

**Studies in Public Choice**  
*Series Editor: Randall G. Holcombe*

**Keith L. Dougherty**  
**Julian Edward**

# The Calculus of Consent and Constitutional Design

 Springer

# Studies in Public Choice

## **Series Editor**

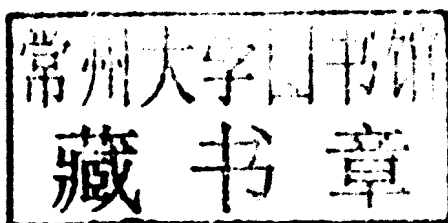
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# Praise for The Calculus of Consent and Constitutional Design

“The Calculus of Consent is one of the founding documents of the Public Choice school, and one of the most important books in political science in the last century. So it takes an ambitious book to promise to extend, and in some cases correct, the Buchanan and Tullock work. But Dougherty and Edward deliver on that promise. Make no mistake: this is much more than a reevaluation and update of the classic work. Dougherty and Edward bring these classic debates back to life, using the most recent literature and techniques. This book will be on dozens of graduate reading lists within a year of being published.” - Michael Munger, Professor of Political Science and Professor of Economics, Duke University and Past President, Public Choice Society

“Dougherty and Edwards have written an excellent book. Its title echoes the classic work by Buchanan and Tullock. The authors re-examine, formalize and provide new insights into some of the main issues addressed in that classic and examine alternative properties of various electoral mechanisms. This book will be of significant interest to both political scientists and practitioners.” - Annick Laruelle and Federico Valenciano, University of the Basque Country and Ikerbasque, authors of Voting and Collective Decision (2008)

-

*To my wife Anjali and mother Bonnie, so they  
may know how much I love them.*

*-Keith*

*To my wife Pam and children William,  
Deirdre, and Isaac, who with their love have  
kept me mostly sane.*

*-Julian*

# Preface

By titling our book *The Calculus of Consent and Constitutional Design* we have undoubtedly attracted fans of Buchanan and Tullock's work, *The Calculus of Consent: Logical Foundations of Constitutional Democracy*, as well as those who might accuse us of coming from some conservative school before reading our work.

We are neither proponents nor opponents of Buchanan and Tullock's classic book. Instead, we are objective researchers interested in several of the same themes. We titled our book after theirs because their book inspired our research on related subjects. This includes questions such as, how do societies form constitutions in normatively appealing ways, and what is the best  $k$ -majority rule for legislative decision making when decision costs are large enough to be an important part of the decision? We also examine the properties of various electoral mechanisms that Buchanan and Tullock did not address in *The Calculus of Consent*.

In cases where some of their assumptions were vague, we have sometimes made assumptions that we found to be reasonable, rather than scouring their works to find the correct meaning. In other cases, we have adopted assumptions of our own. In this sense, we may be accurately accused of deviating from the original book. We can also be accused of deviating because we examine only some of their original themes. *The Calculus of Consent* covered a lot of ground. Formalizing and extending the arguments we missed is worthy of further investigation.

We hope that those who admire *The Calculus of Consent* will find our book to be a careful formalization and extension of some of the foundational parts of Buchanan and Tullock's earlier work. We often arrive at different conclusions, not because we did not like Buchanan and Tullock's original conclusions, but because they were the logical consequences of the models we examined or because we found evidence that drove us in a different direction. Anyone who is serious about a topic will want to expand its teachings and carefully investigate its mechanisms rather than simply reiterate the conclusion that was originally written.

For those who somehow view *The Calculus of Consent* with a tainted eye, we hope they find our book devoid of such taint. In addition to extending a book that had a big impact on political science and to a lesser extent economics, we raise questions about how constitutions are formed and how they ought be formed in a

way that should be useful to any student of constitutional design. Perhaps others will follow our footsteps and try to formalize other classic works.

We are indebted to several people. In particular, Jac Heckelman helped us select voting rules and criteria for our chapter on elections and to find some key studies in that literature. Jie Mi helped clarify some concepts pertaining to conditional probabilities used in our probabilistic arguments. The data on delegate votes from the U.S. Constitutional Convention were gathered with the support of the National Science Foundation, Grant No. SES-0752098, Keith Dougherty and Jac Heckelman investigators. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or the others we have acknowledged.

Keith L. Dougherty  
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January, 2011

*Athens, Georgia*  
*Miami, Florida*

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# Chapter 1

## Introduction

A wave of economic and political liberalization is sweeping the world. Many countries in Latin America and Eastern Europe have made transitions from semi-closed to open societies and from authoritarian governments to liberal democracies. In several of these cases, the transition has been accompanied by a new constitution that purports to increase the fairness and efficiency of the regime. Some who adopt these new constitutions are interested in manipulating policies for their narrow interests. Others are interested in writing constitutions that reflect the concerns of the populace and provide greater legitimacy for their government.

From a purely American perspective, studying the properties of a good constitutional design may seem more like an arcane examination of an outdated historical event than a serious study of contemporary politics. The U.S. Constitution is over 200 years old and it has been rarely amended. Yet the U.S. Constitution is the exception, not the rule. Between 1787 and 2008, the average U.S. state has lived under three different constitutions, and its constitution(s) have been amended more than 144 times. Louisiana has been governed by eleven constitutions and its constitutions have been amended 154 times (Council of State Governments, 2009). Internationally, “we have moved from a situation where almost no country had a written constitution to one where almost every country has one” (Lutz, 2006). The international transformation is partly due to the break up of the Soviet Union and the birth of new democracies Latin America and Eastern Europe. But it is also due to a widespread desire to improve governmental institutions. In fact, between 1974 and 1988 more than half of the countries in the world entirely rewrote their constitution (Voigt, 1997).

With the desire to continually create new constitutions, the natural question is how should a society write such a beast? What institutions will legitimize the state and promote desirable outcomes? By “institutions” we mean the rules and processes that control government functions. These include, but are not limited to, unicameralism versus bicameralism, the extent to which executive and legislative functions are separate, and the powers of the judiciary. They also include more fundamental questions about the voting rules used in various phases of government. Majority rule is only one example.

There are at least three contexts that need voting rules. First, voting rules are usually adopted to make decisions about the constitution itself. In other words, to make decision about how to decide. Second, voting rules are used by legislative bodies to make day-to-day decisions on policy. Third, voting rules are used to elect politicians.

This book investigates these three phases of constitutional decision making critically and analytically. It follows the seminal work of Buchanan and Tullock's *The Calculus of Consent* in trying to unravel how contractarian arguments in political philosophy can help us implement constitutions.

When it was first released in 1962, *The Calculus of Consent* was considered a breakthrough in political science. At the time, theories of politics focused largely on the history of ideas (Friedrich, 1963). Riker (1962, p. 408) wrote, "political theory as a field of academic concentration has been in a confused and unproductive state for at least the last generation." Buchanan and Tullock's application of economic methods to subjects that were traditionally in the realm of political science helped break the deadlock and allowed political scientists to create their own models of politics. Riker argued that *The Calculus of Consent* was one of a few works that re-oriented political theory and helped to make political science more productive (Riker, 1962, p. 409).

Since then, *The Calculus of Consent* has been translated into five languages and is widely cited to this day by scholars studying preference revelation mechanisms, voting rules, legislative procedure, and public choice. Among the major contributions of the book is a connection between constitutional decision making and social contract theory — a philosophical tradition that aims to give institutions legitimacy.

Social contract theorists, such as Hobbes ([1651] 1962), Locke ([1690] 1988), and Rousseau ([1762] 1997) used the notion of unanimous consent to justify government and to codify moral norms. Although these scholars arrived at very different conclusions among themselves, they all emphasized that legitimate state authority must be derived from the consent of the governed. Each used a hypothetical state of nature to examine human behavior in the absence of government. In this state, the only constraints on individual actions are conscience decisions and human interactions. Social contract theorists use this vantage to attempt to explain, in different ways, why it is in an individual's interest to voluntarily surrender part or all of their sovereignty to a government that maintains social order. For example, Hobbes ([1651] 1962) describes a state of nature where individuals fight in a war of all against all. From this state, it is in an individual's interest to surrender his or her rights to all things, most notably the right to self-protection. Locke ([1690] 1988) describes a state of nature where property rights pre-exist. Individuals surrender less of their liberty in his argument because some major issues have already been resolved. Beyond the protection of property, government has a more limited role.

Buchanan and Tullock add to this tradition by moving away from the hypothetical development of a social contract to the actual adoption of constitutions. They ask which voting rules would rational people chose to adopt if property rights were already settled. They conclude that in the ideal case the optimal voting rule would be unanimity rule because it is the only voting rule that guarantees economic efficiency

in the sense of Pareto superiority and Pareto optimality (an outcome where it is not possible to make anyone better off without making someone else worse off). If someone was made worse off by the constitution, gainers would be forced to be compensated by the losers under unanimity rule. They would not be forced to make such compensations under majority rule.

This argument is particularly germane to the types of decisions made at the constitutional stage because society has no way to agree on how to agree at this stage. Hence, requiring everyone to agree seems natural. For the legislative stage of decision making the cumulative time and effort required to make decisions may suggest that other voting rules, such as majority rule, should be preferred. Buchanan and Tullock do not treat elections as a distinct category, as we do here. Instead, they briefly mention how the voting rules used by legislatures can be used in elections. Buchanan echoed these themes throughout his subsequent works and won the 1986 Nobel Prize in Economics partly for this research.

Even though *The Calculus of Consent* may be accurately classified as an extension of modern social contract theory, the book had a greater impact on other fields. As Rowley (2004, v.2, p. ix) writes, *The Calculus of Consent* “played a significant role in carving out two new disciplines from economics and political science — *public choice* (the analysis of politics as it is) and *constitutional political economy* (the analysis of politics as it should be).” Public choice applies economic methods to problems that are normally dealt with by political scientists, such as questions about voting, interest group formation, and rent seeking. Constitutional political economy investigates the creation of constitutions as well as the implications of some institutions that might be adopted. Our work makes a greater contribution to the latter tradition.

Although Buchanan and Tullock’s work is used as a guidepost for our own study (also see Hardin 1988, 1999), we do not advocate nor disavow their position. We merely attempt to analyze three phases of constitutional decision making and to formalize some of their earlier claims. Since their claims were largely descriptive, as were most books written fifty years ago, we occasionally stray from their original ideas. These departures are not the result of insincerity. As is the case with any descriptive work, their assumptions are sometimes unclear, which forces us to fill in the gaps as best as we can. At other times their assumptions are clear, but we stray from their ideas because we think we have a better starting point and want to see the implications of slightly different assumptions.

When modeling the functioning of an assembly, there are two different elements that should be considered: (i) the human interplay that is expressed in the choice of proposal, bargaining, the decision to attend, etc., and (ii) the mathematical properties of the winning coalition. In this work, we emphasize the mathematical properties of the winning coalition, and do not assume bargaining or vote trading in our models. Both play important roles in *The Calculus of Consent*. However, we do not assume bargaining explicitly because we do not want to incorporate any black box processes into our theories. Instead, we allow for bargaining through the process of proposing and voting itself. Such processes are more applicable to large societies attempting

to reach agreements than sit-down meetings where individuals are assumed to talk toward a mutually advantageous solution.

Our models for constitutional decision making allow for bargaining through the process of proposing, voting, and re-proposing to satisfy voters. Our models for legislative decision making presume that individuals are more likely to propose successful proposals as the number of rounds increases. Both could be driven by bargaining, but bargaining is not a necessary condition for either phenomena. In this way, we believe our models are more general and perhaps more realistic for questions of constitutional design. Readers are encouraged to read both *The Calculus of Consent* and our work to see how closely the two books are related to each other.<sup>1</sup>

We begin by summarizing the arguments developed by Buchanan and Tullock and how they relate to social contract theory. We then carefully define several concepts and relate them to Pareto optimality and Pareto improvements, two concepts widely used in the study of economic efficiency. This provides a backdrop for analyzing the three phases of constitutional decision making: (1) the constitutional phase, where rules for constitutional decision making must be justified; (2) the legislative phase, which governs day-to-day decision making; and (3) the electoral phase, where the optimal voting rule for large electorates and potentially more than two alternatives are determined. These phases differ by context and sources of legitimacy.

## 1.1 Three Stages of Decision Making

Buchanan and Tullock divide democratic decision making into two stages: constitutional decision making and legislative decision making. We add a third stage — elections — because they are central to democracy and differ from the other two in kind.

Buchanan and Tullock view constitutional decisions as social contracts that bind all individuals. The most fundamental choice in a social contract is to determine which voting rules, and other institutions, will be used to make decisions in later phases of government. The decision is akin to deciding how to decide itself. According to Buchanan and Tullock, the most basic principle for such a decision is unanimity rule. Unanimity rule has a eminent place in constitutional decision making because it assures that rational individuals will come to mutually advantageous agreements as they would in an economic contract. Individuals will consent to a social contract only if they agree to its terms. Buchanan and Tullock argue in favor of unanimity rule because it requires all individuals to favor collectivization before society is allowed to collectivize. Individual are allowed to reject collectivization if

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<sup>1</sup> We do not include vote trading simply because much of the foundational work, without vote trading, needed further development. Nevertheless, our work can be useful for those who want to study vote trading in future works. For instance, the mathematics on the difficulty of achieving a coalition of a given size can shed light on the depth of concessions needed to pass a piece of legislation with vote trading. We encourage scholars to work on such extensions.

it makes them worse off. Less-inclusive voting rules, such as majority rule, allow some individuals to create constitutions that coerce others against their will.

Legislative decisions are quite different. Because there can be incredible inefficiencies associated with the time and effort needed to negotiate unanimously agreed upon policies, individuals can agree at the constitutional stage to require a less-inclusive voting rule at the legislative stage. In this way, it is completely consistent for a society to require unanimity for constitutional decisions while requiring less-inclusive rules, such as majority rule, for legislative decisions. Because there are hundreds of policy decisions and only a few constitutional decisions, Buchanan and Tullock argue that rational individuals might recognize the expediency of making daily decisions using a less-inclusive voting rule, such as majority rule. Citizens cannot be forced to accept the use of such rules without their consent.

Electoral decisions, which were only briefly mentioned in the *Calculus of Consent*, are typically decisions about electing public officials. Because the electorate is usually quite large, vote trading among citizens is quite difficult.<sup>2</sup> Furthermore, elections can be unique because there is no status quo alternative unless an incumbent runs for re-election. In these cases, constitutional designers typically want to treat all candidates equally rather than favor a status quo candidate. This observation alone moves them away from the type of voting rules advocated for legislatures because the status quo plays an important role in those types of rules. Finally, since the costs of organizing a vote are usually high, citizens are unlikely to want to vote on a pair of alternatives, wait for the outcome, then return to the polls to vote on other pairs, several times. Sequencing votes through such an agenda is extremely rare in elections. Instead, elections are typically conducted with all the alternatives (candidates) considered at once. Any voting rule that wants to consider alternatives pairwise would typically have to gather that information in one or two votes. In legislatures, repetitive voting on different versions of the same bill is more widely accepted because legislatures are professionals expected to iron out the nuances of legislation. These three considerations imply that a different set of voting rules may be more appropriate for the electoral phase than those Buchanan and Tullock had in mind for the constitutional and legislative phases.

Central to the method of the current book are easy-to-understand computer-based simulations and powerful analytical tools used for studying the relationships between voting rules and democratic outcomes. This makes the book appealing to scholars in comparative politics who are interested in the role of institutions in the transition to democracy, democratic theorists interested in putting political philosophy into practice, and computer scientists and constitutional political economists attempting to see the application of a computer model to social science for the first time. It also provides a careful reconsideration of a classic work.

We start, in Chapter 2, by reviewing the arguments made by Buchanan and Tullock in their classic work *The Calculus of Consent*. Buchanan and Tullock (1962) and Mueller (1996, 2001) argued that government decision making should be divided into two phases: a constitutional phase and a parliamentary phase. These

<sup>2</sup> Nevertheless, Buchanan and Tullock (1962) make an interesting argument about different candidates representing implicit bundles of vote trades. See their pages 135–36.

phases correspond to the constitutional and legislative phases described in our book. A cornerstone of the earlier arguments is that the institutions passed at the constitutional phase should make some individuals better off without making other individuals worse off. Decisions made at the parliamentary phase have to balance such concerns with the desire to reduce the time and effort needed to make multiple decisions quickly.

In Chapter 3, we carefully define several concepts employed by Buchanan and Tullock and show why the relationships between unanimity rule and various Pareto principles may not be as closely linked as Buchanan and Tullock seem to suggest. This provides a backdrop for analyzing the three phases of decision making and illustrates how minor differences in definitions can lead to major differences in applications — particularly for medium- and large-sized populations. This has important implications for the use of Pareto concepts, particularly at the electoral phase of decision making. It also sets the stage for showing that other voting rules may be more capable of attaining Pareto optimal results than unanimity rule.

Chapter 4 examines voting in the constitutional phase where decision making costs are allegedly inconsequential. We use computer simulations and deductive techniques to analyze the claim that unanimity rule is better at producing Pareto superior and Pareto optimal results than other voting rules. We do this for settings where proposals are (1) random, (2) sincere, or (3) strategic. We find three interesting results, all related to Pareto optimality.

First, if individuals propose randomly, then majority rule is almost always more likely to select a Pareto optimal outcome than unanimity rule. Second, if individuals propose sincerely, then majority rule is at least as likely to select a Pareto optimal outcome as unanimity rule. Third, if individuals propose and vote strategically, then unanimity rule will always yield a Pareto optimal outcome. Other  $k$ -majority rules often yield a Pareto optimal outcome, and will always yield an outcome that is very nearly Pareto optimal. A  $k$ -majority rule is a majority rule, supermajority rule, or unanimity rule that requires a certain threshold of affirmative votes for a proposal to pass.<sup>3</sup>

In contrast, with rare exceptions for random proposals, unanimity rule is at least as likely as majority rule to select outcomes that are both Pareto superior and Pareto optimal. These findings suggest that unanimity rule is more capable of creating Pareto efficient constitutions only if efficiency requires everyone to be at least as well off as they are under the status quo. We support these findings with laboratory experiments and illustrate them with data from the adoption of the U.S. Constitution.

Chapter 5 examines voting in a legislative setting. In particular, we analyze the optimal  $k$ -majority rule in terms of both decision costs and external costs (defined later). In legislative settings, Buchanan and Tullock (1962) and Mueller (1996) claim that a  $k$ -majority rule near half the voting body would be preferred because this rule minimizes the sum of these two costs.

We examine external costs and decision costs over a sequence of votes. The introduction of multiple alternatives affects external costs and decision making costs

<sup>3</sup> For example, the U.S. House of Representatives requires 218 of its 435 members to sign a successful discharge petition. In this case,  $k = 218$ . More precise definitions are offered in Chapter 3.

in two ways. First, multiple alternatives forces us to re-examine the shape of the external cost function and to compare it to the two alternative case (Dougherty and Edward, 2004, p. 171). Second, with multiple alternatives, our analysis of decision making costs becomes more sophisticated and allows us to make conjectures about the conditions under which specific  $k$ -majority rules minimize total costs. We find that the optimal  $k$ -majority is largely determined by the weight that decision makers put on these two functions, the latent propensity to pass proposals, and the quickness with which favorable proposals can be found. Majority rule is only optimal under stylized conditions unless there is a jump discontinuity in the decision cost function as conjectured by Mueller (2003).

In Chapter 6, we compare the properties of four voting rules, three of which are widely used in elections. Because electoral decisions require voting among an extremely large number of individuals and there is no reason to adopt voting rules that favor the status quo,  $k$ -majority rules are rarely, if ever, employed. Instead, plurality rule, majority rule with a runoff, and instant runoff voting are examined because they are widely used to elect officials in single-member districts. We also include the Borda count because it has received recent attention in the social choice literature. With so many voters almost all candidates are Pareto optimal and the Pareto criterion is of little use in analyzing mass elections. Instead, we evaluate these rules using six normative criteria separately: (i) the Condorcet winner criterion, (ii) the Condorcet loser criterion, (iii) the majority criterion, (iv) consistency, (v) reversal symmetry, and (vi) independence of eliminated alternatives. We conduct our analysis using computer simulations of single-dimensional voting in single-member districts. This allows us to determine the probability that each voting rule adheres to a criterion in a context that is widely assumed in the literature. We find the Borda count outperforms the other three voting rules in terms of the independence of eliminated alternatives, and it performs at least as well as the other voting rules on the Condorcet loser criterion, consistency, and reversal symmetry. Majority rule with a runoff always adheres to the majority criterion (while Borda count does not) and it avoids Condorcet losers. It also performs almost perfectly in terms of consistency and reversal symmetry. Which of the two voting rules perform better on the Condorcet winner criterion depends on the conditions. Hence, the best voting rule may depend on what each society values most.

The book concludes with a few comments about the significance of our research for social contract theory and the creation of constitutions more broadly.

By examining impartial standards and showing which sets of institutions are most likely to fulfill these standards, academics can recommend fairer institutions in a wide variety of settings. Such results help us recommend the most desirable voting rules for countries writing new constitutions (such as Afghanistan and Iraq), for policy makers creating institutions for local municipalities, and for legislatures reconsidering their own voting rules (such as the U.S. Senate reconsidering the filibuster). They can also help us guide smaller voting bodies such as a board of directors or a university senate that wants to establish its own, fairer, and more efficient rules for decision making.



