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THEORETICAL COMPARISONS OF ELECTORAL SYSTEMS

by

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Abstract: Elements of an economic theory of political institutions are introduced. A variety of electoral systems are reviewed. Cox's threshold is shown to measure incentives for diversity and specialization of candidates' positions, when the number of serious candidates is given. Duverger's law and its generalizations are discussed, to predict the number of serious candidates. Duverger's law is interpreted as a statement about electoral barriers to entry, and this idea is linked to the question of the effectiveness of democratic competition as a deterrent to political corruption. The impact of post-electoral bargaining on party structure in presidential and parliamentary systems is discussed. JEL classification number: D72.

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1. Invitation to political economics

To honor Joseph Schumpeter, I should try to begin as he might, from a long view of the history of economic theory, observing that the scope of economics has changed. With an initial goal of explaining the production and allocation of material goods, economic theorists developed analytical tools to predict how changes in market structure may affect rational behavior of producers and consumers. As the principles of rational choice were first developed in this context of price-theoretic decision-making, it seemed sensible to separate the study of markets from the study of other great institutions of society, because price theorists had a rigorous methodology for analysis of incentives in markets that could not be extended to government or other social institutions.

But today, with game theory alongside price theory, we have a general theoretical framework to analyze incentives and rational behavior in any social institution or competitive arena. So where economists once defined their mission as predicting how changes in the structures of markets and government policies would affect the rational behavior of producers and consumers, now economists can accept the more general mission of predicting how changes in the structures and rules of any social institution would affect rational decision-making by the participants in that institution. Thus we can now develop rigorous models to better understand the institutions of civilized society, with the same breadth of vision that characterized the ancient

Greek social philosophers who gave economics its name.

For several fundamental reasons, it is particularly appropriate that we should include the analysis of incentives in political institutions as an essential part of the domain of modern economics. First, markets and politics are substantively interconnected systems in the real world, and economic analysis of markets can suffer from a neglect of relevant political factors. Second, there are logical similarities between political competition and market competition, and so analytical skills that have been sharpened by the study of either arena may be applied to offer new insights in the other arena. Third, failures of the political system can affect people's welfare at least as much as failures of the market systems that economists have traditionally studied. There is an immediate practical need for guidance on the questions of constitutional design in new and reforming democracies all over the world, and so the addition of political institutions to our list of concerns will not decrease the social value of the economics profession to the public which supports us. Fourth, without help from economists, traditional political scientists have lacked the game-theoretic modeling skills to develop an analytical theory of democratic structures, and so this important area of research has been left underdeveloped.

The basic constitutional structure of any democratic system defines the rules of the game played by politicians. As such, this constitutional structure has two levels: the governmental level defines a set of political offices and allocates powers to these offices, and electoral level establishes the procedures by which candidates are elected to these offices. (Although many countries establish the electoral systems by organic law outside their formal written constitution, we consider the electoral system here to be part of the constitutional structure, because it is an essential element in the rules of the political game that politicians must play to win power.)

A complete theory of politics clearly requires analysis at both levels, electoral and governmental. Voters must evaluate candidates' promises in terms of the post-election governmental game that the elected officials will have to play, and elected officials' incentives in the governmental game are largely determined by their perceptions of how the voters will behave in the next electoral game. But to keep things tractable, game-theoretic models of politics usually emphasize one or the other of these two levels. So we have governmental models that focus on the conflict and cooperation among a given set of elected officials, who use their constitutional powers to try to move government policy in their preferred direction. And we have electoral models that focus both on the campaign decisions of candidates who want to win elected offices, and on the voting decisions of voters who want to elect candidates who will implement the voters' preferred policies. Such electoral models necessarily make simplistic assumptions about how the government policies that voters care about will depend on who wins the election.

In this paper, I will focus mostly on analysis of the electoral level. My goal is to introduce the elements of an economic theory of electoral systems and their effect on competitive political behavior. In Section 2, I begin by outlining some of the variety of electoral systems that exist. In Section 3, a simple formula is introduced to measure the tendency of a voting rule to encourage candidates to concentrate separately on special minority interests, or to make similar broad appeals to all voters. This formula assumes a given number of candidates whom the voters consider to be equally serious contenders in the election. This assumption is dropped in Section 4, which introduces Duverger's law and its generalizations, which make predictions about the number of serious candidates under different voting rules. But Duverger's law can be

interpreted as a statement about the relative barriers to entry under different electoral systems, and standard economic reasoning suggests that such barriers can affect long-run profit-taking in competitive systems. So in Section 5, a simple model of corrupt profit-taking is introduced to compare the effectiveness of different electoral systems for deterring such corrupt profit-taking by competitive political parties. This question of how constitutional design can affect competitive incentives against political corruption is discussed more broadly in Section 6. Then Section 7 addresses the question of how post-election bargaining in the legislature, in parliamentary and presidential systems, can affect the relative advantages of large national parties versus small or regional political groups. Section 8 concludes with some thoughts about the role of economic analysis in questions of constitutional design. (For related surveys of this field, see also Myerson, 1995a and 1997a.)

2. Variety of electoral systems

The range of possible electoral systems is enormous. I will focus here on scoring rules, which include almost all of the voting rules that are actually used. (The class of scoring rules can be derived axiomatically; see Myerson, 1995b. For a broader survey of electoral systems that are used in legislative elections, see Taagepera and Shugart, 1989.) In a scoring rule, each voter's ballot is a vector that specifies some number of points that this voter is giving to each of the candidates (or parties) that are competing in the election. These vote-vectors are summed over all voters, to determine who wins the election.

Elections can determine the winners in different ways. In single-winner elections, the winner of the election will be the candidate with the highest total point score. But the number of

winners, denoted by M , can be greater than one in elections to allocate seats in a council or legislature. In such M -winner elections where candidates run as individuals, the winners will be the candidates who get the M highest total point scores. In proportional representation, the alternatives on the ballot are party lists, rather than individual candidates, and the number of seats won by a party is proportional to its total point score (up to some rounding formula; see Balinski and Young, 1982). Other common variations include quota-runoff requirements in which the high scorer wins the election if her¹ point score is above some quota (usually a 50% of the votes), and otherwise a new election is held among some subset of the candidates.

The set of permissible ballots also differs across different scoring rules. Let K denote the number of candidates (or parties, if the alternatives in the election are party lists) in the election. Given any number K of candidates in the election, a rank-scoring rule is characterized by some list of numbers s_1, \dots, s_K such that

$$1 = s_1 \geq s_2 \geq \dots \geq s_{K-1} \geq s_K = 0,$$

and a vote-vector is permissible if and only if it is some permutation of the vector

$$(1, s_2, \dots, s_{K-1}, 0).$$

Without loss of generality, we can use here a (1,0)-normalization in which 1 is the greatest number of points that a voter can give to any candidate, and 0 is the least number of points that a voter can give to any candidate.

There are many types of rank-scoring rules. Most common is single-positive voting in which $s_2 = \dots = s_{K-1} = 0$, and so the permissible vote-vectors are the permutations of the K -vector

$$(1, 0, \dots, 0, 0).$$

¹I use male pronouns for voters, female for candidates.

That is, in single-positive voting each voter must choose one candidate, to whom the voter gives one point, and he gives 0 points to all other candidates. Single-positive voting in a single winner election is called plurality voting or first past the post. Single-positive voting in M-winner elections, where the alternatives on the ballot are individual candidates, is often called SNTV (for single nontransferable vote). List PR is single-positive voting with multiple seats allocated by proportional representation, where the alternatives on the ballot are party lists.

We may also consider single-negative voting, where each voter must choose to vote against one candidate. Single-negative voting is equivalent to voting for all but one candidate, and so in (1,0)-normalization a single-negative vote vector must be some permutation of the K-vector

$$(1, 1, \dots, 1, 0).$$

Such negative voting is rarely used, but it offers a nice theoretical contrast with single-positive voting. In our theoretical modeling, we will see some compelling reasons why single-negative voting should not be used in democratic elections. But that is why we want to have a theory of electoral systems: to enable us to see the problems that may be generated by in an electoral system before it is used.

For any number V, a scoring rule can be defined with V-positive votes; that is,

$$1 = s_1 = s_2 = \dots = s_V, \text{ and } 0 = s_{V+1} = \dots = s_K.$$

A scoring rule with V-negative votes would have

$$1 = s_1 = s_2 = \dots = s_{K-V}, \text{ and } 0 = s_{1+K-V} = \dots = s_K.$$

Of course the difference between specifying the number of positive votes or negative votes only matters when the number of candidates is a variable.

In Borda voting, each voter must rank-order the candidates and give a linearly increasing series of points, and so in (1,0)-normalization a Borda vote-vector with K candidates must have ranking points

$$s_1 = 1, s_2 = (K-2)/(K-2), \dots, s_{K-1} = 1/(K-1), s_K = 0.$$

Another rank-scoring rule is single-positive-and-single-negative voting, where the (1,0)-normalized ranking points are

$$s_1 = 1, s_2 = 1/2, \dots, s_{K-1} = 1/2, s_K = 0.$$

In other nonrank scoring rules, voters are allowed to choose among the permutations of more than one decreasing vote-vector. A good example of a nonrank scoring rule is approval voting, in which each voter can give 0 or 1 point to each candidate, with no restriction on the number of candidates who receive one point from the voter. Thus, in approval voting, a permissible vote-vector can be a permutation of any vector of the form

$$(1, \dots, 1, 0, \dots, 0)$$

where the number of 1's in this vector can be anywhere from 1 to K-1. That is, the permissible ballots in approval voting include all ballots permitted under any V-positive vote system, for all V from 1 to K-1.

3. Electoral incentives for competitive differentiation and specialization

Our goal now is to develop game models in which candidates determine their campaign strategies and voters vote according to the rules of the electoral system, so that we can see how rational competitive behavior of candidates may be different under different voting rules.

There is an enormous literature on multi-candidate electoral competition, in which papers

differ by making different assumptions about the set of alternative policy positions that candidates can promise in their campaigns, and about when candidates can choose their policy positions. Most of this literature, following Hotelling (1929), assumes that there is some given policy space which represents the set of possible government policies. Voters have given utility functions over these policies, and candidates choose their policy positions at the beginning of the electoral campaign. In a simple model of a single-winner election, we generally assume that the winning candidate's policy position will be implemented as government policy after the election. So in the election, each voter should choose his vote rationally to maximize his expected utility payoff from future government policy. It is commonly assumed that each candidate's objective, in choosing her policy position, is to maximize her probability of winning the election.

Since Hotelling, a basic question in the literature on spatial competition has been about the incentives for product differentiation. In this political context, this question is: Will the candidates cluster together, advocating identical or similar policy positions, or will they adopt diverse positions that appeal to different groups of voters? When we think about this question, we should note that the welfare implications of candidate diversity are not isomorphic to product differentiation in markets. In Hotelling's oligopoly game between shops on Main Street, separating the two shops could decrease the total of consumers' transportation costs, because each consumer's transportation cost depends on the location of the shop that he patronizes. But when we re-interpret Hotelling's model as being about a single-winner political election, we should recognize that each voter's welfare depends on the policies of the candidate who wins the election, not the candidate to whom he gives his vote. So in a single-winner election, there is no aggregate welfare benefit from separating the two candidates. Thus the negative connotation that

Hotelling gave to "excessive sameness" may be inappropriate in political competition, even if it has some merit in oligopolistic competition.

A basic theme of this paper is the importance of explicitly comparing different electoral systems in our analytical models. But most of the literature on competitive determinants of political policy positions has focused on just one electoral system: plurality voting. Cox (1987a,1990) gave us the first model that systematically considered different electoral systems, and he showed that incentives for diversity may differ systematically across voting rules.

Cox (1987a,1990) showed that political incentives for diversity depend on the extent to which the voting rule is best-rewarding or worst-punishing. To understand this distinction, notice first that each voter wants his ballot to increase the probability that the winner of the election will be a candidate whose policy position is better for him. To simplify matters (for now), we assume throughout this section that the voters consider all candidates to be equally viable as serious contenders in the election. Under this assumption, a voter should give more points on his ballot to the candidates that he prefers more. Now consider what happens if a candidate changes her policy position in a way that made her more appealing to a particular voter, so that now prefers her to one more other candidate than before. In a rank scoring rule, if the voter would have given this candidate s_J points before, now he will give her s_{J-1} , and so the candidate has gained $s_{J-1} - s_J$ points. The size of this point gain depends on the place J that the candidate had in the voters' rank-ordering. So we can ask, would a candidate gain more from moving up in the ranking of voters who currently rank her near the top of their preference ordering or at the bottom? The answer depends critically on the electoral system. In a best-rewarding system, the candidate gains more from moving up in the preferences of voters who

currently rank her near the top. In a worst-punishing system, the candidate gains more from moving up in the preferences of voters who currently rank her at the bottom.

In single-positive voting, a candidate gains nothing by moving from worst to second-worst or from third-best to second-best in a voter's ranking, because a candidate's score depends only on how many voters rank her best. So single-positive voting is a pure best-rewarding voting rule. In single-negative voting, however, a candidate gains nothing by moving from second-best to best or from third-worst to second-worst in a voter's ranking, because a candidate's score depends only on how many voters rank her worst. So single-negative voting is a pure worst-punishing voting rule. Other rank-scoring rules mix best-rewarding and worst-punishing aspects to varying degrees, and they are exactly balanced in Borda voting, which gives an extra $1/(K-1)$ points to a candidate whenever she moves up one level in a voter's ranking.

Cox's main result is that best-rewarding voting rules encourage candidates to diversify from each other, whereas worst-punishing voting rules encourage candidates to adopt similar policy positions. This result can be made quantitatively precise by defining Cox's threshold of diversity. To define this threshold (applying the formulation of Myerson, 1993a), let us consider a very simple policy space consisting of just two alternatives, which we may arbitrarily label "Left" and "Right." Let Q denote the fraction of voters who prefers the Left alternative, and so $1-Q$ is the fraction of the voters who prefer the Right alternative. Cox (1987a, 1990) considered equilibria of the voting game that are symmetric in the sense that candidates who adopt the same policy position will be treated symmetrically (in aggregate) by the voters. If the fraction Q of voters who prefer Left is very small (close to 0), then we should expect all candidates to choose the Right policy position. Given any number of candidates K , Cox's threshold of diversity, which

we may denote by Q^* , is the largest value of Q such that there exists a symmetric equilibrium in which all K candidates choose the Right policy position with probability 1. That is, Q^* is the largest bloc of voters whose preferred policy position can be neglected by all K candidates. (For other thresholds in voting theory, see Rae, Hanby, and Loosemore, 1971.)

Cox (1987a) showed that, for a general rank-scoring rule in which each voter's ballot must specify a vector that is some permutation of the (1,0)-normalized vector

$$(s_1, s_2, \dots, s_{K-1}, s_K), \text{ where } 1 = s_1 \geq s_2 \geq \dots \geq s_{K-1} \geq s_K = 0,$$

the threshold of diversity can be computed by simply averaging these (1,0)-normalized point values; that is

$$Q^* = \frac{1}{K} \sum_{i=1}^K s_i.$$

Best-rewarding rules have small values of (s_2, \dots, s_{K-1}) and so have small Q^* thresholds, but worst-punishing rules have large values of (s_2, \dots, s_{K-1}) and so have larger Q^* thresholds.

To prove this formula for Q^* , consider a single candidate who deviates to Left while the other $K-1$ candidates all advocate Right. The deviator will get 1 point from each voter in the leftist bloc of size Q and 0 points from the other rightist voters, which gives him an average of Q points per voter. But the average over all candidates of these average-points-per-voter must be $\sum_{i=1}^K s_i / K$, and the symmetry assumption implies that other $K-1$ candidates all expect the same point score. If $Q < \sum_{i=1}^K s_i / K$ then the lone deviator must be below the other candidates' average point score and so should expect to lose the election, which is the result that we need to sustain an equilibrium in which the K candidates all neglect the Q bloc of voters.

For single-positive voting with K candidates, Cox's formula tells us that the threshold of diversity is $Q^* = 1/K$, which goes to zero as K becomes large. So when there are many serious

candidates under plurality voting, we may expect to find candidates who advocate small minority positions and have a positive probability of winning the election. But in a single-winner election, having serious candidates who advocate minority-preferred policies means that there is a positive probability that the winner may be a candidate who does not advocate the policy preferred by the majority. Such defeats of clear majority interests can occur whenever Q^* is less than $1/2$.

Under single-negative voting, Cox's threshold is $Q^* = (K-1)/K$, which goes to 1 as K becomes large. This result may seem very strange, because it allows an absolute majority ($Q > 1/2$) to be ignored by all candidates. The problem can occur because the candidates are afraid of being identified as the single worst candidate by substantial numbers of voters, and adopting the same policy as other candidates can help by splitting the negative votes of voters who dislike this policy. Such neglect of clear majority interests by all candidates can occur whenever Q^* is greater than $1/2$.

Thus, to guarantee majority rule in this model, the ideal is to have $Q^* = 1/2$. Only with $Q^* = 1/2$ can we guarantee that there exists a symmetric equilibrium in which the winner is sure to be a candidate at the majority's preferred position, and there does not exist another symmetric equilibrium where the winner is sure to not be at the majority's preferred position. The voting rules that have this ideal intermediate value of Q^* are those in which a voter can submit ballots that reward his best candidates and punish his worst candidates in some balanced way. Borda voting is such a rank-scoring rule with $Q^* = 1/2$. Cox (1987a) showed that, among nonrank scoring rules, approval voting also has this ideal majoritarian threshold of diversity $Q^* = 1/2$ with any number of candidates.

For a related model, consider a situation where the winner of the election can decide how

to spend the money in some fixed budget. Suppose that this budget is enough to give an average of 1 euro to each voter, or it can be spent on a public good that is worth B euros to each voter, where $B > 1$. Then there is a symmetric equilibrium in which all K candidates promise to spend the money on the public good only if $B > 1/Q^*$. If all other candidates were expected to advocate the public good but there was some positive number ε such that $B + \varepsilon < 1/Q^*$, then any one candidate could do better by offering $B + \varepsilon$ euros to a $1/(B + \varepsilon)$ fraction of the voters, which would give her more than the Q^* expected vote-share that she needs to win. So again from this perspective we find that, as Q^* becomes smaller, candidates feel more driven to campaign on the basis of narrow appeals to small special interests, rather than broad public goods. (See also Myerson, 1993a, and Lizzeri and Persico, 1998.)

This analysis of incentives for candidate diversity in symmetric equilibria does not actually depend on the single-winner assumption. When we assume that voters have additively separable utility over the set of winners, the relationship between the threshold of diversity and best-rewarding or worst-punishing ballot structures can be directly extended to any number of winning candidates up to $K - 1$. For example, consider an M -winner election where the voting is for individual candidates. If the ballot type is single-positive voting, then the candidates will have more incentive to concentrate on building narrow differentiated bases of support; but if the voters are allowed multiple noncumulative votes then the candidates will have an incentive to appeal more broadly to overlapping groups of voters.

The main difference in the case of elections with multiple winners is that a diversity of candidates who each concentrate on advocating different special minority interests can be less problematical in multi-winner elections than in single-winner elections. If each of our M elected

representatives specializes in advocating the interests of a different Q^* fraction of the voters, then we have representation for an MQ^* fraction of the voters. So under single-positive voting where $Q^*=1/K$, a majority of the voters can feel well represented if the number of serious candidates K is not more than twice the number of seats M .

As an application, consider open-list PR election, where each party nominates an unordered list of candidates, and voters for the party can vote among its candidates to determine their priority for filling the party's seats. Unlike closed-list PR elections, where a candidate's place on the party list is determined completely by her support in the party's central committee, open-list systems force candidates to compete individually for voters' support.

Elections to the legislature in Brazil use an open-list PR system in which each voter for a party must name one candidate on the party's list, and the seats that the party wins will be assigned to the candidates on its list who get the most votes. But Ames (1995) reports that the open-list system in Brazil has caused extreme centrifugal forces that undermine the parties' ideological coherence, because each legislative candidate concentrates on building a narrow separate base of support among the voters. Candidates may have little concern for the interests of party supporters outside of this narrow base. This pattern of competitive specialization is exactly what we should predict from the low Q^* threshold of diversity that follows from using the single-positive vote.

Our theory tells us that such centrifugal tendencies within Brazilian party could be reduced or eliminated by changing the open-list rules to a higher- Q^* voting rule like approval voting, where each voter can give an approval vote to as many candidates as he wants. Because approval voting has a Cox threshold of $Q^* = 1/2$, with any number of candidates, it should give

each candidate an incentive to appeal broadly to a majority of the party's supporters. So all candidates on the party list would have an incentive to converge to the center of the party ideologically, which might then force them to compete instead on the dimension of their personal effectiveness as advocates of the party's (now well-defined) position. Thus, if a high-Q* ballot structure is used, a system of democratic competition for party leadership can be compatible with ideological coherence, even in a broad based party.

4. Nonsymmetric voting equilibria and Duverger's law

The previous discussion assumed a given number of candidates, all of whom are taken equally seriously by the voters. We must now drop this assumption and consider nonsymmetric equilibria in which voters may treat candidates differently even when they have adopted similar policy positions.

Duverger (1954) observed a strong tendency to have just two serious candidates in elections by plurality voting (single-winner, single-positive voting). This result has been called Duverger's law by Riker (1982a), who believed that political scientists had not yet discovered any other empirical regularity that was worthy of being called a "law." When Duverger's law holds, if a third candidate tries to enter the race, she finds that the voters tend to ignore her. Even if the third candidate adopts similar policy positions to one of the two established candidates, there can be a self-fulfilling prophecy that a vote for the third candidate would be a wasted vote, so that each voter should vote for his preferred among the two established candidates. To explain and extend Duverger's law and the wasted-vote effect in voters' decision-making, we need a theory of nonsymmetric equilibria of voting games.

We assume here that voters' payoffs after the election are determined by government policies, which are determined in turn by the winners of elected offices. The voters are assumed to care about voting only because they care about future government policies which will depend on who wins the election. After the votes are counted, we may say that a candidate is in a close race if a change in a small number of votes could have changed this candidate from a winner to a loser or from a loser to a winner. A rational voter knows that his vote can matter only in the event of that a close race exists between some pair of candidates. So a rational voter should vote to maximize his expected payoff conditional on the event of a close race existing.

So a rational voter's decision-making must take account of how likely each candidate is to be in a close race with another candidate. In comparative statics analysis, we may say that a candidate becomes a relatively more serious contender when the probability of this candidate being in a close race becomes relatively greater in comparison with other candidates. In absolute terms, we should say that a candidate is not a serious contender if, conditional the event that a close race exists, the conditional probability of this candidate being in the close race would still be considered vanishingly small by the voters in the election.

Each candidate cares about her overall probability of winning. We may say that a candidate is stronger or weaker depending on whether the candidate is more or less likely to win the election. So in our terminology, the "strength" of a candidate depends on her probability of winning, while the "seriousness" of a candidate depends on her probability of being in a close race.

If candidates A and B are both perceived as likely to lose, but candidate A is relatively stronger than candidate B, then candidate B should be considered as a less serious contender than

candidate A, because if one of these likely losers is in a close race then it is much more likely to be the stronger candidate A. So among the likely losers, a weaker candidate is a less serious contender.

In elections with multiple winners, a candidate could also become a less serious contender by being perceived as one of the strongest among the likely winners. For example, consider a legislative election in a district with 5 seats by single nontransferable vote (SNTV), where the candidates run as individuals and the 5 seats will go to the 5 top scorers. If the expected score for one candidate in this district was much larger than any other candidate's expected score, then the voters might also perceive that this candidate is so strong that she is not a serious contender. Thus, in multiple-winner elections, the serious contenders should include the strongest among the likely losers and the weakest among the likely winners.

A rational voter who wants to maximize the expected benefit of his vote in a scoring rule should give the most points to the serious contenders whom he prefers, and he should give the least points to the serious contenders whom he dislikes, subject to the ballot constraints defined by the scoring rule. Other candidates who are not serious contenders should be placed in the middle of a rational voter's rank-scoring ballot, even if they would be at the top or bottom of the voter's sincere preference ordering.

Thus, in a best-rewarding scoring rule, a candidate would be weakened by a perception that she is not a serious contender, because the voters who would like her most may rationally vote instead for a candidate whom they like among the serious contenders. But in a worst-punishing scoring rule, a candidate should be strengthened by a perception that she is not a serious contender, because the voters who dislike her most may rationally vote instead against a

candidate whom they dislike among the serious contenders. These two fundamental principles tell us how the tendencies to nonsymmetric equilibria, in which some candidates are not considered serious contenders, may differ under different electoral systems.

Consider for example an M -winner election with single-positive voting. Suppose that, early in the campaign, polls and endorsements lead to predictions of different predicted vote totals for the K candidates, and as a result the voters perceive an ordering of the candidates from strongest (with highest predicted score) to weakest (with the lowest predicted score). These predictions should lead the voters to believe that the candidates ranked M and $M+1$ in order of predicted strength are the most serious contenders. But this perception should cause some voters to switch to voting for their preferred candidate among these two serious contenders. As a result of this loss of support, the candidates who were weaker than candidate $M+1$ in the initial poll's ranking could become even less serious contenders, causing further loss of support until they are expected to get virtually no votes. On the other hand, the initial loss of support for candidates who were stronger than candidate M in the initial poll's ranking should make them more serious contenders. This tatonnement argument is admittedly not a rigorous equilibrium analysis, and it needs to be supported by more careful game-theoretic methodology, but it strongly suggests that we may expect to find $M+1$ serious contenders getting most of the votes in the election.

Evidence for this "M+1 law" has been found by Reed (1991) and Cox (1994) in data from Japan, where until recently legislative elections were run under this SNTV system, with candidates competing as individuals in multi-seat districts with s ranging from $M=1$ to $M=6$. In single-winner plurality elections, commonly used in Britain and its former colonies, we have $M = 1$; and so the $M+1$ law includes as a special case Duverger's law, that two serious candidates

get almost all the votes in plurality voting.

Cox (1994) has shown that, in such M -winner elections with single-positive voting, the game played by the voters has other "nonDuvergerian" equilibria, in which there can be several likely losers who are expected get positive shares of the votes, but these likely losers can all be serious contenders only if their expected vote shares are almost the same. But if one of the likely losers were perceived to have lost some support and thus fallen behind the others, then she would become a less serious contender and so would lose even more votes until all her supporters abandoned her. In this sense, the nonDuvergerian equilibria of this voting game are unstable.

Now consider instead what would happen if the voters instead used single-negative voting, where each voter is required to vote against one candidate (or, equivalently, to voter for all but one of the candidates). With such negative voting, an early perception that certain candidates are less serious contenders should cause these candidates to gain strength, because voters should switch to voting against the candidates who are more serious contenders. For the $M-1$ initially strongest candidates, this change would make them even stronger and take them even further out of contention, until they are virtually certain of winning. For the $K-(M+1)$ weakest candidates, however, this change would make them stronger, until they become serious contenders and start getting more negative votes. So this dynamic tatonnement process with single-negative voting should leads to an equilibrium where $M-1$ candidates are virtually sure to win, and all other candidates are serious contenders for the last seat. In single-winner elections where $M=1$, this argument says that all candidates should become serious contenders under single-negative voting.

Now consider list-PR elections, where the alternatives on the ballot are party lists that can

win any number of seats. From our theoretical perspective, an important difference between voting for a list and voting for a candidate is that a list cannot go out of serious contention by being too strong, because more votes can always help it to win more seats. So in the tatonnement story, any party that is likely to win seats should be sustained as a serious contender, because it could be in a close race to win another seat if it became stronger, or it could be in a close race to lose a seat if it became weaker. But among parties that are likely to get no seats in this district, a perception of become weaker can induce a perception of being a less serious contender, which tends to further weaken the party until it get virtually no votes at all. In our simple dynamic story, only the strongest of the likely losers might remain in serious contention for a first seat. Following this argument, Cox (1997) concludes that we should expect anywhere from 2 to $M+1$ serious contenders in a list-PR system with M seats per district. This conclusion, that the number of parties in a list-PR system can vary over a wide range, has been called Duverger's hypothesis by Riker (1982a).

The equilibrium analysis in this section has been at an informal level, to sketch broad insights and hypotheses about comparative electoral systems. Scrutinizing the logic of these hypotheses rigorously requires much more work at the level of formal modeling. To formalize the ideas about serious candidates, we need probabilistic models of voting in which the relative probabilities of different close races can be computed. For an introduction to this literature, see Palfrey (1989), Cox (1997), Myerson and Weber (1993), Myerson (1998, 1999). The tatonnement arguments that have been used here to categorize equilibria as stable or unstable have not been identified as special cases of any rigorous theory of stable equilibria in general games, and more work is needed to try to establish such a foundation for these arguments (see

Myerson 1997b).

5. Electoral barriers to entry and incentives to reduce corruption

Duverger's law and its extensions are statements about bounds on the number of serious competitors in political competition. When these upper bounds are achieved, the electoral system is creating a barrier to entry against new parties. This interpretation is very important, because economic theory teaches us that barriers to entry can be the most important determinants of long-term profits in a competitive market.

The ability of political organizations to exploit their institutional role and take profits from the broader public should be a central question in political economics, just as the analogous question about oligopolistic producers is a central question in industrial organization. There is no reason why we should expect politicians to be exceptions from Adam Smith's (1776) general observation that "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the publick." When elected leaders use political power for their own profit, we call it corruption or abuse of power or, in its most extreme form, tyranny. One of the basic motivations for democracy is the hope that electoral competition should reduce such political abuse of power below what would occur under an authoritarian system, just as market competition reduces oligopolistic profits below monopoly levels. (This is a liberal view of democracy, in the sense of Riker, 1982b. See also Schumpeter, 1950, part IV.). But if such deterrence against corruption is what we want from democracy, then it should be a criterion for comparing the effectiveness of democratic structures. That is, we should ask what democratic structures, if any, are likely to be most effective in deterring political

leaders from abuse of power. Duverger's law and its extensions suggest that different electoral systems may indeed differ in this regard.

To investigate this question theoretically, I considered a simple model (Myerson, 1993b) in which voters are allocating seats in a legislature among parties that have different levels of corruption. In this model, I tried to make political corruption as simple and public as producer prices are in market competition. So I assumed that every party has a publicly announced corruption level, which is the cost per voter of paying each legislator who is elected from the party's list. That is, the total corrupt profit to a party is proportional to its corruption level multiplied by the number of seats that it wins in the election, and we could assume that each party wants to maximize its expected corrupt profit. So a party's corruption level here is analogous to a seller's price in oligopoly theory, which is multiplied by quantity sold to compute total revenue.

All voters are assumed to care similarly about the total cost of corruption to all parties, but voters also care about government policy, where their preferences may differ. To keep things very simple in Myerson (1993b), I assumed that there are only two policy alternatives, which we may call "Left" and "Right." Some fraction of the voters are expected to be leftists who prefer the Left policy, and the rest of the voters are rightists who prefer the Right policy. With only two alternative policy positions, we can simply assume that the realized government policy will depend on whether a majority of the seats are allocated to parties favoring the Left or Right policy (with a tie going to whichever is the status quo, say Right).

In this model, each voter wants to maximize his total utility payoff, which is the his payoff from the government policy (higher if the majority of the legislature goes to the parties

that advocate his preferred policy) minus his share of total cost of corruption for all parties. So all voters want to minimize total corruption, when policy is held fixed, but they have different preferences on the policy question of Left or Right.

We could naturally assume that each party chooses its policy position and its corruption level at the beginning of the campaign so as to maximize its expected corrupt profits. But my analysis (Myerson, 1993b) looked at the subgame when all parties' policy positions and corruption levels have already been chosen, and I assumed that, for each positively corrupt party, there is another "clean" party that advocates the same policy position but has corruption level equal to zero. I also introduced a small amount of uncertainty about the numbers of active voters, to guarantee that each voter should think that his vote has a positive probability of making a difference in the election.

These assumptions are sufficient to guarantee that, if all parties differed only in their corruption level, then corrupt parties could never win when voters vote rationally, under virtually any voting rule. But when parties also differ in their policy positions, the policy question can interact with the corruption question in ways that improve the chances for corrupt politicians under some electoral systems.

For example, suppose that there are four parties, called L1, L2, R1, and R2. As their names suggest, parties L1 and L2 advocate the Left policy, while parties R1 and R2 advocate the Right policy alternative. Parties L1 and R1 (the older parties) are known to be corrupt, with the same positive corruption level, while parties L2 and R2 (the newer parties) are known to be noncorrupt or clean. Suppose that we expect about half of the voters to be leftists who prefer the Left policy, and half to be rightists who prefer the Right policy.

With these four parties, consider first a single-winner single-positive-vote plurality election in a single national district. In this situation, plurality voting admits an equilibrium in which the leftist voters all plan to vote for party L1 and the rightist voters all plan to vote for party R1, and so one of these corrupt parties will win the election. In this equilibrium, the vote totals for the corrupt parties are random variables with the similar large expected values, while the vote totals for the noncorrupt parties are expected to be zero. So each voter should perceive that a close race between the corrupt parties L1 and R1 is much more likely than a close race between a corrupt party and a noncorrupt party. Even if a voter cares more strongly about the costs of corruption than about the difference between the Left and Right policy alternatives, he should recognize that the probability that his vote could change the level of corruption in the government is infinitesimally smaller than the probability that his vote could change the policy position adopted by the government. So each voter should rationally vote for the corrupt party whose policy he prefers, to maximize the probability that his preferred policy position will be adopted. Thus, the forces that give us Duverger's law for plurality voting can create a barrier that sustains the corrupt politicians against their noncorrupt rivals in this example.

Of course there is another equilibrium of this game in which nobody votes for the corrupt parties. We might hope that the voters would focus on this equilibrium, which is better for all of them. But suppose that the noncorrupt parties L2 and R2 are new parties, and so history operates as a countervailing focal factor in favor of the corrupt equilibrium. Then the perception that this election is likely to be a close race between parties L1 and R1, as in past elections, can become a self-fulfilling prophecy. (See Schelling, 1960.)

The problem is that getting the voters to coordinate their expectations on the equilibrium

that they prefer may require some coordinating leadership, and they already have leaders in parties L1 and R1 who prefer to maintain the old equilibrium. The need for coordinating leadership to guide blocs of like-minded voters in plurality elections seems particularly problematical when we recognize that the whole point of democratic elections is to select our leaders. In effect, the corrupt leaders of the L1 and R1 parties retain their political support by holding their respective side of the Left/Right policy question as a hostage. In this sense, it is each bloc's need for coordination in plurality elections that can create a barrier to entry and sustain corruption.

If we change electoral systems, then the analysis of this example becomes very different. Under approval voting, it can be shown (see Myerson, 1993b) that, in a wide class of game situations which includes this four-party example, the corrupt parties cannot have any positive probability of winning any legislative seats. To see why, consider again a scenario in which every voter is expected to vote for party L1 or R1. It can be easily shown that a voter might gain, and could not possibly harm his interests, by adding a second approval vote for his most-preferred noncorrupt party, L2 or R2. But no one needs to vote for a corrupt party when all like-minded voters are voting for the most-preferred noncorrupt party. The crucial difference under approval voting is that adding a vote for party L2 or R2 does not reduce a voter's ability to affect the electoral outcome in the case of a close race between parties L1 and R1. Thus, under approval voting, a perception that a close race between parties L1 and R1 is most likely cannot so easily become a self-fulfilling prophecy.

Pure proportional-representation systems also yield good sets of equilibria in these games (see Myerson, 1993b). In our simple example, proportional representation in its ideal sense

(infinite district magnitude) would mean that each voter can allocate an equal fraction of the legislative seats. Recall that the realized government policy is assumed to depend on whether a majority of the seats are allocated to parties favoring the Left or Right policy. So even if a leftist voter expected all other leftist voters to vote for the corrupt party L1, he would still prefer to vote for the clean leftist party L2, because doing so would reduce the corruption cost (by slightly reducing the number of seats won by legislators who take corrupt profits) without affecting the Left/Right policy balance in the legislature. So for list PR with a large magnitude of M seats in each district, our model predicts that voting for a noncorrupt party that advocates the policy which the voter prefers is a dominant strategy for the voter.

The results are very different when we consider M -winner elections with single-positive voting for candidates (SNTV) rather than for party lists. In this system, we have seen that the number of serious candidates is driven strongly towards $M+1$ when there are M seats available. If we assume that incumbents are viewed as serious candidates when they run for re-election, then not more than one incumbent out of M can be expected to lose in the next election. The great difference from the list system is due to the fact that one extra ($M+1$ 'th) candidate can only threaten to win one individual seat in SNTV, whereas one extra party could threaten to win all seats in list PR. This SNTV system also encourages severe party discipline in blocs of voters who want to maximize the number of seats won by like-minded politicians, because the number of seats that they win can be reduced if the voters concentrate their votes on too few candidates or distribute their votes among too many candidates. So it seems reasonable to blame this SNTV system for a political rigidity that protected corrupt political leaders in Japanese politics before the recent electoral reform.

For theoretical completeness, consider now what would happen under a system of single-negative voting, say in a single-winner election. With such negative voting, we do not get barriers to entry against new parties. In fact there is a strong incentive for blocs of like-minded voters to get a large number of identical parties on the ballot, to split the negative votes of opposing voters. But negative voting instead creates a kind of barrier to exit which also protects corrupt parties. Consider what would happen if our four parties competed in a single-winner election under negative-plurality voting. If the voters were sure that the winner was bound to be the candidate of one of the clean parties, L2 or R2, then the corrupt parties L1 and R1 would not be treated as serious contenders, and so all leftist voters would vote against R2, and all rightist voters would vote against L1; and thus the winner would be a corrupt candidate from L1 or R1 (having no negative votes)!

So in single-winner elections, a worst-punishing voting rule can create a barrier against the exit of corrupt parties from the ranks of serious competitors, because being perceived as not a serious contender actually makes a candidate stronger under a worst-punishing system. In contrast, plurality voting could create a barrier against the entry of clean parties into the set of serious competitors, because being perceived as not a serious contender would weaken a candidate under such a best-rewarding system, and so could become a self-fulfilling prophecy.

Borda voting has both best-rewarding and worst-punishing aspects, but for our four-party example it appears dysfunctional in the same way as single-negative voting (see Myerson, 1993b). Consider what would happen if our four parties competed in a single-winner election under Borda voting. If the voters were sure that the winner was bound to be the candidate of one of the clean parties (L2 or R2) then the candidates from the corrupt parties (L1 and R1) would

not be treated as serious contenders. Each voter, to maximize the impact of his vote on the race between the two serious contenders, would move the candidates of the clean parties to the top and bottom of his Borda ballot, putting on top the party that advocates his preferred policy position. But when all voters do so, they must give the same total points to the two clean parties as they give to the two corrupt parties, because $1+0 = 2/3+1/3$, and so there cannot be a close race among the clean candidates without a corrupt candidate also being a close contender to win. So the worst-punishing aspect of Borda voting essentially creates a barrier to exit that sustains the corrupt candidates as serious contenders.

Such perverse "barriers to exit" under worst-punishing voting rules imply that any new political movement that gets on the ballot, clean or corrupt, must be treated as a serious contender by the voters. So worst-punishing voting rules encourage a proliferation of candidates that would hurt politicians as a class, without any necessary benefit for the voters. Thus we can see clearly why worst-punishing voting rules like negative voting are not used in real political systems. But established politicians as a class should be more favorable towards political systems that erect barriers to entry against new political parties.

6. Other perspectives on democratic incentives to reduce corruption

The concept of barriers to entry in political systems has broad applications that go beyond the scope of a simple voting game in one district. For example, consider the common practice of requiring that a party cannot be awarded any seats in a proportional representation systems unless the party has gotten some minimal quota of votes, such as the 5% quota for proportional representation in German Bundestag elections. Such a quota can obviously function as a barrier

to entry against new parties. If the goal of these quotas is to prevent a proliferation of parties with narrow ideological bases, a similar result could be achieved by applying the proportional representation in smaller districts, each with 20 or fewer seats, as Taagepera and Shugart (1989) have emphasized. If the distribution of voters' preferences is relatively similar across different districts, then either system would eliminate parties that could not successfully appeal to more than 5% of the political spectrum. But a new party that has reasonable hope of appealing to 5% of the voters may find it easier to get started if it can enter the legislature with a locally concentrated campaign that wins 1 out of 20 seats in a single district.

Looking more broadly, we should recognize that some of the most fundamental ideals in democratic theory can be derived from a concern to decrease barriers to entry in politics. Freedom of the press and freedom of assembly are important for democracy because they facilitate the creation of new political movements. At another level, guarantees of autonomy for regional or provincial governments should also be recognized as structural features of a democratic system that can lower barriers to entry into national politics, because they allow politicians outside the capital to establish independent credentials for political leadership.

My simple model of effectiveness against corruption (considered in the preceding section) makes predictions that are directly relevant to the recent debates on electoral reform in Italy. In response to apparent excesses of corruption in Italian politics, reformers changed the legislative electoral system from proportional representation to a mixed system in which most seats are allocated in single-member districts with single-positive voting. But the analysis of my model (Myerson, 1993b) suggests that this change was a step in the wrong direction.

If the Italian electoral reform can be justified as step towards reducing corruption, it must

be because some assumption in my model is wrong. Of course, any theoretical model involves simplifying assumptions that are never exactly true. But we should ask, which of my assumptions must be changed in order to realistically explain how proportional representation can be so much less effective against corruption than my model has suggested?²

The essence of my argument was that, when the leaders of a big established party take corrupt personal profits from the government, proportional representation makes it easiest for dissident politicians to launch a party that adopts the same policy positions as this established party but also promises to reduce corrupt profit-taking. Of course it is not so easy for leaders of a new party to convince the voters that they will be cleaner than the old established party, but that problem would be the same under any electoral system.

I would argue now that the crucial problem is in my model's simple assumption about coalition-formation. My model assumed that, on the policy dimension where voters differ, government policy would be set equal to the position advocated by a majority in the legislature. In effect, we were assuming that a legislative seat won by a clean party had as much chance of affecting government policy as a seat won by a corrupt party. But in a world where most parties are very corrupt, a new small party of committed corruption-fighters would probably be, among all parties, the least likely to be invited into the governing coalition. In any post-election bargaining to form a governing coalition, corrupt politicians might rationally choose to compromise on almost any ideological dimension before they would compromise on the corruption dimension, which gives them their profit from elected office. Thus, in a multi-party

²In defense of my past work, I want to suggest that my model should still be considered valuable, even if you disagree with its applied conclusions, precisely because it sharpens the question for us.

parliamentary democracy where most parties are corrupt, a vote for a noncorrupt party will have no beneficial impact on the government policy outcomes that the voter cares about unless the noncorrupt parties get enough seats to form a governing coalition themselves. A vote that gives an extra seat to a small noncorrupt party is wasted just as much as a vote for a party that has no chance of winning a seat at all. So we find again that an expectation that noncorrupt parties will be small can become a self-fulfilling prophecy.

Until now, our theory of voters' decision-making was based on the idea of a close race between two candidates, where changing a few votes could change the winners. But if some changes in the set of winners would not change the outcomes that affect the voters, then we should instead look for close questions in a space of outcomes that the voters actually care about. In general, we may say that there is a close question involving two alternative outcomes if a change in a few votes could (by changing the winners of the election) make a difference between one of these alternatives occurring after the election rather than the other. But in a large election, some close questions are much less likely than others. In any set of possible alternative outcomes that the voters care about, we may say that a particular pair of alternatives is a serious question in the election if, conditional on the event that some pair in of alternatives in this set is in a close race, the event that the close race involves this particular pair has a substantial positive conditional probability (which would not go to zero as the population size becomes large, when expected voting strategies are held fixed).

A rational voter should recognize that his vote can only matter in the event that a close question exists between two alternatives that affect him. So a voter should choose his vote to maximize his conditional expected payoff given the event that there is such a close question in

the payoff-relevant outcome space. Thus, a calculus of rational voting must depend critically on what policy questions in this space are considered serious in the election. (To offer a rigorous quantitative framework in which these ideas can be formulated, Myerson, 1999, develops a calculus of limits of probability ratios in large games when the expected population size goes to infinity.)

We are assuming here that the payoff-relevant outcome space includes both a corruption dimension and some other government policy dimensions that voters care about. So the effectiveness of democracy against corruption depends on whether political leaders can gain by making differences in corruption a serious question in the election.

From this perspective, we can see some advantage for a political system that is dominated by two coherent parties that are large enough so that a governing coalition must include at least one of them. Once the serious political question has become which of these two parties will lead the governing coalition, either party could realize some competitive advantage from a better reputation for reducing corruption. Viewing corruption as political profit, we must be concerned that the leaders of two established parties might collude and agree not to compete on this corruption dimension (which is why we have been concerned about barriers against new parties). But to the extent that such interparty collusion is difficult, we can now recognize the greater competitive effectiveness of a system with two dominant parties.

A similar argument can be made for presidentialism. The key to this argument is the assumption that anyone who wins a presidential election will have enough power to reduce corruption, if she has committed to do so. So in a world where most elected officials are corrupt, an individual presidential candidate can make reducing corruption a serious question, in a way

that an individual candidate for a seat in the legislature cannot. The only individuals in a parliamentary system who can be like presidential candidates in this regard are the leaders of large parties that are considered to have a serious chance of getting a majority of the parliament.

7. Legislative bargaining and party structure

Whenever power is divided among many elected officials, a theory of rational voting must take account, not only of the probability of helping one candidate to win rather than another, but also the probability that helping a particular candidate to win would actually affect government policies in a way that benefits the voter. So the characteristics of voting equilibria cannot be fully analyzed without taking account of the constitutional structure of the government, which defines the post-election games that elected officials will play to determine government policy.

To complete our analysis in this way, we need tractable analytical models that cover pre-election campaigning, voting on election day, and post-election bargaining among elected officials. Such models are hard to develop, and much more work in this direction is needed. In particular, we need such models to explain why legislative politics can be so different in presidential and parliamentary systems.

Austen-Smith and Banks (1988) have given us an excellent example of what we can learn from such integrated models. They consider a list-PR parliamentary election in a nation where the constitutional rules stipulate that the largest single party will get the first opportunity to form a governing coalition. Because this first bargaining move is expected to be successful, the voters care greatly about which single party is the largest. As a result, a party can be strengthened by

being perceived as a serious contender to be the largest party. In the equilibrium analyzed by Austen-Smith and Banks (1988), there is one large party on the extreme left, one large party on the extreme right, and one small party in the center. Because the question of whether the leftist party or rightist party will be largest becomes a serious question for the voters, even moderate voters who like the centrist party's policy position best may rationally give their votes instead to the party that they prefer among these two large parties. This defection from the center is halted only when the small centrist party becomes so small that there can be a serious question of it disappearing from the legislature altogether, in which case the government would be formed by one extreme party alone without the moderating influence of a centrist coalition partner.

Now consider what happens when the constitution is changed so that there is no longer any special significance for the largest party in determining the leadership of the government. So a change in which party is largest may no longer be a serious question for the voters, because the identity of the largest single party is no longer something that voters should care about. Instead, the composition of the governing coalition may depend in complex ways on the sets of parties that together have enough seats to form a majority. So voters may be motivated by the possibility of affecting government policy through an effect on the number of seats won by a party of any expected size (not just a party that is in a close race for largest, or that is so small that its extinction is a close question). In such a situation, a voter may be more willing to vote for party whose legislative position he most prefers. Thus, the two formerly largest parties may be expected to lose much of their electoral support. Such an effect has indeed been attributed to the recent constitutional reform in Israel that created a directly-elected prime minister.

People who consider the resulting increase in the number of small special-interest parties

to be undesirable might then argue that this constitutional reform should be repealed. But we should be careful to think more broadly about constitutional structures before we accept such an argument. Systematically studying the political effects of constitutional structures should make us aware of the great variety of structural parameters that may tend to have particular political effects. If one wishes to discourage a proliferation of small parties, this effect could also be accomplished by subdividing the country into districts with fewer legislative seats per district, so that the M+1 law imposes a tighter bound on the number of parties.

Of course, subdividing a country into small legislative districts could replace ideological specialization with geographical specialization instead. For example, if the members of the legislature are elected by list PR in small 3-seat districts, then the M+1 law predicts that there will be at most 4 serious parties in each district. But will we have a different set of four parties in each district, each of which specializes in advocating the local districts concerns, or will we have four national parties running lists in each district?

To encourage integration of local political organizations into national parties, many nations offer additional bonus seats to parties that win seats in multiple districts (see Cox, 1997). But to qualify for these national bonus seats, local political organizations from different regions could register jointly as a under common national electoral label, as a kind of marriage of convenience, without any constraint to actually vote together in the legislature. So it is not clear that these national bonus seats should actually have the desired effect of creating major national parties with coherent national programs.

A comparison of British and American legislative politics makes it clear that the difference between presidential and parliamentary constitutional structures can affect the

incentives for local legislative candidates to accept national party discipline. Britain and America use essentially the same legislative electoral system (plurality voting in single-seat districts), and legislative politics is dominated by two big parties in both countries. But candidates for the British parliament are more willing to campaign as loyal party members on the basis of their national party manifesto, while candidates for the American congress feel compelled to present themselves more as independent advocates of local interests. It seems clear that these differences in legislative electoral politics are to be explained by the differences between the British and American legislatures' constitutional roles in the national government. But we need a theory to tell us what aspects of the constitutional differences may be responsible for these different incentives for national political integration.

The critical factor may be the relative political rewards that can be achieved by a set of legislators who happen to include a majority of the legislative chamber, if they commit themselves to act together as a durable coalition under the direction of their selected legislative leaders. In a simple unicameral parliamentary system, the leaders of such a coalition can then control both the legislative agenda and the implementation of government policies, and can thereby redistribute all the benefits of politics to their coalition. In a typical parliamentary system, voters expect legislators to form such a governing coalition, and so the critical event of political life after the election will be the determination of this governing coalition and the selection of its parliamentary leadership. The importance of determining the governing majority coalition then creates a kind of increasing return to scale for national parties in the legislature, as Cox (1987b) has observed in his study of the evolution of party discipline in Victorian Britain. A legislator who campaigned as a local independent and refused to join any national coalition could

not have any impact on this critical question of which coalition will control the parliament.

In a presidential system, the leaders of a disciplined majority coalition in a legislative chamber could not automatically get such political rewards of power and control for their followers. A strong president with executive control and a legislative veto can block the initiatives of such a coalition, decreasing its leaders' ability to reward the coalition members. Diermeier and Myerson (1995) have shown that, when legislators act as independent agents who cannot be committed to support any policy by their legislative leaders, they may actually have more effective bargaining power against a strong president or a rival legislative chamber (see also "Model 3" in Myerson, 1995a). Shugart and Carey (1992) have found empirical evidence that legislative powers of a president have detrimental effects on legislative party discipline.

The constitution of Russia today gives the president an unusual combination of veto power and decree power. By writing decrees that have force of law unless reversed by legislative action, and then by vetoing any legislative actions against these presidential decrees, the president of Russia can enact his own legislative program as long as he can get support from either 1/3 of Duma or 1/3 of the Federal Council. (See Parrish, 1998.) A disciplined majority coalition in the Duma could not pass legislation and could not block the president's legislative program. So legislators in the Duma have virtually no incentive to make the hard compromises needed to define a coherent national policy capable of getting majority support. If this system is not reformed, it is difficult to see how voters will identify any national policy decisions as serious questions in future Duma elections.

We clearly need much more theoretical work on legislative bargaining models, as well as empirical work on comparative presidential and parliamentary systems, to understand how

changes in presidential powers and legislative procedures can affect the incentives for legislators to form coherent national parties. The potential importance of different rules for legislative agenda control in shaping political incentives of both presidential and parliamentary systems has been emphasized by Huber (1996) and Diermeier and Feddersen (1998). As Shugart and Carey (1992) have emphasized, there is great variety in the constitutional powers of presidents in different countries. Since the establishment of the French Fifth Republic, there has been great interest in the possibility of new semi-presidential systems that might combine the best features of presidential and parliamentary systems. But without a theory of political institutions, we cannot say whether a new semi-presidential constitution might combine the best features of both, or the worst features of both. As Austen-Smith and Banks (1988) have shown, a critical focus of this analysis must be on how changes in the constitutional allocation of powers may transform way that serious political questions are identified by the voters in elections.

8. Conclusions

In this paper, we have tried to sketch the elements of a theory of electoral systems, viewed as an essential part of the constitutional structure in which politicians compete for power. We looked first at election games in isolation from the rest of the constitutional structure, assuming a given number of equally serious candidates. In this context, we saw how different voting rules can create substantially different incentives for politicians to concentrate on diverse special interests or to make similar broad appeals to all voters. Then we dropped the symmetry assumption, and outlined a conceptual structure for understanding Duverger's law and other generalized propositions about the number of serious contenders in an election. Economic

understanding of barriers to entry led us from simple predictions about numbers of serious competitors to predictions about the relative effectiveness of different democratic structures for deterring political abuse of power. Finally, we saw the importance of taking account of how the winners will bargain after the election to control the government. Rational voters should be concerned about their potential effect on this bargaining process, and this concern may be an essential factor to explain the systematic differences between party structures in presidential and parliamentary systems.

In any complex social institution, individuals' behavior is guided by an interconnected system of incentives, in which the decisions of one individual can alter the incentives of another. When the basic structure of the institution is reformed, this system of incentives may change in subtle ways. Economic analysis aims to expose the workings of this system of incentives, so that institutional reforms can be planned with a better understanding of their long-term consequences.

In a world of increasing democracy, questions of constitutional design in new and reforming democracies have generated a great need for economic analysis of political institutions. In this analysis, we view constitutional structures as the rules of the game that politicians must play to win political power, and we analyze equilibria of corresponding game models to see how rational behavior in this game may change when the rules are changed. For our analysis to address the enormous variety of constitutional structures that have been used or proposed, the structure of these game models must include some parameters that can be varied to represent more of this variety. Because the welfare-relevant consequences of political behavior are complex and multi-dimensional, we need to develop different game-theoretic models of government, which make different simplifying assumptions about the set of government policy

alternatives and about voters' preferences, to focus on a different welfare-relevant aspect of political behavior. To improve the reliability of our analysis, we must also compare the results of game models which make different assumptions about the underlying framework of government policy alternatives, and about the basic preferences of voters and politicians. With the passage of time and the spread of democracy, more data about government performance under different democratic institutions is becoming available, and this data needs to be studied in a dialogue with theoretical analysis.

We must recognize that theoretical analysis cannot definitively prove the practical superiority of new proposals in any area of engineering, and the stakes in constitutional engineering are especially high. But when objective academic expertise is lacking, the principal voices in constitutional debates are likely to be those of professional politicians, whose constitutional preferences may depend mostly on their short-term perceptions of how the political game might be best restructured to their own immediate advantage. An analogy can be made to classic tariff debates in international trade, where economic analysis has served, not to definitively prove the superiority of free trade, but to assure that the welfare consequences of tariff policies for broad groups of unfocused citizens should be considered along with the concerns of active special interest groups. So economic analysis of constitutional structures should serve to expand the scope of public constitutional debates, by offering more perspectives on how a change in the rules of the political game may affect rational political behavior and the resulting performance of democratic government for the welfare of its citizens.

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THEORETICAL COMPARISONS OF ELECTORAL SYSTEMS

by Roger B. Myerson

Schumpeter Lecture, 1998 European Economic Association meeting

Outline of topics:

1. Invitation to political economics
2. Variety of electoral systems
3. Symmetric equilibria and incentives for diversity.
4. Nonsymmetric equilibria and Duverger's law.
5. Electoral barriers to entry and incentives to reduce corruption.
6. Other perspectives on democratic incentives to reduce corruption.
7. Legislative bargaining and party structure.
8. Conclusions

Notes and text are available in Adobe PDF format at

<http://www.kellogg.nwu.edu/faculty/myerson/ftp/schump98.pdf>

1. Invitation to political economics

The scope of economics has changed.

From an initial goal of explaining the production and allocation of material goods, economic theorists developed analytical tools to predict how changes in market structure may affect rational behavior of producers and consumers.

Today we can extend these tools to predict how changes in the structure of any social institution may affect the rational behavior of individuals.

With game-theoretic models, we can now analyze institutions of civilized society with the same breadth of vision that characterized the ancient Greek social philosophers who gave economics its name.

Among these new applications of economic analysis, none are more important than analysis of incentives in political institutions.

Markets and politics are substantively interconnected systems.

Logical similarities between political competition and market competition.

Understanding political failures, to guide constitutional reform, is not less socially important than understanding market failures, to guide regulatory reform and fiscal policy.

Traditional political scientists have lacked the skills to build analytical theories of comparative incentives in political institutions.

The basic constitutional structures of any democratic system defines the rules of the game played by politicians. Consists of structures on two levels.

Governmental structures: definitions of political offices and their powers.

Electoral structures: procedures for electing candidates to these offices.

A complete theory of politics requires analysis of both levels: electoral competition, interactions among elected officials in government.

To keep things tractable, most game-theoretic work focuses on one of these levels, ignoring or oversimplifying the other.

Here I emphasize the electoral level, to introduce elements of a theory of electoral systems and how they may affect competitive political behavior.

2. Variety of electoral systems

We have a wide variety of ballot types in different voting rules.

Let K denote the number of candidates (or party-lists) in the election.

In a scoring rule, the ballot is a K -vector, giving points to each candidate, which are summed across all voters to determine outcome.

Non-scoring rules include single-transferable vote (STV).

Determination of winners in scoring rules.

Single winner: Candidate with highest total point score wins.

M winners: M highest scorers are winners.

Proportional representation: M seats are allocated to party lists in proportion to their scores (using some rounding formula).

Single winner with quota: Candidate with highest total point score wins if her score exceeds some quota (50%), otherwise a second election is called.

Ballot types in scoring rules.

In a rank-scoring rule, permissible vote-vectors are the permutations of one vector $(s_1, s_2, \dots, s_{K-1}, s_K)$ where (w.l.o.g) $1 = s_1 \geq s_2 \geq \dots \geq s_{K-1} \geq s_K = 0$.

Single-positive vote: $(1, 0, \dots, 0, 0)$ (with single-winner = plurality,
with M winners = SNTV, with proportional representation = list PR)

Single-negative vote: $(1, 1, \dots, 1, 0)$.

V-positive votes: $1 = s_1 = \dots = s_V, s_{V+1} = \dots = s_K = 0$.

V-negative votes: $1 = s_1 = \dots = s_{K-V}, s_{1+K-V} = \dots = s_K = 0$.

One-positive-and-one-negative vote: $s_1 = 1, s_2 = \dots = s_{K-1} = 1/2, s_K = 0$.

Borda voting: $s_j = (j-2)/(K-1)$ for $j = 1, 2, \dots, K$.

Nonrank scoring rules may permit the permutations of several vectors.

Approval voting allows any number of positive votes (the union of permissible ballots under all V-positive-vote rules, for $V = 1, \dots, K-1$).

Ballots like single-positive voting ask voters to reward the best candidate; ballots like single-negative voting ask voters to punish the worst candidate. With large K , $\sum_j s_j/K \approx 0$ if best-rewarding, $\sum_j s_j/K \approx 1$ if worst-punishing.

3. Symmetric equilibria and incentives for diversity.

Hotelling (1929) posed the question of rational competitive diversity both in oligopolistic markets and in politics.

But in politics, each voter's utility is from the policy position of the winner, not the candidate that he supported. No costs of "excessive sameness."

Gary Cox (*Am.J.Pol.Sci.*, 1987, 1990) showed that candidates' incentives for diversity depend systematically on the voting rule.

Example: single winner, K candidates, {policy alternatives}={Left, Right}.

Q denotes the fraction of voters expected to prefer Left; $1 - Q$ prefer Right.

First, each candidate independently chooses a policy position in {Left,Right}.

Assume symmetry: candidates at same position are treated same by voters.

Given K , Cox's threshold of diversity Q^* is the greatest value of Q such that there is a symmetric equilibrium in which all K candidates choose Right.

- Fact. $Q^* = \sum_j s_j / K$ for a rank-scoring rule with points $1 = s_1 \geq s_2 \geq \dots \geq s_K = 0$.

Single-positive voting yields $Q^* = 1/K$, and so small minority positions can win when K is large. Best-rewarding creates incentives to diversify, low Q^* .

Single-negative voting yields $Q^* = (K - 1)/K$, so a majority can be neglected when K is large! Worst-punishing creates incentives to cluster, high Q^* .

Approval voting and Borda voting yield $Q^* = 1/2$ for any K . Majoritarian.

A related model: The winner of the election will get a budget of €1 per voter to distribute as cash or to spend on a public good worth € B to every voter.

An equilibrium where the public good is guaranteed exists only if $B \geq 1/Q^*$.

When $B < 1/Q^*$, if all other candidates promised the public good, then a candidate could win by promising € $1/Q^*$ to a Q^* minority of the voters.

(Myerson, *Amer.Poli.Sci.Rev.* 1993; Lizzeri and Persico, 1998.)

These results depend only on ballot type; extend to multi-winner elections.

Consider open list PR, where supporters of a party vote to order its list.

Single-positive vote for candidates in Brazil induces separate constituencies (Ames, *J. of Politics*, 1995). Approval voting would induce broader appeals.

4. Nonsymmetric equilibria and Duverger's law.

Preceding analysis assumed symmetry, all candidates taken equally seriously. Duverger's law: Plurality elections (single-vote single-winner) tend to have only two serious parties. More parties can persist under PR.

(Maurice Duverger, *Political Parties*, 1954. William Riker, *A.P.S.R.*, 1982. Gary Cox, *Making Votes Count*, 1997.)

A candidate is in a close race when a small number of votes could change her from winner to loser or from loser to winner.

A rational voter knows that his vote matters only in the event of a close race, and so should vote in equilibrium to maximize expected utility in this event.

A candidate is a serious contender if, conditional on a close race existing, there is a substantial positive probability of her being in the close race.

A stronger candidate has greater probability of winning; weaker, less.

A likely winner has probability of winning close to 1; likely loser, close to 0.

- In an election with K candidates for M seats, serious candidates normally include the strongest likely loser and the weakest likely winner.
- With best-rewarding votes, being a serious contender strengthens a candidate.
- With worst-punishing votes, being a serious contender weakens a candidate.

These propositions yield generalizations of Duverger's law. Consider an election with M winners, single-positive voting for candidates (SNTV).

Becoming weaker than the strongest likely loser makes a candidate less serious, which weakens her further until she gets almost no votes.

Among likely winners however, being perceived stronger tends to weaken.

Such a tendency towards M+1 serious candidates, with relatively level scores for top M candidates was found by Steven Reed in Japan (*Brit.J.P.S.*, 1991).

Unstable nonDuvergerian equilibria have ties for strongest likely loser. (Cox)

(Single-negative voting? M-1 likely winners, others all serious contenders!)

- In list-PR elections, any party likely to win a seat can seriously contend for more or less; but only strongest of likely losers can be a serious contender. So list PR in M-seat districts should yield at most M+1 serious parties.

5. Electoral barriers to entry and incentives to reduce corruption.

Interpretation of Duverger's law:

Plurality voting creates a barrier to entry against new "third" parties.

Economists should recognize importance of barriers to entry, which may be crucial determinants of long-run profit. Politicians' profits = corruption.

So Duverger's law suggests that electoral systems may differ in their effectiveness at deterring political abuse of power, a basic goal of democracy.

Simple theoretical model (Myerson, *G.E.B.*, 1993). Each party publicly chooses a corruption level in \mathbb{R}_+ and a policy position in {Left, Right}.

A party's profit is its seats multiplied by its corruption level; max E(profit).

A voter gets his utility of legislative majority's policy, minus parties' profits.

Will multiparty democratic competition force party profits to 0?

4-party example: L1 and L2 are leftist parties, R1 and R2 are rightist parties.

L1 and R1 are similarly corrupt, L2 and R2 are noncorrupt. (Fixed, known.)

Half of voters prefer left policy, half prefer right, all prefer noncorrupt.

Plurality voting admits a Duvergerian equilibrium where only L1 and R1 are serious contenders. A leftist voter deviating from L1 to L2 is more likely to affect a close L1-R1 race unfavorably, than a close L2 race favorably.

This equilibrium may be focal when L1 and R1 are established parties.

Coordination game. Corrupt parties hold left/right policy question as hostage.

Shift to less corrupt equilibrium would require coordinating leaders before the election; but elections are our institution for choosing our leaders!

(Single-positive voting for candidates in multi-seat districts demands even more coordination of voters to maximize seats for a bloc; reforms in Japan.)

With approval voting, such a corrupt equilibrium does not exist.

Even if a close L1-R1 race is most likely, voters approve L2 or R2 as well as their preferred serious contender. So a perception of weakness cannot become a self-fulfilling prophecy against the noncorrupt parties.

List PR (pure, assuming large M) also has no corrupt equilibrium in this model, because small parties can contend seats as seriously as large parties.

Worst-punishing ballots creates barriers to exit that protect corrupt parties.

Under single-negative voting, or even Borda voting, a perception that "only L2 or R2 can win" would encourage voting against the less-preferred among L2 and R2, which strengthens L1 and R1 until they are serious contenders.

6. Other perspectives on democratic incentives to reduce corruption.

Barriers to entry can depend on many other factors in political systems.

A list-PR system with a national 5% quota to win seats (Germany) may create higher barriers to entry than a list-PR system with 20-seat districts.

Freedom of the press, freedom of assembly, and restrictions on patronage are important in democratic theory because they lower political barriers to entry.

Recent Italian electoral reforms to reduce corruption went from PR to a system where most seats are allocated by plurality voting.

In my model, such a reform decreases effectiveness against corruption!

Sharpened question: what assumption of my model may be wrong, causing it to overestimate the effectiveness of multiparty PR against corruption?

(Difficulties identifying corruption should not affect electoral comparisons.)

Critical assumption: government policy (left/right) is determined by a majority coalition in which noncorrupt parties can participate as well as corrupt parties that advocate the same left/right policies.

But if most parties are corrupt, a small anticorruption party would be very unlikely to be invited into the governing coalition. So a vote that wins an extra seat for a small anticorruption party is as wasted as if it got no seats.

Then only a leader of a major party that is a serious contender for a legislative majority can gain support by pledging to fight corruption.

This shows advantage of a political system dominated by two large parties.

With corruption as politicians' profit, we must be concerned about collusion among the leaders of the two big parties on this question, but their independent incentive is to undercut each other on the corruption dimension.

A related argument for presidentialism:

Voters know that a committed anti-corrupt winner of a presidential election would have power to reduce corruption,

So presidential candidates can effectively compete against corruption.

8. Conclusions

Assuming a given number of equally serious candidates,
best-rewarding ballot => more differentiated specialization of candidates
worst-punishing ballot => candidate clustering, similar (broad) appeals
Intermediate majoritarian properties of Borda and approval voting.

Dropping symmetry assumption, number of serious candidates (parties) may depend on ballot structure and counting rule. Duverger's law, $(\leq)M+1$ law. Electoral barriers to entry (and exit) of serious candidates, and democratic incentives to reduce political corruption.

Importance of post-election bargaining among elected officials.

Initiatives against widespread corruption can be usefully promised only by candidates who are contenders for high office (majority leader or president). Voters' desire to influence post-election coalition formation can create a kind of increasing returns to scale for larger national legislative parties in parliamentary systems, different from presidential.

Economic analysis aims to expose the workings of incentives in complex social institutions, so that institutional reforms can be debated with a better understanding of their long-term consequences.

In a world of increasing democracy, questions of constitutional design in new and reforming democracies have generated a great need for economic analysis of political institutions.

When objective academic expertise is lacking, the principal voices in constitutional debates are likely to be those of professional politicians, whose constitutional preferences may depend mostly on their short-term perceptions of how the political game might be best restructured to their own advantage. (Analogy to classic tariff debates in international trade, where economists have helped to express the interests of large unfocused groups.)

Economic analysis of constitutional structures should serve to expand the scope of public constitutional debates, by offering more perspectives on how a change in the rules of the political game may affect rational political behavior and the resulting performance of democratic government for the welfare of its citizens.

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Abstract: Elements of an economic theory of political institutions are introduced.

A variety of electoral systems are reviewed. Cox's threshold is shown to measure incentives for diversity and specialization of candidates' positions, when the number of serious candidates is given. Duverger's law and its generalizations are discussed, to predict the number of serious candidates. Duverger's law is interpreted as a statement about electoral barriers to entry, and this idea is linked to the question of the effectiveness of democratic competition as a deterrent to political corruption. The impact of post-electoral bargaining on party structure in presidential and parliamentary systems is discussed.

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