Electoral Incentives, Political Risk-Taking and Policy Reform

Alessandro Lizzeri and Nicola Persico*

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Abstract

We analyze the risk-taking behavior of political candidates who are uncertain about the values voters assign to various policy platforms. We show that the majoritarian and proportional electoral systems lead to different outcomes. The proportional system penalizes risky platforms more than the winner-take-all system. Since candidates choose "safer" platforms, in the proportional system voters face policy alternatives that are on average more similar to each other than under the winner-take-all system. Because the proportional system gives voters less variety in policy platforms, it is more likely to give rise to the "excessive sameness" hypothesized by Hotelling (1929).

*Department of Economics, New York University, 19 W. 4th Street, New York, NY 10012. Lizzeri and Persico are grateful to the National Science Foundation for financial support.

"*So unpredictable are the reactions of the people to governmental action that politicians prefer to be sure that if they act they will not find themselves far out on a limb.*" V.O. Key, *Public Opinion and American Democracy* p. 424.

"*It's hard to get people under normal circumstances to take risk, electoral risk. I think you have to take electoral risk to take on Medicare or Social Security to do it right.*" U.S. Sen. Bob Kerrey, (D.) Nebraska.[1]

1 Introduction

This paper provides a model of risk-taking by candidates in the choice of electoral platforms. We compare electoral systems with respect to the incentives they give candidates to take electoral risks, and provide a welfare analysis of the effects of risk-taking.[2]

The premise of this paper is that policy platforms are risky at the time when they are chosen, and so politicians often face a trade-off: whether to opt for bold policies, which carry greater electoral risk but offer potentially large rewards, or instead to choose safer policies. A memorable instance of a risky platform adoption in US politics is the so-called "Contract With America," which went on to deliver a remarkable electoral upset in the 1994 congressional elections. At the time of adoption, the electoral appeal of this platform was viewed with extreme skepticism by many.[3] The trade-off between electoral risk and return has largely been overlooked in the formal political-economy literature.[4] This trade-off, and the way it is

[1] Cited from "The lesson: Anything's possible, even likely" by David Dahl. *The St. Petersburg Times*, February 13, 1999.

[2] In this paper, as in much of the literature on electoral competition, we use the term "party" and "candidate" interchangeably.

[3] "Some Democrats had greeted the Contract With America with enthusiasm, seeing it as a return to Ronald Reagan's policies and seeing that as a massive political blunder. [...] Many reporters and political commentators dismissed the Contract With America as a political promise, worth nothing on the day after Election Day." Thomas Donlan "Contract With America." *Barrons*. 74(46): 70. 1994 Nov 14.

[4] The literature on incumbency advantage discusses the decision to run for office at the risk of not being re-elected (see Rohde (1979) for a discussion of the risk-taking attitudes of candidates). That literature takes

resolved across different political systems, is the focus of this paper.

Suppose we proxy electoral risk-taking by the variability of a party's vote share around its long-term trend. Then a look at cross-country data reveals a systematic relationship between electoral risk-taking and the "degree of proportionality" of the electoral system. The disproportionality index (Taagepera and Shugart 1989), measures the degree to which a party's vote share is reflected in the proportion of seats in the assembly.[5] Figure 1 plots electoral systems according to their index of disproportionality (vertical axis) and the variability of the largest party's vote share over time (horizontal axis).[6] The figure shows that more proportional systems exhibit less variability in vote shares. Conversely, in systems that are closer to winner-take-all (plurality voting), we observe greater variability in vote shares.[7]

In this paper we analyze how the risk-return trade-off is resolved in electoral competition, and obtain comparative statics consistent with the relationship uncovered in Figure 1. In the model, candidates choose the degree to which their platform embodies a "reformist" agenda, and they are uncertain about how voters perceive reformist platforms. More reformist platforms are more likely *on average* to be well received by voters—but they also carry a greater risk of being rejected by the electorate.

We contrast the candidates' willingness to select risky platforms under alternative electoral incentives. We consider two extreme objectives for candidates: they either care only about winning or they want to maximize their vote share. We have previously argued (Lizzeri and Persico, 2001) that these alternative objectives can capture some elements of the degree of proportionality of the electoral system. A very disproportional system leads to winner-take-

electoral risk as given, and furthermore is not concerned with electoral institutions.

[5] Cox (1997) and Lijphart (1999) also discuss measures of proportionality of electoral systems. See Milesi-Ferretti, Perotti, and Rostagno (2000) for a discussion of the merits of different proportionality measures and an alternative way to measure proportionality.

[6] Note that the relation is betweent the degree of proportionality and the vote share of the largest party, *not* the share of seats captured by this party. The former is an endogenous consequence of voter's behavior and risk-taking by candidates, the latter is a mechanical consequence of the electoral system.

[7] Appendix B describes the index of disproportionality and the way in which we compute the variability of vote shares.

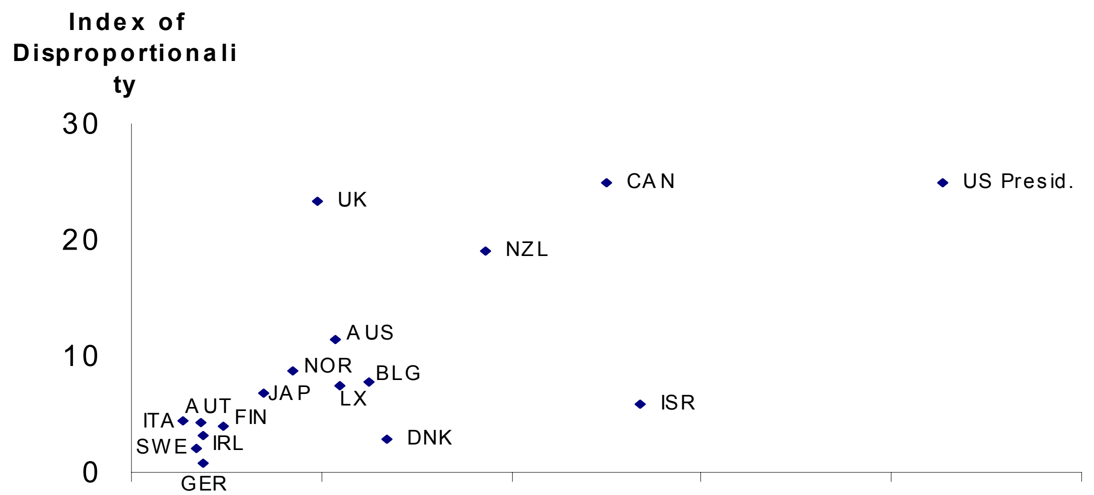

Figure 1: Electoral risk across different electoral systems.

all incentives where candidates only care about obtaining more than 50% of the votes. In an electoral system that is highly proportional, increases in vote shares translate into proportional increases in rewards to parties, such as seats in a legislature. We show that a winner-take-all system induces candidates to take on more electoral risk relative to a proportional system. This difference in risk-taking behavior stems from the different ways in which the variability in vote shares is evaluated in the two systems. In the proportional system, candidates maximize expected vote shares, which in our model translates into effectively maximizing the expectation of a concave function which is an increasing transformation voters' utility functions. Thus, in this system candidates endogenously inherit voters' risk attitudes; when voters are risk averse, policies that entail risk are discounted by the candidates. In contrast, in the winner-take-all system a candidate cares only about whether his vote share exceeds 50 percent. Filtering the vote share through this highly nonlinear (and discontinuous) function works to eliminate the effect of voters' risk aversion on candidates' payoffs. In particular, in the winner-take-all system a candidate is not concerned about the dispersion of vote share around the 50 percent mark, therefore the riskiness of a platform is not taken into account. This explains why riskier platforms will prevail under a winner-take-all system.

To highlight the effects of electoral incentives on candidates risk-taking behavior, we purposely assume that candidates are risk neutral with respect to the outcome of the election. This guarantees that, whatever attitudes the candidates have towards risky policies, they are not *assumed* by building them into the candidates' utility functions: rather, they are *derived* as the equilibrium outcome of the game with two different electoral systems. The assumption of risk-neutrality serves to highlight the fact that electoral systems have effects on risk-taking independent of any risk aversion on the part of candidates. Our results are robust to introducing risk aversion on the part of candidates (see Section 5.3). It is important to recognize the difference between the force we highlight and a logic based on a "loser-risk-all" attitude whereby a winner-take-all system encourages highly disadvantaged candidates to generate variability because, absent any variation in vote shares, they would lose with certainty. This loser-risk-all explanation for electoral variability is not necessarily compelling, because it ignores the behavior of the advantaged candidate. The advantaged candidate is harmed by variability and therefore will tend to choose platforms that minimize electoral risk. Once the behavior of the advantaged candidate is taken into account, it is not clear that a winner-take-all system will produce greater electoral variability. Our symmetric model, in contrast, does not rely on the presence of a disadvantaged candidate, and in equilibrium the incentive to take risk is higher in the winner-take-all system for *both* candidates.

An empirical implication of this model is that there is greater variability in the vote shares of parties competing under electoral systems that are highly disproportional. This implication is consistent with Figure 1.

The fact that different electoral systems induce differences in the candidates' attitudes towards risky policies has implications for the welfare of voters. Two effects must be distinguished. First, the proportional system leads to platforms that reflect voters' risk aversion, whereas in the winner-take-all system this risk aversion is neutralized by the incentive structure for candidates and risk plays no role. Thus, if voters are very risk-averse, this effect will result in overly risky platforms in winner-take-all elections.

The second welfare effect relates not to risk aversion, but to the optimal variety of electoral platforms. In our model, risk-taking on the part of candidates results in variation among the realized platforms. Voters will choose between policies with widely disparate appeal. If we ignore risk aversion, voters benefit from the variety of offered platforms. This is because they get to vote for the best platform, the one with the most favorable realization. The worst policies do not get implemented because candidates supporting them do not get elected. Thus, voters do not bear the losses from the worst possible realiztions of a policy. However, when choosing the amount of risk in his platform, a candidate does take into account the negative consequences of having a very bad realization because these lead to very low vote shares. Thus, a wedge is driven between the politician's incentives to take electoral risk and the social value of risky platforms. If voters are not very risk averse, this wedge leads politicians to choose too little risk relative to the social optimum.

Following Hotelling (1929), we call this effect "(excessive) sameness." In the spatial model, the fact that both parties locate at the same (median) point in the policy space has been interpreted as a failure to offer voters any real choice among policies. However, this reasoning is not well grounded in a welfare criterion since it overlooks the fact that in elections—unlike in markets—the choice of each agent has an externality on all other agents since all voters "consume" the same policy. As a result, the equilibrium where both candidates position themselves at the median is typically ex-ante Pareto-superior to a situation where two candidates choose positions symmetrically around the median. Thus, contrary to Hotelling's intuition, sameness is not necessarily excessive in the spatial model.[8] In contrast, in our model, voters' preferences over policies are roughly aligned. Therefore, in our model "excessive sameness" has a meaningful welfare interpretation: voters are better off for being offered variety in their choice set. Thus, our model affords a formalization of the idea of "excessive sameness."[9]

In our analysis, the question of whether "sameness" is "excessive" depends on the electoral system as well as on the risk attitudes of voters. When voters are not very risk averse,

[8] See Myerson (1997) for this point.

[9] See Chan (2000), who independently proposes a different model that leads to the possible emergence of excessive sameness. Also, see Carillo and Mariotti (2001), which we discuss in the related literature.

both the winner-take-all and the proportional systems lead to insufficient differentiation of electoral platforms, and hence to excessive sameness. In this case, the winner-take-all system is preferable since it leads to riskier platforms, and so suffers less from excessive sameness.[10]

We view these findings as relevant for the issue of policy reform. As the quotations in the epigraph suggest, we frequently observe that major policy reform entails substantial electoral risk.[11] To the extent that major policy reforms are associated with a high degree of electoral risk, our findings can be interpreted as laying some initial groundwork for a comparative politics of reform. Although empirically difficult to assess, it is apparent that countries exhibit large differences in the speed with which reforms, and new policies, are introduced. This suggests that some political systems are more conducive than others to policy reforms. We propose that these differences may be due, at least in part, to the incentives provided by different electoral systems.

2 Model

Agents and endowments There are two parties (or candidates), L and R. There is a continuum of voters of measure one.[12] Each voter is endowed with ω units of money.

Platforms: the "electoral portfolio" Candidates can choose to run on platforms that embody different degrees of risk. The least risky platform simply leaves voters with their endowment. Risky (reformist) platforms take the form of taxing voters some amount t in order to invest in a public project. The public project is produced using the technology $g(t)$ which is increasing, strictly concave, and differentiable. We assume $g'(0) > 1$, and $g'(\omega) < 1$.

[10] This property of our model contrasts with what happens in the spatial model when candidates have policy preferences and there is uncertainty about the ideal point of the median voter. In that model, the high-power incentives of the winner-take-all system generate more pronounced convergence to the median policy, and hence more sameness than a proportional system.

[11] See e.g. Alesina and Drazen (1991), Fernandez and Rodrik (1991), and Coate and Morris (1999). Roland (2000) surveys this literature.

[12] We build on the model studied by Lindbeck and Weibull (1987) and Dixit and Londregan (1996).

To introduce electoral risk, we assume that the public project is perceived by the electorate as the realization of a random variable. If candidate L choose a tax of t_L and promises to invest the proceeds in the public project, candidate L's **electoral portfolio** is perceived by voters to be

$$\omega - t_L + g(t_L) + t_L Z_L,$$

where Z_L is a zero-mean, symmetrically distributed random variable. Candidate R's portfolio is similarly perceived. At the time of the election, voters observe the realization of Z_L and Z_R. However, when candidates commit to platforms, they regard the Z_i's as random variables. The random variable Z_i captures the candidates' uncertainty about how voters will perceive the public project offered by candidate i.

The tax t captures the intensity of reform. Pursuing the financial analogy, the term $g(t) - t$ can be interpreted as the expected return of a candidate's electoral portfolio, while the term tZ_i represents the risk for candidate i of choosing a portfolio with expected return $g(t) - t$. Observe that the electoral risk associated with reform increases with the intensity of reform t.

Let t^{RN} be such that $g'\left(t^{RN}\right) = 1$. We refer to this as the *risk-neutral* level of reform, because it is the level of reform that would be implemented by a (risk-neutral) decision-maker who maximizes the expected value of the electoral portfolio.

Voters' behavior We assume that voters are heterogeneous, and we follow Lindbeck and Weibull (1987) in positing that the source of heterogeneity is an ideological bent: some voters ex-ante favor the ideological position represented by the L candidate, some favor the position represented by the R candidate. This could be due to some difference between the candidates along some other policy dimension, unrelated to the reform issue. One example could be the issue of abortion, with one candidate being pro-choice and the other pro-life. We implicitly assume that on this dimension, candidates' positions are exogenous.[13]

[13] We could allow for candidates to offer platforms along the ideological dimension as well. All that would be needed is that candidates are not strictly office seeking but care about the ideological dimension as well. As in Calvert (1983), we would obtain some divergence along the ideological dimension which is all that is needed for our results.

Following Lindbeck and Weibull we assume that voters' ideological preferences enter linearly in their utility function: Voter i's utility if candidate j is elected is given by:

$$U[\omega - t_j (1 - Z_j) + g(t_j)] + x_j^i,$$

where U is strictly increasing, concave, and differentiable. Thus, the voter's utility is composed of two elements: one is the enjoyment of the policy platform proposed by candidate j, and the other is the ideological utility of the voter if the position of candidate j is implemented. Denote

$$x^i \stackrel{\text{def}}{=} x_R^i - x_L^i.$$

The number x^i captures the ideological slant of voter i. Voter i votes for candidate L if and only if

$$U[\omega - t_L (1 - Z_L) + g(t_L)] - U[\omega - t_R (1 - Z_R) + g(t_R)] > x_i \tag{1}$$

We assume that, for each voter i, the variable x^i is realized from a cumulative distribution function F with density f symmetric around zero. This implies that the distribution of ideology in the population as a whole favors neither candidate.

Given a pair of policy platforms t_L and t_R, the vote share of candidate L is given by

$$S_L(t_L, t_R) = F\left(U[\omega - t_L (1 - Z_L) + g(t_L)] - U[\omega - t_R (1 - Z_R) + g(t_R)]\right).$$

Observe that, from the candidates' perspective, this vote share is a random variable because Z_L and Z_R are random. As in Lindbeck and Weibull (1987), in order to guarantee existence of a pure strategy equilibrium, we assume that the vote share of each candidate is strictly concave in his action. A sufficient condition is that the function $F(U(p)) - U(q))$ be strictly concave in p, which we assume hereafter (see Lindbeck and Weibull (1987) for details).

Electoral Systems We focus one an important way in which political systems differ. At one extreme are countries where policy decisions are made through a bargaining process in an assembly. In these more proportional systems, vote shares translate into considerable influence even if they fall short of plurality. Countries with more proportional systems include Italy and Belgium. At the opposite extreme, majoritarian systems are thought to favor the candidate with the highest share of the vote, in the sense that more power of policy setting is conferred upon that candidate; this seems to be the case in Britain, for example. In majoritarian systems, small vote shares do not translate into much influence. For the purpose of studying the electoral incentives of politicians, we project this institutional complexity onto one dimension, namely the rewards that accrue to vote shares. In the proportional system, vote shares are valued according to their size: politicians maximize the expected plurality. In contrast, in the winner-take-all system all the power goes to the candidate with the highest vote share, and candidates maximize the probability of winning.

Proportional System: Candidates maximize their vote share

Winner-Take-All System: Candidates maximize the probability that their vote share exceeds 50 percent

Of course, this characterization of electoral systems is a highly specific one and does not capture several additional distinguishing features of proportional systems such as coalition governments. See the Conclusions for some discussion of this point.

This description does not specify how policy is implemented in each system. For the moment we assume that in both systems the policy of the candidate with larger number of votes is implemented. This assumption has the virtue of limiting the difference between the two systems to the incentives to politicians, thus highlighting the focus of our analysis. While this assumption is uncontroversial in the winner-take-all system, in the proportional system one may think of alternative rules for policy implementation, perhaps reflecting policy compromise. This issue is discussed further in Section 5.4.

3 The Two-Policies Example

To generate intuition about the basic trade-off between electoral risk and return, in this section we discuss a special case where candidates can choose between only two policies, the status quo ($t = 0$) and reform ($t = 1$).[14] This is the simplest model in which this trade-off can be discussed. In the next section we analyze the general model in which candidates can choose the degree to which their platforms implement reform.

We want to show that reform is implemented more frequently (as a function of $g(1)$) in the winner-take-all system. In that system, if both parties choose $t = 1$ their expected payoff is $1/2$. If candidate L deviates to offering $t = 0$ his expected payoff is

$$\begin{aligned} \Pr\left(S_L > \frac{1}{2}\right) &= \Pr\left(F\left(U(\omega) - U(\omega - 1 + g(1) + Z_R)\right) > \frac{1}{2}\right) \\ &= \Pr\left(U(\omega) - U(\omega - 1 + g(1) + Z_R) > 0\right) \\ &= \Pr\left(g(1) - 1 + Z_R > 0\right). \end{aligned}$$

Whenever $g(1) > 1$ this probability is less than $1/2$, and therefore the unique equilibrium is that both candidates promise reform.[15]

Consider now the proportional system. We want to show that the condition $g(1) > 1$ does not guarantee that both candidates promise reform. In fact, we show that unless $g(1) > K > 1$, there exists an equilibrium where both candidates promise $(0, 0)$. To verify that this is the case, start from a $(0, 0)$ strategy combination and suppose candidate L deviates and offers $t = 1$. Candidate L's payoff at this strategy combination is

$$E(S_L) = E\left(F\left(U(\omega - 1 + g(1) + Z_L) - U(\omega)\right)\right).$$

The function $F(U(p)) - U(q))$ is concave in p by assumption, and so by Jensen's inequality we have

$$\begin{aligned} E\left(F\left(U(\omega - 1 + g(1) + Z_L) - U(\omega)\right)\right) &< F\left(U(\omega - 1 + g(1) + E(Z_L)) - U(\omega)\right) \\ &= F\left(U(\omega - 1 + g(1)) - U(\omega)\right). \end{aligned}$$

When $g(1) \leq 1$ the last expression is less than $1/2$, showing that the deviation makes candidate L strictly worse off. In order to make a deviation profitable, $g(1)$ has to be larger than some

[14] That one of the policies is $t = 1$ is simply a normalization, what matters is the value of $g(1)$.

[15] Analogously, when $g(1) < 1$ the unique equilibrium has both candidates promising the status quo.

K >1. Whenever $1 < g(1) < K$, it is an equilibrium for both candidates to promise $t = 0$ in the proportional system but not in the winner-take all system.

This argument shows that in the proportional system candidates need a higher "expected rate of return" $g(1)$ in order to promise the risky policy. In the winner-take-all system, candidates are more likely to adopt risky policies because they only care about the average value of the reform policy relative to the status quo. In the proportional system, however, candidates also care about the dispersion of the distribution because, in order to maximize vote shares, candidates incorporate into their objective function the concavity of voters' utility functions.

4 The Extent of Reform

In order to study the question of the extent of reform, we now turn to the general case where candidates choose the degree to which their platforms incorporate reforms, i.e., they can choose any $t \geq 0$.

We now impose more structure on the Z_i's. We assume that $Z_i = Z \cdot X_i$, where Z, X_L, and X_R are independent random variables with zero mean and symmetric distribution. In addition, we assume X_L and X_R are identically distributed. Thus Z_L and Z_R are two identically distributed (but not necessarily independent) symmetric random variables. Note that each candidate's uncertainty about voters' preferences is the product of a component that is common to both candidates (Z) and an idiosyncratic component (X_i). This formulation allows for the possibility that, even if candidates propose the same level of reform, voters' perceptions of the policy may depend on the identity of the candidate. This depndence on the candidate's identity could be due to residual differences between the proposed policies reflecting ideological components or some valence dimension.

Theorem 1 *Let $t \in [0, \infty)$. In the winner-take-all system, in the unique pure-strategy equilibrium, both candidates choose the platform $t^{WTA} = t^{RN}$ that maximizes the expected value of reform. In the proportional system, a symmetric equilibrium exists and in the symmetric* *equilibrium each candidate chooses platform $t^{PR} < t^{WTA}$. Thus, there is less reform in the proportional system.*

Proof: **Winner-take-all.** In the winner-take-all system, candidate L cares about the probability that his vote share exceeds 1/2. Thus, he solves

$$\begin{aligned} & \max_{t_L} \Pr(F\left(U[\omega - t_L\left(1 - Z_L\right) + g(t_L)] - U[\omega - t_R\left(1 - Z_R\right) + g(t_R)]\right) > 1/2) \\ = \; & \max_{t_L} \Pr(\omega - t_L\left(1 - Z_L\right) + g(t_L) > \omega - t_R\left(1 - Z_R\right) + g(t_R)) \\ = \; & \max_{t_L} \Pr\left(g(t_L) - t_L - (g(t_R) - t_R) > t_R Z_R - t_L Z_L\right). \end{aligned}$$

First, observe that for any t_L and t_R the random variable $t_R Z_R - t_L Z_L = Z\left(t_R X_R - t_L X_L\right)$ has zero mean and is symmetric in view of Lemma 1 of the Appendix, because Z and $t_R X_R - t_L X_L$ are independent symmetric random variables with zero mean. We begin by showing that, in equilibrium it must be $g(t_L^*) - t_L^* = g(t_R^*) - t_R^*$. Suppose not. Then the equilibrium probability of winning for the candidates is not 1/2 (remember, for any t_R, t_L we know that $t_R Z_R - t_L Z_L$ has median zero). So, one candidate must win with probability smaller than 1/2, which is impossible in equilibrium.

Now consider a strategy combination t_L^*, t_R^* such that $g(t_L^*) - t_L^* = g(t_R^*) - t_R^*$. For any $\widetilde{t} \geq 0$, $t_R^* Z_R - \widetilde{t} Z_L$ is symmetric and has mean zero (hence zero median), so

$$\Pr\left(g(t_L^*) - t_L^* - (g(t_R^*) - t_R^*) > t_R^* Z_R - \widetilde{t} Z_L\right) = \frac{1}{2}. \tag{2}$$

We want to show that if t_L^*, t_R^* constitute an equilibrium then it must be $g'\left(t_i^*\right) = 1$. Suppose not, and to fix ideas, suppose $g'\left(t_L^*\right) > 1$. Denote $\widetilde{t}_L = t_L^* + \Delta$ for some small Δ, so that $g\left(\widetilde{t}_L\right) - \widetilde{t}_L > g\left(t_L^*\right) - t_L^*$. Using equation (2) we have

$$\begin{aligned} & \Pr\left(g(t_L^*) - t_L^* - (g(t_R^*) - t_R^*) > t_R^* Z_R - t_L^* Z_L\right) \\ = \; & \Pr\left(g(t_L^*) - t_L^* - (g(t_R^*) - t_R^*) > t_R^* Z_R - \widetilde{t}_L Z_L\right) \\ < \; & \Pr\left(g(\widetilde{t}_L) - \widetilde{t}_L - (g(t_R^*) - t_R^*) > t_R^* Z_R - \widetilde{t}_L Z_L\right) \end{aligned}$$

which contradicts the optimality of t_L^*. A symmetric argument holds in the case where $g'\left(t_L^*\right) < 1$. Thus, in equilibrium it must be $g'\left(t_L^*\right) = 1$ and, similarly, $g'\left(t_R^*\right) = 1$. The same argument shows that a strategy combination such that $g'\left(t_L^*\right) = g'\left(t_R^*\right) = 1$ is an equilibrium.

Proportional. In the proportional system, candidate L maximizes

$$E(F\left(U[\omega - t_L\left(1 - Z_L\right) + g(t_L)] - U[\omega - t_R\left(1 - Z_R\right) + g(t_R)]\right)).$$

Denote $Y\left(t_L, Z_L\right) \overset{\text{def}}{=} \omega - t_L\left(1 - Z_L\right) + g(t_L)$. Notice that $Y\left(t_L, Z_L\right)$ is a concave function of t_L for all realizations of Z_L. Since $F\left(U\left(p\right) - U\left(q\right)\right)$ is concave in p by assumption, it follows that $F(U(Y\left(t_L, Z_L\right)) - U(Y\left(t_R, Z_R\right)))$ is concave in t_L. Thus, candidate L's objective function is a concave transformation of t_L, and so the first-order conditions identify the solution to the agent's problem. Any pair t_L^*, t_R^* that solves the first-order conditions constitutes a Nash equilibrium. The first-order conditions for an interior equilibrium are

$$\begin{array}{l} E\left[-(1 - Z_L) \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)\right. \\ \left.+g'\left(t_L^*\right) \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)\right] = 0. \end{array} . \tag{3}$$

Rewriting,

$$g'\left(t_L^*\right) = 1 - \frac{E\left[Z_L \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)\right]}{E\left[f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)\right].}$$

The denominator in the above fraction is positive because $F\left(U\left(p\right) - U\left(q\right)\right)$ is increasing in p. Thus, the sign of the fraction is determined by its numerator. We have

$$\begin{aligned} & E\left[Z_L \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)\right] \\ = \; & E_Z\left\{E_{X_R}\left\{E_{X_L}\left[Z_L \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)|X_R, Z\right]|Z\right\}\right\} \\ = \; & E_Z\left\{ZE_{X_R}\left\{E_{X_L}\left[X_L \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)|X_R, Z\right]|Z\right\}\right\} \\ = \; & E_Z\left\{ZE_{X_R}\left\{Cov_{X_L}\left[X_L, \cdot f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)|X_R, Z\right]|Z\right\}\right\}. \end{aligned}$$

Now, decompose the expectation with respect to Z into the sum of two parts, the part where $Z > 0$ and the part where $Z < 0$. When $Z > 0$ then $f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right)U'\left(Y(t_L^*, Z_L)\right))$ is a decreasing function of X_L (recall that $F\left(U\left(p\right) - U\left(q\right)\right)$ is concave in p), and so

$$Cov_X\left[X_L \cdot, f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right)|X_R, Z\right] < 0.$$

Then, the expectation with respect to X_R is negative, and multiplication by a positive Z preserves the sign. Taking expectation over the values $Z > 0$ shows that the part of the expectation where $Z > 0$ is negative. When $Z < 0$ then $f\left(U\left(Y(t_L^*, Z_L)\right) - U\left(Y(t_R^*, Z_R)\right)\right) \cdot U'\left(Y(t_L^*, Z_L)\right))$ is an increasing function of X_L, and the same reasoning shows that the part of the expectation where $Z < 0$ is also negative. In sum, the expectation with respect to Z has a negative sign. This shows that if t_L^*, t_R^* constitute a symmetric equilibrium, then $g'(t_L^*) > 1$ (and $g'(t_R^*) > 1$). Since $g'\left(t^{WTA}\right) = 1$, we have proved that if a symmetric interior equilibrium t^{PR} exists, it is smaller than t^{WTA}.

If a symmetric equilibrium is not interior then $t^{PR} = 0 < t^{WTA}$. Thus, it remains to show that a symmetric equilibrium exists. Set $t_L^* = t_R^* = t^*$, and suppose there is a $t^* > 0$ that solves equation (3). Then we are finished. Suppose there is no such t^*. Since the right-hand side of equation (3) is continuous in t^*, it must be that the right-hand side is either always positive or always negative for all $t^* > 0$. However we know that at $t^* = t^{WTA}$ the right-hand side is negative. Thus, it can only be that for all $t^* > 0$ the right-hand side negative. But then continuity guarantees that at $t^* = 0$ the right-hand side is nonpositive, hence $t^{PR} = 0$ is an equilibrium. ∎

The result that $t^{WTA} > t^{PR}$ can translate into testable implications on variability for the vote share, of the kind discussed in the introduction. To see why, observe that at a symmetric equilibrium t^*, candidate L's vote share equals

$$F\left(U[\omega - t^*(1 - Z_L) + g(t^*)] - U[\omega - t^*(1 - Z_R) + g(t^*)]\right).$$

The variability of this expression is due solely to the fact that $t^* Z_L \neq t^* Z_R$. This effect is strongest when t^* is large. In particular, when t^* approaches zero this random variable converges in probability to its mean 1/2: in the limit there is no uncertainty and the vote shares equal 1/2. Therefore, when the value of t^{PR} is close to zero relative to the value $t^{WTA} = t^{RN}$ we are guaranteed that the variability of vote shares is greatest in the winner-take-all system.[16] This result is consistent with the stylized implication about the variability

[16] Equilibria in which t^{PR} is close to zero relative to t^{WTA} arise when the function g is such that g' is close to 1 on $[0, \omega]$ (see equation (3)). In the extreme, when $g(t) \equiv t$ and so $g'(t) \equiv 1$, the proof of Theorem 1 yields that $t^{PR} = 0$ and t^{WTA} can be any value in $[0, \omega]$, so taking small perturbations $\widetilde{g}$ of the g function such that $\widetilde{g}' > 1$ on $[0, \omega)$ can ensure that $t^{WTA} = \omega$ while t^{PR} remains close to zero.

of vote shares that was presented in the introduction.

5 Welfare Implications

Our welfare measure is the expected utility of voters, evaluated prior to the resolution of the uncertainty. Thus, we take an *ex-ante*, behind the veil of ignorance perspective. We argue that this is the appropriate perspective for the purpose of evaluating the performance of political systems: the electoral system is presumably put in place to last for several elections, and at the time of its selection, voters have imperfect information about their future preferences for policy. Observe also that the ideological motives of voters, which in principle should affect the computation of welfare, can (in equilibrium) be ignored. This is because the distribution F of ideology in the population is symmetric. So, while each voter's ideological bias may lead him to regret or rejoice the election of a particular candidate, in the aggregate the contributions of the ideological component cancel out. Consequently, in this setup the voters' ideological motives do not influence welfare comparisons between policies.

In order to analyze welfare, we need to take a stand on policy implementation. Our default model is that the implemented platform is the one of the winning candidate. This assumption puts both systems, the proportional and the winner-take-all, on equal footing in terms of policy implementation, so that any differences between the two systems are due solely to the different incentives to propose risky policies in the two systems. In Section 5.4 we extend the analysis to discuss the case in which the policies implemented in the proportional system represent some compromise between the winner's and the loser's platforms.

At an equilibrium in which candidates choose $t_1 = t_2 = t^*$, under our assumption the implemented policy is the same in either electoral system,

$$\omega - t^* + g(t^*) + t^* \max\{Z_L, Z_R\}, \tag{4}$$

and the ex ante welfare is the utility associated with this portfolio. The value of t That maximizes the ex ante welfare depends on the statistical relationship between Z_1 and Z_2. We study the two welfare effects associated with an increase in the amount of reform. The first effect reflects the value of variety associated with reform. The second reflects the risk that reform entails. The first effect dominates if risk aversion is small, in which case both systems produce too little reform and the winner-take-all system is preferable to the proportional system. If risk aversion is large, the second effect is the more important and the winner-take-all system leads to excessively risky platforms.

5.1 Excessive sameness in both electoral systems

A key point about the implemented policy described by expression (4) is that, even though $E(Z_i) = 0$, $E \max\{Z_1, Z_2\} > 0$. This reflects the fact that voters vote on the *realization* of platforms and select the platform with the better realization. In this case, the value t that maximizes the expected value of (4) solves $g'(t) + E \max\{Z_1, Z_2\} = 1$ (take expected value of (4) and differentiate). This level is higher than $t^{WTA} = t^{RN}$, the reform level implemented in the winner-take-all system. Thus, from the point of view of risk neutral or mildly risk averse voters, the equilibrium level of reform is too low under both electoral systems. As explained in the introduction, this inefficiency results from the fact that individual candidates do not internalize the positive effect of offering variety to voters. We call this effect *excessive sameness* following Hotelling (1929).

5.2 Excessive risk-taking in the winner-take-all system

When voters are sufficiently risk averse, the level of reform t^{RN} implemented in the winner-take-all system entails excessive risk. To show this, we refer to expression (4) and show that if t^* were equal to t^{RN}, then slightly lowering t^* would be beneficial. A slight decrease in t^* below t^{RN} has two competing effects. The first is negative, due to the fact that the term $g(t^*) - t^*$ goes down—but this is a second-order effect because, by definition, we have $g'(t^{RN}) = 1$. The second effect is that reducing t^* reduces the effect of the variance of the random variable $\max\{Z_L, Z_R\}$. If voters are sufficiently risk averse this positive effect dominates. The dominance of this second effect shows that voters who are very risk averse find the level of reform t^{RN} excessive: in this case the winner-take-all system unambiguosly leads to excessive risk taking.

5.3 Candidates' risk aversion

One may wonder whether the conclusion of excessive risk-taking in the winner-take-all system reflects our assumption that, while voters are risk averse, candidates are risk neutral. This is not so: even risk averse candidates would choose $t^{WTA} = t^{RN}$. Indeed, the curvature of the candidates' utility function does not affect the equilibrium under the winner-take-all system because in that system there are only two outcomes that matter to candidates: victory and defeat.

In the proportional system, although the precise value of t^{PR} would depend on the shape of the candidates' utility function if candidates were risk averse, it would remain true that $t^{PR} < t^{WTA}$. Indeed, suppose candidates each had a risk-averse utility function $u(S)$ defined over their vote share. In this case their objective function would be

$$E\left[u(F\left(U[\omega - t_L\left(1 - Z_L\right) + g(t_L)] - U[\omega - t_R\left(1 - Z_R\right) + g(t_R)]\right))\right].$$

Denoting $\widetilde{F}(x) = u(F(x))$ we can rewrite this as

$$E\widetilde{F}\left(U[\omega - t_L\left(1 - Z_L\right) + g(t_L)] - U[\omega - t_R\left(1 - Z_R\right) + g(t_R)]\right).$$

Now observe that the only property of F that was used in the proof of Theorem 1 is that $F(U(p) - U(q))$ is concave in p. If F has this property then *a fortiori* $\widetilde{F}(\cdot) = u(F(\cdot))$ has the property, because u is concave. This shows that the proof of Theorem 1 goes through unchanged when candidates are risk averse over vote shares.

5.4 Policy implementation and compromise in the proportional system

So far, we have discussed the contrast between the winner-take-all and proportional systems only in terms of the different objectives that these systems induce in office-motivated candidates. In particular, we have assumed that in each system the implemented policy is that of the winning candidate. However, in reality, and especially in a proportional system, minority parties may have an influence on policy, and the final outcome may depend in a complicated way on the outcome of some post-election bargaining game. We now discuss two alternative models of post-election policy compromise.

The first version model is one of probabilistic compromise.[17] Consider a function $\pi(s) \rightarrow [0,1]$. This function represents the probability that the policy proposed by candidate L is the implemented policy, as a function of candidate L's share of the vote s. We assume that the same weight π is assigned to the ideological component of the candidate's position.

We also assume that π is symmetric, differentiable, non decreasing in s, and that $\pi(1/2) = 1/2$. Assume further that this function is not constant everywhere. The function π may be thought of as a reduced form of a bargaining game between the two candidates.

We now show that given any such π, optimal behavior for voters is unchanged relative to our previous analysis. In order to see this, assume that candidate j proposes position t_j. Recall that voter i's utility if the candidate entire platform is implemented is given by $U[\omega - t_j(1 - Z_j) + g(t_j)] + x_j^i$. With probabilistic compromise, the expected utility of a voter is:

$$\pi(s)(U[\omega - t_L(1 - Z_L) + g(t_L)] + x_L^i) + (1 - \pi(s))(U[\omega - t_R(1 - Z_R) + g(t_R)] + x_R^i).$$

Differentiating this expression with respect to s, we obtain

$$\pi'(s)((U[\omega - t_L(1 - Z_L) + g(t_L)] + x_L^i) - (U[\omega - t_R(1 - Z_R) + g(t_R)] + x_R^i)).$$

This expression represents the marginal effect of a vote by voter i on his expected utility in the election. Hence, voter i will vote for candidate L if this marginal effect is positive. Since $\pi'(s) > 0$, voter i will vote for candidate L if and only if

$$U[\omega - t_L(1 - Z_L) + g(t_L)] - U[\omega - t_R(1 - Z_R) + g(t_R)] > x_R^i - x_L^i.$$

[17] Fishburn and Gehrlein (1977) study the properties of a variety of notions of probabilistic compromise for a large class of voting games.

This expression is the same as the one in equation (1) that describes voting behavior in the case in which the policy of the candidate with more than 50% of the votes is implemented with probability one.

Since voters' behavior is unchanged, we may conclude that the candidates' equilibrium strategies are unchanged relative to our previous analysis (in this Downsian model candidates only care about shares of the vote, and not about policy). Thus, under the proportional system, candidates will still choose policies that are less risky than under the winner-take-all system.

There is, however, a negative welfare consequence of this compromise. The compromise limits the ability of voters to choose the best policy on offer given that they observe the realization of the uncertainty concerning the value of policies. This is similar to the excessive sameness logic described above. Thus, the possibility of compromise can worsen the effectiveness of the proportional system relative to the winner-take-all system.

The second model of compromise we discuss involves a physical blending between the policies proposed by the two candidates. As before, consider a function $\phi(s) \to [0,1]$. This function now represents the weight of the policy proposed by candidate L in the implemented policy, as a function of candidate L's vote share s. Thus, if candidate L chooses t_L and candidate R chooses t_R, and these platforms result in a vote share of s for candidate L, then the implemented policy is a compromise between the policies proposed by the two candidates represented by $t^{comp} = \phi(s)\, t_L + (1 - \phi(s)) t_R$. In addition, the compromise is also implemented for the ideological component of policy (with the same weight).[18]

The same properties we assumed for the π function are now assumed for the ϕ function. The notion of physical compromise is different from probabilistic compromise in two ways. First, the welfare consequences are different. Second, voting behavior becomes much more complex. We will ignore the second aspect here to focus on the first. Thus, we assume that voting behavior is still described by equation (1). In the present context, this is equivalent to assuming sincere voting. Again, this assumption implies that the candidates' equilibrium

[18] Grossman and Helpman (1996) proposed a similar notion of policy compromise to study a different issue.

strategies are unchanged relative to our previous analysis.

However, the implemented policy will now reflect this compromise. The compromise will have the following contrasting effects on welfare. On the one hand, as in the case of probabilistic compromise, there is a reduction in the ability of voters to choose the best policy on offer upon the realization of the values of the different policies. The new effect is that from an ex-ante perspective this policy compromise will provide some insurance against risk, insurance that is valuable to risk averse voters. The overall effect is clear if in the absence of compromise the proportional system leads politicians to be too "cautious" in their choice of a risky platform. In this case this bias is exacerbated by the presence of compromise. More generally however, whether the overall effect of compromise on welfare is positive or negative depends on voters' preferences and on the specific form of the compromise function.

Clearly, these two ways of thinking about policy compromise are only examples of the many possible ways to think about post-electoral bargaining. In our context an interesting possibility is that such bargaining might lead to efficient policy choice. This efficient choice may result because the election outcome might resolve some of the uncertainty that politicians have about voters' preferences. However, such analysis would be quite complex.

6 Related Literature

The differences between majoritarian (winner-take-all) and proportional systems have been addressed by a number of authors. Aranson *et al.* (1974) argue that in a symmetric environment these two systems lead to the same equilibrium outcomes. Lindbeck and Weibull (1987) reach similar conclusions in a different (but symmetric) model of electoral competition. In the absence of aggregate uncertainty, if a deviation does not pay in the proportional system, then it does not increase the vote share; hence, this deviation cannot lead to an increased probability of winning, and thus cannot be beneficial in the winner-take-all system (see Aranson *et al.*). Thus, absent uncertainty (a key ingredient in our model), the two systems yield the same equilibrium outcomes. Snyder (1989) is concerned with the effects of electoral incentives on redistribution across districts. Departing from the assumption of symmetry, Snyder shows that, while in a proportional system swing districts receive more resources, this feature need not be true in a winner-take-all system. Taken together, these papers show that systematic differences between the two systems are not easy to find. In our paper, electoral uncertainty implies a difference between the proportional and winner-take-all electoral systems even in a completely symmetric world, where voters are ex ante identical and neither candidate has an electoral advantage.

Lizzeri and Persico (1999) compares proportional and winner-take-all systems in terms of public project provision. In that paper, what generates the difference between the two systems is the lack of targetability of the public project, relative to transfers. In the present paper all policies are equally non targetable. Thus, in contrast with our previous paper, the relative targetability of policies plays no role. Additional work on the comparison between majoritarian and proportional systems has been done by Persson and Tabellini (1999). They construct a model of redistributive politics *a' la* Lindbeck and Weibull in which a majoritarian system generates less public project provision than a proportional system. Persson and Tabellini also examine cross-country data from around 1990 and find weak support for the prediction that majoritarian elections are associated with less public projects.

Milesi-Ferretti, Perotti, and Rostagno (2000) consider an alternative model and empirically examine the relationship between the degree of proportionality of electoral systems and the composition of public spending. They find that the share of transfers in GDP is positively related to the degree of proportionality and, in contrast with Persson and Tabellini, find a negative relation between the degree of proportionality and spending on public goods.[19] Case (2001) empirically contrasts winner-take-all and proportional systems of incentives in their ability to explain the pattern of electoral redistribution in Albania.

Coate and Morris (1995) consider the effect of asymmetric information on the choice of platforms. In their model, it is citizens who are less informed than politicians. This leads politicians to prefer means of redistribution that, although inefficient, are not clearly perceived

[19] The two papers look at different data and have different definitions of public goods.

by voters to be inefficient. In our model it is politicians who, at the time they commit to their platform, are uncertain about how voters will perceive the platform.

Austen-Smith and Banks (1988) compare a three-candidate proportional system with a two-candidates winner-take-all system, in the context of a model of spatial competition. They find that, under plurality rule, both candidates adopt the policy preferred by the median voter, while under proportional representation the equilibrium electoral platforms are symmetrically distributed around the median. The government is formed between the candidate that adopts the median position (which receives the fewest votes) and one of the other parties. The policy outcome that emerges from the legislative process is a compromise between the platforms of these two parties and is different from the median voter's preferred policy.

Carillo and Mariotti (2001) present a model where parties select candidates to run in an election. Candidate quality is uncertain; however, electoral campaigns serve as signals of this quality. Therefore, at election time, voters have better information about candidate quality than parties do when they select the candidates. They discuss the potential asymmetries that result if incumbents are better known than challengers. They only consider a winner-take-all system and furthermore, in their setup a proportional system would lead to the same outcomes, so our basic question could not be addressed in their model. However, a point of similarity between the two models is that in their context excessive conservatism arises for reasons similar to our excessive sameness result.

Finally, our model is distinct from models of electoral ambiguity (see Shepsle (1972) and, more recently, Aragones and Postlewaite (1999)). In those models, candidates purposely leave voters in a state of uncertainty about the policy that the candidate will implement once in office. In our model, at election time voters are not uncertain about the value of the policy proposed by a given candidate.

7 Concluding Remarks

In this paper we have analyzed an important aspect of political campaigning, namely, the risk-taking behavior of political candidates. We have suggested that electoral systems differ in terms of variability of the vote share that parties receive in elections, and we have ascribed this difference to the candidates' risk-taking behavior. We have shown that two different electoral systems, the proportional and the winner-take-all, give candidates different incentives for electoral risk-taking. The proportional system penalizes policies of uncertain popular appeal. In contrast, risky policies are not penalized in the winner-take-all system. This difference in incentives has interesting welfare consequences, which we have discussed.

We view our findings as indicating that different electoral systems offer different incentives for the adoption of risky reform projects. In this paper, we have pointed out one dimension of the political environment which can determine the ease of introducing reforms. Thus, one interpretation of our analysis is that it offers a basis for a comparative political analysis of reform with a focus on the specific rules of the electoral contest. In recognizing the importance of uncertainty and in emphasizing the role of political constraints in the implementation of reform, we follow the existing literature. In this literature the uncertainty is equally perceived by candidates and voters and it involves the ultimate effects of reform. While we take a somewhat different perspective, focusing on the uncertainty that comes from the imperfect information that candidates have about the electorate, our conclusions do not rest on the simplifying assumption that voters know their value for each policy at the time of voting. Indeed, our model could be reinterpreted to allow voters to be uncertain about the future value of policy platforms, in which case voters would choose based on their expectations. This is to say that the forces on which we focus should survive changes in the fine details of the information structure, so long as the key assumption is preserved that candidates, at the time that they choose their platforms, know less about the voters' preferences than the voters themselves will know at election time.

One special feature of our model is that it assumes the ability to commit to policies, and ignores any ideological consideration in the politicians' choice of risky platforms. We believe that this stylized representation captures some important aspects of electoral competition. Other authors have discussed the efficiency of democracies when politicians are motivated by ideological considerations (see Besley and Coate (1998), and Dixit and Londregan (1998)).

An important limitation of our analysis is that we restrict attention to elections with two candidates. This has some appeal because it shows that some interesting differences across electoral systems may arise even in the case of two candidates. Our analysis shows that proportional and winner-take-all systems can generate different outcomes just from the different electoral incentives that are generated for candidates. In Section 5.4 we showed that some differences in post-election policy implementation across the two systems can be incorporated in our model. However, we do not capture the richness of coalitional politics that takes place in real electoral systems.

An interesting aspect of elections with more than two candidates can be discussed in the context of our welfare analysis. In our model, a beneficial effect of having many (N) candidates is the expansion in the choice set available to voters. Now we would have an analogue of Equation (4) that involves a maximum among N random variables instead of just two, thereby increasing the value of the realized policy. Thus, a first order effect of increasing the number of candidates is beneficial. Of course, the equilibrium choices of candidates will be affected by the number of competitors and by the details of the electoral system.

Appendix

A Technical Lemma

The proof of Theorem 1 uses the following property of symmetric zero-mean random variables.

Lemma 1 *Let X_1 and X_2 be two independent symmetric random variables with zero mean. Then*

1. *their weighted sum $t_1 X_1 + t_2 X_2$ is distributed symmetrically around zero for all values of t_i; as a consequence,* $\Pr(X_1 < X_2) = \Pr(X_1 - X_2 < 0) = 1/2$.

2. *their product $X_1 \cdot X_2$ is distributed symmetrically around zero.*

Proof: (1) The result is immediate if we show that $X_1 + X_2$ is distributed symmetrically. To this end, denote by f_i the density of X_i; because X_i is symmetric around zero, $f_i(x) = f_i(-x)$. By the convolution formula, the density of $X_1 + X_2$ is $f_{1+2}(x) = \int f_1(x-z) f_2(z)\,dz = \int f_2(x-z) f_1(z)\,dz$. Then we have

$$\begin{aligned} f_{1+2}(-x) &= \int f_1(-x-z) f_2(z)\,dz \\ &= \int f_1(x+z) f_2(z)\,dz \\ &= \int f_1(y) f_2(y-x)\,dy \\ &= \int f_1(y) f_2(x-y)\,dy \\ &= f_{1+2}(x). \end{aligned}$$

(2) We have

$$F_{1\cdot 2}(x) = \Pr(X_1 \cdot X_2 \le x) = E_{X_2}\left(F_1\left(\frac{x}{X_2}\right)\right) = \int F_1\left(\frac{x}{y}\right) dF_2(y)$$

so

$$f_{1\cdot 2}(x) = \int \frac{1}{y} f_1\left(\frac{x}{y}\right) dF_2(y) = \int \frac{1}{y} f_1\left(-\frac{x}{y}\right) dF_2(y) = f_{1\cdot 2}(-x)$$

∎

B Construction of Figure 1

The index of disproportionality for each electoral system (the vertical axis in Figure 1) is the index D from Taagepera and Shugart (1989), p. 106, 107. This index measures the deviation from a perfectly proportional system in which the proportion of seats in the assembly exactly equals each party's vote share. Algebraically, we have $D = (1/2) \sum |s_i - v_i|$, where s_i and v_i denote the percentage of seats in the assembly and votes, respectively, for party i, and the summation ranges over all parties. See Taagepera and Shugart (1989) for a discussion of this index.

The vote shares are taken from Mackie and Rose (1991), and refer to the period from 1950 (inclusive) to 1985. Extending the analysis to later elections would be desirable, but would necessitate altering the index of proportionality for those countries (such as Italy) which have had changes in the electoral system after the publication of Taagepera and Shugart (1989).

The variability in vote share is computed by taking, for each country, the largest party and computing the variability of its vote share over time relative to a linear trend. Almost always there is a party which has the largest vote share consistently throughout the period. The parties for each electoral system are:

Australia	Labor
Austria	Socialist
Belgium	Christian Socialist[20]
Canada	Liberal
Denmark	Social Democratic
Finland	Social Democratic
Germany	CDU/CSU
Ireland	Fianna Fail
Israel	Labour
Italy	Christian Democratic
Japan	Liberal Democratic
Luxenbourg	Christian Social
New Zealand	National
Norway	Labor
Sweden	Social Democratic
UK	Conservative

For example, for Italy we have the following pattern of vote shares over time.

Election Year	Vote Share DC
1953	40.1
1958	42.4
1963	38.2
1968	39
1972	38.7
1976	38.7
1979	38.3
1983	32.9

To compute the variability of the vote share, we regress the vote share on the election year,

[20]Includes Christian People's Party from 1968.

and take the sum of squared residuals of the regression. This is a measure of the variability around a trend. Dividing by the number of elections provides the appropriate normalization. This is the number that is reported on the horizontal axis of Figure 1.

The R^2 value of the regression of the variability in vote shares on D is 0.31.

One may be concerned that the variability in vote share appears to be larger in winner-take-all systems simply because these systems have larger parties. We performed the same exercise by computing a "normalized" index of variability by dividing the previously obtained variability index by the average vote share for each party. The results are somewhat weaker in this case but the qualitative features are preserved.

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