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**DEMOCRATIC MECHANISMS:
DOUBLE MAJORITY RULES AND
FLEXIBLE AGENDA COSTS**

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ABSTRACT

Democratic Mechanisms: Double Majority Rules and Flexible Agenda Costs*

We develop democratic mechanisms where individual utilities are not observable by other people at the legislative stage. We show that an appropriate combination of three rules can yield efficient provision of public projects: first, flexible and double majority rules where the size of the majority depends on the proposal and verifiable parameters and taxed and non-taxed individuals need to support the proposal; second, flexible agenda costs where the agenda-setter has to pay a certain amount of money if his proposal does not generate enough supporting votes; third, a ban on subsidies. We provide a rationale why double majority rules are used in practice. We also show that higher degrees of uncertainty about project parameters can make it easier to achieve first-best allocations and that universal equal treatment with regard to taxation is undesirable.

JEL Classification: D62, D72 and H40

Keywords: democratic constitutions, double majority rules, flexible agenda cost rules and unobservable utilities

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1 Introduction

In this paper we discuss how democracies should be designed when no complete social contracts can be written and individual utilities are not observable by other people during legislation. We employ a mechanism design approach involving a set of constitutional principles. The constitutional principles assumed in this paper must obey liberal democracy's fundamental principles of equal voting and agenda rights. That is, every agent has the right to vote and has the same chance to make a proposal. Moreover, the constitutional principles must not require more messages or information from citizens than proposals or voting, including the possibility of non-participation. All these constraints are summarized under the liberal-democracy constraint. Accordingly, democratic mechanisms are understood as the liberal-democracy constraint on the set of all available constitutions or mechanisms.¹

Erlenmaier and Gersbach (1999), based on Aghion and Bolton (2003), have illustrated that increasingly sophisticated treatment, agenda and decision rules yield an efficient provision of public projects in democracies, provided that agents observe who benefits and loses from public projects when the agenda is set. While this assumption is reasonable for a number of examples, such as the construction of roads, labor market reforms or the scale-down of the defense industry, it is not plausible in all circumstances. Consider, for instance, the increase of safety through a rise in the number of police officers in the street. There is no way that other citizens can observe who feels safer and who does not.

When an agenda-setter cannot observe who benefits and who loses, the problem he faces is that he cannot impose taxes on the beneficiaries of a project only. Moreover, agenda-setters may not know the proportion of individuals who benefit from the project. Nevertheless, we show in this paper that democratic constitutions can achieve first-best allocations in a variety of circumstances. The first novel element in this paper is the double majority rule. Double majority rules require the adoption of proposals among both the set of taxed and non-taxed individuals.

The minority protection feature is illustrated by the following example. Suppose that

¹Without the liberal-democracy constraint there are always mechanisms for implementing socially efficient public project provisions in our context (see e.g. Moore 1992, Moulin 1996).

60% of the population benefit from a public project, while 40% would suffer a utility loss. There are no further costs associated with the project. Suppose a project winner, i.e. a person who benefits from the project, has the right to set the agenda. Under the simple majority rule, the agenda setter could propose the project and heavily tax half of the population in such a way that a bare majority and he himself can be subsidized. Even if the agenda setter cannot observe who is a project winner, he can ensure that the subsidized half of the population supports his proposal since the minority has no influence. As a result, if there are costs of redistribution excessive taxation occurs.²

Suppose that the population is split according to whether individuals need to pay taxes or not and taxed and non-taxed subsocieties need to support the proposal by a simple majority rule. Then the agenda setter can tax individuals up to the benefits at most to stand a chance of the majority of taxed individuals supporting the proposal, since taxed project losers will always vote against a proposal to undertake the public project. Therefore, double majority rules constrain the exploitation of parts of the population. Of course, the agenda setter can completely renounce taxation and the use of double majority rule since there are no financing needs for the provision of the public project. But in this example renouncing taxation would be the ideal protection of minorities.

The double majority rules act as a constraint on the taxes agenda setters will levy on other individuals. As discussed in detail in the next section, we can provide a rationale why such rules are used in practice. Double majority rules can be combined with flexible majority rules, where the size of the majority depends on the proposal, e.g., on the share of taxed individuals. The second novel element of the constitutions proposed is that agenda costs are made dependent on whether a particular share of votes supporting an agenda is achieved (flexible agenda costs). By introducing such flexible costs for agenda-setting, individuals attempting to thwart socially efficient proposals by putting forward their own proposals can be deterred from agenda-setting. In this respect, the non-observability of other people's utility is advantageous in achieving first-best allocations. It allows a society to set agenda costs at levels at which only project-winners will apply for agenda-setting, whereas project-losers will not.

²Minority protection and minority participation is a standard theme in political philosophy and in political science, going back at least to Madison (1788) and Hill (1861). Recent studies by Guinier (1994) and Chwe (1999) have shown that special voting power for minorities is sometimes welfare enhancing since more information is aggregated.

Our central conclusion is that the combination of the following rules yields efficient provision of public projects: flexible and double majority rules, a ban on subsidies, and flexible agenda costs.

Our second insight is that a higher dimensional uncertainty about the project parameters – e.g., who benefits, how large the benefits are, and how large the share of beneficiaries is – may make it easier to design rules to achieve first-best allocations under a veil of ignorance. Higher dimensional uncertainty makes it possible to set agenda cost rules so that project-losers, who will not know how large the benefits are at the legislative stage, do not apply for agenda-setting. Such a deterrence of project losers from agenda-setting is desirable since project-losers have an incentive to prevent the adoption of socially desirable projects by making unattractive proposals.

Our third insight is that equal treatment of all individuals with respect to taxes prevents the society in question from achieving first-best allocations since the size of the required majority cannot vary with the share of taxed individuals. However, a more restricted equal treatment clause, where only the individuals who have to pay taxes need to be treated equally with respect to taxation, does not destroy first-best allocations.

The paper is organized as follows. In the next section, we provide detailed motivation for our approach. In section three, we introduce the model and the constitutional rules. In the fourth section, we discuss first-best constitutions depending on the uncertainty about project parameters at the constitutional stage. In the fifth section, we discuss dictatorial agenda-setting, the role of non-anonymous proposals, and the case where there are only project-winners. In the last section, we summarize our conclusions and propose some avenues for further research.

2 Motivation and Approach

There are several further motivations and justifications for this paper. To start with, we believe that we can provide a rationale showing why double majority rules are useful decision rules in practice. Democracies use a variety of decision rules with a double majority feature. Double majority rules require that a proposal is adopted only if it is approved by two different sets of voters. Recently, in the November 2002 elections, the voters in Los Angeles decided on whether to split up the city. To make the split

effective, both potentially new cities were required to support the break-up proposal. Therefore the voters were split into two parts and both parts needed to support the proposal.³

Furthermore, in Switzerland and Australia two majorities are required for the approval of certain laws: a majority of all electors voting and a majority of states. This is called double majority rule (see e.g. Saunders 2001). Moreover, in Australia a proposed law to alter the constitution must be passed by both the Parliament and the people, the latter voting directly in a referendum. Finally, many representative democracies have a bicameral Parliament and in most circumstances laws must be passed by both Houses. Since we are not examining a representative democracy or a hierarchy of federal and state levels, our double majority rules do not exactly match these real-world examples. However, the reasons put forward here for using double majority rules to restrict the taxation of minorities point in the same direction as the one taken by constitutions in Australia and Switzerland (see e.g. Saunders (2001) and Feld and Kirchgässner (1998) for a recent survey).

On a conceptual level, our analysis is closely related to the fundamental issues in mechanism design. Two main results in the area of mechanism design represent polar cases for this paper. First, in a mechanism design setting, d'Aspremont and Gérard-Varet (1979) and Arrow (1979) show that the expected externality mechanism as a direct revelation mechanism yields an ex post efficient social choice implementable in Bayesian Nash equilibrium if agents' types are statistically independent and agents must participate in the mechanism. Second, the Myerson-Satterthwaite theorem (Myerson and Satterthwaite 1983) shows that there is no Bayesian incentive-compatible social choice function that is efficient ex post and where agents are free to opt out of the mechanism. The democratic mechanisms discussed in this paper force people to participate after the event and are thus not subject to the Myerson-Satterthwaite impossibility theorem. However, we restrict our analysis to democratic mechanisms characterized as follows: First, there is an agenda application stage where everybody can apply for agenda setting and the agenda setter is determined by fair randomization, which is one expression of equal agenda rights. Second, after a proposal has been made, only voting,

³The proposal was rejected.

i.e. yes/no-messages, are allowed,⁴ or a voter can decide to send no message which is equivalent to non-participation.⁵ Third, every individual has the same voting right. This is equivalent to the anonymity principle introduced by May (1954). We call these three constraints the liberal democracy constraint on the set of mechanisms. Feasible mechanisms are called democratic mechanisms or, equivalently, democratic constitutions. Since the expected externality mechanism is not a democratic mechanism, it is therefore unclear a priori whether we can reach efficiency or not.

A difficult issue arises. Since we use democratic mechanisms, we cannot use the revelation principle to simplify the mechanism-design task as is usually done. The range of democratic mechanisms encompasses all conceivable agenda-setter rules, agenda and decision rules (which themselves are arbitrary functions of the project/finance package proposed by the agenda setter subject to feasibility constraints), and the liberal-democracy constraint. As will be apparent, such functions neither need nor ought to be continuous in all cases, e.g., when threshold majority rules are used. Therefore, even under the liberal-democracy constraint, the range of possible mechanisms is extremely large.⁶ Accordingly, we employ a constructive or inductive approach.

Our approach is constructive in the sense that we design rules which must fulfill the liberal-democracy constraint. We do not attempt to provide a grand theory of constitutional design but introduce novel rules which – when combined in an appropriate way – can allow a society to achieve first-best allocations under various uncertainty scenarios. An alternative approach would be to characterize in a first step all feasible mechanisms and in a second step to prove the possibility or impossibility of first-best allocations. While a formal description is possible by making agenda setter rules, agenda and decision rules into arbitrary functions of the proposal, it is not yet clear whether this approach allows for the general characterization of democratic mechanisms, which must be the long-term objective of the research on that subject. Since we can design

⁴This means that if a voter sends more or other messages, he will be neglected in the collective decision.

⁵The focus on small or smallest message spaces goes back to the seminal paper by Mount and Reiter (1974). Recently, Ledyard and Palfrey (2002) have shown that simple and fixed majority rules can approximate the same total welfare when there are many individuals. Aghion, Alesina and Trebbi (2002) establish optimal (super)majority rules needed to pass legislation and to control politicians. We focus on broader constitutions with agenda-setter rules, agenda rules, flexible and double-majority rules to study the allocation of public goods in a complete democratic process.

⁶As long as we restrict all rules to piecewise continuous functions, we obtain infinitely dimensional Riesz spaces as comprehensively examined in Aliprantis and Border (2000).

mechanisms with novel rules to achieve first-best allocations, the constructive approach appears to be a useful substitute. Moreover, our mechanisms do not depend on a priori distributions of project parameters and thus belong to the research program on prior free mechanisms. The third motivation for our approach is the interest in new agenda-setter rules. As far as we can judge, flexible agenda costs, where costs depend on the share of supporting votes and on the requirement that agenda-setters must pay the highest tax they are proposing, are new rules that might be helpful in democratic decision-making.

Our paper is a study in constructive constitutional economics, as outlined in the classic contribution by Buchanan and Tullock (1962). Individuals decide, under a veil of ignorance, which rules should govern legislative decision-making. In a long tradition dating back to Rousseau, Harsanyi (1955), Mirrless (1971) and Wicksell (1896), Buchanan and Tullock (1962) have examined the costs and benefits of majority rules chosen by a society operating under a veil of ignorance. Aghion and Bolton (2003) have explicitly introduced contractual incompleteness for the design of optimal majority rules. In our paper, which follows this incomplete-contract approach, we examine how democratic rules over and above majority rules with a fixed share of required yes-votes can help to achieve first-best allocations of public projects, even if utilities for individuals cannot be observed by other citizens.⁷

The constitutional rules in our paper induce agenda setters to propose projects which are only accepted if they are socially desirable. Accordingly, our constitutions induce efficient information aggregation. Our paper is thus broadly related to the recent literature on efficient information aggregation through voting.⁸ However, none of the existing papers in the literature is concerned with the design of constitutional rules for agenda setting and/or decisions to implement efficient allocations of public projects.

⁷It is an open question whether the complexity of the rules proposed in the paper may exceed those a society wants to incur. But the idea of using flexible and double majority rules and making agenda costs dependent on the share of supporting votes could still prove to be general ideas applicable in real-world situations.

⁸An important strand of the literature has examined the validity of the Condorcet Jury Theorem, which states that majority-rule voting allows efficient information aggregation. Austen-Smith and Banks (1996), Feddersen and Pesendorfer (1994, 1996) and Meyerson (1994) have shown that taking into account the possibility of strategic voting does allow generalization and reinforces the informational efficiency of voting. Others have relaxed the independence assumption to 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.

3 Model and Constitutional Principles

3.1 Model

We consider a standard social-choice problem of public project provision 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 how public project provision and financing should be governed in the legislative period. Citizens are indexed by $j \in [0, 1]$.

In the legislative period, $t = 1$, each citizen is endowed with e units of a private consumption good. The community can adopt a public project with per capita costs $k > 0$. Let c_j denote the utility of agent j from the provision of the public project. At $t = 0$, the utility c_j is unknown and can hence be interpreted as a random variable. For simplicity of presentation, we assume that c_j can take two values (expressed in terms of the consumption good), $c_j = C_h > 0$ (project-winners) and $c_j = C_l < C_h$ (project-losers) with probability p and $(1 - p)$ respectively. Throughout the paper we assume that $C_l < 0$ and that project-losers are indeed disadvantaged by the public project. In the final section, we comment on the way in which our results are affected by assuming $C_l > 0$.

Moreover, we assume that citizen's utility types are distributed in such a way that aggregate uncertainty is canceled out.⁹ Thus, p is equal to the fraction of winners.

Public projects must be financed by taxes. We assume that taxation is distortionary. Let $\lambda > 0$ denote the shadow cost of public funds. Accordingly, taxation uses $(1 + \lambda)$ of taxpayer resources in order to levy 1 unit of resources for public projects and 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 with a vector $\mathcal{P} = (p, C_h, C_l, (1 + \lambda)k)$.

We use t_j and s_j to denote a citizen j 's tax payment or subsidy, respectively. We

⁹The exact construction of individual randomness so that this statement holds can be found in Alos-Ferrer 1999 and works roughly as follows: Let X be a random variable which takes the values C_h and C_l with probabilities p and $1 - p$ respectively. Let $I = [0, 1]$ be the population of agents. As shown in sections 3.1 and 3.2 in Alos-Ferrer, there exists a population extension and thus a stochastic mapping assigning to each agent in I a type with the desired properties, either C_h or C_l . We could also rely on the weaker forms of the strong law of large numbers developed in Uhlig (1996) and Al-Najjar (1996), where independence of individual random variables can be assumed and aggregate stability is the limit of an economy with finite characteristics.

define the variable g as indicating whether the public project is proposed ($g = 1$) or not ($g = 0$). Assuming that c_j is a private benefit that cannot be taxed, the utility U_j of citizen j in the legislative period if the proposal is accepted is given by¹⁰

$$U_j = e + gc_j - t_j + s_j.$$

We drop the index j in U_j whenever convenient. Finally, the budget constraint of the society in the legislative period is given by

$$\int_0^1 t_j dj = (1 + \lambda) \left[gk + \int_0^1 s_j dj \right]$$

We assume throughout the paper that e is sufficiently greater than C_h for individuals to be taxed at a rate that is at least equal to the maximal benefits they are likely to receive from the public project.

3.2 Socially Efficient Solutions

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

$$C := pC_h + (1 - p)C_l > k(1 + \lambda)$$

and taxes are raised solely to finance the public project. Any redistribution activities are detrimental from an ex ante point of view. A socially efficient tax scheme, for instance, is one where 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 our observation as follows.

Ex ante First-best Allocation

Any allocation that provides the public project if and only if $C > k(1 + \lambda)$ and that raises taxes only to finance the public project is ex ante socially efficient.

An example of a first-best allocation is given by

¹⁰All tax and subsidy functions t_j and s_j , are assumed to be integrable and we will only discuss mechanisms where this condition is trivially fulfilled.

(i) If $C > k(1 + \lambda)$, then $g = 1$, $t = \begin{cases} k(1 + \lambda)/p & \text{for project-winners} \\ 0 & \text{for project-losers} \end{cases}$ and $s_j = 0$ for all j .

(ii) If $C \leq k(1 + \lambda)$, 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 is usual in the incomplete contracting literature, we assume that future states of nature cannot be described precisely and that accordingly a constitution can only specify rules for future social decision-making. Moreover, individual utility levels cannot be observed by other persons. In particular, an agenda setter faces the problem that he cannot impose taxation on project-winners only, because from his perspective all persons are alike. Given socially efficient allocations, it is important at this stage to identify the sources of inefficiencies that may arise in legislative decision-making: There are four types of inefficiencies:

- (1) inefficient projects are proposed and adopted
- (2) pure redistribution proposals are made and adopted
- (3) efficient projects are proposed and rejected
- (4) efficient projects are not proposed.

Implicitly, the latter two inefficiencies mean that delay in undertaking public projects is costly. In the paper, we adopt the extreme assumption that not adopting efficient projects results in the status quo. As discussed in more detail in section 5, democratic mechanisms mainly become more complex because of the fourth source of inefficiency. Democratic mechanisms must ensure that project-losers cannot set the agenda and block the adoption of efficient projects. In section 5, we also discuss an example showing that much simpler mechanisms would solve the first three inefficiencies but not the fourth.

3.3 The Game

We consider the duality of constitutional and legislative periods as a substitute for the complete social contract, which 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 own utility c_j . 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 by fair randomization¹¹ to set the agenda. The agenda setter proposes a project/financing package $(g, t_j, s_j)_{j \in [0,1]}$. Denote this choice by A_a .
- Stage 4: Given A_a , citizens decide simultaneously whether to accept A_a ($\delta_j(A_a) = 1$) or not ($\delta_j(A_a) = 0$).

Note that if nobody applies for agenda setting, the status quo will prevail. Moreover, individuals know at the voting stage who will be taxed and who will receive subsidies if the proposal is accepted. Obviously, the status quo also prevails if a proposal to change it does not receive enough yes-votes, as required by the majority voting rule.

Given a constitution with a set of principles discussed in the next section, we look at implementations in stages 2 to 4. An equilibrium for the stages 2 to 4 can be described as a set of strategies

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

where $\psi = (\psi_j)_{j \in [0,1]}$, $A = (A_a)_{a \in [0,1]}$, $\delta = (\delta_j)_{j \in [0,1]}$ and where $\delta_j = \delta_j(A_a)$ depends on the proposed agenda A_a .

To derive an equilibrium, we face the problem that an individual vote has no influence on the outcome if a positive measure of agents vote. To describe the voting outcome

¹¹Fair randomization means that the probability measure used in determining who sets the agenda is uniform.

in our model we use weak dominance criteria, incentive compatibility and tie-breaking rules that mimic optimal voting behavior of a society with a large but finite number of agents.¹² As voting in our model is a simple binary decision and thus individuals cannot gain anything from strategic voting, the central assumption is that agents participate¹³ and behave according to their preferences, i.e. they vote for their most preferred alternative.

For the voting game in stage 4 and for the decision about applying for agenda-setting (stage 2), we therefore will assume that

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

EWS is a standard assumption for eliminating the multiplicity of voting equilibria based on the trembling-hand perfection of Nash equilibria. In order to universally apply the dominance solution concept at the agenda-setting stage, two additional variants of weak dominance are used to obtain uniqueness. First, weak dominance for agenda application strategies is used, given uniqueness of voting equilibria and hence elimination of weakly dominant voting strategies. Second, if needed, we apply iterated weak dominance. The latter is required in situations as in Proposition 1, where not applying for agenda setting is only weakly dominated for project-winners. If, however, project-winners apply for agenda setting and non-application by project-winners is eliminated, it will also be weakly dominant for project-losers to apply. All types of the weak dominance concept (see e.g. also Fudenberg and Tirole 1992) are assumed to be incorporated in (EWS).

Incentive compatibility of voting is captured by the following rule.

- **(IC)** *Suppose that citizens have agreed on one constitution in stage 1. Then, given an agenda A_a , the voting strategies are $\delta_j^*(A_a) = 1$ if the net benefit $u_j = gc_j + s_j - t_j$ from A_a is nonnegative and $\delta_j^*(A_a) = 0$ otherwise.*

¹²Using weak dominance, incentive compatibility and tie-breaking rules discussed in the following avoids an explicit analytical treatment of asymptotic influence in voting models as developed in Mailath and Postlewaite (1990) and extended and generalized in Al-Najjar and Smorodinsky (2000).

¹³Individuals cannot gain anything when they abstain. Allowing for abstention does not affect our results qualitatively as long as the probability to abstain is the same across individuals.

The rule (IC) ensures that the voting outcome is unique.¹⁴ Hence, we can use $U_j(A_a)$ to define the utility level that an agent j will achieve if agent a has proposed the agenda A_a and voting has taken place. Moreover, the set of all possible agendas is denoted by \mathcal{A} . In order to simplify the exposition, we assume that the following two tie-breaking rules are applied:

- **(T1)** *If an agent j cannot strictly improve his utility by agenda setting, he will not apply for agenda setting.*¹⁵
- **(T2)** *If an agenda setter is indifferent between an agenda which leads to $g = 1$ and another which yields $g = 0$, he will propose the former.*

Note that $U_j(A_a)$ includes the optimal voting strategies of all agents and that of agent j in particular. In what follows we will always assume - without referring to the fact explicitly - that (EWS), (IC), (T1) and (T2) are applied. We are now in a position to characterize the expected utility level that a particular constitution can deliver. We can say that a constitution, denoted by CO , implements an expected utility U if the following holds: If (EWS), (IC), (T1) and (T2) are applied, all possible equilibria under the constitution CO yield the expected utility U . Non-uniqueness of equilibria can occur in the agenda setting stage with respect to who applies for agenda setting and to the distribution of taxes. A detailed formalization of this implementation requirement can be found in Gersbach (2000).

We call a constitution *first-best* if it implements the expected utility \bar{U}_{opt} induced by the socially efficient contract, namely

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

Since individuals are identical at the constitutional stage, we can apply the unanimity rule for the society's decision about the constitutional rules. Then, to prove that a constitution under consideration is first-best, we will show that

¹⁴We will specify rules for which it can never occur that voting between a proposal and the status quo is undecided.

¹⁵The rule (T1) could also be justified by a very small but positive cost of agenda setting.

- applying and voting strategies are unique;
- if $C - (1 + \lambda)k \geq 0$, then at least one individual applies for agenda setting and all agenda setters propose the socially efficient project which will be adopted;
- if $C - (1 + \lambda)k < 0$, then nobody will apply for agenda setting, i.e. $\psi_j^* = 0$ for all j .

A constitution that implements the first-best solution therefore must be associated with unique applying and voting strategies and proposals of $g = 1$ if and only if the project is efficient. However, it is not necessary for the financing proposal to be unique with respect to the distribution of taxes.

3.4 Constitutional Principles

The rules in the constitution now have to specify

1. whether there is special treatment for the agenda setter (**agenda-setter rules**);
2. which restrictions on the agendas 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 about a proposal (**decision rules**).

To formulate the constitutional rules, we introduce the following notation:

Let A be an arbitrary agenda. We use n_T to denote the fraction of citizens that have to pay positive taxes. We use r to denote the share of yes-votes for a proposal. By analogy, r_T and r_{NT} denote the share of yes-votes for a proposal among the set of taxed and non-taxed individuals, respectively. Furthermore, we use \bar{t} to denote the average tax rate among the set of taxed people and $T = \int_0^1 t_j dj$ to denote the total tax payments proposed in A . Finally, we use t^{\min} to denote the minimal tax rate of an agenda A .

Formaly for proposals where the tax rate t_j is positive for a positive measure of individuals, \bar{t} and t^{\min} are defined as:

$$\bar{t} := \frac{\int_0^1 t_j d_j}{\int_0^1 1\{t_j > 0\} d_j} = \frac{T}{n_T}, \quad t^{\min} = \inf_{t_j > 0} \{t_j\}$$

where $1\{t_j > 0\}$ is the indicator function, i.e. equal to one if the tax rate is positive and zero otherwise. Since the set of feasible rules under the liberal-democracy constraint is still very large, we use a sequential approach, i.e., we invent rules which will be helpful to achieve first-best allocations for a constitutional problem under consideration.¹⁶ We consider the following options to design appropriate constitutional rules or democratic mechanisms:

Agenda-setter rules

- *Costs of agenda setting [CA(b)]*

The agenda setter has to pay a fixed amount of $b > 0$ if his agenda does not lead to the provision of the public project.¹⁷

- *Flexible costs of agenda setting [CA(b₁, b₂(r*))]*

The agenda setter has to pay a fixed amount of $b_1 \geq 0$ if his agenda does not lead to the provision of the public project. Additionally, he pays $b_2(r^*)$ if his agenda does not lead to the provision of the public project and if the share of supporting votes r is smaller than r^* ($0 \leq r^* \leq 1$). Clearly, $CA(b_1, 0)$ corresponds to fixed costs of agenda setting.

Agenda Rules

- *No subsidies [NS]*

The agenda setter is not allowed to propose any subsidies.

¹⁶Since the space of feasible mechanisms is extremely large, the sequential approach appears to be more fruitful than a general design approach. However, with our approach, we cannot characterize the set of all possible constitutions that would lead to first-best allocations.

¹⁷We could also specify costs of agenda setting that become effective if the agenda setter loses a vote. This would lead to the same results if an individual who is recognized to set the agenda is forced to make a proposal that is different from the status quo.

- 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*

This rule divides the population into the part P_T that - according to the proposal - has to pay positive taxes ($t_j > 0$) and the rest P_{NT} (of the population). A proposal is adopted if it receives an m percent majority of the citizens, where $m(n_T, T, \bar{t})$ may depend on the fraction n_T of taxed people in the population, on the total taxes T , and on the average tax rate \bar{t} proposed in the agenda.

The following special cases of the flexible majority rule are important for our discussion:

- Fixed majority rule,

$$m(n_T, T, \bar{t}) = m.$$

- Threshold majority rule (fixed threshold) [**TMf** (m_1, m_2, q)].

Under this rule, m jumps from m_1 to m_2 when the proportion of taxed people reaches the threshold level q , i.e.,

$$m = \begin{cases} m_1 & \text{if } n_T \leq q \\ m_2 & \text{else} \end{cases}$$

- Threshold majority rule (variable threshold) [**TMv** (m_1, m_2, q)]

$$m = \begin{cases} m_1 & \text{if } n_T \leq q(T, \bar{t}, t^{\min}) \\ m_2 & \text{else} \end{cases}$$

- *Double majority rule*

Under this rule, a proposal is only accepted if it is adopted among the set of taxed individuals and among the set of non-taxed individuals.

Double majority rules can be combined with flexible majority rules. E.g.:

- Fixed double majority rule m [**DM**(m)].

A proposal is adopted if $r_T \geq m$ and $r_{NT} \geq m$.

- Threshold double majority rule [$\mathbf{DTMf}(m_1, m_2, q)$] (fixed threshold) or [$\mathbf{DTMv}(m_1, m_2, q)$] (variable threshold).

Under this rule, m jumps from m_1 to m_2 when the proportion of taxed people reaches the threshold level q . q is a function of the proposal in the case [$DTMv(m_1, m_2, q)$]. A proposal is accepted if $r_T \geq m$ and $r_{NT} \geq m$.¹⁸

Note that both majority rules and [CA (b)] may depend on information generated by the proposal $(n_T, \bar{t}, T, t^{\min})$. Moreover, the rules may depend via the function q on verifiable parameters of the model. Flexible majority rules have been introduced in Erlenmaier and Gersbach (1999). The novel rules in this paper are double majority rules and flexible agenda costs. Moreover, note that the constitutionality check occurs both at the proposal and at the voting stage. If a proposal or the majority voting outcome violates one of the agenda or decision rules, then the status quo prevails, since the constitution is violated and the proposal is void. This implies that the constitutional check on proposals may only be possible after votes have been cast.

4 First-Best Constitutions

Our major assumption is that at the legislative stage individuals cannot observe whether other individuals are project winners or losers. The remaining question is which entries of the project vector $\mathcal{P} = (p, C_h, C_l, (1 + \lambda)k)$ are *verifiable* in front of a constitutional court in the legislative period. When 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, since a court can determine them in the legislative period.

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 written into the constitution directly. In the following, we describe our results in terms of the second view. Note that the greater the number of parameters in \mathcal{P} known at

¹⁸An alternative formulation is the requirement is that the share of yes-votes among the taxed population must be at least equal to the share of yes-votes in the non-taxed part of the population. The conclusions in the paper do not depend on which concept of majority rule is used.

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. Therefore, we will present our results in a descending order of assumptions about the parameters known at the constitutional stage.

In each section, we introduce more uncertainty about the parameters of the public project. This exposition will show that the complexity of optimal constitutional rules increases as more parameters at the constitutional stage are considered uncertain. We insist on constitutional rules that do not rely on prior beliefs about project parameters. For this reason, and due to the liberal democracy constraint, we cannot use the seminal work of Mookherjee and Reichelstein (1992), who have characterized the set of efficient dominant strategy mechanisms in Bayesian environments.

4.1 Uncertainty about Winners and Losers

We begin with the simplest case, where all elements of $\mathcal{P} = (p, C_h, C_l, (1 + \lambda)k)$ are known at the constitutional stage, while there is uncertainty for the individuals whether they will be project winners or losers. Note that an agenda setter cannot observe whether other individuals are project winners or losers. We obtain

Proposition 1

Suppose that all elements of the project vector $\mathcal{P} = (p, C_h, C_l, (1 + \lambda)k)$ are known at the constitutional stage.

- (i) *If $C \geq k(1 + \lambda)$, the constitution $CO_{1a} := \{[CA(-C_l)], [NS], [M(p)]\}$ is first-best.*
- (ii) *If $C < k(1 + \lambda)$, the constitution $CO_{1b} := \{[CA(-C_l)], [NS], [M(1)]\}$ is first-best.*

The proof of proposition (1) is given in the appendix. Proposition (1) indicates the rather obvious point that there is no problem in achieving a first-best allocation if project data are known at the constitutional stage, even if the agenda setter does not know who benefits from the public project. However, since the first-best constitutions differ considerably for socially efficient and socially inefficient projects, it is unclear what is to be done if there is uncertainty in $t = 0$ whether projects are efficient or not. This problem is addressed in the next section.

4.2 Uncertainty regarding C_h

We assume in this section that there is uncertainty in $t = 0$ about the size of the utility gain C_h and therefore whether projects are socially valuable or not. If we assume that C_h is not known at the constitutional stage, we have to use a flexible majority rule in order to achieve a first-best allocation. 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:

$g = 1$ if and only if $C_h > C_h^*$, where

$$C_h^* := \min\{C_h \geq 0 \mid pC_h + (1-p)C_l \geq (1+\lambda)k\}; C_h^* = \frac{(1+\lambda)k - C_l(1-p)}{p}$$

and taxes are raised solely to finance the public project.

Hence, for given p, C_l and project costs $(1+\lambda)k$, the utility level C_h^* is the smallest benefit level at which it is socially beneficial to provide the public project. We obtain

Proposition 2

Suppose that C_h is not known at the constitutional stage. Then the constitution

$$CO_2 := \{[CA(b)], [NS], [TMf(p, 1, q^*)]\}$$

$$\text{with } q^* = \frac{k(1+\lambda)}{C_h^*}$$

and b sufficiently high¹⁹

is first-best.

The proof is given in the appendix. Note that $TMf(p, 1, q^*)$ means that the required majority is equal to p as long as $n_T \leq q^*$, otherwise, the unanimity rule prevails. Proposition (2) indicates that a first-best allocation can be achieved by the combination of costly agenda-setting, a ban on subsidies, and flexible majority rules. Essentially, an agenda setter is able to form a majority if and only if $C_h \geq C_h^*$, since he can tax a fraction of q^* individuals by $t = C_h^*$, which is sufficient to finance the public

¹⁹In the case where the probability of $C_h < C_h^*$ is positive, a sufficient condition is $b \geq \frac{C_h^* - C_l}{\varepsilon}$ where ε is sufficiently small such that $\text{Prob}\{C_h < C_h^*\} > \varepsilon$ for all conceivable distributions. If it is known that $\text{Prob}\{C_h < C_h^*\} = 0$, it would be sufficient to set $b = C_h^*$.

project. Since tax rates are not higher than C_h^* , taxed project-winners still support the proposal. The high costs of agenda setting deter project-losers from applying for agenda setting as they risk that the public project will not be provided, since they do not know whether C_h is larger or smaller than C_h^* . A project-winner will apply for agenda setting if and only if he observes that C_h is larger than C_h^* and $g = 1$ can be therefore implemented. The fact that individuals cannot observe the utilities of other agents makes it possible to set agenda costs so high that project-losers will not want to apply for agenda setting. If they did they would face the risk of paying the agenda costs, either when they propose the public project and it is defeated or when they do not propose the public project.

4.3 Uncertainty regarding p

In this section, we assume that individuals do not know whether they benefit from the public project at the constitutional stage, and how large the share of project-winners is. Now the problem becomes more subtle, since neither a project-winner nor a project-loser can observe the proportion of project-winners and thus whether a proposal is likely to be accepted or not. Nevertheless, a modified constitution will ensure that a first-best allocation can be achieved. Again we represent the first-best public project provision rule in a convenient way.

$$g = 1 \quad \text{if and only if} \quad p \geq p^*, \quad \text{where}$$

$$p^* := \min\{p \geq 0 \mid p C_h + (1 - p) C_l \geq (1 + \lambda) k\}, \quad p^* = \frac{(1 + \lambda)k - C_l}{C_h - C_l}$$

$$s_j = 0, \quad \forall j$$

We use $Pr\{p \geq p^*\}$ and $Pr\{p < p^*\}$ to denote the probabilities that the share of project-winners is larger or smaller than p^* , respectively. We obtain

Proposition 3

Suppose that p is not known at the constitutional stage and that

$$-C_l \leq \frac{Pr\{p \geq p^*\}(1 + \lambda)k}{Pr\{p < p^*\}}.$$

Then the constitution

$$CO_3 := \left\{ [CA(b)], [NS], [TMf(p^*, 1, p^*)] \right\}$$

where b fulfills

$$-C_l \leq b \leq \frac{Pr\{p \geq p^*\}(1 + \lambda)k}{Pr\{p < p^*\}}$$

is first-best.

The proof is given in the appendix. Note that $TMf(p^*, 1, p^*)$ means that $m = p^*$ if $n_T \leq p^*$. Otherwise, the unanimity rule prevails. When there is only uncertainty about p , there is no possibility of deterring project-losers from setting the agenda by making agenda costs prohibitively high, as this will act as a deterrent for everyone. However, project losers must be deterred from making unconstitutional proposals.²⁰ Moreover, it follows from Proposition (3) that the constitutional problem is already sufficiently delicate if p is not known at the constitutional stage, because the successful implementation of CO_3 depends on parameters. However, as the next section shows, the joint uncertainty about the size of the benefits and the share of project-winners improves the likelihood for democracies to achieve first-best allocations because agenda-setting incentives for project-winners and losers diverge.

4.4 Uncertainty regarding C_h and p

In this section, we address the more complex problem posed by the fact that the size of the benefits from public projects and the proportion of project-winners are not known at the constitutional stage. We assume that at the constitutional stage p and C_h are stochastically independent and distributed according to some density functions with $p \in [\underline{p}, \bar{p}]$ and $C_h \in [\underline{C}_h, \bar{C}_h]$. $\underline{p} > 0$ and $\underline{C}_h > 0$ are the lowest possible realizations. $\bar{p} \leq 1$ and $\bar{C}_h > \underline{C}_h$ are the upper bounds of p and C_h . We assume that $\underline{C}_h < k(1 + \lambda)$ and that $Pr\{C_h < k(1 + \lambda)\}$ is strictly positive. Again, we reformulate the socially efficient public good provision in a convenient way, by setting $s_j = 0$, $\forall j$ and

$$g = 1 \quad \text{if and only if} \quad p(C_h) \geq p^*(C_h) \quad \text{where} \\ p^*(C_h) := \min\{p \geq 0 \mid pC_h + (1 - p)C_l \geq (1 + \lambda)k\}, p^*(C_h) = \frac{(1 + \lambda)k - C_l}{C_h - C_l}$$

Hence, for given C_h , $p^*(C_h)$ is the smallest proportion of project-winners for which it is socially beneficial that the public project be provided. Note that p^* is decreasing in

²⁰By extending the argument, one can show that no constitution consisting of a subset of rules introduced in subsection 3.4 yields first-best allocations under any distributional assumption about p .

C_h . We also define

$$\hat{C}_h := \frac{(1 + \lambda)k - (1 - \bar{p})C_l}{\bar{p}} \quad (1)$$

Thus \hat{C}_h is the benefit level at which the society is indifferent with regard to the public project if the share of project-winners is equal to the upper bound \bar{p} . We obtain:

Proposition 4

Suppose that C_h and p are not known at the constitutional stage. Then, the following constitution implements a first-best solution:

$$CO_4 := \left\{ \left[CA(b_1(t^{\min}), b_2(\underline{p})) \right], [NS], \left[DTMv\left(p^*(t^{\min}), 1, p^*(t^{\min})\right) \right] \right\}$$

$$\text{with } p^*(t^{\min}) = \max \left\{ \frac{(1 + \lambda)k - C_l}{t^{\min} - C_l}, 1 \right\}$$

$$b_1(t^{\min}) = \begin{cases} 0 & \text{if } t^{\min} \geq \hat{C}_h \\ b_1 & \text{otherwise} \end{cases}$$

$$b_2(r) = \begin{cases} 0 & \text{if } r \geq \underline{p} \\ b_2 & \text{otherwise} \end{cases}$$

and b_1, b_2 sufficiently large.

The proof is given in the appendix. An important observation from Proposition (4) is that the joint uncertainty about C_h and p can make it easier to achieve first-best, since CO_4 works under any circumstances, whereas CO_3 can fail. The additional uncertainty about C_h makes it possible to set flexible agenda costs at a level such that project-losers do not apply for agenda setting in equilibrium because they do not know C_h , whereas project-winners do. Project-winners apply for agenda setting if and only if $C_h \geq \hat{C}_h$. In such a case, both costs of agenda-setting can be avoided, since taxes can be set to be smaller than C_h , thus ensuring $r \geq \underline{p}$.

We finally notice that double majority rules are needed to achieve a first-best allocation. Suppose for instance, we were replacing in the above constitution the double majority rule $DTMv\left(p^*(t^{\min}), 1, p^*(t^{\min})\right)$ by the corresponding single majority rule $TMf\left(p^*(t^{\min}), 1, p^*(t^{\min})\right)$. Then, it is straightforward to show that such a substitution creates inefficiencies. To illustrate the point consider a project that is inefficient

and for which $C_h > \hat{C}_h$ and $p < p^*(C_h)$ hold. Then, an agenda setter can tax heavily a small share of the society. This enables him to obtain enough support from project winners among the non-taxed part of the society such that a proposal with $g = 1$ will be adopted. This, in turn, encourages project winners to apply for agenda setting as they can avoid any costs of agenda setting. The project, however, is inefficient. Double majority rules protect citizens from excessive taxation.

5 Discussion and Alternative Democratic Mechanisms

5.1 Dictatorial Agenda Setting

The preceding section indicates that democratic constitutions may become more complex the more uncertainty dimensions are present. The main reason for the rapidly increasing sophistication of rules is that all four potential inefficiencies in section 3.2 need to be overcome by democratic mechanisms. If only the first three inefficiencies had to be dealt with, much simpler first-best mechanisms would exist. Suppose that the agenda is set by a benevolent dictator. Then the fourth source of inefficiency would be automatically avoided and we could consider the following game.

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

Stage 2: At the start of the legislative period, the benevolent agenda setter proposes a project/financing package $(g, t_j, s_j)_{j \in [0,1]}$. Denote this choice by A_a .

Stage 3: Given A_a , citizens decide whether to accept the proposal $\delta_j(A_a) = 1$ or not ($\delta_j(A_a) = 0$).

As an example of simpler mechanisms, we explore the design of constitutions when there is uncertainty about winners and losers and uncertainty regarding the share of project-winners, i.e., uncertainty regarding p . Then, we obtain

Proposition 5

Suppose that p is not known at the constitutional stage and agenda setting is dictatorial and benevolent. Then the constitution

$$CO_5 = \{[NS], [M(p^*)]\}$$

where

$$p^* := \min \{p \geq 0 \mid pC_h + (1-p)C_l \geq (1+\lambda)k\}; p^* = \frac{(1+\lambda)k - C_l}{C_h - C_l}$$

is first-best.

The proof follows directly from the first two steps in the proof of Proposition 3, since a benevolent agenda setter proposes $g = 1$ if and only if $p \geq p^*$ and in this case can set the tax rates $t = (1 + \lambda)k$ for all individuals.

Several remarks need to be made at this point. First, it is important that the benevolent agenda setter maximizes aggregate utility and therefore proposes projects if welfare in a utilitarian sense can be improved, although project-losers are worse off compared to the status quo. Second, under benevolent and dictatorial agenda setting, the ban on subsidies, NS , in constitution CO_5 could even be dropped. Third, if agenda setting is determined randomly and thus all agents have the same chance to set the agenda as in the previous sections, the constitution CO_5 is not first-best. All individuals would apply for agenda setting. If a project-loser could determine the agenda, he would propose $g = 0$ since, because of NS , he loses when the project is adopted. This problem could only be avoided by dropping NS , but then inefficiencies arise from excessive taxation to generate subsidies, thus increasing tax distortions. Therefore, the simple mechanism in this section does not yield first-best allocations under democratic agenda setting.

Fourth, when there is uncertainty about p and C_h , the dictatorial and benevolent agenda setter would need to possess information about the realization of C_h in order to use simpler constitutions than in the previous sections. This might not be the case. Moreover, under democratic agenda setting, it appears plausible from the previous sections that the combination of flexible and double majority rules, a ban on subsidies, and flexible agenda costs are needed for first-best allocations if p and C_h are not known ex ante, because project-losers must be deterred from agenda setting and project-winners should only apply for agenda setting if the project is socially desirable.

5.2 Equal Treatment Rules

An important feature of the constitutions considered so far is that individuals can be – and are – treated differently with respect to taxation. An agenda setter can make non-anonymous proposals and can impose positive taxes on other individuals and not on themselves. In this section, we consider whether this feature is vital to our arguments. For this purpose, we consider two constitutional treatment rules. We use *ETT* to denote the requirement that a proposal is only constitutional if all individuals are treated equally with respect to taxes, i.e. if t_j is the same for all individuals. Further, we use *ETT**axed* to denote the treatment rule that all individuals who are taxed (i.e. for whom $t_j > 0$) must be treated equally with respect to taxation. As Propositions 3 and 4 illustrate, imposing *ETT**axed* in addition to the constitutions under consideration would not destroy the first-best allocation, because equilibrium proposals satisfy *ETT**axed* and further constraints on out-of-equilibrium strategies do not destroy the equilibrium.

The situation is different, however, if *ETT* is imposed. Consider the situation where p and C_h are not known at the constitutional stage. Then constitution CO_4 plus *ETT* fails to implement first-best allocations. The argument runs as follows. Because of *ETT* a first-best proposal in case $C \geq k(1 + \lambda)$ must always be $g = 1$ and $t = k(1 + \lambda)$ for all individuals. Since the majority requirement can depend on the proposal but first-best proposals cannot vary in terms of the fraction of taxed individual n_T or in the pattern of taxation and subsidization across agents, majority rules must be a fixed real number, say m^* , for all first-best proposals in the case $C \geq k(1 + \lambda)$. As long as there is a positive probability of $C > k(1 + \lambda)$ or $C < k(1 + \lambda)$, there always exist realizations of parameters C_h and p such that either $p < m^*$, but $C > k(1 + \lambda)$ or $p > m^*$ but $C < k(1 + \lambda)$ and $pC_h > k(1 + \lambda)$. As first-best constitutions must impose *NS*, any proposal with $g = 1$ and $t = k(1 + \lambda)$ for all individuals in case $p < m^*$ would be rejected, since a share of $1 - p$ individuals (project-losers) would vote against it. In the second case, a project-winner able to set the agenda can ensure that $g = 1$ is adopted despite $C < k(1 + \lambda)$. Therefore $\{CO_4, ETT\}$ is not first-best. Since the preceding argument holds for any constitution involving *ETT*, we summarize this observation in the following proposition.

Proposition 6

Suppose that p and C_h are not known at the constitutional stage. There then exists no constitution including *ETT* that is first-best if there is uncertainty as to whether $C > k(1 + \lambda)$ or $C < k(1 + \lambda)$.

5.3 Project-Winners Only

Throughout the paper we have assumed $C_l < 0$ and that project-losers are indeed disadvantaged by the project. Examples such as roads, labor market reforms or scale-downs in the defense industry may fall into this category. But it is still important to see how the democratic mechanisms need to be adjusted in the case of $C_l \geq 0$. Since the proofs do not depend on the fact that $C_l < 0$, all constitutions can be applied for $C_l \geq 0$ as well. The only exceptions are Propositions 1 and 3, where agenda-setting costs can be skipped or have to be set as $CA(\max\{[0, -C_l]\})$ for the general case when C_l can be positive or negative.

There exists, however, an important difference between $C_l > 0$ and $C_l < 0$. In the case of $C_l > 0$, it may not be necessary to deter agents from agenda setting, since they can always benefit potentially from $g = 1$ by proposing zero taxes for themselves. Therefore, simpler mechanisms may again be first-best in the case $C_l > 0$. As an example, suppose that $C_l > 0$ and p is not known at the constitutional stage. Then, since agents with C_h or C_l will propose $g = 1$ if they can determine the agenda (including zero taxes for themselves), the simple constitution $CO_5 = \{[NS], [M(p^*)]\}$ will implement the first-best allocation. However, if there is uncertainty regarding C_h and p , such simple constitutions are not first-best, since deterrence from agenda setting becomes again important. Constitutions such as CO_4 are required, since project-losers do not know whether the project is efficient and therefore should not set the agenda, and project-winners should only apply for agenda setting if the project is socially desirable.

6 Conclusions

Our analysis suggests that, viewed as the liberal-democracy constraint on the set of social mechanisms, democracies can deliver socially desirable results if agenda-cost rules are combined with flexible and double majority rules.

There are a number of extensions that should be taken up by future research. First, how can the ideas in this paper be applied to situations with an arbitrary number of different utility levels from the project? By setting the minimal tax at a sufficiently high level, it will still be possible to deter all individuals not eligible for the highest project benefits from applying for agenda setting. But whether precise socially efficient implementation can be achieved is unclear, since taxation of intermediate beneficiaries cannot be tailored to their actual benefit level, this being unobservable for agenda setters.

Second, our current conjecture is that it is impossible to design a constitution under the liberal-democracy constraint which implements a first-best allocation, if there is uncertainty about all project parameters. If this conjecture is true, our results might imply a role for constitutional courts in the provision of public projects. That role would be an assessment of negative utilities from a public project, in order to enable democratic constitutions to work efficiently.

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, indeed they are unwelcome, since individuals who gain less from a proposal than others have the opportunity to wait for better proposals which, in turn, could lead to rejections of socially desirable proposals.

Fourth, since Oates Decentralization Theorem (Oates 1972) a large strand of literature has identified the benefits and costs of when a layer of local governments is added to a central government. Lockwood (2002) and Rubinchik-Pessach (2000) have recently provided extended justifications for welfare improving two-tier government hierarchies.

Fifth, flexible and double majority rules require open ballots and are therefore best suited for smaller communities. It appears possible, however, that even in cases of mass voting new internet technologies can allow anonymous identification of votes and persons (e.g. the discussion in Walker and Akdeniz 1997). Thus, the internet could alleviate the practical implementation problems of democratic constitutions discussed in the paper. Tackling these and further issues might enhance the potential that societies have for using democratic mechanisms.

7 Appendix

Proof of Proposition 1

- (i) We first consider part (i) of the proposition. We claim that under CO_{1a} there exists a unique subgame perfect equilibrium in which all individuals apply for agenda setting and propose $g = 1$ and $t_j = (1 + \lambda)k$ for $j \neq a$. Thus, we claim that CO_{1a} implements first-best.

The agenda-setter can tax all other individuals by $t = (1 + \lambda)k$. Since $C_h > C > k(1 + \lambda)$, the proposal ($g = 1, t_j = (1 + \lambda)k \forall j$, with $j \neq a, s_j = 0 \forall j$) will be supported by all project-winners and therefore receives a p -majority as required for adoption. Since an agenda setter can always propose zero taxes for himself, his utility is either $e + C_l$ (if project-loser) or $e + C_h$ (if project-winner) if he proposes $g = 1$ with the above financing scheme. Therefore, applying for agenda setting is a weakly dominant strategy for project-winners.

If the proposal of an agenda setter is unconstitutional or is not adopted, his utility is $e + C_l$ because of the agenda setting costs. If an individual does not apply for agenda setting, he risks paying taxes if others apply for agenda setting. And because of $[NS]$ he will never receive subsidies. Therefore, given that project-winners apply for agenda setting, iterated elimination of weakly dominated strategies implies that project-losers also apply for agenda setting under the constitution CO_{1a} . Because of our tie-breaking rules, project-losers who can determine the agenda will propose $g = 1$ as well. Therefore, the constitution CO_{1a} is first-best.

- (ii) The second part follows from the observation that project-losers never support a proposal $g = 1$ since they cannot receive subsidies. Therefore no agenda setter can form a majority for $g = 1$. Thus, no agent applies for agenda setting because of agenda setting costs, and the status quo prevails.

■

Proof of Proposition 2

- (i) Suppose that a project-winner applies for agenda setting and can determine it. Since he observes his own utility level, he knows that other project-winners will receive the same utility. Suppose that the agenda setter observes that his utility C_h is greater than C_h^* . Then the agenda setter can propose $g = 1$ and

$$t = \begin{cases} C_h^* & \text{for } q^* \text{ individuals} \\ 0 & \text{for others} \\ 0 & \text{for himself} \end{cases}$$

Since tax revenues are equal to $q^*C_h^* = k(1 + \lambda)$ by definition of the critical share q^* , the public project can be financed. Since $n_T = q^*$, only p individuals are needed to support the proposal. Since taxed project-winners benefit because $C_h > t = C_h^*$ and untaxed project-winners benefit *a fortiori*, the proposal is supported by all project-winners and thus will be adopted because the p -majority rule applies. Only the agenda setter can avoid the risk of being taxed.

Suppose that $C_h < C_h^*$. Since project-losers never support a proposal with $g = 1$, the agenda setter needs the yes-votes of all project-winners. Hence, he cannot impose a very high tax on a small fraction of the population, because this would imply that a share of the project-winner group rejects the proposal as the identities of winners and losers are unknown to the agenda setter.²¹ The other possibility is to tax a larger fraction of the population with a tax rate that is no higher than C_h . This, in turn, implies that the proportion of taxed people must be larger than q^* in order to satisfy the budget constraint. If, however, $n_T > q^*$, the unanimity rule applies and will lead to a rejection of $g = 1$. Therefore, the status quo prevails, which, in turn implies that the agenda-setter is better off not applying for agenda-setting, because of $[CA(b)]$ and $b > 0$.

To sum up, if $C_h \geq C_h^*$, project-winners have a weakly dominant strategy to apply for agenda setting and thus they will apply for agenda setting in equilibrium.

- (ii) Suppose that a project-loser can determine the agenda. Since he only observes his own utility C_l , he does not know whether C_h of project-winners is larger

²¹The argument is a consequence of the strong law of large numbers, which implies that every positive measure of individuals contains a positive measure of project-winners.

or smaller than C_h^* . We distinguish two cases. Suppose that the probability that $C_h < C_h^*$ is zero. Then he can do the same as the project-winner who can determine the agenda. As an agenda setter the project-loser will receive utility C_l , which is better than not applying for agenda setting and being subject to the risk of taxation. In this case, the socially optimal allocation is also achieved when a project-loser sets the agenda. Suppose now that the probability of $C_h < C_h^*$ is positive. If the project-loser applies for agenda setting, he risks $C_h < C_h^*$ and thus he cannot form a majority in favor of $g = 1$ by using the same arguments as under (i) and he will suffer a loss of b . If b is sufficiently high, the expected utility from agenda setting can be made smaller than without because the maximal tax rate is limited by C_h^* . Therefore, by setting b sufficiently high, not applying for agenda setting is a weakly dominant strategy for project-losers.²²

Summarizing, under CO_2 there exists a subgame perfect equilibrium $\psi_j = 1$ if and only if individual j is a project-winner and $C_h \geq C_h^*$. An agenda setter proposes $g = 1$ and $t_j = C_h^*$ for q^* individuals. CO_2 implements a first-best allocation. ■

Proof of Proposition 3

- (i) Suppose that $p < p^*$. Since subsidies are prohibited, a share of $1 - p$ of the voters will reject any proposal to introduce the public project, since they are project-losers. Therefore, no majority can be formed in favor of the public project since p^* -yes votes are required under all circumstances.
- (ii) Suppose that $p \geq p^*$ and that an agenda setter proposes $g = 1$ and

$$t = \begin{cases} \frac{(1+\lambda)k}{p^*} & \text{for a share of } p^* \text{ individuals} \\ 0 & \text{for all others and himself} \end{cases}$$

Denote this proposal by $(g = 1, t = \frac{(1+\lambda)k}{p^*})$. Since $p^*C_h + (1 - p^*)C_l \geq (1 + \lambda)k$ and $C_l \leq 0$, we have $t \leq C_h$. Therefore, all taxed project-winners will support the proposal. All non-taxed project-winners benefit as well, and a majority of

²²A sufficient condition is $b \geq \frac{C_h^* - C_l}{\varepsilon}$ where ε is sufficiently small such that $\text{Prob}\{C_h < C_h^*\} > \varepsilon$ for all conceivable distributions.

at least p^* individuals will vote yes. Since $n_T = p^*$, the p^* -majority rule applies. Thus, the proposal will be accepted.

- (iii) Project-winners and losers, however, cannot observe whether $p < p^*$ or $p \geq p^*$. By making the proposal $(g = 1, t = \frac{(1+\lambda)k}{p^*})$, an agenda setter maximizes the chances of the public project being accepted without bearing taxes. In order to derive the agenda setting costs, suppose that all agents apply for agenda setting and propose $(g = 1, t = \frac{(1+\lambda)k}{p^*})$. If a project-winner can determine the agenda, his expected utility relative to the status quo, denoted by $U_j^h(A_j)$, is

$$U_j^h(A_j) = -Pr\{p < p^*\}b + Pr\{p \geq p^*\}C_h$$

If a project-winner cannot set the agenda, his expected utility $U_j^h(A_a)$ when another agenda setter $a \neq j$ proposes $(g = 1, t = \frac{(1+\lambda)k}{p^*})$ is given by:

$$U_j^h(A_a) = Pr\{p \geq p^*\}(C_h - \frac{(1+\lambda)k}{p^*}p^*) = Pr\{p \geq p^*\}(C_h - (1+\lambda)k).$$

For a project-loser the corresponding comparisons, if he makes the same proposal $(g = 1, t = \frac{(1+\lambda)k}{p^*})$, amount to:

$$\begin{aligned} U_j^l(A_j) &= -Pr\{p < p^*\}b + Pr\{p \geq p^*\}C_l \\ U_j^l(A_a) &= Pr\{p \geq p^*\}(C_l - (1+\lambda)k) \end{aligned}$$

Therefore, the utility gain for both project-winners and losers when they can set the agenda and make the proposal $(g = 1, t = \frac{(1+\lambda)k}{p^*})$ are given by:

$$Pr\{p \geq p^*\}(1+\lambda)k - Pr\{p < p^*\}b$$

In order to motivate agenda-setting, agenda costs must therefore at least satisfy

$$b \leq \frac{Pr\{p \geq p^*\}(1+\lambda)k}{Pr\{p < p^*\}} \quad (2)$$

Note that if all others do the same and propose $(g = 1, t = \frac{(1+\lambda)k}{p^*})$ agenda setting has the same differential impact on project-winners and losers.

- (iv) Condition (2) ensures that a project-winner is better off applying for agenda setting when anybody else does. However, if (2) holds, project-winners are also

better off applying for agenda setting if no one else applies, since $C_h > k(1 + \lambda)$ and thus the expected gains in this case

$$\begin{aligned} U_j^h(A_j) &= -Pr\{p < p^*\}b + Pr\{p \geq p^*\}C_h \\ &\geq Pr\{p \geq p^*\}(C_h - k(1 + \lambda)) \end{aligned}$$

are positive and hence better than the status quo. Thus, $\psi_j = 1$ weakly dominates $\psi_j = 0$ for project-winners. Therefore, in any equilibrium, project-winners apply for agenda setting if (2) holds.

- (v) For project-losers, the situation is more delicate. Since project-winners choose $\psi_j = 1$, project-losers also choose $\psi_j = 1$ if condition (2) holds. However, to deter project-losers from making unconstitutional proposals when they can set the agenda, the costs of agenda setting must also fulfill

$$-b \leq Pr\{p < p^*\}(-b) + Pr\{p \geq p^*\}C_l$$

which is equivalent to $b \geq -C_l$. Therefore, if

$$-C_l \leq b \leq \frac{Pr\{p \geq p^*\}(1 + \lambda)k}{Pr\{p < p^*\}},$$

all agents apply for agenda setting and propose $g = 1$ and $t = \frac{(1+\lambda)k}{p^*}$ for a share of p^* individuals. If and only if $p < p^*$ the proposal will be rejected. Therefore CO_3 implements a first-best allocation. ■

Proof of Proposition 4

- (i) We first consider project-winners who observe C_h . If $C_h < \hat{C}_h$, we claim that $\psi_j = 0$ weakly dominates $\psi_j = 1$. By the definition of \hat{C}_h and because $C_h < \hat{C}_h$, we have $pC_h + (1-p)C_l < (1+\lambda)k$ for all $p \in [\underline{p}, \bar{p}]$. Therefore, in order to finance a project proposal $g = 1$, the project-winner has two possibilities.

First, he can try to levy taxes on the whole population. In such a situation, \bar{t} is equal to $k(1+\lambda)$ and t^{\min} cannot be higher than $k(1+\lambda)$. As n_T is equal to the whole population, $DTMv(p^*(t^{\min}), 1, p^*(t^{\min}))$ implies that the unanimity rule governs legislative decision-making. Two cases can occur. In the first case, $n_T \leq p^*(t^{\min})$ and the $p^*(t^{\min})$ -majority rule will be applied; but since $n_T = 1$, the $p^*(t^{\min})$ -majority rule implies unanimity in this case, because no more than 100 percent yes-votes can be required. In the second case, we have $n_T > p^*(t^{\min})$ and the unanimity rule will be applied by construction of the majority rule. In both cases, project-losers will vote against the proposal and the status quo prevails.

Second, the project-winner can try to levy taxes on a fraction of the voters. As a result of the double majority rule requirement, such a proposal only has a chance of getting accepted if $t^{\min} \leq C_h$, because otherwise all taxed project-winners would vote against $g = 1$. But by definition of \hat{C}_h and since $C_h < \hat{C}_h$, we have $p^*(t^{\min}) > \bar{p}$, if $t^{\min} \leq C_h$. Since the fraction of project-winners cannot exceed \bar{p} , a share of yes-votes of $p^*(t^{\min})$ cannot be achieved. According to our tie-breaking rules, project-winners will not apply for agenda setting if $C_h < \hat{C}_h$.

- (ii) Suppose that $C_h \geq \hat{C}_h$ and consider a project-winner determining the agenda. To minimize the fraction of taxed people, he can propose $g = 1$ and can tax a proportion of $q = \frac{k(1+\lambda)}{C_h}$ individuals by a tax $t = C_h$. Therefore, the required majority is $p^*(t^{\min}) = p^*(C_h)$ if the share of taxed individuals n_T is no larger than $p^*(t^{\min})$. If not, the unanimity rule applies.

If $p < p^*(t^{\min})$, the proposal will be rejected, since all project-losers $1 - p$ will vote against a proposal $g = 1$.

If $p \geq p^*(t^{\min})$ we claim that the proposal will be accepted. Note that $p^*(t^{\min}) = p^*(C_h) = \frac{(1+\lambda)k - C_l}{C_h - C_l} > \frac{(1+\lambda)k}{C_h}$ since $\frac{(1+\lambda)k}{C_h} < 1$. Therefore $n_T < p^*(t^{\min})$ and thus the $p^*(t^{\min})$ majority rule applies. Because $t^{\min} = C_h$, all project-winners will support the proposal and hence the double majority rule requirement is fulfilled.

We next observe that for $C_h \geq \hat{C}_h$ applying for agenda setting is a weakly dominant strategy for project-winners. Either $p \geq p^*(t^{\min})$ and agenda setting is beneficial because of the benefits from the public project and the absence of tax costs, or $p < p^*(t^{\min})$ and the status quo prevails, but the costs of agenda setting are zero, since $t^{\min} \geq \hat{C}_h$. As $t^{\min} \leq C_h$, the share of supporting votes is at least p . Thus, $\psi_j = 1$ weakly dominates $\psi_j = 0$ for project-winners.

- (iii) Let us now consider project-losers. As a result of the double majority feature of the decision rule, acceptance of a proposal $g = 1$ is only achievable if $t^{\min} \leq C_h$, since otherwise all taxed individuals will vote against. Using the same arguments as in (i), if $C_h < \hat{C}_h$ it is impossible to get $g = 1$ accepted whatever financing scheme is proposed. Therefore, with probability $Pr\{C_h < \hat{C}_h\}$, at least the status quo will prevail. In the next stage, we observe that the project-loser cannot avoid either the agenda costs b_1 or b_2 if $C_h < \hat{C}_h$. To avoid b_1 , the agenda setter needs to set $t^{\min} \geq \hat{C}_h$. However, for $C_h < \hat{C}_h$ no one will support such a proposal and therefore the agenda setter incurs b_2 . If $t^{\min} < \hat{C}_h$, e.g. $t^{\min} = (1+k)\lambda$, cost b_2 can be avoided but b_1 has to be paid. Hence, expected agenda costs for project-losers are at least $Pr\{C_h < \hat{C}_h\} \min\{b_1, b_2\}$. Since b_1, b_2 can be set at arbitrarily high levels, expected agenda costs become very large. Hence, since the maximal tax burden is limited by \bar{C}_h , not applying for agenda setting weakly dominates agenda setting for project-losers if b_1 and b_2 are sufficiently large.
- (iv) Taking (i), (ii) and (iii) together implies that CO_4 implements first-best allocations. Under CO_4 , there exists a unique subgame perfect equilibrium in which project-winners apply for agenda setting if and only if $C_h \geq \hat{C}_h$. They propose $g = 1$ $t = C_h$ for a share of $q = \frac{(1+\lambda)k}{C_h}$ individuals. The proposal is accepted if and only if $p \geq p^*(t^{\min})$. Project-losers never apply for agenda setting.

■

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