

# Distributional Conflict in Organizations\*

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## Abstract

Hierarchy can function as an instrument to channel influence activities or power struggles in organizations. Contrary to what has been frequently argued, we show that multi-divisional organizations may involve lower influence costs than single-tier organizations, even though they offer more scope for organizational conflict and have more executives that can be influenced. These benefits derive from two effects. First, part of the conflict in multi-divisional organizations takes place on the division level, where a small number of agents fight over only a fraction of the overall prize. Second, by grouping agents into common divisions, multi-divisional organizations create free-rider problems in rent-seeking. We apply our framework to study divestitures and the transition from the U- to the M-form by US corporations in the 1920s. *JEL Classification Numbers:* C72, D74, G31, G34. *Keywords:* Hierarchy, conflict, influence activities, U-form vs. M-form.

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Personal ambition always has been and will remain a more powerful incentive to exertion than  
a desire for the general welfare.  
Frederick Winslow Taylor, *The Principles of Scientific Management*.

## 1 Introduction

Power and conflict are ubiquitous in organizational life. According to one of the leading scholars in the field of organizational behavior, “power is, first of all, a structural phenomenon, created by the division of labor and departmentation that characterizes the specific organization [...] being investigated” (Pfeffer 1981, p. 4). Accordingly, power struggles should be particularly pronounced in hierarchical, multi-divisional organizations. Based on this notion, sociologists and social psychologists have primarily studied conflict between different subunits of multi-divisional organizations, including departments and schools of universities (Hills and Mahoney 1978; Pfeffer and Moore 1980), government agencies (Wildavsky 1979), school districts (Freeman 1979), departments in firms (Perrow 1970), and local service agencies of United Fund, a nationwide charity organization (Pfeffer and Leong 1977).

Similarly, in the economics and finance literature, conflict is primarily viewed as a problem of multi-divisional firms. For instance, in Scharfstein and Stein (2000) and Rajan, Servaes, and Zingales (2000), division managers squabble over compensation packages and the produced surplus, respectively. In the jargon of this literature, inter-divisional conflict constitutes a potential cost of integration. Moreover, it is used as an argument for why conglomerates have a lower value than stand-alone firms, an empirical regularity known as conglomerate discount. In a similar vein, Meyer, Milgrom, and Roberts (1992) examine a model in which influence activities by a division render it optimal to divest the division. More generally, firms with more hierarchy layers are viewed as having greater influence problems, the reason being that they have more executives that can be influenced: “With new levels of executives having authority, there are greater possibilities for [...] self-interested interventions. The opportunities for influence costs to arise also expand (Milgrom and Roberts 1990, p. 84).” While this argument appears compelling, no paper has, to our knowledge, formally examined whether influence costs in multi-divisional firms are greater than in firms which have no divisional structure.

In this paper, we formally investigate the argument that divisionalization exacerbates influence problems. Contrary to what has been frequently argued, we find that multi-divisional organizations may face lower influence costs than single-tier organizations, even though they offer more scope for organizational conflict and have more executives that can be influenced.

If conflict is modelled using the widely popular conflict technology suggested by Tullock (1975, 1980), we even find that multi-divisional organizations always exhibit lower influence costs than single-tier organizations.<sup>1</sup>

Divisionalization of the overall conflict into many small, intra-division conflicts reduces the prize in each conflict and hence the marginal return to influence activities. On the other hand, divisionalization adds an extra round of wasteful conflict as the divisions must first compete for divisional shares of the overall prize. We consider two different forms of inter-division conflict: i) division managers fight on behalf of their divisions, and ii) the members of each division collectively fight for a greater divisional share. As fighting for a greater divisional share is a public good, expending resources in the inter-division conflict is subject to free-rider problems. This effect is reinforced by the fact that a dollar going to a division yields less than a dollar to the division's members, since part of it is dissipated away in the subsequent intra-division conflict. Regardless of how the inter-division conflict is modelled, we find that the benefits of divisionalization may outweigh the costs.

Underlying our model is the notion that contracts in organizations are inherently incomplete, which implies that decisions must be made on the basis of negotiations and authority. Whenever discretionary decisions are made, however, agents affected by the decision have an incentive to take costly measures to influence the outcome. Examples range from the manipulation of information (Milgrom 1988; Milgrom and Roberts 1990) to activities aiming at shifting bargaining powers, such as entrenchment or investments in unproductive outside alternatives (Rajan and Zingales 2000; Scharfstein and Stein 2000; Shleifer and Vishny 1989). Our notion of organizations is thus a political one, with conflict being the norm rather than the exception: “incentive theories of organizations argue that through the payment of a wage, particularly when compensation is made contingent on performance, individuals hired into the organization come to accept the organization's goals. Political models of organizations assume that these control devices, as well as others such as socialization, are not wholly effective in producing a coherent and unified set of goals [...]. Conflict is viewed as normal or at least customary in political organizations” (Pfeffer 1981, p. 28).

Some examples of situations where influence activities may arise might be in order. Most firms, including those relying heavily on objective performance measurement, augment their incentive systems with subjective assessments of performance. For instance, Eccles and Crane

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<sup>1</sup>Wärneryd (1998) uses this approach to explain federalist structures of jurisdictions. Müller and Wärneryd (2001) show that selling a firm to outsiders may mitigate rent-seeking in partnerships. The authors do not look at hierarchical structure within the firm, however.

(1988, p. 166) show that even in investment banks where ample objective performance measures are available, compensation relies heavily on subjective assessments of factors such as the “quality of the deals, the bankers’ contribution to customer satisfaction, training of younger associates, and marketing”. Similarly, at Lincoln Electric, which is widely known for its rigorous use of piece-rate pay, half of a worker’s annual compensation comes in the form of a year-end bonus based on supervisors’ subjective ratings of factors such as cooperation, innovation, and dependability (Fast and Berg 1975). Lincoln Electric is anything but an exception. In a recent study, Murphy and Oyer (2001) investigate the role of discretion in executive compensation based on a sample of 280 bonus plans. They find that bonus payments are highly discretionary, in particular for lower-level management. Discretion in bonus pay naturally gives rise to the sort of influence activities studied in this paper.<sup>2</sup>

Another potential cause for influence activities is resource allocation. Cyert and March (1963) explicitly argue that budgets are the outcomes of bargaining and political contests, rather than the result of the application of rational and efficient decision rules. Mainly because of data availability, earlier studies of resource allocation in organizations focused on public organizations: Wildavsky (1979) (government agencies), Hills and Mahoney (1978) and Pfeffer and Moore (1980) (universities), and Pfeffer and Leong (1977) (United Fund) all find that the allocation of resources is determined by power and conflict. As Pfeffer (1981, p. 233) points out, however, “anecdotal evidence suggests that corporations are not as different as one might think, in terms of the influence of power and politics, from these public organizations.” Indeed, recent studies investigating the allocation of capital across divisions in conglomerates find evidence consistent with the notion that influence activities and conflict also affect the resource allocation in corporations (Rajan, Servaes, and Zingales 2000; Scharfstein 1998; Wulf 2000).

In the second part of the paper, we consider two applications where corporate reorganization either alters the form or degree of divisionalization. The first application concerns divestitures. The second application concerns the transition from the U- to the M-form organization by many large US corporations in the 1920s, a phenomenon studied by, e.g., Chandler (1966) and Williamson (1975). In the U- vs. M-form application, we show that the M-form involves lower influence costs than the U-form if and only if the number of products, brands, or regions is sufficiently large. This confirms a conjecture by Williamson (1975) that the M-form is better

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<sup>2</sup>Any division of surplus potentially gives rise to conflict. The following statement concerns a leading Wall-Street firm: “Despite efforts to tie the three semi-autonomous firms in London, Paris and New York more closely together, Lazard remains factional. Tensions erupted recently of the division of profits [...]” Tension rises at Dresdner Bank over Wasserstein, Financial Times, November 14, 2001.

suited to cope with expansion. In the divestiture application, we find that divesting is beneficial only if the divisions are sufficiently similar in size. In particular, we show that it may be a mistake to divest the division that rent-seeks most, for this may encourage the remaining divisions to increase their rent-seeking activities. Models that have only a single division (e.g., Meyer, Milgrom, and Roberts 1992) necessarily fail to capture such interaction effects.

The rest of the paper is organized as follows. Section 2 lays out the model. Section 3 contains our main results. Section 4 analyzes divestitures and the choice between the U- and M-form organization from a distributional conflict perspective. Section 5 concludes.

## 2 Distributional Conflict

Consider a situation where a fixed, divisible rent  $z$  (e.g., assets, firm profits, or a research budget) must be distributed among  $N$  organizational units, e.g., workers or managers in a firm or professors in a university. To secure a share of the rent, the units may expend effort  $r$  at unit cost. Using an established term, we refer to such activities as *rent-seeking*.<sup>3</sup> We model rent-seeking as a contest. Given a profile of rent-seeking expenditures  $\mathbf{r} := (r_1, \dots, r_n, \dots, r_N)$ , the share of  $z$  awarded to unit  $n$  is then given by the *contest success function*  $\alpha_n(\mathbf{r})$ .

Skaperdas (1996) imposes a set of reasonable properties on  $\alpha_n(\mathbf{r})$  and shows that they are equivalent to assuming that  $\alpha_n(\mathbf{r})$  takes the form

$$\alpha_n(\mathbf{r}) := \frac{f(r_n)}{\sum_{m=1}^N f(r_m)}, \quad (1)$$

where  $f$ , which we might call the *impact function*, is a positive increasing function. Hence rents are distributed according to relative impact, and an agent's impact is an increasing function of his effort. We additionally assume that  $f$  is concave and thrice differentiable. This guarantees the existence of a unique interior equilibrium (see Szidarovszky and Okuguchi 1997). Finally, we assume that  $f(0) = 0$ . In the boundary case where nobody expends anything, we assume that the rent is split equally. It is easy to see that this case cannot happen in equilibrium, since given that no-one else expends anything, any agent can appropriate the entire rent in return for an arbitrarily small expenditure.

If  $z$  represents a productive resource such as capital, rent-seeking takes costly resources (e.g., time and effort) away from productive activities. In this case, we may assume that the units rent-seek because they derive private benefits that are proportional to the produced output

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<sup>3</sup>Alternative expressions are *safeguarding activities* (Williamson 1985), *influence activities* (Milgrom 1988), and *power-seeking activities* (Rajan and Zingales 2000).

(e.g., better research enhances the value of a professor’s human capital). As adding a private benefit parameter does not change our results, we refrain from doing so. Finally, to simplify the exposition, we normalize  $z$  to one.

In the following, we compare two organizational forms. In a flat, or *single-tier* organization there is a single round of conflict where all  $N$  units directly compete with each other for the overall rent. In contrast, in a *multi-divisional* organization the  $N$  units are divided into  $K < N$  divisions (or faculties in the university example). In each division, the units belonging to the division compete for a fraction, or division share, of the overall rent. Division shares are determined endogenously in a preceding contest between the different divisions. Hence a multi-divisional organization involves two rounds, or  $K + 1$  conflicts: one inter-division conflict where the different divisions compete for greater division shares, and  $K$  subsequent intra-division conflicts. We consider two different scenarios for the inter-division conflict.

- 1) Rent-seeking by division members. Division shares are determined by the collective efforts of individual division members. Here we assume that effort choices are made noncooperatively.
- 2) Rent-seeking by division representatives. Division shares are determined by the efforts of division representatives, such as division managers (or faculty deans in the university example). Representatives may have different motives to rent-seeking, depending on whether they are professional bureaucrats or ordinary division members to whom the task of representing the division has been delegated. We shall be more explicit about these motives below.

Sometimes organizational structures are given, e.g., for historical or political reasons, or simply because there is a “natural” way of organizing economic activity. For instance, there are presumably good reasons for why universities are organized into faculties and departments, and efficiency considerations may play a minor role there. Hierarchy, for our purposes, may then be viewed as allocation procedures and rules that may, but need not correspond to hierarchies in terms of organizational charts. Suppose a university has a research budget coming from government grants, tuition fees, or donations, that must be divided among its professors. Under a single-tier hierarchy, professors directly apply for research grants at the university level. In contrast, under a multi-divisional hierarchy, the research budget is first divided across faculties (and only those can apply at this stage). In a second step, the professors within a faculty apply for a personal share of the faculty budget. Similarly, suppose firm profit shall be divided among the firm’s employees in the form of bonus payments. Under a single-tier hierarchy, the bonus is directly divided among the employees. In contrast, under a divisional structure the bonus is first divided across divisions. Subsequently, the division boni are divided across the employees

in the respective divisions.

### 3 Hierarchy

#### 3.1 Decentralization of Conflict

As a benchmark, we first find equilibrium rent-seeking expenditure for the single-tier organization. The objective function of unit  $n$  is  $\alpha_n - r_n$ . Suppose the  $N$  units make their rent-seeking expenditure noncooperatively. There is then a unique equilibrium where the equilibrium expenditure of unit  $n$  is given by the first-order condition

$$\frac{f'(r_n^*) \sum_{m \neq n} f(r_m^*)}{\left(\sum_{m=1}^N f(r_m^*)\right)^2} = 1.$$

As this must hold for all units, the common equilibrium rent-seeking expenditure  $r^*$  in the single-tier organization is given by

$$h(r^*) = \frac{N-1}{N^2}, \quad (2)$$

where  $h(r) := f(r)/f'(r)$ .

We shall assume that  $h$  is convex. As the following observation shows, convexity of  $h$  has a natural interpretation.

**Observation.** *In a contest with  $N$  participants for a prize of value  $z$ , the dissipation rate  $Nr^*/z$  is increasing in  $N$  for all  $N$  if and only if  $h$  is convex.*

**Proof.** We have that

$$\begin{aligned} \frac{d}{dN} \frac{Nr^*}{z} &= \frac{1}{z} \left( r^* + N \frac{\partial r^*}{\partial N} \right) \\ &= \frac{1}{z} \left( r^* - \frac{N-2}{N-1} \frac{h(r^*)}{h'(r^*)} \right), \end{aligned}$$

where the second equality follows from (2). As  $\lim_{N \rightarrow \infty} (N-2)/(N-1) \rightarrow 1$  and  $h' > 0$ , the rhs is positive for all  $N$  if and only if  $r^* h'(r^*) \geq h(r^*)$ , which holds if and only if  $h'' \geq 0$ .  $\square$

Hence convexity of  $h$  is equivalent to the property that an increasing fraction of the prize is dissipated as the number of contestants grows large. Most conflict technologies studied in the literature, including the popular specification  $f(x) = x^\gamma$ , exhibit this property.<sup>4</sup>

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<sup>4</sup>Note that

$$\frac{d^2 h(r)}{dr^2} = -\frac{f''(r)}{f'(r)} + \frac{2f(r)f''(r)^2}{f'(r)^3} - \frac{f(r)f'''(r)}{f'(r)^2}.$$

As the first two terms are positive, convexity of  $h$  is equivalent to the assumption that  $f''' < M$ , where  $M$  is a sufficiently small positive number.

Consider next the multi-divisional organization. To find subgame perfect equilibrium outcomes, we solve the game backwards, beginning with the second round of conflict where in each division the  $N_k \geq 1$  division members fight over the division share  $\beta_k$ , where  $\sum_{k=1}^K \beta_k = 1$  and  $\sum_{k=1}^K N_k = N$ . At this stage, division shares are already determined, which is why we take them as given. Let  $G_k$  denote the set comprising all members of group  $k$ . The objective function of an individual unit  $n \in G_k$  is then  $\beta_k \alpha_n - r_n$ , where  $\alpha_n$  is the unit's personal share of the division rent. We allow for arbitrary, asymmetric divisions of the overall rent and the  $N$  units into division shares and divisions, respectively. We also allow for degenerate divisions with only one unit. As  $K < N$ , at least one division must have  $N_k \geq 2$  units, however.

Analogously to the single-tier organization, there is a unique equilibrium where all members of a division make the same expenditure. Denote this common, division-specific expenditure level by  $r_k^{**}$ . It is implicitly defined by the first-order condition

$$h(r_k^{**}) = \beta_k \frac{N_k - 1}{N_k^2}. \quad (3)$$

We can now ask whether aggregate rent-seeking expenditure in the  $K$  intra-division conflicts alone is greater or smaller than aggregate expenditure in the single-tier organization. If it is greater, a multi-divisional organization must necessarily involve greater aggregate expenditure than a single-tier organization, since in addition to the  $K$  intra-division conflicts it also has the inter-division conflict. If it is smaller, the comparison between single-tier and multi-divisional organizations depends on the magnitude of expenditure in the inter-division conflict. As a first step, we must therefore determine whether it pays to decentralize a grand conflict where all  $N$  contestants fight over a common prize into  $K$  local conflicts, where in each local conflict a subset  $N_k$  of the contestants fights over only a fraction  $\beta_k$  of the prize.

Decentralization of the grand conflict into subconflicts involves two countervailing effects. On the one hand, reducing the size of the prize lowers the marginal return to rent-seeking in each subconflict. On the other, reducing the number of contestants raises it. Convexity of  $h$  guarantees that the overall effect is unambiguous.

**Theorem 1 (Decentralization of Conflict).** *Aggregate rent-seeking expenditure in the  $K$  intra-divisional conflicts alone is strictly lower than in the single-tier organization where all  $N$  units directly compete with each other.*

**Proof.** Since  $\sum_{k=1}^K N_k = N$ ,  $K > 1$ , and  $(x - 1)/x$  is an increasing function, it holds for all  $\beta_k$  satisfying  $\sum_{k=1}^K \beta_k = 1$  that

$$\frac{N - 1}{N^2} > \sum_{k=1}^K \beta_k \frac{N_k}{N} \frac{N_k - 1}{N_k^2}.$$



Inserting (2)–(3) yields

$$h(r^*) > \sum_{k=1}^K \frac{N_k}{N} h(r_k^{**}).$$

As  $h$  is increasing and convex, we have that  $r^* > \sum_{k=1}^K (N_k/N) r_k^{**}$ . Multiplying both sides by  $N$  then gives  $Nr^* > \sum_{k=1}^K N_k r_k^{**}$ .  $\square$

Theorem 1 is a fundamental result of this paper. It states that, provided  $h$  is convex, decentralization is optimal *regardless* of how the  $N$  contestants and the rent are divided into divisions and division shares, respectively. If  $h$  is not convex, decentralization may still be optimal for *specific* division rules. For instance, if the division is symmetric, i.e., if in each intra-division conflict a fraction  $N/K$  of the contestants fights over a fraction  $1/K$  of the rent, it can be shown that decentralization is optimal irrespective of the curvature of  $h$  (Wärneryd 2001).

Given Theorem 1, it is now straightforward to characterize situations in which a multi-divisional organization involves lower aggregate rent-seeking expenditure than a single-tier organization. We begin with the case where rent-seeking in the inter-division conflict is performed by individual division members.

### 3.2 Rent-Seeking by Division Members

Suppose rent-seeking in the inter-division conflict is performed by individual division members. Denote the expenditure of unit  $n$  in the inter-division conflict by  $t_n$ . Division shares depend on the collective efforts of division members as follows.<sup>5</sup>

$$\beta_k(\mathbf{t}) := \begin{cases} f\left(\sum_{n \in G_k} t_n\right) / \sum_{l=1}^K f\left(\sum_{n \in G_l} t_n\right) & \text{if } \sum_{l=1}^K f\left(\sum_{n \in G_l} t_n\right) > 0 \\ 1/K & \text{otherwise.} \end{cases}$$

Consider the incentives of an individual unit. As a dollar going to division  $k$  must be shared with  $N_k - 1$  fellow division members, fighting in the inter-division conflict is a public good. Hence there is a free-rider problem. To this is added that the subsequent intra-divisional rent-sharing is itself the result of a wasteful conflict where each of the  $N_k$  division members spends resources equal to  $r_k^{**}$ . Hence the utility of an individual division member from the division share  $\beta_k$  is less than  $\beta_k/N_k$ . Specifically, it is

$$\rho_k(\beta_k) := \frac{\beta_k}{N_k} - r_k^{**}(\beta_k), \quad (4)$$

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<sup>5</sup>This formulation follows Skaperdas (1998). It takes the following view of the inter-division conflict. As all members of a division have the same objective in this conflict, their expenditures, while chosen noncooperatively, are channeled through the same impact function. We refer the reader to Skaperdas's paper for further motivation and discussion.

where  $r_k^{**}(\beta_k)$  is given by (3).

As all units rationally anticipate the outcome in the intra-division conflict, their objective function in the inter-division conflict is  $\rho_k(\beta_k) - t_n$ . Due to the public-good nature of this conflict, first-order conditions only determine aggregate division expenditure, i.e., there are multiple equilibria, all of which involve the same aggregate division expenditure. We focus on symmetric equilibria where all members of a division make the same expenditure  $t_k^*$ . Equilibrium expenditure in the inter-division conflict is then given by

$$\frac{d\rho_k}{d\beta_k} \frac{f'(N_k t_k^*) \sum_{l \neq k} f(N_l t_l^*)}{\left(\sum_{l=1}^K f(N_l t_l^*)\right)^2} \leq 1, \quad (5)$$

where  $d\rho_k/d\beta_k$  represents the (marginal) *valuation* of an individual unit in division  $k$  for the division share  $\beta_k$ .

Given the public-good nature of the inter-division conflict, it is now obvious that aggregate expenditure in this conflict can be made arbitrarily small by increasing division size. Together with Theorem 1, this implies that total rent-seeking expenditure in the multi-divisional organization will be lower than in the single-tier organization.

**Proposition 1.** *Suppose rent-seeking in the inter-division conflict is performed by individual division members. If divisions are sufficiently large, aggregate rent-seeking expenditure in the multi-divisional organization is strictly less than in the single-tier organization.*

**Proof.** For any division in which  $t_k^* > 0$  the first-order condition (5) must hold with equality. Multiplying (5) with  $f(N_k t_k^*)/f(N_k t_k^*) = 1$  and using the definition of  $\beta_k$ , we obtain

$$\frac{d\rho_k}{d\beta_k} \beta_k (1 - \beta_k) = h(N_k t_k^*).$$

From (3) and (4) we have that

$$\frac{d\rho_k}{d\beta_k} = \frac{1}{N_k} - \frac{N_k - 1}{N_k^2} \frac{1}{h'(r_k^{**})}.$$

Clearly, as  $N_k \rightarrow \infty$  the valuation  $d\rho_k/d\beta_k$  goes to zero. As  $h$  is strictly increasing with  $h(0) = 0$ , this implies that  $N_k t_k^*$  also goes to zero. Hence if divisions are sufficiently large, aggregate expenditure in the inter-division conflict becomes arbitrarily small. In conjunction with Theorem 1, this proves the proposition.  $\square$

Incidentally, it suffices that  $K - 1$  divisions are sufficiently large. The  $K$ th division can then extract the entire rent by spending an arbitrarily small amount.

What is less obvious is that for specific conflict technologies, multi-divisional organizations may involve lower rent-seeking expenditure than single-tier organizations *regardless* of the division size. An example is the widely used conflict technology  $f(x) = x^\gamma$ , where  $0 < \gamma \leq 1$  ensures that the impact function is concave.<sup>6</sup>

**Example 1: Lottery Contests.** Suppose  $f(x) = x^\gamma$ . For simplicity, assume that there are two divisions. Consider first the single-tier organization. Solving (2) for  $r^\star$ , we obtain

$$r^\star = \gamma \frac{N-1}{N^2}. \quad (6)$$

Hence aggregate expenditure equals  $Nr^\star = \gamma N/(N-1)$ , which is strictly increasing in  $N$ . As  $N \rightarrow \infty$ , aggregate expenditure converges to  $1/h'(0) = \gamma$ .

Consider next the multi-divisional organization. From (3), we have that

$$r_k^{\star\star}(\beta_k) = \gamma \beta_k \frac{N_k - 1}{N_k^2}. \quad (7)$$

The valuation of an individual unit  $n \in G_k$  in the inter-division conflict is therefore

$$\frac{d\rho_k}{d\beta_k} = \frac{1}{N_k} - \gamma \frac{N_k - 1}{N_k^2} =: \hat{\rho}_k. \quad (8)$$

Observe that valuations are a strictly decreasing function of division size. As the members of both divisions will expend positive effort in the inter-division conflict, the first-order condition (5) holds with equality. Solving (5) for  $t_k^\star$ , we have that

$$t_k^\star = \gamma \frac{\hat{\rho}_k}{N_k} \frac{\prod_{l=1}^2 \hat{\rho}_l^\gamma}{(\sum_{l=1}^2 \hat{\rho}_l^\gamma)^2},$$

implying that

$$\beta_k^\star = \frac{\hat{\rho}_k^\gamma}{\sum_{l=1}^2 \hat{\rho}_l^\gamma}. \quad (9)$$

Hence the larger division gets a smaller share of the rent. This is because fighting in the inter-division is a public good, and the free-rider problem is more severe in larger divisions.

We can finally compare rent-seeking expenditure for the single-tier and multi-divisional organization. Expenditure is greater under the single-tier organization if and only if

$$\frac{N-1}{N} - \frac{1}{\sum_{l=1}^2 \hat{\rho}_l^\gamma} \sum_{l=1}^2 \frac{N_l - 1}{N_l} \hat{\rho}_l^\gamma - \frac{\prod_{l=1}^2 \hat{\rho}_l^\gamma}{(\sum_{l=1}^2 \hat{\rho}_l^\gamma)^2} \sum_{l=1}^2 \hat{\rho}_l > 0,$$

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<sup>6</sup>This contest success function, sometimes called a *lottery contest*, was popularized by Tullock (1975, 1980). As  $\gamma \rightarrow \infty$ , the rent-seeking technology converges to the perfectly discriminating all-pay auction. Hirshleifer and Riley (1992, Chapter 10) and Fullerton and McAfee (1999) illustrate how the lottery contest may be derived from more primitive assumptions. For a general discussion, see Skaperdas (1992, 1996).

or

$$\sum_{l=1}^2 \frac{\beta_l}{N_l} - \left( \sum_{l=1}^2 \frac{1}{N_l} - \gamma \sum_{l=1}^2 \frac{N_l - 1}{N_l^2} \right) \prod_{l=1}^2 \beta_l - \frac{1}{N} > 0, \quad (10)$$

where the lhs in (10) is bounded from below by  $\sum_{l=1}^2 (\beta_l^2 / N_l) - 1/N$ . But

$$\sum_{l=1}^2 \frac{\beta_l^2}{N_l} - \frac{1}{N} = \frac{1}{NN_1N_2} (N_1 - N\beta_1)^2 > 0.$$

Hence the single-tier organization involves greater rent-seeking expenditure than the multi-divisional organization. This holds for any value of  $\gamma \leq 1$ .  $\square$

### 3.3 Rent-Seeking by Division Representatives

Suppose division representatives, such as division managers (or faculty deans in the university example), fight on behalf of their divisions. The representatives rent-seek because they have a (marginal) valuation  $\lambda_k > 0$  for the rent. This valuation may represent an exogenous taste for large empires, or it may be endogenous and depend on the equilibrium outcome in the subsequent intra-division conflict. The rent-seeking effort of the representative of division  $k$  is denoted by  $s_k$ . Division shares are determined in the same fashion as individual shares, i.e., by

$$\beta_k(\mathbf{s}) := \begin{cases} f(s_k) / \sum_{l=1}^K f(s_l) & \text{if } \sum_{l=1}^K f(s_l) > 0 \\ 1/K & \text{otherwise.} \end{cases}$$

The objective function of the representative of division  $k$  in the inter-division conflict is thus  $\lambda_k \beta_k - s_k$ . We assume that division representatives make their rent-seeking expenditures non-cooperatively. Equilibrium expenditure in the inter-division conflict is then given by

$$\lambda_k \frac{f'(s_k^*) \sum_{l \neq k} f(s_l^*)}{\left( \sum_{l=1}^K f(s_l^*) \right)^2} \leq 1. \quad (11)$$

It is now obvious that aggregate expenditure in the inter-division conflict can be made arbitrarily small if valuations are sufficiently low. Together with Theorem 1, this implies that total expenditure in the multi-divisional organization will be lower than in the single-tier organization.

**Proposition 2.** *Suppose rent-seeking in the inter-division conflict is performed by division representatives. If the representatives' valuations are sufficiently low, aggregate rent-seeking expenditure in the multi-divisional organization is strictly less than in the single-tier organization.*

**Proof.** For any division in which  $s_k^* > 0$  the first-order condition (11) must hold with equality. Multiplying (11) with  $f(N_k t_k^*) / f(N_k t_k^*) = 1$  and using the definition of  $\beta_k$ , we obtain

$$\lambda_k \beta_k (1 - \beta_k) = h(s_k^*).$$

The rest is analogous to the proof of Proposition 1.  $\square$

Again, it suffices that  $K - 1$  valuations are low. The  $K$ th representative will then automatically make a low expenditure in equilibrium.

As argued earlier, valuations may depend on the equilibrium outcome in the subsequent intra-division conflict. If valuations are a decreasing function of intra-division expenditure, divisions where a greater fraction of the rent is dissipated receive fewer rents, which is efficient. On the other hand, if valuations are an increasing function of intra-division expenditure, divisions with a higher dissipation rate also receive more rents. In what follows, we provide an example for each of these two cases. We again assume that  $f$  takes the form  $f(x) = x^\gamma$ , where  $0 < \gamma \leq 1$ .

**Example 2: Incentives of Faculty Deans.** Frequently, representatives are regular group members who have been elected to act on behalf of the group. In universities, for instance, faculty deans are usually regular professors who head the faculty for a prespecified time period. As the dean must share the faculty budget with other faculty members, his incentives to lobby on behalf of the faculty are dulled. The problem is exacerbated if the sharing is the result of a costly intra-faculty conflict where additional resources are wasted.

Consider first the intra-faculty conflict. Clearly, equilibrium expenditure in this conflict is given by (7). The dean's valuation in the inter-faculty conflict is thus

$$\lambda_k = \frac{1}{N_k} - \gamma \frac{N_k - 1}{N_k^2},$$

which is decreasing in  $N_k$ . Hence deans of larger faculties have lower valuations. Primarily, this is because an extra dollar going to a larger faculty must be shared with more professors. As the dissipation rate is increasing in faculty size, this also means that faculties where a greater fraction of funds is dissipated receive less funds than faculties where only little is dissipated.

Consider finally the choice between different application rules mentioned at the end of Section 2. For simplicity, assume again that  $K = 2$ . By (6), aggregate expenditure under the one-round application rule where professors from all faculties directly apply for funds at the university level is

$$Nr^* = \gamma \frac{N - 1}{N}.$$

In contrast, under a sequential application procedure faculties must first compete for greater faculty budgets. Subsequently, professors within a faculty may apply for a personal share of the faculty budget. From (11), we have that aggregate expenditure in the inter-faculty conflict is

$$\sum_{l=1}^2 s_k^* = \gamma \frac{\prod_{l=1}^2 \lambda_l^\gamma}{(\sum_{l=1}^2 \lambda_l^\gamma)^2} \sum_{l=1}^2 \lambda_l.$$

The share of the overall budget going to faculty  $k$  is given by (9). Accordingly, combined rent-seeking expenditure in the two intra-faculty conflicts is

$$\sum_{l=1}^2 N_l r_l^{**} = \frac{\gamma}{\sum_{l=1}^2 \lambda_l^\gamma} \sum_{l=1}^2 \frac{N_l - 1}{N_l} \lambda_l^\gamma.$$

Aggregate expenditure in each conflict is the same as in Example 1, with  $\lambda_k$  and  $s_k^*$  being replaced by  $\hat{\rho}_k$  and  $N_k t_k^*$ , respectively. Accordingly, a sequential application rule where first faculties and then professors apply for funds involves strictly lower expenditure than a one-round application rule where professors directly apply for funds.  $\square$

**Example 3: Corrupt Organizations.** Suppose executives at the middle and top level of an organization *personally* benefit from the rent-seeking efforts by the agents below them, e.g., because rent-seeking comes partly in the form of wining and dining or bribes. A novel element here is that not all rent-seeking is wasteful; part of it is merely a utility transfer from agents at the bottom of the organization to agents at the top. This automatically endogenizes division representatives' incentives. As intra-division expenditure is an increasing function of division shares, division representatives, in an effort to maximize subsequent bribes, will seek to maximize division shares.

In particular, suppose a unit of effort expended by lower-level agents increases the utility of agents at the next higher level by  $\delta \in (0, 1)$ . From (7), we then have that the valuation of division  $k$ 's representative in the inter-division conflict is

$$\lambda_k = \delta \gamma \frac{N_k - 1}{N_k}.$$

Unlike Example 2, representatives of larger divisions now have higher valuations, as for any given division share  $\beta_k$  they can expect larger bribes. As division size and dissipation rate are positively related, this also means that a greater fraction of the rent goes to a division where more of it is dissipated away.

One can again compare single-tier and multi-divisional organizations. As rent-seeking is now only partly wasteful, the appropriate efficiency measure is the deadweight loss from rent-seeking, which is strictly lower than aggregate rent-seeking expenditure. The formal analysis is similar to Examples 1 and 2. Unlike these examples, however, there are now parameter ranges where the deadweight loss is lower under the single-tier organization.<sup>7</sup>  $\square$

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<sup>7</sup>This is, for instance, the case if either both  $\gamma$  and  $\delta$  are sufficiently close to one, or if both divisions are sufficiently large.

## 4 Applications

We now apply our framework to study divestitures and corporate reorganization. As in the preceding examples, we assume that  $f$  takes the form  $f(x) = x^\gamma$ , where  $0 < \gamma \leq 1$ . Regarding the inter-division conflict, we assume that all rent-seeking on this level is performed by individual division members.

### 4.1 Divestiture of Unrelated Divisions

Suppose a firm has two divisions with  $N_k$  units (e.g., projects, departments) each. The two divisions are unrelated, i.e., there are no synergy gains. The question is whether the firm should retain both divisions or spin one of them off. We again normalize the firm's rent to one. If the firm is disintegrated, the rent associated with a stand-alone firm is  $z_k > 0$ , where  $\sum_{k=1}^2 z_k = 1$  underscores that the two divisions are unrelated.

Consider first the two divisions in isolation. By analogy with (7), aggregate rent-seeking expenditure in the two stand-alone firms is given by

$$\sum_{l=1}^2 N_l r_l^{**} = \gamma \sum_{l=1}^2 \frac{N_l - 1}{N_l} z_l.$$

Aggregate expenditure in the integrated firm is the same as in Example 1. Comparing aggregate expenditure under integration and non-integration, we obtain the following proposition.

**Proposition 3.** *If the two divisions are equal in size, divesting is strictly optimal. In contrast, divesting is never optimal if the two divisions are sufficiently different in size.*

The first statement is straightforward. If  $N_1 = N_2$ , aggregate rent-seeking expenditure in the two stand-alone conflicts is the same as in the two intra-division conflicts. As the multi-divisional firm involves a second, inter-division conflict where additional resources are wasted, divesting is strictly optimal.

As an illustration of the second statement, fix  $N_1$  and let  $N_2 \rightarrow \infty$ . As division 2 grows in size, the public-good problem in this division becomes so big that aggregate expenditure by division 2 in the inter-division conflict tends to zero. Accordingly, (almost) all of the rent goes to division 1. Moreover, to secure this rent, the units in division 1 need to make lower and lower expenditures. In the limit, aggregate expenditure in the multi-divisional firm tends to  $\gamma(N_1 - 1)/N_1$ . In contrast, combined rent-seeking expenditure in the two stand-alone firms tends to  $z_1\gamma(N_1 - 1)/N_1 + \gamma z_2$ , which is strictly more. The general idea is that asymmetries

among divisions tilt the allocation in favor of smaller divisions.<sup>8</sup> Smaller divisions face lower public-good problems, which is why they rent-seek more on the inter-divisional level than larger divisions. As smaller divisions also exhibit a lower dissipation rate, this further implies that a greater fraction of the rent goes to divisions where less is wasted.

Proposition 3 and the subsequent discussion is not meant to provide a “theory” of divestitures. For this, a much richer framework would be needed. Rather, the point is to show that firms with equally strong divisions are likely to face higher influence costs than firms with unequal divisions. The argument is similar to Che and Gale (1998), where caps on campaign expenditures reduce asymmetries among political candidates. The result is that weaker candidates do more lobbying than they otherwise would, with the consequence that overall lobbying expenditures might increase.

An argument frequently found in the literature is that divisions that rent-seek too much should be divested (e.g., Meyer, Milgrom, and Roberts 1992). As the above example shows, this may be misleading. In the example, division 1 is the one that rent-seeks most. And yet, divesting division 1 may have fatal consequences. In particular, it may *increase* overall rent-seeking. The argument, again, is that the only reason why division 2 rent-seeks little is that it faces a strong competitor in division 1. Once division 1 is taken away, rent-seeking in division 2 increases. Models of divisional rent-seeking that have only one division (as, e.g., Meyer, Milgrom, and Roberts 1992) necessarily fail to capture such interaction effects.

## 4.2 U-Form vs. M-Form

The early 1920s witnessed a radical change in the way many large US corporations such as DuPont or General Motors were organized (Chandler 1966). Whereas firms had previously been organized along functional lines (e.g., manufacturing, sales, etc.), with the functional divisions being subdivided into brand, regional, or product subdivisions, they now came to be organized along brand, regional, or product lines, with the divisions being subdivided into functional subdivisions. Chandler refers to the two organizational forms as U- and M-form, respectively.

The merits of the M-form vis-à-vis the U-form are discussed at length in Chandler (1966) and Williamson (1975). One argument of relevance for the theory put forth in this paper is that switching to the M-form “reduced *partisan political input* into the resource allocation process” (Williamson 1975, p. 137–138, emphasis added). Moreover, Williamson attributes

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<sup>8</sup>If  $z$  is a resource, this implies that small divisions receive a disproportionately large share of the resource. If the production technology exhibits decreasing returns to scale there is thus a tradeoff: firms with unequal divisions exhibit lower influence costs but produce at higher marginal cost than firms with equally strong divisions.



the disadvantages of the U-form partly to its inability to cope with expansion. For instance, he argues that “expansion of the U-form enterprise [...] alters the character of the strategic decision-making process in ways that favor attending to other-than-profit objectives” (p. 133).

In the following, we shall explore Williamson’s argument in more detail. Suppose a firm has  $A \geq 2$  functions and  $B \geq 2$  products (or brands or regions). Under the U-form structure, the firm then has  $K = A$  divisions with  $N_k = B$  units each, while under the M-form structure it has  $K = B$  divisions with  $N_k = A$  units each. Along with Williamson, we assume that the units compete for resources (which in turn generate rents). Holding the number of functions fixed, we model expansion as an increase in the number of products, brands, or regions, i.e., an increase of  $B$  vis-à-vis  $A$ .

The analysis in Section 4.1 readily extends to more than two divisions. As both the U- and M-form are symmetric, (5), in conjunction with (8), implies that aggregate rent-seeking expenditure in the inter-division conflict amounts to

$$KN_k t_k^* = \gamma \frac{K-1}{K} \left( \frac{N_k(1-\gamma) + \gamma}{N_k^2} \right). \quad (12)$$

Moreover, from (7) we have that aggregate rent-seeking expenditure in the  $K$  intra-division conflicts is

$$KN_k r_k^{**} = \gamma \frac{N_k - 1}{N_k}. \quad (13)$$

Combining (12)–(13) and rearranging terms, we obtain for the difference in rent-seeking expenditure between the U- and M-form organization

$$AB(r_{kU}^{**} + t_{kU}^* - r_{kM}^{**} - t_{kM}^*) = \gamma^2 \frac{(A-B)(A+B-1-AB)}{A^2 B^2}.$$

Given that  $A, B \geq 2$ , the following result is immediate.

**Proposition 4.** *Suppose a firm has  $A$  functions and  $B$  products (or brands or regions). If  $A > B$  ( $A < B$ ), the U-form involves lower (higher) aggregate rent-seeking expenditure than the M-form, while if  $A = B$  expenditure is the same under both organizational forms.*

In words, aggregate rent-seeking expenditure under the M-form is lower than under the U-form if and only if the firm has fewer functions than products, brands, or regions. This holds for any impact factor  $\gamma \in (0, 1]$ . Hence for small firms with few products or a limited geographical presence, the U-form is better suited. However, as the firms grow in terms of products, brands, or geographical presence, switching to the M-form may become optimal, like Williamson conjectured.

Intuitively, the optimal organizational structure is the one with the greater number of “local” conflicts, or greater degree of decentralization. On the one hand, greater decentralization lowers rent-seeking expenditure on the intra-division level. On the other, it raises expenditure on the inter-division level, since reducing division size lessens the public-good problem in the inter-division conflict. For the specific conflict technology under consideration, the first effect outweighs the second, and the total effect of an increase in decentralization is positive.

## 5 Concluding Remarks

Previous approaches to hierarchical structure in organizations give essentially technological reasons for its existence. Examples include information processing and team theory (Radner 1993), supervision and task assignment (Rosen 1982), the allocation of authority (Hart and Moore 1999) or expert knowledge (Garicano 2000), the coordination of interactions across activities (Harris and Raviv 2000), and the question of rigidity vs. flexibility with respect to the environment (Harrington 1998).

In this paper we have stressed that structure also determines at which, and how many, points in the organization costly influence may be applied in order to divert resources in the absence of complete contracting, and to which extent free-rider incentives will be operative in rent-seeking. We have shown that even in the absence of technological efficiency effects, divisionalization may lower the deadweight losses from distributional conflict in the organization.

In doing this, we have implicitly assumed that organizational structure is a variable that can be controlled by some optimizing agent—e.g., the owner of the firm, or its partners at some *ex ante* constitutional stage. That is, we have studied structure as a form of contract, and shown how it may lessen inefficiencies due to incompleteness in other contracts. But of course organizational structure is also itself subject to influence activities, and cannot really be taken for given. For instance, Pfeffer (1981, p. 266) remarks: “Organizational structures have most frequently been analyzed as a problem in design or engineering, with the issue being how structures can be developed to maximize the organization’s effectiveness. An alternative view [...] looks at structure as being the outcome of a political contest for control within the organization which, at the same time, provides participants with further advantages in the political struggles because of their structural positions.” Along similar lines, Downs (1967), in his classic study of bureaucracy, devotes much time to the incentives for officials to try to expand the size and domain of their bureaus (divisions, departments). Incorporating such behavior into the present framework should be an interesting task for future research.

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