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FLEXIBLE MAJORITY RULES

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Abstract

In this paper we introduce flexible majority decision rules where the size of the majority depends on the proposal made by the agenda setter. Flexible majority rules can mitigate the disadvantages of democracies in the provision of public projects. In many cases, the combination of the principles taxation constraint to majority winners, a ban on subsidies, costly agenda setting and flexible majority rules constitute a socially optimal democratic constitution. Flexible majority rules might also be a useful decision-making procedure in other circumstances.

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1 Introduction

Democracies are built on two twin principles: equal voting and agenda rights. In most cases, decisions are made according to a majority rule. From an ex ante perspective, however, majority rules may often produce inefficient provision of public projects. For instance, a majority may support a public project although the minority's losses outweigh the benefits for the majority. From an ex ante perspective, the expected utility is negative, but the public project is provided nevertheless. In addition, majority voting can give rise to excessive redistribution activities with the majority simply expropriating the minority. Democracies can also fail to provide socially efficient public projects since winners may constitute a small minority and compensating part of the losses in order to form a supporting majority may require large transfers. Financing such transfers through the tax system may involve distortions that outweigh the net benefits from the public project. Finally, when losers from public projects have the right to determine the agenda, they can block the provision of socially efficient public projects by creating proposals that simply redistribute income from the majority to the minority.

Aghion and Bolton (1998) show that the simple majority rule can be optimal because it can help to overcome ex-post vested interests. In Gersbach (1999) it has been shown that fixed majority rules and constitutional treatment rules with respect to taxes and subsidies can increase the efficiency of the democratic process. But inefficiencies remain; in this paper we introduce flexible majority rules and other complementary constitutional rules to mitigate the remaining disadvantages of democracies in the provision of public projects.

Under flexible majority rules, the size of the majority required for the adoption of a proposal depends on the proposal itself, eg. on the share of taxed individuals. As an example suppose that the size of the majority is equal to the share of taxed people plus half of the share of non-taxed people. Then, if the share of taxed people is 60% of the society, the required majority is equal to 80% of the population. If the share of taxed people only amounts to 20% of the society, only 60% yes-voters are required for the adoption of the proposal. Therefore, if the individuals who are taxed correspond to the group of beneficiaries from the public project, the size of the majority required for a change of the status quo increases with the size of the project winners group. Another example are majority rules which require unanimity if the share of taxed individuals is below a certain threshold. Above the threshold, however, only the yes votes of all taxed individuals are required for a change of the status quo.

We examine a model where risk neutral individuals decide at the constitutional stage un-

der a veil of ignorance how public project provision and financing should be governed in the legislative period. The constitutional principles assumed in this paper must fulfill the fundamental democratic principles of equal voting and agenda rights. Moreover, constitutional principles cannot require more messages or information from citizens than proposals or voting including the possibility of non-participation. Thus, democratic constitutions are understood as the liberal democracy constraint on the set of all feasible mechanisms to collectively provide public projects. We show that at the constitutional stage, individuals unanimously agree to constitutional principles involving flexible majority rules and costly agenda setting. Our main conclusions are:

First, if nobody is affected negatively by the public project, the combination of the following constitutional principles constitutes a socially optimal constitution:

- Taxation constrained to majority winners which requires that only individuals that have voted for a proposal can be taxed
- Maximal taxation of the agenda setter, i.e. he has to pay the highest taxes
- A ban on subsidies
- Fixed majority rules

Second, if the utility from public projects can be negative for some agents, the following constitutional principles yield a first-best allocation in almost all cases:

- Taxation constrained to majority winners
- Maximal taxation of the agenda setter and costly agenda setting
- A ban on subsidies
- Flexible majority rules

Under both types of constitutions only the individuals with a high utility from the public project want to set the agenda. In order to lower their tax burden they tax other agents to the extent that they still support the proposal. Subsidization is banned which eliminates excessive tax distortions. In the case where some agents are affected negatively by the public project, the flexible majority rules require unanimous support if the public project is not socially valuable and a lower level of support if it is socially valuable. Flexible

majority rules ensure that a winning majority for the project proposal can be obtained if and only if the public project is socially valuable.

While we explore flexible majority rules in the context of public project provision, the idea could have broader applications in a variety of other circumstances. For instance, it might be useful to make the size of the majority dependent on the importance of the issue, captured by the associated tax volume. Then, large reform proposals may require super majority rules whereas marginal changes are voted on by the simple majority rule. An other application would be to let the size of the majority depend on the tax differences across the population which would allow to pursue distributional objectives in a society.

While we are not aware of real world constitutions which exactly match the constitutions and flexible majority rules suggested in this paper, there are examples that exhibit some similarities. The German legislation has been characterized over the last years by a first chamber (Bundestag) dominated by the winners of the federal elections. The opposition won the majority of state elections and had a blocking majority in the second chamber (Bundesrat), which represents the states. For large packages - such as large tax reforms - which needed the support of both chambers the constellation led to de facto larger majority requirements to change the status quo than for smaller packages.

The paper draws on the seminal contribution of Buchanan and Tullock (1962) and the recent incomplete contract approach to social contracts by Aghion and Bolton (1998). Following a long tradition started by Rousseau (see Harsanyi (1955), Mirrless (1971) and also Wicksell (1896)), Buchanan and Tullock (1962) have examined which constitutional rules would be chosen behind a veil of ignorance (see also Rae (1969), Taylor (1969), Rawls (1971) and the comprehensive surveys of Buchanan (1991), Mueller (1996) and Voigt (1998)). In this paper, we examine which treatment rules for agenda setting and which decision rules will be chosen behind the veil of ignorance. We use the model of Aghion and Bolton (1998) which builds on Romer and Rosenthal (1983) and on Laffont (1995). Aghion and Bolton (1998) have shown that fixed majority rules are a compromise between limits to the exploitation of minorities and overcoming vested interests. We introduce flexible majority rules which, together with costly agenda setting, yield efficient provision of public projects.

Our paper is also related to a large literature on optimal collective decision rules and to the majoritarian logic (see e.g. Buchanan (1998) and Mueller (1996)). May (1952) has shown that the simple majority rule satisfies a number of axioms founded in the enlightment era (see Schofield (1972) for a discussion). Guttman (1998) finds that under plausible conditions about project data the simple majority rule is second-best in a binary decision

context. Recently Koray (2000) has outlined a method for viewing social choice functions themselves as alternatives, so that one can ask whether a social choice function selects itself. He shows that given enough richness of preferences the only self-selective social choice functions are dictatorial.[1] In our paper we suggest that flexible majority rules can implement first-best solutions and provide an efficient bridge between the twin problems of democracy: overcoming vested interests and expropriation of minorities.

The constitutional rules in our paper induce agenda setters to propose only social-efficient projects. Our paper is thus related to the recent literature on efficient information aggregation through voting.[2] However, none of the existing papers in the literature is concerned with the design of the constitutional rules for agenda setting and decisions to implement efficient allocations of public projects.

An important remark about our approach to design constitutional rules is in order. We consider mechanisms under the liberal democracy constraint.[3] Within this constraint we use a constructive procedure, i.e. we design rules in order to achieve first-best allocations under various scenarios of uncertainty. We have not yet found a direct method to characterize the set of feasible mechanisms. Such a characterization would be necessary in order to built a general theory of constitutional design. We think that as long as no general theory is available, the constructive approach taken here is a useful substitute, since we can find rules which implement first-best allocations.

2 Model and Constitutional Rules

2.1 Model

The basic structure of our model builds on Romer and Rosenthal (1983) and Aghion and Bolton (1998). We consider a standard social choice problem of public project provision

[1] See also the self-stable voting rules of Barbera and Jackson (2000).

[2] An important strand of literature has examined the validity of the Condorcet Jury Theorem which states that majority rule voting allows efficient information aggregation (Young and Levenglick 1978). Austen-Smith and Banks (1996), Feddersen and Pesendorfer (1994), Feddersen and Pesendorfer (1996) and Myerson (1994) have shown that taking into account the possibility of strategic voting does allow to generalize and reinforce the informational efficiency of voting. Others have relaxed the independence assumption and allow for correlated voters and still obtain efficient information aggregation (Berg (1993), Ladha (1992), Berend and Paroush (1998)). For a concise survey see Piketty (1999). Piketty (2000) has developed a theory through which communicative voting can influence future elections which is absent in our model.

[3] Without the liberal principles constraint there are always mechanisms for implementing socially efficient public project provision in our context (see e.g. Moore (1992) and Moulin (1997)).

and financing. Time is indexed by $t = 0, 1$. The first period $t = 0$ is the constitutional period. In the constitutional period a society of risk-neutral members decides upon how public project provision and financing should be governed in the legislative period.

In the legislative period $t = 1$ each citizen is endowed with some private consumption good whose density on the unit interval is e. The community can adopt a public project with per capita costs $k > 0$. Citizens are indexed by i or $j \in [0, 1]$. We denote the utility of agent j from the provision of the public project by v_j. For simplicity of presentation, we assume that v_j can take two values (expressed in terms of the consumption good), $v_j = V_h > 0$ if $j \in [0, p]$ (project winners) and $v_j = V_l < V_h$ if $j \in (p, 1]$ (project losers). At $t = 0$ agents do not know whether they will be project winners or project losers in $t = 1$, i.e. in $t = 0$ for each citizen his location j in the unit interval is a uniformly distributed random variable. Moreover, we assume that those random variables are independent and hence, by the law of the large numbers, the fraction of project winners and project losers will be p and $(1 - p)$ respectively.

Public projects must be financed by taxes. We assume that taxation is distortionary.[4] Let $\lambda > 0$ denote the shadow cost of public funds. That is, taxation uses $(1 + \lambda)$ of taxpayer's resources in order to levy 1 for public projects or for transfers to citizens. Hence the overall per capita costs of the public project amount to $(1 + \lambda)k$ and we can represent the project data in a vector $\mathcal{P} = \Big(p, V_h, V_l, (1 + \lambda)k\Big)$.

We denote by t_j and s_j the tax payment or subsidy of citizen j respectively and define the variable g that indicates whether the public project is provided ($g = 1$) or not ($g = 0$). Assuming that v_j is a private benefit that cannot be taxed,[5] the utility of citizen j in the legislative period is given by

$$e + gv_j - t_j + s_j.$$

Finally the budget constraint of the society in the legislative period is given by

$$\int_0^1 t_j \, dj = (1 + \lambda)\Big[gk + \int_0^1 s_j \, dj\Big].$$

Throughout the paper we assume that $e \geq V_h$.

[4] It is well known (e.g. Buchanan and Tullock (1962), Aghion and Bolton (1998)) that without cost of redistribution the unanimity rule in this context is first-best.

[5] If v_j is a monetary return it could be taxed in addition to e. The results would be unaffected by this modification.

2.2 Socially Efficient Solutions

The fact that citizens are risk neutral implies that it is socially efficient from an ex ante point of view to provide the public project if and only if

$$V := pV_h + (1-p)V_l > k(1+\lambda).$$

Moreover, money should only be raised to finance the public project. Any redistribution activities are waste from an ex ante point of view. A socially efficient tax scheme, for instance, is that a socially desirable public project is financed by project winners and no subsidies are paid. In order to implement such a solution, a complete social contract would be necessary. We summarize the first-best solution as follows.

First-Best-Solution

Any allocation where the public project is provided if and only if $V > k(1+\lambda)$ *and where taxes are only raised to finance the public project is socially efficient (first -best) in an ex-ante sense. An example for a first-best allocation is given by*

(i) If $V > (1+\lambda)k$ *then* $g = 1$, $s_j = 0$ *for all* j *and*

$$t_j = \begin{cases} (1+\lambda)k/p & \text{for project winners} \\ 0 & \text{for project losers.} \end{cases}$$

(ii) If $V \leq (1+\lambda)k$ *then* $g = 0$ *and* $t_j = s_j = 0$ *for all* j.

In the following we assume that complete social contracts cannot be written. As it is common in the incomplete contracting literature, we assume that future states of nature cannot be described precisely and therefore a constitution can only specify rules for future social decision making. In this paper we suggest new constitutional rules that - to our knowledge - are not yet implemented in any existing constitution. We will argue that these rules will improve the efficiency of public project provision under certain circumstances.

2.3 The Game

We consider the duality of constitutional and legislative period as a substitute for the complete social contract that cannot be written. At the constitutional stage, the society

decides about the rules governing the legislative processes. The sequence of events for a decision process in this context is summarized as follows:

Stage 1: In the constitutional period, the society decides unanimously about the constitutional principles governing legislative decision making.

Stage 2: At the start of the legislative period, citizens observe their location j on the unit interval and the location of all other agents. Citizens decide simultaneously whether to apply for agenda setting ($\psi_j = 1$) or not ($\psi_j = 0$).

Stage 3: Among all citizens that apply, one citizen $a \in [0,1]$ is determined randomly to set the agenda. The agenda setter proposes a project/financing package $\Big(g, t_j, s_j\Big)_{j\in[0,1]}$. Denote this choice by A_a.

Stage 4: Given A_a, citizens decide simultaneously whether to accept the proposal $\delta_j(A_a) = 1$ or not ($\delta_j(A_a) = 0$).

Note that if nobody applies for agenda setting, the status quo will prevail and that individuals know at the voting stage who will be taxed and who will receive subsidies if a proposal is accepted. Given a constitution with a set of principles discussed in the next section, we look at subgame perfect implementations in stages 2 to 4. A comprehensive overview of implementation issues can be found in Moore (1992). An equilibrium for the subgame that consists of the stages 2 - 4 can be described as a set of strategies

$$\Big\{\psi, A, \delta(\cdot)\Big\},$$

where $\psi = (\psi_j)_{j\in[0,1]}$, $A = (A_a)_{a\in[0,1]}$, $\delta = (\delta_j)_{j\in[0,1]}$. Note that $\delta_j = \delta_j(A_a)$ depends on the proposed agenda A_a. For the voting game in stage 4 and for the decision about applying for agenda setting (stage 2) we will assume that

- **(EWS)** *Agents eliminate weakly dominated strategies.*

EWS is a standard assumption to eliminate the multiplicity of voting equilibria. Moreover, we denote the utility payoff of agent j in $t = 1$ by $U_j(A_a, \Delta_j, \delta_j)$. Obviously U_j depends on the agenda A_a which the agenda setter a has proposed, on the vote δ_j of agent j and on the votes of all other citizens denoted by $\Delta_j := (\delta_i)_{i\in[0,1];\, i\neq j}$. In order to simplify the exposition we assume that two tie-breaking rules are applied:

- **(T1)** *Suppose that agent a has proposed the agenda A_a. If $U_j(A_a, \Delta_j, 1) = U_j(A_a, \Delta_j, 0)$ for all possible votes Δ_j of the other agents, then agent j will vote against the proposal if his net benefit $u_j = gv_j + s_j - t_j$ from the proposal is smaller than zero and he will vote yes in all other cases.*

In order to formulate the second tie-breaking rule we assume that the voting subgame has a unique equilibrium.[6] In this case we can define the utility level $U_j(A_a)$ that an agent j will achieve if agent a has proposed the agenda A_a. Moreover, denoting the set of all possible agendas by $\mathcal{A}$, we obtain that an agent j cannot strictly improve his utility by setting the agenda if

$$\sup_{A_j \in \mathcal{A}} U_j(A_j) \leq \min\Big\{e\,,\ \inf_{a\in[0,1],\, a\neq j,\, A_a \in \mathcal{A}} U_j(A_a)\Big\}.$$

Under these circumstances we assume that he will not apply for agenda setting:

- **(T2)** *If an agent cannot strictly improve his utility by setting the agenda, he will not apply for agenda setting.*

In what follows we will - without referring explicitly to it - always assume that (EWS), (T1) and (T2) are applied. We are now ready to characterize the expected utility level a particular constitution can deliver. We say that a constitution $\mathcal{C}$ implements an expected utility U if, given agents have agreed on $\mathcal{C}$ in stage 1 the following holds:

If (EWS), (T1) and (T2) are applied, all possible subgame perfect equilibria under the constitution $\mathcal{C}$ yield a fixed expected utility U. Non-uniqueness of equilibria does only occur in out-of-equilibrium strategies or in the agenda setting stage.[7] A formalization of this implementation requirement is given in the appendix.

Finally note that the constitutional rules are decided on in stage 1 by the unanimity rule. It is obvious that if a set of constitutional rules yields first-best, it will be approved unanimously in stage 1 since individuals are identical at this point.

[6] We will show that for all constitutions that we will consider, (EWS) and (T1) imply that the voting subgame has a unique solution.

[7] Note that for all but one of the constitutions that we will propose, non-uniqueness only occurs in out-of-equilibrium strategies but not in the agenda setting stage.

2.4 Constitutional Principles

The rules in the constitution now have to specify:

1. Whether there is a special treatment of the agenda setter (**Agenda setter rules**).
2. Restrictions on the agendas that can be proposed, i.e. definition of all constitutional agendas (**Agenda rules**). An agenda consists of a project proposal and a financing package.
3. How the nation decides upon a proposal (**Decision rules**).

We assume open ballots. Therefore, individuals can be divided ex post into majority winners and the minority. Moreover we assume that individuals can observe whether other agents are project winners or losers. However, following the incomplete contract literature, we assume that this observation is not contractable and hence not verifiable in a constitutional court. In order to avoid ambiguous language, we will distinguish between project winners (losers) and majority winners (losers).

Note again that we use a construction procedure and outline all rules which we found to be potentially of help to reach first-best. In order to formulate the rules that we will use in this paper we need the following notation:

Notation

Let A_a be an arbitrary agenda. We denote the fraction of citizens that have to pay positive taxes by n_T. Furthermore we denote the maximal taxes that are proposed for a citizen by t^{max} and the total tax payments that are proposed in A_a by $T = \int_0^1 t_j \, dj$.

We will consider the following possibilities of designing constitutional rules:

Agenda setter rules

- *Costs of agenda setting* ***[CA(a)]***
  The agenda setter pays a fixed amount of $a > 0$ if his agenda does not lead to the provision of the public project.

Agenda rules

- *Maximal taxation of agenda setter* ***[MTA]***
  The agenda setter pays the maximal tax rate that is proposed in his agenda.

- *No subsidies* ***[NS]***
  The agenda setter is not allowed to propose any subsidies.

- *Constraint taxation to majority winners* ***[CTW]***
  Only majority winners can be taxed.

- The financing package must satisfy the budget constraint.

Decision rules

- *m-majority rule* ***[M(m)]***
  If a proposal to change the status quo receives a majority of m percent of the citizens, the proposal is adopted.

- *Flexible majority rule* ***[FM(α, β)]***
  This rule divides the population into the part P_T that - according to the proposal - pays positive taxes and the rest P_N of the population. A proposal is adopted if it receives an α-majority in P_T and a β-majority in P_N. $\alpha = \alpha(n_T, T, t^{max})$ and $\beta = \beta(n_T, T, t^{max})$ may depend on the fraction n_T of taxed people in the population, on the total taxes T and on the maximal tax rate t^{max} proposed in the agenda.
  The following special cases of the flexible majority rule are important for our discussion:

  - *Fixed participation rule:* $\alpha(\cdot) \equiv 1$ and $\beta(\cdot) \equiv \beta$ $(0 \leq \beta \leq 1)$.
  - *Threshold majority rule (fixed threshold)* ***[TMf(q)]***
    Under this rule β jumps from 1 to 0 when the share of taxed people reaches the threshold level q.
    $$\alpha(\cdot) \equiv 1 \text{ and } \beta(n_T) := \begin{cases} 1 & \text{if } n_T \leq q \\ 0 & \text{else.} \end{cases}$$
  - *Threshold majority rule (variable threshold)* ***[TMv(q)]***
    $$\alpha(\cdot) \equiv 1 \text{ and } \beta(n_T, T, t^{max}) := \begin{cases} 1 & \text{if } n_T \leq q(T, t^{max}) \\ 0 & \text{else.} \end{cases}$$

Note that the flexible majority rules [FM(α, β)] may depend on information generated by the proposal (n_T, t^{max}, T). Therefore, constitutions that use such rules produce a *feedback effect* : the actual rules governing the decision whether a proposal is constitutional depend on the proposal and hence in return the proposals that will be made will depend on those

rules. In contrast, the rules [CA(a)] and [M(m)] do not depend on proposal information but may depend on project parameters. Finally [MTA], [NS] and [CTW] do not depend on any additional information. Note how the agenda and the majority rules work. If a proposal or the majority voting outcome violates one of the agenda rules or if it does not receive the required majority, then the status quo prevails. We will call a proposal A_a of an agent a constitutional if the triple $\left(a, A_a, \delta^*(A_a)\right)$ does not violate the constitutional rules. $\delta^*(A_a)$ denotes the equilibrium voting strategies if A_a is proposed.[8]

In the following sections, we will demonstrate that the agenda and decision rules introduced above are helpful to achieve optimal allocations. Note how flexible majority rules take into account how many individuals are taxed. For instance, under the fixed participation rule, the size of the majority increases with the share of taxed individuals in a society. If the individuals who are taxed correspond exactly to the project winners, the size of the majority required for a change of the status quo is increasing in the size of the project winners group.

3 First-best Constitutions

In what follows we will - as noted above - assume that all entries of the project vector $\mathcal{P} = \left(p, V_h, V_l, (1+\lambda)k\right)$ are *observable* by all citizens in the legislative period. But they might nevertheless not be *verifiable* in front of a constitutional court. In the case where some entries of $\mathcal{P}$ are verifiable in a constitutional court, constitutional rules can be formulated dependent on those parameters even if they are not known in the constitutional period. A court can determine them in the legislative period in order to fully specify the constitutional rules that will govern the decision about the actual proposal. Take e.g. the [CA(a)] rule and suppose that V_l is verifiable. Then [CA($-V_l$)] requires that a court determines V_l for the actual project under decision and sets the costs of agenda setting to $(-V_l)$.

An equivalent alternative view is that - instead of being verifiable in the *legislative period* - some parameters of $\mathcal{P}$ are known in the *constitutional period* and hence can be directly written into the constitution. In the following we describe our results in terms of the second view. Note that the more parameters in $\mathcal{P}$ are known at the constitutional stage, the more likely it is that one can find a constitution that implements the first-best solution and the less complex such a constitution will be. If e.g. all entries of $\mathcal{P}$ were known, a

[8] We show in the appendix that equilibrium voting strategies are unique for all the constitutions we will discuss.

constitution could simply describe the first-best solution. First, however, we will state a special case where first-best is implementable, even if all parameters in $\mathcal{P}$ are not known. After that we will present our results in a descending order of assumptions about which parameters are known at the constitutional stage.

3.1 No Negative Utility

In the first step we assume that $V_l \geq 0$ and hence nobody has negative utility from the provision of the public project. At the constitutional stage there is complete uncertainty about the parameters of the project. As we will see, a constitution with simple rules can ensure a socially optimal constitution in this case. We start with the most simple constitution, denoted by $\mathcal{C}_0(m)$ and given by

$$\mathcal{C}_0(m) := \Big\{ \text{[M}(m)\text{]} \Big\}.$$

Without additional constitutional rules, however, the agenda setter will be able to fully tax a share $(1-m)$ of the population that he does not need to create the majority for his proposal. This leads to subsidization of the agenda setter and to the provision of socially inefficient public projects. We can avoid these inefficiencies by enlarging our basic constitution $\mathcal{C}_0(m)$ with the [MTA], [NS] and the [CTW] rule:

$$\mathcal{C}_1(m) := \Big\{ \text{[MTA], [NS], [CTW], [M}(m)\text{]} \Big\}.$$

Proposition 1
If $V_l \geq 0$ then the constitution $\mathcal{C}_1(m)$ is first-best for arbitrary m $(0 \leq m \leq 1)$.

Proof.

In the appendix (see lemma 1) we prove that voting strategies are unique. It is shown that an agent j will vote yes for an agenda A_a if his net benefit $u_j = gv_j + s_j - t_j$ is nonnegative and no if it is negative.

We now investigate the agendas that will be proposed. Note that because of [CTW] we have that for all j $\inf_{a\in[0,1],\, A_a \in \mathcal{A}} U_j(A_a) \geq e$.[9] Hence - according to (T2) - agents will only apply for agenda setting if they can make a constitutional proposal involving $g = 1$ that

[9] This can be derived from the following reasoning: If A_a has been proposed by agent a then only the case where $u_j(A_a) < 0$ for some agent j is interesting. In this case agent j would reject the proposal. But since $V_l \geq 0$ such a proposal necessarily involves tax payments of j and therefore - according to [CTW] - the proposal is unconstitutional and the status quo prevails.

will be adopted.[10] Consider such a proposal: Because of [MTA] and [NS], the agenda setter will try to propose an uniform tax rate in order to minimize his tax burden. [CTW] limits the possible tax rate for project losers[11] to V_l because otherwise, taxed project losers would reject the proposal. We distinguish three cases:

(i) $k(1+\lambda) \leq V_l$. In this case the agenda setter will propose $g = 1$ and a uniform tax rate equal to $k(1+\lambda)$ for all individuals and the proposal will be adopted since $u_j \geq 0$ for all voters. Hence $\psi_j = 0$ is a weakly dominated strategy for all citizens.[12]

(ii) $V_l < k(1+\lambda) < V$. Taxation for project losers is limited to V_l and hence project winners have to pay higher taxes in order to satisfy the budget constraint. Because of (T2) and [MTA] project losers will not apply for agenda setting. A project winner will propose

$$t = \begin{cases} \Big[(1+\lambda)k - (1-p)V_l\Big]/p & \text{for project winners} \\ V_l & \text{for project losers,} \end{cases}$$

which will be adopted since $u_j \geq 0$ for all voters. Therefore $\psi_j = 0$ is a weakly dominated strategy for project winners.

(iii) $V \leq (1+\lambda)k$. As argued under point (ii), in a constitutional proposal that proposes $g = 1$ and will be adopted, the tax rate for the agenda setter is at least $\Big[(1+\lambda)k - (1-p)V_l\Big]/p$ and hence his utility in $t = 1$ is not higher than

$$e + V_h - \Big[(1+\lambda)k - (1-p)V_l\Big]/p.$$

It is bounded from above by e because $V \leq (1+\lambda)k$. Hence by (T2) nobody would apply for agenda setting.

□

Proposition 1 shows that [MTA] and [CTW] deter project losers from setting the agenda in the case where their utility from the provision of the public project is low compared

[10] If he proposes $g = 0$, then [NS] ensures that he cannot subsidize himself without making the proposal unconstitutional. Hence the resulting utility is e.

[11] Note that we call the part of the population with lower utility (V_l) project losers since they gain less than V_h.

[12] Obviously, $\psi_j = 1$ never leads to a lower utility than $\psi_j = 0$. But, given that nobody else applies, $\psi_j = 1$ is strictly better than $\psi_j = 0$.

to the project costs. Project winners only want to propose $g = 1$ if it is socially efficient. Finally [NS] ensures that taxes are only used for project financing. Note that the [MTA] rule is not needed to obtain a first-best solution, but it ensures that the implemented allocation is always unique.

Note also that in proposition 1 we allow for a change of the status quo to be brought about by a share of yes votes that is smaller than 50% (i.e. by a minority). Since, however, the required size of yes votes for a change of the status quo does not matter, the possible constraint that majority rules must have $m \geq 1/2$ would not affect the result.

The result in proposition 1 can be easily extended to the case where we have an arbitrary number of nonnegative utility levels from the public project. Suppose that there are n ($n \geq 2$) different utility levels from the public project, ordered as $0 \leq V_1 < ... < V_n$. Denoting the fraction of the population with utility V_j by p_j ($j = 1, .., n$), we can characterize the first-best solution in the following way.

First-Best-Solution (Many utility levels)

(i) If $V := \sum_{j=1}^{n} p_j V_j > k(1+\lambda)$ *then* $g = 1$ *and a citizen with utility level* V_j *has to pay taxes* $t_j^* = \min\{V_j, \bar{t}\}$ $(j = 1, .., n)$ *where*

$$\bar{t} := \min\Big\{t \mid \sum_{j=1}^{n} \min\{V_j, t\} = (1+\lambda)k\Big\}$$

(ii) If $V \leq k(1+\lambda)$ *nobody applies for agenda setting.*

Proposition 2
If a public project generates no negative externalities then $\mathcal{C}_1(m)$ *is first-best for arbitrary* m $(0 \leq m \leq 1)$.

The proof follows the lines of the previous proof. Note that only citizens with utility level $V > \bar{t}$ will apply for agenda setting and that because of [CTW] the tax rate for each citizen is limited by his utility level.

In the following, we derive optimal constitutions when V_l might be negative. In each section we introduce more uncertainty about the parameters of the public project.

3.2 Uncertainty regarding p

In this and the following sections we consider the more general case where V_l is negative. In this case the fixed majority rule [M(m)] will either lead to subsidization of project losers

(if $m > p$) or to proposals of project losers that are only made to avoid the provision of the public project.

If we assume that p is not known at the constitutional stage, we have to use a flexible majority rule in order to still achieve first best. To make the working of this rule more transparent we will use a slightly different representation of the rule for socially efficient public project provision:

$$g = 1 \text{ if and only if } p > p^* \text{ where}$$

$$p^* := \min\Big\{w \geq 0 \mid wV_h + (1-w)V_l \geq (1+\lambda)k\Big\}$$

and taxes are only raised to finance the public project.

Hence, for given utility levels V_h, V_l and for given project costs $(1+\lambda)k$, the fraction p^* is the smallest share of project winners so that it is still socially valuable to provide the public project. We define $a \vee b := \max\{a, b\}$ and

$$\mathcal{C}_2 := \left\{ \text{[CA}(-V_l \vee 0)\text{]}, \text{[MTA]}, \text{[NS]}, \text{[CTW]}, \text{[TMf } (p^*)\text{]} \right\}.$$

Proposition 3
Suppose that the utility levels V_h, V_l and the project costs $(1+\lambda)k$ are known at the constitutional stage but not p. Then the constitution $\mathcal{C}_2$ is first-best.

The proof is given in the appendix. Note that V_h, V_l and $(1+\lambda)k$ are needed to calculate p^* and therefore must be known at the constitutional stage or, equivalently, must be determined by a court at the legislative stage. Proposition 3 illustrates the power of flexible majority rules. If $p < p^*$ unanimous support for $g = 1$ is required since, according to [CTW] only a fraction p of the population can be taxed. Subsidization of losers is, however, excluded by [NS] and the public project will not be provided, in accordance to the socially efficient solution. If $p > p^*$ only the support of all taxed individuals is required for the adoption of $g = 1$. Since $V > k(1+\lambda)$ and thus $V_h > k(1+\lambda)/p$, project winners will apply for agenda setting and will implement $g = 1$ with a tax rate $t = k(1+\lambda)/p$ for project winners. Note that we do not need to make any assumptions about the statistical distribution of p at the constitutional stage.

3.3 Uncertainty regarding p and $(1+\lambda)k$

In this section we assume that only V_h and V_l are known at the constitutional stage but not p and $(1+\lambda)k$. Again we do not need to make any specific assumptions about the statistical distribution of p and $(1+\lambda)k$ at the constitutional stage. Since the threshold p^* now depends on the unknown parameter $(1+\lambda)k$ we have to change our majority rule from the previous section to a rule with a variable threshold:

$$\mathcal{C}_3 := \left\{ \text{[CA}(-V_l \vee 0)\text{]}, \text{[MTA]}, \text{[NS]}, \text{[CTW]}, \text{[TMv } (q^*)\text{]} \right\},$$

where $q^*(T) := \min\Big\{w \geq 0 \mid wV_h + (1-w)V_l \geq T\Big\}$.

Proposition 4
Suppose that only the utility levels V_h and V_l are known at the constitutional stage. Then the constitution $\mathcal{C}_3$ is first-best.

The proof is given in the appendix. Note that the critical threshold q above which the yes votes of taxed individuals are sufficient for the adoption of the public project itself depends on the aggregate tax revenues generated by a specific proposal. Small aggregate tax revenues correspond with small costs for the public project provision. Therefore, the critical share $q^*(T)$ above which taxed individuals decide alone about the provision of the public project is smaller, since public projects are socially valuable for smaller winner group sizes as well.

3.4 Uncertainty regarding p, V_h and $(1+\lambda)k$

In this section we assume that only V_l is known at the constitutional stage but not p, V_h and $(1+\lambda)k$. Hence the threshold p^* now depends on the additional unknown parameter V_h. Therefore we have to adjust our majority rule from the previous section again:

$$\mathcal{C}_4 := \left\{ \text{[CA}(-V_l \vee 0)\text{]}, \text{[NS]}, \text{[CTW]}, \text{[TMv } (q^*)\text{]} \right\},$$

where $q^*(T, t^{max}) := \min\Big\{w \geq 0 \mid wt^{max} + (1-w)V_l \geq T\Big\}$.

Proposition 5
Suppose that the utility level V_l is known at the constitutional stage. Then the constitution $\mathcal{C}_4$ is first-best.

The proof is given in the appendix. The flexible majority rule above is the most demanding since the critical size of q depends on the overall revenues and the maximal tax rate proposed by the agenda setter.

Note how $\mathcal{C}_4$ works: If the public project is socially efficient then the agenda setter can avoid the requirement of unanimous support by taxing a sufficiently high share of project winners and by imposing a sufficiently high maximal tax rate $t^{max} \leq V_h$. In this case the project will be adopted by the yes votes of all project winners. Note that an agenda setter will not propose an uniform tax rate $(1+\lambda)k/p$ for all project winners, since in this case $p < q^*$ and therefore $n_T \leq p < q^*$, which would imply that unanimous support for the proposal is required. Hence t^{max} has to be higher than $(1+\lambda)k/p$. Therefore, in order to avoid raising more overall taxes than are needed to finance the public project, the agenda setter has to create at least two groups of project winners: one with a tax rate t^{max} and one with a lower tax rate. If on the other hand $p \leq p^*$, then the agenda setter cannot avoid the requirement of unanimous support since by [CTW] the maximal tax rate t^{max} cannot be higher than V_h.

Note also that [MTA] in this context is not feasible since the incentives for project winners to apply for agenda setting would not be clear anymore: Given that nobody applies, a single project winner has an incentive to apply if the project is socially valuable. But, given that another project winner applies, it is better for him to stay back since not setting the agenda implies a positive probability to belong to the low taxed group while setting the agenda would always lead to the maximal tax rate.

Finally we note that for $V_l \geq 0$, the constitutions $\mathcal{C}_2, \mathcal{C}_3$ and $\mathcal{C}_4$ implement a first-best solution. Hence $\mathcal{C}_4$ implements a socially optimal mechanism for public project provision in all scenarios we have considered by now.

4 Conclusion

The flexible majority rules and the rules for agenda setting introduced in this paper appear to be a mechanism to solve the allocation problems of democracies in the provision of public projects. We have shown that a constitution that implements a first-best solution can be constructed. This, however, requires that it is possible to divide the population in two groups (project winners and project losers) with the same utility level from the public project in each group and that the negative utility V_l of project losers is known at the constitutional stage. If this parameter is not known, there is a vote for judges to provide unbiased estimates of V_l in the legislative period. In other words, an unbiased estimate

of negative externalities by courts is needed for social optimal public project provision. Of course it would be more satisfying if V_l could also be endogenized in the decision via the agenda setting and voting process. We conjecture that this is not possible in the considered framework since in our opinion it seems impossible to determine $(1-p)V_l$ without requiring that the *whole* population has to vote for a proposal if it shall be adopted. But in this case subsidies would be necessary which would not be consistent with a first-best solution of the allocation problem.[13] If our conjecture is true, our results suggest a role for a constitutional court in the provision of public projects: Determination of negative utility from a public project in order to allow the efficient working of the flexible majority rule.

However, before the potential role of flexible majority rules in democracies can be fully assessed, a number of issues should be cleared by future research.

First, the rules [CA] (costly agenda setting) and [NS] (no subsidies) are constructed in order to deter the agenda setter from proposing high subsidies for himself and others by expropriating the minority. They also deter him from making unacceptable proposals in order to prevent the provision of a socially efficient public project. But of course, if interest groups are able to subsidize an agenda setter for making proposals in their sense, they can circumvent the intended effects of [CA] and [NS]. Hence, there have to be additional constitutional rules that prevent such subsidizations.

Second, is should be examined whether it is possible to modify the proposed constitutions in order to achieve first-best solutions when there are arbitrary many utility levels from public projects.[14]

Third, will the possibility of amendments or second proposals at the legislative stage help to generate better outcomes? In our model such counterproposals are not necessary or even unwelcome since individuals that gain less from a proposal than others have the opportunity to wait for better proposals.[15]

[13]Note however that it is possible to circumvent this problem in a framework where there are fixed government expenses that also have to be financed by taxes and that are not subject to decision. In this case it would be possible to give "subsidies" to project losers via a cut of the taxes that have to be paid for the fixed expenses. If those expenses are large compared to the negative utility of project losers it is possible to compensate project losers completely by such tax cuts. In this case the unanimity rule is a first-best solution.

[14]Note e.g. that if there are more than one positive utility levels, then $\mathcal{C}_4$ can lead to the provision of inefficent public projects since the decision rule will be based on the highest utility level.

[15]Note e.g. that for constitution $\mathcal{C}_4$ to produce first-best allocations it might be necessary that the agenda setter taxes some project winners higher than others. If there is only one proposal at all, even the high taxed project winners will vote for the proposal since compared to the status quo they still achieve a higher utility level. However if they know that there will be further proposals on the same public project they would have an incentive to vote against the proposal, hoping that next time they will belong to the low taxed part of project winners.

Fourth, one could argue that flexible majority rules violate equal voting rights in a sense since the impact of a vote of taxed individuals can be different from that of a vote of non-taxed citizens. In our view it appears to be a matter of taste to restrict decision rules to fixed majority rules. There seems to be, however, no prior reason to exclude flexible majority rules since the impact of votes on final outcome also differs under fixed majority rules.

Fifth, flexible majority rules require open ballots and are best suited for smaller communities. It appears to be possible however, that the new technologies through the internet allow anonymous identification of votes and persons even in mass voting (see e.g. Walker and Akdeniz (1997)). Hence, implementation problems of flexible majority rules could be alleviated by the evolution of the internet.

While we have introduced flexible majority rules in the context of public project provision, we believe that the idea of flexible majority rules might have broader applications in democracies. For instance, the size of the majority may depend on the tax differences across the population which would allow to pursue distributional objectives in a society. We believe that that flexible majority rules might become a useful decision making procedure in democracies.

Appendix

A.1 Formalization of the Implementation Requirement

In section 2.3 we have required that if (EWS), (T1) and (T2) are applied, all possible subgame perfect equilibria under the constitution $\mathcal{C}$ yield a fixed expected utility U and that non-uniqueness of equilibria does only occur in out-of-equilibrium strategies or in the agenda setting stage. A formalization of this implementation requirement is that the set of equilibrium strategies can be described by

$$\Big\{\mathcal{E}(A^*) : A^* \in \mathcal{S}^*\Big\},$$

where $\mathcal{E}(A^*) = \Big(\psi^*, A^*, \delta^*\Big)$ is a subgame perfect equilibrium and $\mathcal{S}^*$ is an arbitrary set of agenda setting strategies. Moreover, for each equilibrium agenda setting strategy $A^* \in \mathcal{S}^*$ the payoff

$$\bar{U}(A) = \int_0^1 1\{\psi_a^* = 1\} \int_0^1 U_j(A_a^*)\, dj\, da$$

expected in $t = 0$ has to be equal to U.

Note that the fact that there might be more than one set of equilibrium strategies does not cause a coordination problem since the only possible ambiguity concerns a decision that involves only one person (the agenda setter) and hence there is no *strategic uncertainty*. We call a constitution *first-best* if it implements the expected utility $\bar{U}_{opt}$ that is induced by the socially efficient contract, namely

$$\bar{U}_{opt} = \begin{cases} e + V - (1+\lambda)k & \text{if } V - (1+\lambda)k > 0 \\ e & \text{else.} \end{cases}$$

In order to prove that the constitutions that we propose are first best, we show that

- Equilibrium applying and voting strategies are unique;
- If $V - (1+\lambda)k > 0$ then for all $A^* \in \mathcal{S}^*$ there exist $a \in [0,1]$ with $\psi_a^* = 1$ and for such a, A_a^* is an agenda that implements a socially efficient allocation;
- If $V - (1+\lambda)k \leq 0$ then nobody will apply for agenda setting, i.e. $\psi_j^* = 0$ for all j.

A.2 Proofs

In this section of the appendix we give the proofs for propositions 3 - 5 in the case where $V_l < 0$. If $V_l \geq 0$ the proofs are along the lines of the proof of proposition 1.

The following observations will be needed for all proofs:

Lemma 1

(i) Suppose that citizens have agreed on one of the constitutions $\mathcal{C}_1$ - $\mathcal{C}_4$ in stage 1. Then, given an agenda A_a, the voting strategies are unique, namely $\delta_j^*(A_a) = 1$ if the net benefit $u_j = gv_j + s_j - t_j$ from A_a is nonnegative and $\delta_j^*(A_a) = 0$ else.

(ii) Suppose that a constitution involves the principles [CA($-V_l \vee 0$)], [NS] and [CTW] and that $V_l < 0$. Then a project loser will never apply for agenda setting in equilibrium, i.e.: $\psi_j^* = 0$ for all $j \in (p, 1]$.

Proof.

(i) For taxed citizens, voting no is strictly dominated by voting yes if their net benefit u_j is positive and vice versa if u_j is negative. For taxed agents with $u_j = 0$ or for non-taxed agents we have that $U_j(A_a, \Delta_j, 1) = U_j(A_a, \Delta_j, 0)$. Hence, applying the tie-breaking rule (T1) we find that citizen j votes yes if $u_j \geq 0$ and no else.

(ii) First of all note that because of [CTW] we have that the utility of a citizen j that does not apply for agenda setting is never smaller than $e + V_l$:[16]

$$\inf_{a \in [0,1],\, A_a \in \mathcal{A}} U_j(A_a) \geq e + V_l.$$

If on the other hand a project loser a sets the agenda, we distinguish the following cases: First, his proposal A_a is either unconstitutional, will not be adopted or involves $g = 0$. Then, according to [CA($-V_l \vee 0$)], the agenda setter will have to pay $(-V_l)$ and because of [NS] will receive no subsidies implying that $U_a(A_a) \leq e + V_l$. But if on the other hand A_a involves $g = 1$ we again have $U_a(A_a) \leq e + V_l$ because of the negative utility and the ban on subsidies. Hence

$$\sup_{a \in (p,1],\, A_a \in \mathcal{A}} U_a(A_a) \leq \inf_{a \in [0,1],\, A_a \in \mathcal{A}} U_j(A_a)$$

for all $j \in (p, 1]$ and statement (ii) follows by the tie-braking rule (T2).

[16] This can be derived from the following reasoning: Suppose that an agenda setter has proposed an agenda A_a. Only the case where $u_j < V_l$ for some agent j is interesting. But then $t_j > 0$ and hence agent j rejects the proposal (see lemma 1) implying that A_a is unconstitutional according to [CTW] and $U_j(A_a) = e$.

□

We will now give a set of criteria that are sufficient to show that a constitution is first-best. In order to do so we note that for $a \in [0,p]$ the value $U_a(A_a)$ does not depend on a and define $U_W^{opt} := \max_{A_0 \in \mathcal{A}} U_0(A_0)$ and

$$\mathcal{A}_W := \left\{ A_0 \in \mathcal{A} \,|\, U_0(A_0) = U_W^{opt} \right\}.$$

Lemma 2
In order to prove that one of the constitutions $\mathcal{C}_1$ - $\mathcal{C}_4$ is first-best, it is sufficient to show that the following holds:

(i) If $V > (1+\lambda)k$ then $U_W^{opt} > e$ and

$$U_W^{opt} \geq \sup_{a,j \in [0,p],\, A_a \in \mathcal{A}_W} U_j(A_a) \tag{1}$$

Moreover, all agendas in $\mathcal{A}_W$ propose a socially efficient allocation.

(ii) If $V \leq (1+\lambda)k$ then $U_W^{opt} \leq e$.

*We denote these criteria by **(SFBC)** (sufficient first-best condition).*

Proof.

(i) First of all note that $\psi_j = 0$ is a weakly dominated strategy for project winners, since by equation (1), $\psi_j = 1$ never leads to a lower utility than $\psi_j = 0$, but, given that nobody applies, $\psi_j = 1$ is strictly better than $\psi_j = 0$ because $U_W^{opt} > e$. Together with lemma 1 we therefore find that applying and voting strategies are unique.

(ii) By [CTW] we know that $\inf_{a \in [0,p],\, A_a \in \mathcal{A}} U_j(A_a) \geq e$ and the tie-braking rule (T2) together with lemma 1 imply that nobody will apply for agenda setting: $\psi_j^* = 0$ for all j.

□

Proof of proposition 3.

By lemma 2 it is sufficient to show that condition (SFBC) holds. Note that $U_W^{opt} > e$ can only be achieved by a constitutional agenda with $g = 1$ that will be adopted. Because of [CTW], we have $n_T \leq p$ for each constitutional proposal. Hence, if $p \leq p^*$, such a proposal

will need unanimous support in the whole population. Therefore a constitutional proposal with $g = 1$ will not be adopted since project losers cannot be subsidized and would reject the proposal. Hence $U_W^{opt} \leq e$ if $p \leq p^*$. If on the other hand $p > p^*$, the best an agenda setter can do is to propose an uniform tax rate $(1+\lambda)k/p$ for all project winners since it minimizes his own tax burden and the majority needed for the adoption of the proposal. Since $n_T = p > p^*$ the proposal will be adopted if all project winners vote yes. But this will be the case since $p > p^*$ is equivalent to $V > (1+\lambda)k$ and hence the net benefit for project winners is positive. Therefore we know $U_W^{opt} > e$ and the corresponding agenda proposes a socially efficient allocation.

□

Proof of proposition 4.

The proof follows the lines of the proof of proposition 3. Just note that in a constitutional proposal with $g = 1$ we necessarily have $T = (1+\lambda)k$.

□

Proof of proposition 5.

By lemma 2 it is sufficient to show that condition (SFBC) holds. Note that $U_W^{opt} > e$ can only be achieved by a constitutional agenda with $g = 1$ that will be adopted. Consider such a proposal. [NS] implies that $T = (1+\lambda)k$ and because of [CTW] we have that $n_T \leq p$ and $t^{max} \leq V_h$. Hence

$$q^* \geq \min\Big\{w \geq 0 \mid wV_h + (1-w)V_l \geq (1+\lambda)k\Big\} = p^*$$

and therefore if $p \leq p^*$, unanimous support for the proposal is required. But since project losers cannot be subsidized, they would reject such a proposal. Hence $U_W^{opt} \leq e$ if $p \leq p^*$. If on the other hand $p > p^*$ we show that the agenda setter can achieve the utility level $e + V_h$ by proposing an agenda of the following type: He taxes a fraction w of project winners by $t_{w1} := V_h$ and the other fraction $(1-w)$ has to pay for the rest of the project costs, i.e. their tax rate is

$$t_{w2} := \frac{(1+\lambda)k}{(1-w)p} - \frac{wV_h}{1-w}.$$

The fraction w has to be small enough in order to make sure that $t_{w2} > 0$. Hence, in this case $n_T = p$ and $t^{max} = V_h$ which implies that $q^* = p^* < n_T$ and therefore that the

proposal only needs the unanimous support of the project winners. But since $t^{max} = V_h$, all project winners have a positive net benefit from the proposal and vote yes. Note that because of [NS] the agenda setter cannot achieve a higher utility level than $e + V_h$ and that all agendas that lead to the same utility level for the agenda setter necessarily involve $g = 1$, overall taxes $T = (1 + \lambda)k$ and no subsidies,[17] which completes the proof.

□

[17] In order to avoid the requirement of unanimuous support of the proposal in the whole population, the tax distribution among project winners has to satisfy:

$$n_T t^{max} + (1 - n_T)V_l - (1 + \lambda)k > 0.$$

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