish the following three scenarios using the threshold values of pooling. First, when $\frac{m}{n\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)\geqq\beta$, incumbents will separate in the decentralised as well as the centralised setting, so that $\lambda_i^D=\lambda_i^C=0$ and (62) will be equal to zero. Inversely, when $\frac{1}{\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)<\beta$, pooling strategies are aligned so that $\lambda_i^D=\lambda_i^C=1$, yet welfare will be higher under decentralisation as (62) collapses to $\frac{EW_i^D(\mu_i)-EW_i^C(\mu_i)}{(1-\pi_i)}=\lambda_i^C\left(1-\frac{m}{n}\right)\Delta_i^d>0$. Lastly, when $\frac{m}{n\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)<\beta\leqq\frac{1}{\sigma_i(\alpha_i)}\left(1-\frac{\widehat{r}_i^1}{X_i}\right)$, pooling strategies differ depending on the fiscal regime. Whereas incumbents will no longer pool in the decentralised setting, a central government still would -because of selective pooling- so that $\lambda_i^D=0$ and $\lambda_i^C=1$. Welfare gains under decentralisation then reduce to

$$\frac{EW_i^D(\mu_i)-EW_i^C(\mu_i)}{(1-\pi_i)(1-q)}=\left(\beta\pi_i\Delta_i^s-\Delta_i^d\right)+\left(1-\frac{m}{n}\right)\Delta_i^d, \tag{63}$$

which will only be positive when $\pi_i>\frac{m}{n}\frac{\Delta_i^d}{\beta\Delta_i^s}=\bar{\pi}_i$. For β sufficiently large and since $\Delta_i^s>\Delta_i^d$, we have that $0<\bar{\pi}_i<1$. □