Majority Rule Determination and Uncertainty Aversion: A Critical Systematic Review

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Abstract
This article surveys the issue of uncertainty in the constitutional design, with emphasis on the majority rule determination, from the Constitutional Political Economy (CPE) perspective. The analysis starts from the seminal contribution to CPE – *The Calculus of Consent: Logical Foundations of Constitutional Democracy* – of Buchanan and Tullock (1962), and reviews the relevant behavioral models of majority rule determination in the light of their policy implications. In these models, the constitutional stage is described as a game, whereas the post-constitutional stage is modeled either as a game or a lottery. From a behavioral point of view, the main finding is that risk aversion leads voters to prefer a higher majority threshold. This result reflects a psychological distortion: the fear of losing and being subject to a majority tyranny. However, more recent experimental evidence suggests that voter's aversion to uncertainty might have originated from the ignorance of the objective probabilities of outcomes (winning, losing, status quo); that is, from ambiguity, not risk. Therefore, extended models of decision making are needed in order to better capture heterogeneity of voters' preferences on majority rules.

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collective choice — methodological individualism — constitutional political economy — majority rule – risk aversion — ambiguity aversion

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Introduction

The theory of political choice is a theory of collective choice. By definition, collective choice differs from individual choice in what constitutes the entity for whom the choice is made: the collectivity instead of the individual. Yet, the decision-making unit could be the individual in both types of choices. Indeed, in collective choice, if collectivity's motivation cannot be conceived independently of individuals' self-motivations, then collectivity's will cannot be separated from the single individual wills. To wit, the only real decision maker is the individual, as it is for individual choice. Now, separated individuals have different aims and interests for the result of the collective choice. Different interests are likely to be mutually exclusive. As a result, these differences represent conflicts of opinion about the action to take collectively. Such conflicts need to be reconciled. Agreement can be attained only through compromises among individuals. That is, there is not one individual's will that must prevail over the others: collective choice is the result of an individual calculus, in which benefits are compared against costs, under the constraint that other individuals in the collectivity must agree for the action to be taken. This approach of analyzing collective action, where the decision-making unit is set equal to the individual, is described by the term *"methodological individualism"* (Buchanan and Tullock, 1962).

Alternatively, if collective action is seen to serve some "public interest", "common good" or "social welfare", towards which individuals are assumed to steer their collective participation, independently of their own motivations, then collectivity's will must exist apart from single individual wills. As a result, the collectivity "becomes" an individual. To wit, collectivity is the decision-maker unit, unlike individual choice. This is an "organic" approach to collective action. For the organic conception of collective choice, the "social welfare" needs to be determined. The literature of modern welfare economics, the so-called "new welfare economics", gives a precise answer in this respect (see, e.g., Arrow, 1963). Indeed, their approach attaches to "social welfare" a function, the so-called *social welfare function*, which aggregates individual preferences into collective preferences. Essentially, this function orders all possible states of collectivity and allows for the choice of the best alternative from a collective point of view. At the end of the day, in collective choice theory, the *individualistic method* (i.e., decision-making unit equals individual) is contrasted with the *organic method* (i.e., decision-making unit equals collectivity).[1] The choice of the decision-making unit depends on the collective choice theory under investigation.

[1] Note: *individualistic* collective choice is *factored* into participants' individual choices; *organic* collective choice *aggregates* participants' individual choices.

This review article focuses on Constitutional Political Economy (or Constitutional Economics), which is a methodologically individualistic theory of collective choice. The seminal contribution to Constitutional Political Economy (CPE) is *The Calculus of Consent: Logical Foundations of Constitutional Democracy*, by Buchanan and Tullock (1962). CPE differs from standard Political Economy (or Public Choice) only in what constitutes the object of attention.[2] Public Choice focuses on political choices *within* rules that are, themselves, exogenously given, hence fixed. CPE directs attention to the political choices *of* rules. In other words, Public Choice studies voting choices under fixed rules fell from the sky; CPE endogenizes voting rules. Such rules include the electoral system – majoritarian or proportional; the voting procedure – majority rule, Borda count or approval voting; the majority rule – simple majority, supermajority or unanimity; the ballot turn rule – single-stage or multi-stage electoral procedure; and the ballot access.[3] Buchanan (1990) refers to the collective choice of voting rules as *constitutional* choice. This essay focuses on the choice of the simplest voting rule: the majority rule. In particular, it probes the determinants of the *majority rule* choice, with special attention for risk aversion.

The discussion is divided into three parts: section 1 describes the existing theoretical models of majority rule determination, especially those involving risk aversion. Section 2 is the experimental counterpart of Section 1. The last section (Section 3) closes the critical review with policy implications.

Majority Rule Choice: Choosing a Strategy or a Lottery?

Voting gives a shape to an individual's will in democratic collective choice. There is a categorical distinction between voting choice *about* rules and voting choice *given* rules. The former is made ex ante, to make the latter possible in the future. That is, the former is distinct but intrinsically related to the latter. In particular, an expected-utility-maximizing individual tries to anticipate which specific rule might benefit her during the future voting choices, given her beliefs on the behaviors of all other voters. Can she predict how the choice of the rule will influence her welfare in future voting? Not really. One may argue that the outcome of voting is uncertain. Indeed, the outcome of any collective choice is never determined by one *vote* only. Each participant is aware about her own vote but she does not know what others are voting for. In other words, there is strategic uncertainty. Although non-cooperative game theory allows players to make predictions about others' voting behavior thereby setting optimal voting strategies, the real crux of constitutional choice is that *future* voting choices, namely future policy or party alternatives, are undetermined, with voters neither knowing which party they will vote for.

With this, at the constitutional stage, the participant's role in future voting choices is *wholly* uncertain.[4] Because of such "radical" uncertainty,[5] a participant cannot anticipate which specific rule might be beneficial during a *particular* future voting. If she is *averse* to uncertainty (Ellsberg, 1961; Ghirardato et al., 2004; Gollier, 2011; Attanasi and Montesano, 2012), she will try to reduce the uncertainty over the constitutional choice. Uncertainty may be reduced by agreements among participants (Buchanan and Tullock, 1962, p. 35). When the interests of the individuals are mutually conflicting, agreement can be reached only through bargaining (Buchanan and Tullock, 1962, p. 35). Note that, for each individual, such interest is *not* determined by her role in future voting, being such role itself undefined at the constitutional stage.[6] Instead, this interest is determined by behavioral characteristics which are of course individually identifiable at the constitutional stage.

The main characteristics that have been identified in the literature of behavioral political economy are risk attitude (Aghion et al., 2004), "confidence" attitude (Ortoleva and Snowberg, 2015), voting power (Aghion et al., 2004) and, more recently, loss aversion (Alesina and Passarelli, 2019). Interests are mutually conflicting when individuals are "un-

[2] Indeed, they share the individualistic method of analysis.

[3] "Ballot access" refers to the set of rules concerning the requirements for candidates to appear in elections.

[4] Cf. Buchanan and Tullock, 1962, *The Calculus of Consent: Logical Foundations of Constitutional Democracy*, page 72. In particular, ≪the individual is uncertain as to what his own precise role will be in any one of the whole chain of later collective choices that will actually have to be made. (...) He cannot predict with any degree of certainty whether he is more likely to be in a winning or a losing coalition on any specific issue. Therefore, he will assume that occasionally he will be in one group and occasionally in the other≫ (*ibidem*, page 61).

[5] Following Rawls (1971), some authors refer to this radical uncertainty or "high degree of uncertainty" as v*eil of ignorance* (Eichberger and Pethig, 1990; Muller, 1998; Aghion et al., 2004; Attanasi et al., 2017). In particular, the veil of ignorance at the constitutional stage is defined as the situation in which ≪either individuals are completely ignorant about the role they are going to play in the post-constitutional society (perfect constitutional uncertainty)≫ (Cf. Eichberger and Pethig, 1990, page 12). Actually, Eichberger and Pethig (1990) provide another possible definition of the veil of ignorance. It is described as the situation in which individuals ≪have varying chances (or even certainty) of facing certain roles at the stage but equal chances of facing situations giving them similar payoffs (perfect post-constitutional uncertainty)≫ (*ibidem*).

[6] In this respect, Buchanan and Tullock (1962) do not appear to be entirely clear when they maintain that: ≪At the constitutional level, *identifiable* self-interest is not present in terms of external characteristics. The self-interest of the individual participant at this level leads him to take a position as a "representative" or "randomly distributed" participant in the succession of collective choices anticipated. Therefore, he may tend to act, from self-interest, *as if* he were choosing the best set of rules for the social group. Here the purely selfish individual and the purely altruistic individual may be indistinguishable in their behavior≫ (page 74). Such words could be interpreted as: "external characteristics are individually identifiable at the constitutional stage, whereas self-interests don't. Self-interest is not identifiable as it is determined by the individual's undefined role in future voting". In other words, uncertainty over the constitutional choice concerns the individual's *role* and situations in future voting; not her own external characteristics. However, at the constitutional stage, there must exist some identifiable self-interest which leads the individual to prefer some rule over the others. Indeed, ≪What really matters for an individual's choice among rules (...) are their prospective post-constitutional *characteristics* in the widest sense≫ (Eichberger and Pethig, 1990, page 23), which are certainly known by each individual, though privately, also at the constitutional level.

equal" or heterogeneous, i.e. when they are different in some behavioral characteristic.[7]

In any case, the constitutional-choice problem is mainly a *cooperative* game (Aghion and Bolton, 2003; Attanasi et al., 2017).[8] In particular, the voting rule choice is the joint action of the coalition formed by *all* individuals who participate at the constitutional stage: the voting rule should be adopted in the constitutional stage by unanimity (Buchanan and Tullock, 1962).[9] In particular, if individuals are homogeneous, they *all* agree on the same voting rule. In this case, no bargaining is needed and the constitutional choice is unequivocally equal to the individual's optimal voting rule. If individuals are heterogeneous, in order to *all* agree, they need to bargain, and the individual's choice to join (or not) the grand coalition[10] is conceived as reciprocal *self-constraint*: each individual chooses to impose restrictions on her own behavior as a part of an exchange in which such restrictions are sacrificed in return for the benefits that are anticipated from the *reciprocal* restrictions on the behavior of the other participants (Buchanan 1990).[11]

Instead, it is controversial whether participants, at the constitutional stage, regard *future* voting (i.e., post-constitutional choices) as a game or as a lottery. That is, at the constitutional stage, does each individual choose the optimal voting rule *as if* she decides in isolation, i.e., disregarding the future strategic interaction with the other participants? If the answer is positive, post-constitutional voting is regarded as a *lottery*, with only exogenous (nature) uncertainty; otherwise, individuals choose the optimal rule strategically and post-constitutional voting is a *game*, with strategic uncertainty.[12] According to Attanasi et al. (2014a, 2017), post-constitutional voting is a lottery.[13] Following Rae (1969), the idea is that the choice of rules is in fact determined by individual *preferences over the uncertain voting outcomes (winning, losing or maintaining the status quo), not by strategic reasoning* based on guessing other participants' voting choices. Indeed, the expected value of this lottery does depend on voting rules. In particular, a different voting rule determines a different level of risk: less decisive voting rules, such as supermajority, reduce the risk of losing but also the chance of winning, increasing the probability of maintaining the *status quo*. Thus, a different voting rule gives birth to a different lottery. That is, choosing a voting rule is equivalent to choosing a lottery.[14] Now, individual preferences over the risky outcomes are *characterized* by two features: tastes for risk (aversion, neutrality or loving) and beliefs about outcomes. Attanasi et al. (2014a, 2017) show that, *ceteris paribus*, a risk-averse individual prefers a higher majority threshold. That is, risk aversion positively affects the individual's choice of majority rule. The intuition is simple: future voters use the majority threshold as a self-protection instrument to lower the risk of losing. As a matter of fact, losing implies being subject to the rivals' will. This result reflects a psychological distortion. It is true that a higher threshold reduces not only the risk of losing but also the chance of winning. However, a risk-averse individual is more hurt by the fact to fall into minority (i.e., losing) than pleased for being part of majority (i.e., winning).[15] In other terms, the idea is

[7] The converse also holds: the interests of individuals are mutually compatible when they are "equal" or homogeneous, i.e. when they are equivalent in all behavioral characteristics (Cf. Buchanan and Tullock 1962, *The Calculus of Consent: Logical Foundations of Constitutional Democracy*, page 19). In fact, ≪the requisite "equality" can be insured only if the existing differences in external characteristics among individuals are accepted without rancor and if there are no clearly predictable bases among these differences for the formation of permanent coalitions≫ among individuals who belong to the same social class or separate racial, religious, or ethnic group (*ibidem*, page 63).

[8] Actually, Schweizer (1990), Eichberger and Pethig (1990), Messner and Polborn (2004), and Xefteris (2011) describe the constitutional stage as a non-cooperative game. But at the constitutional stage, how is it possible to reciprocally predict future individuals' behaviors without mutual coordination? These models necessarily assume future possible policy alternatives (or equivalently individuals' actions) are defined at the constitutional stage, even though uncertain. To wit, they replace the "veil of ignorance" with the "veil of uncertainty".

[9] Some assumption about the rule for choosing the voting rule is necessary in order to avoid the infinite regress of choosing the rule for choosing the rule for choosing the rule etc. (Eichberger and Pethig, 1990, p. 11). Furthermore, the unanimity reflects the authors' contractarian view of the constitutional choice, the contractual will being by definition the unanimity.

[10] That is, the coalition participated by all players.

[11] Note that self-constraints are also studied by the economics of self-control. But in the latter case self-constraints are *individual*, as they are concerned with self-control problems. Yet individual constraints can be relevant to constitutional choice. Bisin et al. (2015) present a model of fiscal irresponsibility and public debt accumulation to study constitutional balanced budget rules. They claim such rules should restrain government's response to voters' time-inconsistency due to self-control problems.

[12] In fact, if the constitutional stage is described as a cooperative game, then future voting could be a cooperative game too. Voting as a cooperative game would be an interesting extension of Attanasi et al. (2017): ≪The idea would be that, through side-payments, a formateur collects the "yes" votes of other agents and forms a majority. Suppose the supermajority threshold increases. The formateur has to pay more people in order to collect a wider support. An agent who is initially in the minority has a chance to receive payments if she casts her vote. This chance makes her expected outcome less "tyrannical". In a sense, because of side-payments the expected tyranny is less severe. A likely outcome would be that whenever side-payments or other efficient forms of legislative bargaining are possible, people would agree on a more decisive voting rule than the one predicted by our model≫ (p. 137).

[13] Yet there is a fundamental difference between the majority rule model by Attanasi et al. (2014a) and the one by Attanasi et al. (2017). In Attanasi et al. (2017), individuals are heterogeneous; hence, they need to bargain for the collective choice to be taken. Indeed, the constitutional stage is modeled as a cooperative game. Instead, in Attanasi et al. (2014a) the authors maintain that: ≪In this paper we have not answered the question of which threshold will be chosen at the constitutional level≫ (page 378). Actually, given the voting lottery, the constitutional stage can be conceived as an individual decision-making problem, under the (implausible but) instructive hypothesis of homogeneous participants.

[14] Therefore, the individual's calculus for the choice of rule is an expected-utility maximization (Schweizer, 1989). This is apparently in contrast with *The Calculus of Consent* tradition. Indeed, Buchanan and Tullock (1962) analyze the individual's choice of rule in terms of minimisation of expected external costs and decision-making costs. In fact, Eichberger and Pethig (1990) show the equivalence of these two approaches. That is, the two approaches lead to the same decision.

[15] In addition, Attanasi et al. (2014a, 2017) embed into their models another psychological distortion, namely the individual's degree of overconfidence about how the other individuals will vote. Individual's confidence about how others will vote affects her beliefs about winning and losing. They find that, *ceteris paribus*, an overconfident individual prefers a lower majority

that a risk-averse individual is particularly afraid of losing. For this reason, the pain over the decrease in the chance of winning is more than offset by the pleasure of a lower risk of losing.

Majority Rule Choice and Risk aversion: Fallacy from Experimental Evidence

In the post-constitutional stage, the voting outcome is uncertain because the participant, say j, does not know how others will vote. Let k be the number of individuals who will vote like j (Attanasi et al., 2014a): $k$is unknown. Yet the existing expected-utility maximization models of majority rule determination (Attanasi et al., 2014a, 2017) assume probabilities of future outcomes to be objective, known and commonly agreed upon (decision under measurable uncertainty), i.e., *risk* (Knight, 1921; Ghirardato, 2004). Indeed, such models explain the choice of the majority rule as mainly determined by *risk aversion*. In particular, in such models, although k is unknown, probabilities of outcomes (winning, losing, status quo) are assumed to be known because they can be computed from an underlying probability distribution of votes. More precisely, each individual is assumed to know the probability that any other participant will vote for either one or the other policy; which is enough to be able to assess the probabilities of the voting outcomes (winning or losing).[16] However, Attanasi et al. (2014a) provide experimental evidence that, when individuals are given a private signal on a subset of the distribution of votes over the alternative policies in future voting (exit poll), the individual's preferred majority rule is fully determined by this signal. This reflects the fact that the individual *updates* what she knows about the probability to vote for either a policy or the other, so that her beliefs about voting outcomes change, and her constitutional choice too. Thus, (un)knowledge of k plays a role on individual preferences about the majority rule, in line with the experimental evidence of threshold levels of information an individual needs in order not to perceive a situation as "uncertain" (Klingebiel and Zhu, 2023). Since k is actually unknown, this shows that individuals actually *perceive* the probability of winning vs. losing the voting lottery in the post-constitutional stage as non-objective and/or not known and/or not commonly agreed upon. Therefore, decision making is not under measurable uncertainty (i.e., risk), but rather under unmeasurable uncertainty, i.e., *ambiguity* (Knight, 1921; Ghirardato, 2004).

Here the fallacy of the relevant models, in absence of pre-voting information: aversion to uncertainty, as predictor of the individual's majority rule choice, should be treated as *ambiguity aversion*, not as risk aversion. The latter is the preference for a lottery with lower expected value but lower variance, under measurable uncertainty. Ambiguity aversion (Ghirardato, 2004) is instead the preference for lotteries with unknown probabilities (i.e., the same outcomes under measurable rather than measurable uncertainty). The experimental literature has proved that (i) *ambiguity aversion is a relevant behavioral characteristic of decision makers in various contexts* (Ellsberg, 1961; Fox and Tversky, 1995, Halevy 2007, Trautmann and Van De Kuilen, 2015, Borozan et al., 2022), and that (ii) *ambiguity aversion usually is not correlated with risk aversion* (Attanasi et al., 2014b; Abdellaoui et al., 2015; Armantier and Treich, 2016; Cohen et al., 1987; Cohen et al., 2011; Epstein and Halevy, 2019).

Thus, the critical review of the literature suggests for future research models of majority rule determination as a function of not only risk aversion, but *also* of *ambiguity aversion*, that is a further application of the idea of ambiguity aversion in economics (Mukerji, 2000). The final section of this article highlights the policy implications of the suggested path of behavioral and experimental studies on constitutional political economy.

Conclusive Remarks

A higher majority rule reduces the risk of losing (together with the chance of winning) and increases the probability of maintaining the *status quo*. But this is equivalent to saying that the probability of *changing* the *status quo* decreases. Hence, the majority rule determination problem relates to the one of reforms and *policy changes*. In particular, a high supermajority makes reforms and policy changes more difficult; a larger *consensus* is needed. This gives, at the same time, more protection to minorities. Thus, choosing the majority rule requires solving a trade-off between decisiveness and protection. In many cases, such a trade-off is solved in favor of protection (Attanasi et al., 2014a). The existing expected-utility maximization models of voting rules determination – see Attanasi et al. (2017) and the literature review therein – (i) only rely on risk aversion and (ii) study one rule only, the simplest one: the majority rule; and (iii) they do so in a very simple system, where no second ballot is possible. As for (i), the analysis of the effect of individuals' uncertainty aversion (Ellsberg, 1961) on the determination of majority thresholds urges to be addressed. This can be done by moving from expected utility under risk (von Neumann and Morgenstern, 1953) to most recent models of expected utility under ambiguity (e.g., Gilboa and Schmeidler, 1989; Klibanoff et al., 2005) in order to account for not only voters' risk aversion but also for their ambiguity aversion in the determination of the preferred majority threshold in the constitutional stage. As for (ii) and (iii), these models of decision making under uncertainty should be also applied to other voting rules (e.g., type of electoral system, voting procedure, ballot turn rule, ballot access, etc.).

More sophisticated and most thorough theoretical models of majority voting determination might help explain real-life examples of supermajorities that cross countries and industry lines. Indeed, most governments utilize bicameral systems, *effectively* serving as supermajorities. The United States'

threshold.

[16] Disregarding any consideration concerning individuals' probability sophistication.

Federal Constitution mandates a two-thirds majority to override a presidential veto, ratify a treaty, or expel a member of Congress. Any waiver of balanced budget provisions necessitates the approval of three-fifths of the entire Senate. Recent European treaties have implemented dual supermajorities for the Council of the European Union (Barr and Passarelli, 2009), curtailing the voting influence of countries with greater voting weights (Fedeli and Forte, 2001;[17] 2005, 2016).[18] Within international treaties, members retain the ability to employ veto power when decisions directly affect their vital interests (e.g., the Council of the European Union, the United Nations Security Council). Corporate boards typically demand significant thresholds to be met for major actions to be approved, such as mergers and acquisitions or substantial capital expansions.

From a policy perspective, the higher uncertainty brought by the recent black swans (Taleb, 2005; Hertwig et al., 2006) as for health, environmental and political issues (namely, COVID-19 pandemic, earthquakes and floods, and the Russian-Ukrainian war) might have increased decision-makers' ambiguity aversion (see Alifano et al., 2020; as for COVID-19). In voting systems, this in turn might result in a higher willingness to maintain the *status quo* and to avoid unforeseen contingencies, thereby boosting preferences for higher majority thresholds, and, in general, more protective voting systems. In this regard, the intuition is that higher supermajorities constrain to take (relevant) decisions with a higher collective agreement (possibly, unanimity) within the community affected by these decisions, which works as a form of insurance in a world becoming more and more ambiguous.

[17] Actually, Fedeli and Forte (2001) refer to the "old" Double Supermajority (DS) for Council decisions. From 1 November 2014, decisions in the Council of the European Union are adopted by the "new" DS. The change lowers the standard supermajority (first requirement), set at 55% of States, and adds the second majority, in terms of population shares (at least 65% of the European Union's total population), as compulsory requirement. In fact, the second majority must be satisfied only if there is a minority block (i.e., States which disagree equals minority). In this respect, a minority block must now include at least four Council members. If the standard supermajority is reached but there are less than four States which disagree, the second majority requirement does not apply. This change resolves the trade-off between decisiveness and protection more in favor of decisiveness.

[18] In general (and intuitively), a Double Supermajority (DS) rule requires a combined threshold for votes to pass. This voting rule has been introduced for the Council decision-making process by the 2001 Nice Treaty. There were actually three criteria for decisions to be adopted: 74% of Member States' weighted votes, expressed by a majority of States, and *optionally*, on request of any State, a check that the majority represented at least 62% of the European Union's total population. Note that the majority in terms of population shares is *regressive* to population, which, at first glance, might favor big States. Fedeli and Forte (2001) studied the effects of DS on the decisional efficiency of the Council, by jointly examining voting weights *and* voting powers. They showed the optional population-based majority reinforced the minority veto power in blocking the initiatives of the majority. Indeed, against any proposal passing the standard supermajority requirement, they could invoke the population check by asking for a second approval with the quota of 62% of the population of the European Union. Thus, on the one hand, the DS rule did not give the big States a substantial power in passing proposals; on the other hand, such a rule gave to minorities a strong power of blocking undesired proposals. As a result, the DS did not solve the decisional deficit of the Council, as it was, in fact, in its intentions. *De facto*, the DS increased the protection of minorities. The fact that a criterion regressive to population does not necessarily favor big States is confirmed by Fedeli and Forte (2005), who study the population regressivity in the seats' assignment in the European Parliament. In particular, they aimed to assess whether the regressivity is biased in favor of electors of either big States or small States. They found that neither the electors of big States nor those of small States are favored. Object of discussion in Fedeli and Forte (2016) is instead the *opposite* criterion to population regressivity, that is the one *degressive* to population, also known as "degressive proportionality" principle.

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