Help and Factionalism in Politics and Organizations *

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Abstract Whether in electoral politics or promotions within organizations, players often face the dilemma of whether to enter the contest or to assist other candidates. This paper analyzes incentives in a rank-order tournament when the winner, apart from earning the "first prize," also has control over a "second prize" that he can distribute to his supporters. Some players may then be encouraged to help others in exchange for paybacks, resulting in factionalism, with leaders and supporters sorted by ability. The number and the size of factions depend on the reward structure of the contest and the distribution of abilities. These implications are corroborated by data on U.S. gubernatorial primary elections.

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I. Introduction

In politics, whether in a democracy or otherwise, there is often no shortage of aspirants for public offices. In the United States, presidential hopefuls abound, but only a relatively small number of candidates actually enter the race every four years. Some simply stay out of the contest or drop out during the process, while others choose to support the campaigns of other contenders. In less open political systems, when to stand up and be counted and when to lie low and play loyal crony can be an even more tricky decision, sometimes with more than a career at stake. So, when there are players of different calibers in this political game, who would step into the ring and who would resign themselves to a supporting role? Given that the strength of a campaign depends both on the ability of the candidate and the support he receives, what determines the frontrunners and the underdogs? These are interesting questions not just in the public arena but also within organizations as well. Even though candidacies for promotion to senior positions are rarely openly announced and battle lines are usually not clearly drawn, the jockeying for position and lobbying for support are often played out in the corporate boardroom or even academic institutions with as much ferocity and intrigue as in electoral politics, as individuals sort themselves into different roles within and across contending factions. How then can we understand the outcome of this process?

Whether it is a contest for public office or promotion within an organization, the payoffs are usually fixed and entitlement to these rewards generally depends on relative performance only (at the ballot box or by other assessment mechanisms). As such, the rank-order tournament appears to offer an appropriate theoretical framework for the analysis of incentives within the game. But while the economic efficiency of the tournament in eliciting effort has been well discussed in the literature (e.g. Lazear and Rosen 1981, Holmstrom 1982, Green and Stokey 1983, Nalebuff and Stiglitz 1983, Mookherjee 1984, and Malcomson 1986), the conventional model does not offer a ready explanation for helping or cooperative behavior. Indeed, as Lazear (1989) points out, because hampering an opponent has a similar effect on the outcome as enhancing a candidate's own performance, competitive pressure in a contest can result in negative behavior among candidates, ranging from non-cooperation to outright sabotage of other contestants' work, which obviously compromises efficiency. Chen (2003) and Munster (2007) extend the Lazear sabotage model to settings with multiple heterogeneous players and find that because of the tendency for players to gang up on the frontrunner, more productive candidates may not enjoy a higher chance of winning. This can further contribute to inefficiency if sorting by ability into different positions is important in production.

Because of the inevitably antagonistic nature of a contest, strategic interaction among agents tends to have negative results. Eliciting cooperation among agents appears to be difficult if not impossible. Although Lazear (1989) raises the possibility of "sainthood" (in which a player derives utility from helping others at the expense of his own chance of winning), his point is that even saints may fail when tempted with the opportunity to sabotage the competition. Similarly, Grund and Sliwha (2005) find that not even "compassion," an aversion for pay inequity felt by winners of contests, can result in cooperative behavior in a contest. When teamwork in the workplace is discussed in the literature, it is usually in a context that does not involve compensation by relative performance. For example, Itoh (1993) shows that when agents can more effectively monitor one-another's behavior than the principal can, the optimum solution to the agency problem may involve delegating the implementation and enforcement to the agents themselves (through side-contracting). In another paper, Itoh (1991) also finds that help for coworkers can be induced by conditioning a worker's pay not only on the output of his own task but also on those of his coworkers. In neither case does the conventional tournament fit the requirements for an effective scheme in promoting teamwork. More explicitly, Che and Yoo (2001) compares relative performance evaluation (RPE) and joint performance evaluation (JPE) in a dynamic setting where implicit incentives are generated by repeated interaction of the agents. They conclude that compensation schemes based on JPE dominate those based on RPE because it is better able to encourage coordination among workers in a long-term relationship.

It would likely be futile to search for sainthood or compassion in politics or in the boardroom, much less appeal to them for an explanation for the behavior of politicians or corporate ladder-climbers. Yet, incentives for the allocation of efforts can look very different once we recognise that in a real-world contest, the winner often has at his disposal certain resources that can be distributed as rewards for friends and supporters. Winners of political elections are often entitled to make political appointments or hand out patronage jobs as paybacks for contributions of various sorts to their campaigns, while within a firm a newly appointed CEO usually has the authority to pick members of his senior management team, and more often than not, they would be his "close associates." Given these payoffs, each potential candidate in a contest must now decide whether to focus on improving his own chance at winning the top position, or devote part or all of his efforts to help another candidate. Such a decision obviously depends on the relative magnitudes of the payoffs ("first prize" for the contest winner vs. "second prize" that is to be distributed to supporters of the winning candidate, the latter also affected by the number of supporters who must be rewarded). It would also depend on the worker's ability relative to that of other candidates, as well as on the way in which help from supporters is translated into better performance for the candidate. Under plausible assumptions and given a distribution of the abilities of the players, we can show that there is a unique subgame perfect equilibrium in which faction leaders and helpers are sorted by ability. In addition, by changing the rewards of the contest, different outcomes can be induced. These results can potentially offer insights into how tournament schemes can be designed to elicit optimal effort coordination, whether in the corporate boardroom or the corridors of power in the government.

The choice of the term "factionalism" over the more commonly encountered "coalition formation" in the title of the paper is deliberate. The latter concept is often found in the game theoretic literature that focuses on how coalition formation can affect final resource allocation. One line of this research investigates the division of surpluses and the efficiency of blocking coalitions in multi-person bargaining games (e.g. Chatterjee et al. 1993, Bloch 1996, Okada 1996, and Seidmann and Winter 1998). Another approach explores coalition formation in the non-cooperative implementation of the core of a coalition game (e.g. Perry and Reny 1994). This paper, by contrast, tries to characterize the equilibrium structure of coalitions when all agents move unilaterally, abstracting from bargaining and redistribution among agents. Moreover, this paper attempts the problem within the specific setting of a rank-order tournament. Therefore, it does not presume to offer a general solution to the coalition formation problem, and is only tangentially related to the game theoretic literature on the topic. This analytic choice also sets our work apart from some recent research on the internal politics within bureaucracies and political parties. Tirole (1986) analyzes collusion among players with different roles within an organization when information is asymmetric as a variant of the principal-agent problem, while Persico, et.al (2007) models the dynamics of distributive politics within political parties that give rise to "factions of interest" as networks of patron-client relationships. Although we share their interest in collaborative behavior among agents, it is the allocation of (help) resources and sorting of talents across factions in a "market" equilibrium rather than the nature of the collaborative process itself that is the focus of our work.

The remaining parts of the paper are organized as follows: Section II sets up the theoretical model, characterizes a perfect sorting equilibrium as a solution to a two-stage non-cooperative game, and analyzes the comparative statics. The empirical implications of the model are tested in Section III using data on US gubernatorial elections. Section IV concludes.

II. The Model

A. Assumptions

Consider a system with a unit mass of infinitesimal agents participating in a rank-order tournament. Each agent $i \in [0,1]$ is endowed with ability $a(i) > 0$, where $a(i)$ is a continuous, increasing function on [0,1] (so that the higher i is, the greater the ability), and one unit of indivisible effort which he can use to either raise his own performance as a candidate or help another candidate.[1] The effect of "help" and the stochastic structure of the contest can be summarized by the following winning probability density of player i:

$$\pi(i) = \begin{cases} 0 & \text{if } i \notin M \text{ or } M \text{ is not measurable or } m = 0 \\ \dfrac{a(i)\left(n(i)\right)^{\gamma}}{\int_{j \in M} a(j)\left(n(j)\right)^{\gamma} dj} & \text{if } i \in M \text{ and } 0 < m < 1 \\ \dfrac{a(i)}{\int_0^1 a(j)dj} & \text{if } i \in M \text{ and } m = 1 \end{cases} \qquad (1)$$

[1] By assuming effort to be fixed, we are abstracting from the work incentive effect of a rank-order tournament and focus instead on the allocation of help within an organization.

where $n(i)$ is the mass of helpers supporting candidate i, M, the set of candidates with measure m, and $0 < \gamma < 1$. This assumption rules out the possibility of helpers winning a contest. Contestants with non-measurable support will have no chance either, except when everyone is an unassisted contestant, in which case the winning probability density is determined by the candidate's ability relative to the average among all agents. When $0 < m < 1$, then candidate i's helpers' efforts are translated into "effective effort" of $a(i)n(i)^{\gamma}$, which shows diminishing marginal product, given $\gamma < 1$. This specification is a continuous analogue and a specialization of the probabilities in Chen (2003) and Rosen (1986). The "multiplier" effect of the ability of the candidate receiving help can be justified by Rosen (1983), which suggests that the productivity of a senior worker is transmitted down the chain of command to those within his span of control. It is also consistent with the empirical observation in Hamilton et al. (2003) that the most productive member in a team has a greater influence on the team's productivity. While the assumption that the efficiency of helping effort does not depend on the ability of helpers may seem unrealistic, most of our results carry through as long as ability matters more for leaders than for helpers, which is intuitive.

The contest is played out in two stages. In the first stage, agents decide whether to present themselves as candidates in the contest, or to help another candidate win the contest. In the second stage, once the candidates have identified themselves, helpers will decide on which candidate to help, and a candidate will accept any offer of help. Each helper makes the decision on his own, taking the decisions of all others as given. A faction arises when one or more players contribute their efforts in helping the same candidate who becomes the leader of that faction.[2] Because each player's endowed effort is indivisible, there is no overlap in faction membership.

The decision on whether to become a candidate or a helper depends on expected payoffs. In the most basic contest with multiple agents, there may be two or more fixed prizes to be awarded according to the rank order of the performance of the candidates.[3] We depart from the conventional setup in that, in addition to the winner's prize (W_1) and the losers' payoffs (normalized to zero), there is a fixed "second prize" (W_2) that is distributed at the discretion of, but cannot be pocketed by, the contest winner. We assume that this amount would be divided equally among those who have helped the winner in the contest.[4] Therefore, the expected payoff for candidate $i \in M$ is $\pi(i)W_1$, while that for each of his helper would be $\pi(i)W_2/n(i)$.

To abstract from bargaining that can greatly complicate the problem, we preclude any side-payments that redistribute the prizes among members within and across factions. In many contexts, this may in fact be the reasonable assumption. A newly elevated CEO promoting his lieutenants to senior positions, or an elected politician repaying political debts with appointments in a new administration, usually cannot legally involve kickbacks or

[2] Formation of a faction can be either implicit or explicit. It is interesting to note that workers in Microsoft can choose the project they want to join, and workers in GE can choose which division to work in. While there can be many reasons for such policies, they certainly tend to encourage camaraderie, cooperation, and perhaps factionalism as well.

[3] There can be potentially as many prizes as there are players, as in Green and Stokey (1983), but as Nalebuff and Stiglitz (1983) shows, three different prizes often suffice in an optimal scheme.

[4] An alternative assumption is to introduce heterogeneity in helping effort in accordance with the ability of the helper and distribute W_2 in proportion to the contribution (ability) of each helper, but as long as helping effort is additive, the results are qualitatively similar with few additional analytic insights.

bribes paid in either direction. While illicit or informal transfers cannot be ruled out, we do not believe we are sacrificing too much generality with this simplifying assumption.

B. The Equilibrium

The two-stage problem constitutes an almost perfect information sequential game for all players. We shall derive the (pure strategy) subgame perfect equilibrium using backward induction, solving first for the equilibrium allocation of helpers before analyzing the sorting of players into leading and supporting roles.

1. Allocation of Helpers Across Factions

In the second stage, a set of players M (with mass m) will have declared their candidacies for the first prize. When m is either 0 or 1, there will be no allocation problem. If $0 < m < 1$, then helpers with mass totaling $(1 - m)$ will join the faction that maximizes their expected payoff, given the choices of all other helpers. Recall that the expected payoff for helpers in any faction i is given by

$$\frac{a(i)W_2}{\int_{j\in M} a(j)\left(n(j)\right)^{\gamma} dj} n(i)^{\gamma-1} \tag{2}$$

which goes to infinity as $n(i)$ approaches zero but converges to W_2 as $n(i)$ approaches one. Hence, corner solutions are never optimum, and all candidates will be backed by a positive mass of helpers.

Because of free mobility across factions, in equilibrium, all helpers will receive the same expected payoff:

$$\frac{\pi(i)}{n(i)} W_2 = \frac{\pi(j)}{n(j)} W_2$$

or

$$a(i)\left(n(i)\right)^{\gamma-1} = a(j)\left(n(j)\right)^{\gamma-1}$$

for any $i,j \in M$. In other words, given M, equilibrium in the second stage requires that

$$a(i)(n(i))^{\gamma-1} = \lambda \tag{3}$$

or

$$n(i) = \left(\frac{a(i)}{\lambda}\right)^{\frac{1}{1-\gamma}} \quad \text{for all } i \in M \tag{4}$$

where λ is constant across factions, and total helping effort equals the total mass of helpers:

$$\int_{j\in M} n(j)dj = 1 - m\,. \tag{5}$$

λ can be interpreted as a shadow price of a helper. Allocating a helper to one faction must necessarily mean that his service is denied to another faction, and this opportunity cost is proportional to λ. This opportunity cost depends on the supply of helpers and is an increasing function of m.

Rearranging and integrating equation (3) over M gives

$$\int_{j\in M} a(j)(n(j))^{\gamma}\, dj = \lambda \int_{j\in M} n(j)dj = \lambda(1-m)\,. \tag{6}$$

Substituting (3) and (6) into equation (2), the expected payoff for helpers in an equilibrium can be simplified to $W_2/(1 - m)$. This result is intuitive. Given that there is a total mass of (1 - m) helpers, equalization of expected payoff for all helpers across factions dictates that each helper will expect an equal share of the second prize.

While all helpers have the same expected payoff, the candidates have rather different prospects, depending on their abilities. Equation (4) can be integrated over M for the following expression:

$$\lambda = \left(\frac{\int_{j\in M} (a(j))^{\frac{1}{1-\gamma}}\, dj}{1-m}\right)^{1-\gamma}.$$

Inserting this back into equation (4) gives

$$n(i) = (1-m)\frac{a(i)^{\frac{1}{1-\gamma}}}{\int_{j\in M} a(j)^{\frac{1}{1-\gamma}}\,dj} \tag{7}$$

which shows support for a candidate is increasing and convex in his ability. If all factions were equal in size, then a candidate of superior ability would have a higher chance of winning because of the "multiplier effect" of the leader's ability implied in equation (1). This would tend to attract defectors from factions headed by less able candidates. Reallocation of helpers will continue until condition (3) holds for all faction, at which point more productive candidates will have attracted a larger number of helpers. With $n(i)$ increasing in $a(i)$, a more able candidate will have a better chance of winning and therefore enjoys a higher expected payoff:

$$\pi(i)W_1 = \frac{a(i)^{\frac{1}{1-\gamma}}}{\int_{j\in M} (a(j))^{\frac{1}{1-\gamma}}\,dj} W_1 .$$

Because $\pi(i)$ is convex in $a(i)$, an increase in ability at the higher end of the ability spectrum brings in more additional helpers than the same increase in ability at a lower range. This reinforcement of innate superiority by helping behavior and the complementarity between the leaders' ability and helping effort produce positive assortative matching that is standard in the literature (Becker 1973, Kremer 1993, Kremer and Maskin 1996), but contrasts with the results in Chen (2003) and Munster (2007), where the most able candidate tends to attract the most sabotage and may not emerge the most likely winner.

2. Self-Selection into Candidates and Helpers

In the first stage, each player will choose to be either a candidate or a helper, whichever yields a higher expected payoff in the second-stage equilibrium allocation resulting from his choice, given the choices of other players. An equilibrium arises when no player would like to switch roles, given the lineup of declared candidates. Because each player is infinitesimal, expected payoffs and the mass of the candidate sets will not be affected by individual decisions to deviate, and the equilibrium candidate set, M^* (with measure m^*) must satisfy the following conditions:

$$\frac{a(i)^{\frac{1}{1-\gamma}}}{\int_{j\in M^*}\left(a(j)\right)^{\frac{1}{1-\gamma}}dj}W_1 \geq \frac{W_2}{1-m^*} \quad \text{for all } i \in M^*;$$

and

$$\frac{a(i)^{\frac{1}{1-\gamma}}}{\int_{j\in M^*}\left(a(j)\right)^{\frac{1}{1-\gamma}}dj}W_1 \leq \frac{W_2}{1-m^*} \quad \text{for all } i \notin M^*.$$

Given M^*, the LHSs of these inequalities are increasing in $a(i)$. Hence, if $a(i) > a(j)$ and $j \in M^*$, then i must also be a candidate as well if M^* is an equilibrium set of candidates. In other words, agents are perfectly sorted by abilities, with high ability players contesting as candidates, while low ability players choose supporting roles. At the margin of these groups, there exists an agent i^* who is just indifferent between contesting and helping, defined by the following condition:

$$\frac{a(i^*)^{\frac{1}{1-\gamma}}}{\int_{i^*}^{1}\left(a(j)\right)^{\frac{1}{1-\gamma}}dj}W_1 = \frac{W_2}{i^*}$$

or

$$\frac{a(i^*)^{\frac{1}{1-\gamma}}\, i^*}{\int_{i^*}^{1}\left(a(j)\right)^{\frac{1}{1-\gamma}}dj} = \frac{W_2}{W_1}. \tag{8}$$

The LHS of equation (8) equals zero when $i^* = 0$, is strictly increasing in i^*, and goes to infinity as i^* approaches 1. Therefore, for any non-zero, finite value of W_2/W_1, there always exists a unique $i^* \in (0,1)$ that satisfies the equation. This outcome, together with the allocation of helping effort discussed earlier, determines the unique subgame perfect equilibrium outcome of the two-stage game.

C. Comparative Statics in a Perfect Sorting Equilibrium

Given perfect sorting, equation (7) can be written as

$$n(i) = \frac{a(i)^{\frac{1}{1-\gamma}}}{\int_{i^*}^{1} a(j)^{\frac{1}{1-\gamma}}\, dj} i^* \tag{9}$$

for $i \in M$. This second-stage help allocation function and the first-stage sorting function (equation (8)) completely define the unique sorting equilibrium and can be used to derive comparative static results of exogenous changes in the structure of the tournament and in the abilities of contestants.

1. Change in the reward structure

It is obvious from equation (8) that given the set of participants in the game, the sorting equilibrium depends only on the relative magnitude of W_1 and W_2. Proportionate changes in the two prizes do not affect the equilibrium.

Consider a change in W_2/W_1. This has no direct effect on the allocation of helpers across factions because the prizes do not enter into equation (9), but the incentive to enter the contest will change. It can be shown from equation (8) that $di^*/d(W_2/W_1)$ has the same sign as

$$\int_{i^*}^{1} a(j)^{\frac{1}{1-\gamma}}\, dj \left(1 + \frac{i^*}{1-\gamma} \frac{a'(i^*)}{a(i^*)}\right) + i^* a(i^*)^{\frac{1}{1-\gamma}} a'(i^*) > 0 \, .$$

Therefore, a relative increase in the second prize will increase expected payoff for helping and discourage agents from entering the contest, thereby raising the ability of the marginal candidate. The increase in the supply of helpers will affect membership in all factions. It is immediate from Equation (9) that

$$\frac{dn_i}{di^*} > 0$$

for $i^* \le i \le 1$. In particular, stronger candidates will gain disproportionately more support as expected payoff for helpers equalize across factions. These results can be summarized as follows:

Proposition 1: An increase in the payoff to be shared by supporters of the winning candidate relative to the payoff for the winner will reduce the number of candidates but increase the size of the contesting factions.

This proposition contrasts with the typical result in rent-seeking models that more powerful positions tend to attract more contestants. In our model, a distinction is made between control over resources for self-consumption by the winner and control over resources to be distributed. While increasing the former (holding the latter fixed) does attract more contestants, increasing the power of appointment allows the office holder to bribe his potential competitors and thus reduces the number of candidates. As a result, increasing the total “rent” for an office may or may not increase the number of contestants for the office, depending on the nature of “rent” concerned.

2 Change in the distribution of abilities

Since helpers’ abilities do not affect the outcome of a contest, only the abilities of candidates matter. But in equations (8) and (9), candidates’ abilities enter only in ratios, so any proportional changes in abilities would not have any effect either. Increasing the spread of the abilities, however, will result in a change in the equilibrium.

Define

$$\bar{a} = \int_0^1 a(j)dj$$

and consider the following change in the *a*(*i*) function:

$$\tilde{a}(i) = a(i) + \phi(a(i) - \bar{a}) = (1+\phi)a(i) - \phi\bar{a}$$

where $\phi \geq 0$. Replacing *a*(*i*) with ã(*i*) in equation (8) gives

$$\frac{\left[(1+\phi)a(i^*) - \phi\bar{a}\right]^{\frac{1}{1-\gamma}} i^*}{\int_{i^*}^1 \left[(1+\phi)a(j) - \phi\bar{a}\right]^{\frac{1}{1-\gamma}} dj} = \frac{W_2}{W_1}.$$

Standard manipulation of this equation shows that $di^*/d\phi\big|_{\phi=0}$ has the same sign as

$$\int_{i^*}^1 a(j)^{\frac{\gamma}{1-\gamma}} \left(a(j) - a(i^*)\right) dj$$

which is always positive. Thus, a proportional mean-preserving spread will increase *i** and reduce the number of candidates. As explained before, the subsequent increase in the supply of helpers will be distributed to all remaining factions, with high ability candidates benefitting more from the realignment. This suggests the following:

Preposition 2: A more lopsided contest will involve fewer but better supported candidates.

This result arises from the intrinsic asymmetry in the productivity of ability in leadership and supporting roles. A mean-preserving spread that reduces abilities of agents in the lower tail of the distribution does not compromise their effectiveness as helpers since only their mass matters, but the increase in abilities of candidates in the upper tail enhances their chances at the expense of the marginal candidate. Some candidates are therefore encouraged to switch to a supporting role, boosting the ranks of the remaining factions.

This Proposition has particularly interesting implications for political elections, in that the existence of established parties and election machines usually discourage political participation, at least in the form of candidacies. In our model with a continuous distribution of players, there will not be any unchallenged contests. In the real world, however, with discreteness in the number of candidates, a runaway favorite can siphon off support from all potential challengers, resulting in a grand coalition. This is perhaps most vividly illustrated in U.S. presidential primaries, where the fates of candidates are often sealed by elections in a few crucial states. Those who fall behind at these junctures will face dwindling resources that will often force them to withdraw, while the candidacies of frontrunners will gather steam by absorbing the support for failed candidates. In fact, unity is important at the end of a primary contest as the party primes itself for the external challenge that follows. It is therefore not coincidental that incentives are designed so that a primary race is rarely taken all the way to the party convention which, more often than not, is staged as a coronation rather than a final showdown.

On the other hand, the absence of frontrunners or strong candidates can have negative consequences. Apart from compromised performance during the contest due to the lack of cooperation among players, the winning candidate can also be hampered by a dearth of talent in his team after the dust settles. As suggested by Proposition 2, a crowded field with no favorites reduces the number as well as the quality of helpers for each candidate. Whoever wins the contest will then have to appoint mediocre supporters to senior positions. Indeed, it is often observed that fragmented political systems with no dominant parties are perenially plagued by poor governance that further contributes to instability and stagnation.

III. Empirical Analysis

The results derived in the previous section have empirical implications that are testable. Even though the model can be applied to the context of a firm, and the proposed relationship between employees' helping behavior and a firm's compensation scheme is intuitive, it is difficult to find empirical support for the hypotheses from corporate data, as some key variables (such as the "second prize" to be shared among helpers, the size of factions, and the number of candidates) are not readily observable or measurable in promotion tournaments. The application of our analysis to political elections suggests a more ready source of data. Just like an executive climbing the corporate ladder, an aspiring politician faces the same dilemma of whether to present himself as a candidate in an election or play a supportive role in the hope of earning a future political appointment or other favors. Altering the structure of rewards can therefore profoundly affect participation in the electoral process and the makeup of party electoral politics. With different offices offering different resources directly and indirectly available to winning candidates, often clearly defined in statutory terms, and campaign organizations and financing potentially observable, political elections in different jurisdictions present a natural experiment for testing the relationship between reward structure and helping behavior. Accordingly, in this section, we shall take the implications of our model to the data on gubernatorial primaries in the United States.

Unlike elections at the federal level, there is much more cross-sectional variation in U.S. state and local contests. Gubernatorial races, for example, are different games in different states, with the winners given different constitutional powers to govern and to appoint officials in their administrations. Because of the two-party system, however, general elections usually shape up as a duel between the Democratic and the Republican candidates.

Therefore, the incentive to participate in gubernatorial elections is more readily captured in party primaries where the number of candidates is more varied.

Even in primary elections, some variables in our theoretical model are more difficult to measure than others. Conceptually, the size of a faction can be proxied by the number of endorsements and volunteers or by the amount of political contributions, but with the possible exception of the last, these data are difficult to collect, and even when disclosure of campaign finances is required by law, complete and reliable data on contributions are not available except for more recent elections. Therefore, in the following, we shall focus on the one endogenous variable that can be most reliably measured, namely the number of candidates in a primary election, and on how it is affected by different institutional and exogenous variables.

Proposition 1 suggests that the number of candidates is increasing in the payoff for the winner but decreasing in the reward for helpers. Personal payoff for the winner may include pecuniary and non-pecuniary benefits, but for seekers of public offices, political power is likely to dominate immediate pecuniary gain in terms of salary. Therefore, measures of the personal political power of the governor can be used to represent W_1 in the model. By contrast, although the authority to appoint key officials also reflects gubernatorial power, it more directly measures the capacity of the election winner to reward his supporters, and can be considered a proxy for W_2.

Proposition 2 implies that participation is discouraged if the distribution of the abilities of the candidates becomes more diffused or, by implication, if the frontrunner enjoys a boost in strength. While the abilities of candidates can be difficult to gauge, it is commonly accepted that, ceteris paribus, an incumbent seeking re-election has an inherent advantage over other contestants for the office. Therefore, one can expect that the number of candidates in a primary will be reduced by the re-election bid of an incumbent within the party.

The effect of an incumbent from another party seeking re-election must, however, be interpreted differently. This event would lower the chance of a candidate from the non-incumbent party eventually winning the office in the general election, and therefore would reduce the expected payoffs for participating in the primary, either as a candidate or as a helper, to the same proportionate extent. With relative payoffs unchanged, there should be no effect on the equilibrium in the primary election. Nevertheless, this conclusion assumes a constant set of agents whose only decision is on whether to compete against or to support another candidate. In a more general context, when their options also include not participating in the primary altogether, a reduction in expected payoff can actually violate the participation constraint for some players. Hence, an incumbent from another party can also lower the number of candidates in a primary election, although for a different reason than before.

Size also matters in determining the number of candidates. Governorship of a larger state carries a higher prestige as well as greater political influence. A larger population also tends to breed more people with political ambition, as well as a greater diversity of interests that demand representation in the political process. One would therefore expect more primary candidates in more populated states. On the other hand, controlling for population and governor's budgetary power, a larger state budget reflects a greater amount of resources that the governor can use either to pursue personal agenda or to reward supporters. Therefore, the theoretical effect on the incentive to stand as candidates is ambiguous and is likely to be determined empirically by the relative magnitudes of offsetting forces.

Apart from the predictions of the model, other social and political variables are also included in the regressions to control for exogenous variations. For example, discontent with existing conditions can be a strong motivation for political participation, so the number of candidates can be inversely related to economic health. Accordingly, unemployment rate in the state is also included as a control variable. Year and state dummies are also included in some regressions to capture specific effects.

Summarizing, we can use the following empirical model to capture participation in state primary elections:

$$\begin{aligned} y_{ijt} &= \beta_0 + \beta_1 x_{it} + \beta_2 z_{it} + \beta_3 D_j + \beta_4 D_t + \beta_5 D^a_{ijt} + \beta_6 D^b_{ijt} \\ &\quad + \beta_7 POP_{it} + \beta_8 BUD_{it} + \beta_9 UMP_{it} + \varepsilon_{ijt} \end{aligned} \tag{10}$$

where y_{ijt} is the number of candidates in party *j* (*j* = Democratic or Republican) gubernatorial primary in state *i* in year *t*, x_{it} is a vector of measures of personal power of the governor in state *i* in year *t*, z_{it} is a set of measures of the governor's power to reward supporters in state *i* in year *t*, D_j is a party dummy (Democrats = 1), D_t is a vector of year dummies, D^a_{ijt} (D^b_{ijt}) is a dummy that equals one if there is an incumbent from the same (another) party running for re-election, POP_{it}, BUD_{it} and UMP_{it} are, respectively, state *i*'s population, total government expenditures, and unemployment rate in year *t*, and ε_{ijt} is an error term which is independent over time and across, but not necessarily within, states. According to our model, it is expected that $\beta_1 > 0$, $\beta_2 < 0$, $\beta_5 < 0$, $\beta_6 \leq 0$, $\beta_7 > 0$ and $\beta_8 \gtrless 0$. β_9 is also expected to be positive, although this is outside the model. There are conceivably many other variables that can potentially affect participation in a gubernatorial primary election, but as long as the missing variables are independent of the regressors, the estimated coefficients provide valid tests of our hypotheses.

Most of the data for the empirical test are derived from Beyle's website[5] on gubernatorial elections, including the number of candidates and incumbency. The data set covers virtually all gubernatorial democratic and republican primaries from 1976 to 2006,

[5] http://www.unc.edu/~beyle/gubnewpwr.html.

totaling 826 elections.[6] Beyle also compiles various measures of gubernatorial power over time, but long series of data are available only for four indices: budget power, tenure potential, veto power and appointment power. Each of these is a 5-point scale reflecting, respectively, (i) the governor's power in preparing the state budget; (ii) the number of years he can serve and term-limit status; (iii) his veto power over bills and the threshold for legislative overrides; and (iv) his appointment power in major functional areas and offices.[7] It is not always obvious whether these indices are measuring W_1 or W_2 in our model; in fact, each index may have elements of both. For example, personal control over the budgetary process may increase payoffs for both the governor and his supporters. Even veto power and term potential, which apparently relate more to payoff for the governor, can affect the extent to which supporters can benefit from the administration. Nevertheless, it can plausibly be argued that, on balance, the personal power of the governor is more directly reflected in the first three indices, while the power to reward supporters, in the last.

Descriptive statistics of the relevant variables are given in table 1. It can be seen that the typical primary is contested by fewer than three candidates, with more than 28 percent of the races involving an incumbent seeking re-election.

Results of OLS estimation of equation (10) are displayed in table 2. Democratic primaries attract significantly more contestants (almost 0.5 out of an average of 2.9). More importantly, an incumbent seeking re-election greatly reduces the incentive to contest as expected, and doubly so (literally) if he is from the same party, consistent with proposition 2. In fact, with estimates around -1.32 for "own-party incumbent," there is a good chance that a

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[6] For some reasons, data on the 1976 primaries in North Dakota, New Hampshire, North Carolina and West Virginia are not given in the website.

[7] The criteria for measuring these powers can change over time. Please refer to the website for detailed information on these indices.

governor seeking re-election would not be challenged in his party's primary. Coefficients on the various measures of gubernatorial power largely show the expected sign. In the first two columns for regressions without state dummies, it can be seen that, greater control over the budgetary process strongly encourages participation in the electoral process, while greater authority in appointing officials discourages it. The latter is particularly noteworthy, since appointment power is a very good measure of W_2 in our model and the result affords the most unambiguous test of Proposition 1. Better tenure potential also raises the number of candidates, but greater veto power, which supposedly increases the benefits for contestants as well, has the opposite effect. These latter results are, however, insignificant, indicating that their effects are probably dominated by those of other powers in determining candidacies.

Elections in states with a larger population or higher unemployment rate do tend to involve significantly more candidates as expected. Controlling for gubernatorial budgetary power, the state budget has a negative effect that diminishes with its size. The non-linearity may be reflecting the offsetting effects of the state budget discussed above, but the incentive to help apparently dominates.

Including state dummies in the regressions improves the fit of the models but reduces significantly the variation across states left for the gubernatorial power measures to explain. It also takes away the explanatory power of state population, size of the budget and unemployment rate, which are subsequently dropped from the regression. Nevertheless, as shown in columns 3 and 4 in table 2, the qualitative results remain consistent with our predictions, with even the coefficient on veto power, insignificant though it may be, showing the correct positive sign.

Since the number of candidates is an integer variable, we also estimate Poisson regressions of equation (10). The results are shown in table 3, which reports the incidence ratios rather than the actual coefficients. The goodness-of-fit χ^2 statistics in general show that the hypothesis that the data are Poisson distributed cannot be rejected at any reasonable significance level, and the model provides a very good fit for the data. The estimates mirror closely the OLS results. For example, for the regression in the first column, which includes all measures of gubernatorial power and state characteristics but no state dummies as regressors, a statistically significant incidence ratio estimate of 0.92 translates into a 0.22 reduction in the number of candidates for a unit increase in the appointment power index, given the average number of candidates of 2.918. This is comparable to the OLS estimate of -0.25 in the first column in table 2. Similarly, the incident ratio of 0.35 for budget power translates into a 0.36 increase in candidate number, very much in line with the corresponding OLS estimate of 0.35. In the same regression, the negative impact of an own-party incumbent can be calculated as a 1.09 reduction in the number of candidates, which, again, is not too different from the OLS estimate of -1.31. Other results largely follow the same pattern. If anything, the Poisson regressions show even more significant results for the power indices, particularly in the models with state dummies.

In sum, it can be concluded that implications of the theoretical model are corroborated by the data. The generally opposite effects of appointment power and other indices of gubernatorial power are particularly illuminating, highlighting the different incentives that different types of rewards for the winner of a contest can have on the choice of roles that participants can play in this game.

IV. Conclusion

In this paper, we have presented a model for help and factionalism in politics and within organizations. It is shown that if the winner of a contest is given control over resources that he can use to reward supporters, help among players is encouraged as factions form around candidates. The sorting into leading and supporting roles is, however, not random, as helpers are inferior in abilities to leaders. It is also shown that more able leaders will always attract more helpers in equilibrium, and therefore stand a better chance of winning the contest, while less able candidates receive less support, further undermining their prospects.

The number of candidates and the size of factions are also affected by the reward structure. A larger top prize for the winner relative to the second prize that is to be distributed among supporters of the winner will result in more factions and less cooperation among players, while the opposite is true if the second prize is large. A more uneven distribution of abilities favoring the top candidates also tends to discourage competition, as helpers scramble for the frontrunner's (or frontrunners') bandwagon and marginal candidates drop out. These implications are supported by data on U.S. gubernatorial primary elections.

Although empirical application of our model to contests within private firms or organizations is constrained by the paucity of data, interesting insights can still be derived. The effects of the payoff structure on factionalism implies that a firm's organizational structure can have a profound impact on workers' incentives and behavior. A more decentralized structure, in which division or team leaders are allowed greater discretion in personnel or resource allocation decisions, may encourage teamwork and cooperation. Similarly, there may be less industrial politics at the top echelons if the CEO is given a freer hand in appointing his top assistants, not only because of better working relationship between the CEO and his own appointees after his promotion, but also because of less factionalism and greater cooperation within (if not across) factions during the competition for the position. Lazear (1989) observes that in a firm organized by products, the CEO is often chosen from among heads of different product divisions because it is important to maintain cooperation among colleagues working on the same product line. Extending that argument, our analysis suggests that there tends to be more "cronyism" in firms with such organizational structures, because having more resources for rewarding supporters would facilitate teamwork within divisions.

The reward structure may, however, also depend on the technology of production as suggested by Itoh (1991). Even if we abstract from the incentive effects of a compensation scheme on workers' efforts, it is still not the case that less competition and greater cooperation is always to be preferred. In some creative industries, diversity is a very important part of the production process and competing ideas should be encouraged rather than restrained. This is particularly the case if team production is subject to high diminishing returns and cooperation among workers does not result in substantial gain in team productivity. In the extreme case, when there is no complementarity in different workers' inputs, it may be more efficient for the firm to offer a simple tournament scheme with no payoff for helping.

Much has been said about differences in corporate cultures across firms. Some firms thrive on a competitive environment that encourages a rivalrous relationship among workers in order to bring out their best efforts. Others value camaraderie and congenial relationship among colleagues that foster cooperation. The contrast extends to international comparisons as well. It is often suggested that the team spirit is emphasized in Japanese corporations while individual achievements and innovations are more prized in western, particularly U.S., corporate cultures. Ultimately, such differences across firms and countries may just be a reflection of differences in incentive schemes dictated by the choice of production techniques, a most intriguing topic which we hope to explore in the future.

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Table 1
Descriptive Statistics

Variable	Mean	s.d.
No. of candidates [a]	2.918	1.939
Population [b]	5.088	5.572
State budget [c]	9.860	12.894
Unemployment rate [d]	5.837	2.011
Budget power [a]	3.920	1.080
Veto power [a]	4.270	1.240
Tenure potential [a]	4.024	0.840
Appointment power [a]	3.120	1.021
Incumbents [a]	0.281	0.450

N = 826

[a] Data from http://www.unc.edu/~beyle/gubnewpwr.html.

[b] Data on state population (in millions) are from from various issues of US Census Bureau, *Statistical Abstract of the United States*.

[c] State budgets, in US$1,000,000,000, are from *Statistical Abstract of the United States* and deflated by CPI-U (1982 to 1984 = 1; CPI data from http://www.census.gov/compendia/statab/tables/08s0703.xls.)

[d] Annual average unemployment rate by state are from US Bureau of labor statistics (http://www.bls.gov/data/home.htm; N = 2012).

Table 2
Determinants of Number of Candidates (OLS)

Variable	(1)	(2)	(3)	(4)
Budget power	0.3488*** (0.1110)	0.3208*** (0.1050)	0.1709 (0.1124)	0.2056* (0.1103)
Appointment power	-0.2473*** (0.0890)	-0.2224** (0.0887)	-0.1710* (0.0944)	-0.1745* (0.0904)
Tenure potential	0.1080 (0.1682)	-	0.0743 (0.1594)	-
Veto power	-0.1282 (0.1478)	-	0.2444 (0.2057)	-
Population	0.1561*** (0.0533)	0.1570*** (0.0532)	-	-
State budget	-0.0957*** (0.0320)	-0.0964*** (0.0319)	-	-
State budget ^{2}	0.0006*** (.0002)	0.0006*** (.0002)	-	-
Unemployment rate	0.2116*** (0.0607)	0.2104*** (0.0605)	-	-
Democrats	0.4748*** (0.1676)	0.4748*** (0.1674)	0.4854*** (0.1735)	0.4854*** (0.1733)
Own-party incumbent	-1.3054*** (0.1739)	-1.2989*** (0.1727)	-1.2407*** (0.1692)	-1.2238*** (0.1658)
Other-party incumbent	-0.7004*** (0.1605)	-0.6939*** (0.1615)	-0.6244*** (0.1639)	-0.6075*** (0.1584)
Year dummies	Yes	Yes	Yes	Yes
State dummies	No	No	Yes	Yes
Constant	0.2373 (1.0589)	0.3079 (0.8477)	1.7845 (1.4359)	3.0697*** (0.7708)
N	826	826	826	826
R-squared	0.2151	0.1987	0.4043	0.4023

* $p < 0.1$; ** $p < .05$; *** $p < .01$

Note: Numbers in parentheses are robust standard errors allowing for non-independence among observations within states; Democrats is a dummy variable = 1 for a Democratic party primary; Own-party incumbent is a dummy =1 if a party incumbent is seeking re-election; Other-party incumbent is a dummy = 1 if an incumbent in the other party is seeking re-election.

Table 3
Determinants of Number of Candidates (Poisson)

Variable	(1)	(2)	(3)	(4)
Budget power	1.1223***	1.1114***	1.0571*	1.0651**
	(0.0365)	(0.0345)	(0.0332)	(0.0324)
Appointment power	0.9235***	0.9320**	0.9428**	0.9427**
	(0.0284)	(0.0286)	(0.0283)	(0.0279)
Tenure potential	1.0398	-	1.0257	-
	(0.0607)		(0.0611)	
Veto power	0.9542	-	1.0522	-
	(0.0472)		(0.0553)	
Population	1.0001***	1.0001***	-	-
	(0.0000)	(0.0000)		
State budget	0.9687***	0.9684***	-	-
	(0.0113)	(0.0113)		
State budget ^{2}	1.0002***	1.0002***	-	-
	(.0001)	(.0001)		
Unemployment rate	1.0733***	1.0722 ***	-	-
	(0.0200)	(0.0199)		
Democrats	1.1779***	1.1777***	1.1846***	1.1843***
	(0.0623)	(0.0622)	(0.0626)	(0.0626)
Own-party incumbent	0.6260***	0.6274***	0.6465***	0.6487***
	(0.0375)	(0.0375)	(0.0365)	(0.0358)
Other-party incumbent	0.8005***	0.8021***	0.8325***	0.8350***
	(0.0392)	(0.0398)	(0.0399)	(0.0390)
Year dummies	Yes	Yes	Yes	Yes
State dummies	No	No	Yes	Yes
N	826	826	826	826
χ^2	727.76	732.42	528.39	529.3
Prob > χ^2	0.9572	0.9502	1.0000	1.0000

* $p < 0.1$; ** $p < .05$; *** $p < .01$

Note: Estimates are reported in incident rate ratios. Numbers in parentheses are robust standard errors allowing for non-independence among observations within states. Refer to the note for Table 2 for further explanations.