Organizations with Power-Hungry Agents

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Abstract

We analyze a model of hierarchies in organizations in which neither decisions nor the delegation of decisions is contractible and in which power-hungry agents derive a private benefit from making decisions. Two distinct agency problems arise and interact: subordinates make more biased decisions (which favors adding more hierarchical layers), but uninformed superiors may fail to delegate (which favors removing layers). A designer may remove intermediate layers of the hierarchy (eliminate middle managers) or flatten an organization by removing top layers (eliminate top managers). We show that stronger preferences for power result in smaller, less-integrated hierarchies. Our key insight is that hoarding of decision rights is especially severe at the top of the hierarchy.

1. Introduction

Hayek (1945) famously argued that decisions are best made by agents who have relevant, local information.¹ With this information considered exogenous, and in the absence of any private benefits or agency conflicts, this immediately delivers a clear theory of the internal structure of organizations—in particular, to whom decision rights should optimally be allocated.

Following from this fundamental observation, a large literature studies the optimal design of organizations, both in the presence of agency costs and without

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¹ As Hayek (1945, p. 524) puts it, "If we can agree that the economic problem of society is mainly one of rapid adaptation to changes in the particular circumstances of time and place, it would seem to follow that the ultimate decisions must be left to the people who are familiar with these circumstances, who know directly of the relevant changes and of the resources immediately available to meet them."

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Figure 1. Decentralization and power distance index by country (from Bloom, Sadun, and Van Reenen 2012, p. 1688).

them.² This has deepened our understanding of how organizations—especially firms—are structured, how decision rights are allocated, how effectively information is communicated internally, and what decisions are ultimately made.

Yet a significant body of experimental evidence points to an agency problem in the design of organizations. For many individuals, decision rights carry an intrinsic value beyond their instrumental benefits for achieving certain outcomes (Bartling, Fehr, and Herz 2014). This literature finds a substantial underdelegation of decision rights (Fehr, Herz, and Wilkening 2013), as subjects are willing to sacrifice expected earnings to retain control. Relatedly, in an empirical study surveying 100,000 IBM employees across 50 countries in the 1970s, Hofstede (2001) documents substantial variation in cultural attitudes toward hierarchy and authority, which is summarized in a country-specific power distance index. As shown in Figure 1, Bloom, Sadun, and Van Reenen (2012) find that the power distance index is strongly correlated with their own decentralization index, which captures the autonomy of plant managers in a 2006 cross-industry survey averaged by country.

Building on this literature, this paper moves away from the optimal-design paradigm by considering a model in which managers may be power hungry: they may get rents from making decisions themselves rather than delegating them to

² Early important contributions include Chandler (1962), which emphasizes the link between a firm's organizational structure and the strategy it pursues, and Marschak and Radner (1972), which introduces the formal analysis of working in teams and led to an entire literature on team theory. The importance of agency costs in organizational design was first noted in Berle and Means (1932), and these have played an important role in much of the organizational economics literature, just as they have in corporate finance in thinking about the private benefits of control and the optimal structure of voting rights.

a subordinate. A direct consequence is that delegation decisions are subject to moral hazard.

Our model can be used to shed light on important questions. What is the optimal number of layers in a hierarchy? When do middle managers destroy value? What is the optimal scope of a firm? When does integrating two sets of activities by putting them under common control of a top manager add or destroy value?

We show that while having larger power rents results in excessive centralization for a given hierarchical organization and firm size, the presence of powerhungry managers also results in a flattening of the organization and smaller, less integrated firms. Intuitively, the anticipation of a lack of delegation makes it optimal to flatten, which forces decisions to be made by agents with better local information. Interestingly, we show that the hoarding of decisions tends to be most severe at the top of the organization. As a result, under certain regularity conditions, hierarchical layers at the top are the first to be removed when preferences for power become stronger. This is consistent with the observation that firms and hierarchies in developing economies (in which decision rents are arguably larger) tend to be both smaller and more centralized (Bloom et al. 2013; Hsieh and Klenow 2014).

1.1. The Model

Formally, we consider an organization involved in a set of activities, each of which requires an action to be undertaken and each of which is assigned to a hierarchy of managers. One can think of a delegation hierarchy consisting of a chief executive officer (CEO), followed by a division manager, a subdivision manager, and a department manager, with each subsequent manager being assigned a subset of the activities of his superior. Managers are probabilistically informed about the optimal decision and can delegate to lower-level managers when uninformed.

The organization faces two types of agency problems. The first is familiar from the delegation literature (see, for example, Aghion and Tirole 1997; Dessein 2002). Managers are biased when taking an action, and delegation therefore entails a loss of control. Concretely, managers are assigned a subset of the organization's activities and do not internalize externalities for activities not assigned to them. Lower-level managers are assigned a smaller set of activities and are therefore more biased. The second agency problem is novel and concerns the delegation of the decision. Managers are power hungry in that they earn a private benefit if they make the decision themselves. They may therefore hoard decision rights, even when uninformed.

The tools of the organization designer are limited in our model. In the spirit of the incomplete-contracting literature,³ neither decisions nor the delegation of decisions is contractible. Moreover, managers do not respond to monetary incentives. The organization designer, however, can remove layers of management to

³ The pioneering contributions are Grossman and Hart (1986) and Hart and Moore (1990). See Aghion and Holden (2011) and Dessein (2014) for overviews of the ensuing literature.

keep managers from hoarding decision rights. For example, she can remove the CEO or top manager so that the initial decision right is delegated by default to the next layer of management. Alternatively, she can flatten the hierarchy by removing intermediate layers of middle management. In the limit, only the lowest-level manager remains, who is assumed to be perfectly informed about the optimal decision but ignores any externalities for other activities. This limit corresponds to a set of unintegrated, stand-alone activities.

1.2. The Results

In the absence of preferences for power, additional layers always improve outcomes, and similarly, integrating disjointed sets of activities always adds value. Intuitively, adding layers allows for a better internalization of externalities provided that the new middle or top managers are at least sometimes informed. Naturally, the presence of power-hungry managers may overturn this conclusion. An uninformed middle or top manager may then hoard decision rights, which prevents better-informed lower-level managers from making informed, albeit somewhat biased, decisions. Our setup thus gives a rather direct answer to the selective intervention puzzle of Williamson (1985): why is integration not always value increasing? By assumption, selective intervention is subject to a moral-hazard problem in our model: managers may intervene and centralize decision-making even when delegation is optimal. In this sense, managers who are more power hungry decrease the value of managers at all hierarchical levels.

More surprisingly, our model shows that the inefficient hoarding of power tends to be more severe at the top of the organization. While all layers of a hierarchy are valuable when preferences for power are weak, under certain regularity conditions, layers at the top are the first to be removed when preferences for power become stronger.

To see this, consider a three-layer hierarchy consisting of the president of a university (top manager), the dean of the business school (middle manager), and the chair of the economics division (lower-level manager). Assume that both president and dean are equally power hungry and equally likely to be informed about a particular decision pertaining to the economics division. The dean is biased, as she mainly cares about the well-being of the business school. The chair is even more biased, as she cares mainly about the glory of her division. The chair, however, is also perfectly informed about the decision at hand. Imagine that a new professor in health care economics who will also lead a university-wide center in which the business school is a key partner must be hired.

In the absence of preferences for power, it is optimal to allocate the hiring decision to the president. Indeed, the president is unbiased and will optimally delegate hiring to the dean if uninformed. An uninformed dean, in turn, optimally delegates to the chair. For intermediate preferences for power, however, it often becomes optimal to give the business school independence over hiring. The reason is that an uninformed president is less likely to delegate than an uninformed dean. Since the hoarding of decision rights is inefficient, a biased dean who delegates when uninformed is then often preferred over an unbiased president who makes all decisions by himself.

Why is the president more reluctant to delegate than the dean? To see this, note first that the preferences of dean and chair are more aligned than the preferences of president and chair. As a result, the dean has a greater willingness to delegate to the chair than the president does. But what if the preference alignment between president and dean is similar to that between dean and chair? Are the incentives to delegate to the next layer not identical for president and dean? They are not. An uninformed dean can rely on the chair always making an informed (albeit biased) decision. In contrast, the president knows that the dean is often uninformed and then delegates to the chair. Such redelegation results in a very biased decision from the president's perspective. As a result, the president has strictly weaker incentives to delegate than the dean and often fails to do so even though it is efficient. A smaller hierarchy—dean to chair rather than president to dean to chair—may then result in better decision-making. Note that in the latter case, a dean-to-chair hierarchy is also strictly preferred over a president-to-chair hierarchy, as the president would not delegate to the chair when uninformed.

Finally, if preferences for power are very strong, neither president nor dean ever delegates. If they are frequently uninformed, it is then optimal to have no hierarchy at all (and let the chair always decide). Of course, such delegation may not be credible, in which case there is inefficient centralization of decision-making.

Beyond comparative statics with respect to the magnitude of decision rents which generally result in smaller, less-layered organizations—we show that the value of both top and middle managers tends to be nonmonotonic in the uncertainty surrounding the decision and in the bias and expertise of their subordinates. Intuitively, while an increase in the bias of subordinates makes a superior more valuable, this also makes it more likely that the latter will inefficiently hoard decision rights. As a result, a manager is least likely to be valuable for intermediate values of bias and expertise of her subordinates. This yields the counterintuitive result that an increase in externalities between activities may initially result in fewer layers of management and less centralization. This finding shows how preferences for power may reverse a standard result in the delegation literature (Dessein 2002; Alonso, Dessein, and Matouschek 2008).

1.3. The Literature on Hierarchies and Firms' Boundaries

Our paper follows Alchian and Demsetz (1972, p. 778) in viewing the "*team* use of inputs and a centralized position of some party in the contractual arrangement of *all* other inputs" as a central feature of firms. As argued by Alchian and Demsetz, team production often makes it hard to meter the productivity of individual agents, who may shirk as a consequence. In our model, such shirking takes the form of lower-level managers maximizing divisional as opposed to firm output. In turn, this creates a role for a central player (the top manager in our

model) who is a residual claimant and coordinates the production of the lowerlevel agents. The contribution of our paper is to add a novel cost to having such a central player: a top manager may intrinsically value and abuse the power that stems from this centralized position.

We further deviate from Alchian and Demsetz (1972) in recognizing the role of noncontractible decisions (Grossman and Hart 1986) and hence decision rights in organizations. As a result, the paper perhaps closest to ours is Hart and Moore (2005), in which the authors analyze a model of the design of hierarchies in a setting in which agents perform different tasks (coordination versus specialization). The key assumption they make, however, is that decisions are made hierarchically: the senior person in the hierarchy who has an idea about a decision makes it. Agents never actively choose whether to delegate. In this setting, Hart and Moore study when, for a given number of agents, generalists (or coordinators) should be senior to specialists. Unlike ours, their model does not speak to the optimal number of hierarchical layers in an organization.

Also closely related to our paper is Aghion and Tirole (1997). The authors consider a setting in which there are two agents, one of whom has formal authority to make a decision.⁴ The agents, however, are probabilistically informed about a decision, and the likelihood of being informed depends on privately costly, noncontractible effort. They show that the agent who has formal authority may not have real authority in the sense that she will not make the decision very frequently because she optimally puts little effort into having an idea. Unlike us, Aghion and Tirole focus on ex ante incentives for effort rather than delegation of decision rights in a multilayer hierarchy.

The two papers discussed above focus on the role of hierarchies in making decisions when information is dispersed and agents have conflicting preferences. Other models in this class of decision hierarchies include Dessein (2002), Alonso, Dessein, and Matouschek (2008), Rantakari (2008), Hart and Holmstrom (2010), and Dessein, Garicano, and Gertner (2010).⁵ Decentralization, or removing the top layer, in a decision hierarchy may be optimal because centralization results in a distortion of information (Dessein 2002), because it demotivates information acquisition (Aghion and Tirole 1997), or because the top manager is biased (Hart and Holmstrom 2010). Unlike in our model, the principal or top manager is always valuable if she is, on average, a better decision maker than the agent. Together with Hart and Moore (2005), our paper is novel in offering a theory of hierarchies with more than two layers.

Another strand of literature focuses instead on how hierarchies facilitate the division of labor in information processing or problem solving (Radner 1993; Bolton and Dewatripont 1994; Garicano 2000; for a review, see Garicano and

⁴ Baker, Gibbons, and Murphy (2002) analyze a repeated-game version of the model in Aghion and Tirole (1997) and show how the desire to build a reputation can sustain delegation to a subordinate even when it is not an equilibrium in the one-shot game.

⁵ Harris and Raviv (2002) and Alonso, Dessein, and Matouschek (2015) study decision hierarchies in a team theoretical setting in which there are no incentive conflicts but communication is limited.

Van Zandt 2013). While this approach allows the study of large, multilayered organizations, communication costs (such as delay) rather than incentive conflicts determine the optimal organizational structure.⁶

1.4. The Literature on Preferences for Power

Social psychologists have long argued that power is a basic human need. Power is one of five categories in the system of needs that Murray (1938) describes. In his human motivation theory, McClelland (1961, 1975) proposes that most people are consistently motivated by one of three basic desires: the need for affiliation (or being liked by others), the need for achievement, and the need for authority or power. The intrinsic value of autonomy is also at the center of the self-determination theory of Deci and Ryan (1985). In economics, private benefits of control and preferences for power play a central role in the corporate finance literature (for example, Aghion and Bolton 1992; Hart and Moore 1995; Dyck and Zingales 2004) and the organizational economics literature (Aghion and Tirole 1997).⁷

Perhaps the clearest evidence that decision rights carry an intrinsic value, beyond their instrumental benefits for achieving certain outcomes, is presented in Bartling, Fehr, and Herz (2014). The authors develop an approach that rules out alternative explanations based on regret and ambiguity aversion and show through an experiment that the intrinsic value of decision rights is both significant (on average 17 percent of the monetary payoffs associated with a decision)⁸ and correlated across individuals and game parameterizations. Interestingly, higher stakes are associated with proportionally higher intrinsic values. These results confirm similar results from Owens, Grossman, and Fackler (2014), who find that individuals are willing to sacrifice expected earnings to retain control,⁹ and Fehr, Herz, and Wilkening (2013), who find a significant underdelegation of decision rights from principals to agents in settings in which delegation is clearly optimal.¹⁰ Evidence on the private benefits of autonomy can also be found in the entrepreneurship literature. Nonpecuniary motives such as the desire to be one's own boss are a major self-reported driver of the decision to enter selfemployment (Hurst and Pugsley 2011), and entrepreneurs typically forgo substantial earnings when becoming self-employed (Hamilton 2000; Moskowitz and Vissing-Jørgensen 2002).

⁶ Calvo and Wellisz (1979) emphasize the role of hierarchies in monitoring effort. Their focus is on explaining wage differentials across layers rather than organizational structure.

¹⁰ See also Sloof and von Siemens (2017), who point to overconfidence and an illusion of control as a source of preferences for power.

⁷ In those literatures, control may either convey tangible benefits or be more psychic in nature. Both interpretations are consistent with our model.

⁸ Bartling, Fehr, and Herz (2014) compare the certainty equivalents of delegation lotteries and nondelegation lotteries, as all decisions are risky.

⁹ Owens, Grossman, and Fackler (2014) find that the average participant is willing to sacrifice 8–15 percent of expected earnings to control their own payoff. Interestingly, Pikulina and Tergiman (2020) show how individuals are willing to accept a lower payoff for themselves in exchange for power over the payoff of others.

The paper proceeds as follows. Section 2 illustrates the model for the simplest case when there are two workers and, potentially, one manager. Section 2 also highlights our main assumptions and shows how some central results in the delegation literature may be overturned when there is moral hazard in delegation. Section 3 then considers three-level hierarchies with middle managers and a top manager. Section 4 concludes by discussing some empirical implications of our model and future avenues of research.

2. Two-Level Hierarchies

To illustrate the basic assumptions that lead to moral hazard in delegation, we first consider a simple example. In this example, the organization consists of at most two levels: a manager and two workers.

2.1. A Delegation Hierarchy with Two Levels

Consider an organization engaged in two activities $s \in \{s', s''\}$. Each activity *s* is associated with an action choice *a*, and generates a payoff

$$\pi_s = \pi_s(\theta_s, a_s, a_{-s}) = 2(\theta_s a_s - \mu a_{-s}) - a_s^2,$$

where θ_s is an activity-specific independently and identically distributed shock with variance σ_{θ}^2 and $\mu > 0$ is an exogenous parameter that reflects externalities between the two activities.

By default, each activity $s \in \{s', s''\}$ is assigned to a worker $w \in \{w', w''\}$, who observes θ_s . In addition, both activities may be assigned to a manager m, who observes θ_s with probability p < 1. If m is part of the organization (see the discussion of organization design below), then the initial decision right over a_s is owned by m. An uninformed m however, may choose to delegate the decision right for a_s to the relevant worker who always observes θ_s .

When choosing a_s , the workers and the manager maximize the payoffs of the activities assigned to them. These preferences are taken as exogenous but can be viewed as stemming from career concerns, the ability of agents (workers or the manager) to divert a fraction of the profits of activities assigned to them, or the intrinsic reward agents experience when the activities are successful. In addition, agents are power hungry in that they derive a private benefit r(s) > 0 from choosing a_s . This private benefit can be viewed as the intrinsic value of making a decision (as in Bartling, Fehr, and Herz 2014). Alternatively, one can think of a_s as a complex, multidimensional action, with some aspects of a_s affecting organizational payoffs and other aspects affecting private (even psychological) benefits of workers. Managers are power hungry in that they derive a private benefit from choosing a_s . We allow r(s) to be either deterministic or a random variable with a cumulative distribution function $F(\cdot)$ on support [0, R] or $[0, \infty)$. As shown by Bartling, Fehr, and Herz (2014), situational determinants may affect the intrinsic

value of decision rights.¹¹ Similarly, nonpsychological private benefits of control may depend on opportunities that arrive stochastically or are specific to individual managers.

The organization designer has limited instruments. Neither decisions nor the delegation of decisions is contractible. Moreover, neither the workers nor the manager responds to monetary incentives. The organization designer however can decentralize decision-making by removing the manager.

2.2. Discussion of the Model

We now pause briefly to discuss some of the modeling choices we have chosen to make. First, as in the career concerns literature pioneered by Holmstrom (1999), we abstract from monetary incentives to motivate managers and instead assume that managers focus on maximizing the payoffs of the activities assigned to them. The novel component of our model is that agents are power hungry. One can therefore think of the firm as being able, to some degree, to pay with power instead of with cash. Indeed, in some circumstances the presence of this preference for power can be beneficial to the firm in the richer setting in which the firm needs to satisfy the manager's participation constraint, and cash incentives are required in addition to private benefits or career concerns.

Second, we abstract from competition and instead focus on the internal organization of the firm. Like other incomplete-contracting models, both on the boundary of the firm (for example, Grossman and Hart 1986; Hart and Moore 1990) and on the allocation of authority in organizations (for example, Aghion and Tirole 1997), we do not put firms in a market setting. This is for reasons of both tractability and clarity. Embedding second-best models in equilibrium environments makes it hard to understand the important within-firm effects of the main features of such models.¹²

That said, the intensity of product-market competition does seem to play a role in the well-established trend that firms are flattening their hierarchies. That trend has been demonstrated in many studies such as Osterman (1996), Whittington et al. (1999), and Rajan and Wulf (2006). And causal evidence for product-market competition driving this trend is offered by Guadalupe and Wulf (2010). In our model it is preferences for power that drive the flattening of firms. We thus see our contribution as complementary to other explanations for this phenomenon.

Third, we do not consider competition in the market for managers. As with a standard critique of behavioral economics—that behavioral biases might be ame-

¹¹ People prefer to delegate if it allows them to shift responsibility for unpleasant outcomes (Bartling and Fischbacher 2012), which suggests that r(s) may even be negative. More generally, many other situational determinants likely affect how much agents (intrinsically) value making decisions.

¹² Two partial exceptions are Fershtman and Judd (1987), which considers a principal-agent model in a Cournot oligopoly setting, and Gibbons, Holden, and Powell (2012), which examines an incomplete-contracting model in the spirit of Grossman and Hart (1986) in rational expectations equilibrium.

liorated by competitive forces—one wonders whether, when power hungriness is undesirable, market forces may drive out managers who are too power hungry.

To this we have a number of responses. First, we show that power-hungry managers can be valuable in some circumstances and value reducing in others. It is thus unclear that power-hungry managers would be driven out of the labor market, as they are sometimes valuable. Second, since preferences for power are not observable or contractible, it is also unclear that market forces would work in the standard way. Put differently, in our context there is no first welfare theorem in the market for managers because of hidden information and incomplete markets.

2.3. Expected Payoffs and Moral Hazard in Delegation

Since the manager cares about the payoffs of both activities, she will choose the first-best action $a_s = a_s^* \equiv \theta_s - \mu$ when informed and $a_s = E(\theta_s) - \mu$ when uninformed. The workers are always informed but care only about the payoffs of the activities assigned to them. When delegated authority, they therefore choose $a_s = \theta_s$.

Informed Manager as Decision Maker. Let us denote $U_{\rm m}$ the expected payoffs of the manager and $U_{\rm w'}$ and $U_{\rm w''}$ the expected payoff of workers w' and w''. If an informed manager chooses both actions, this yields expected payoffs

$$U_{\rm m} = \Pi^* + r(\mathbf{s}') + r(\mathbf{s}'')$$

and

$$U_{w'} = U_{w''} = \frac{\Pi^*}{2},$$

where Π^* are first-best profits:

$$\Pi^{\star} = \sum_{s \in \{s', s''\}} E[\pi_s(\theta_s, a_s^{\star}, a_{-s}^{\star})].$$

Workers as Decision Makers. By contrast, if workers w' and w'' are the decision makers, then payoffs are given by

$$U_{\rm m} = 11^* - 2\mu^2,$$

$$U_{w'} = \frac{\Pi^*}{2} - \mu^2 + r(s'),$$

and

$$U_{w''} = \frac{\Pi^*}{2} - \mu^2 + r(s'')$$

Note that shifting decision rights from an informed manager to the workers results both in an efficiency loss μ , as workers do not internalize externalities on

each other's activities, and in a shift of the private benefits of control, r(s') and r(s''), from the manager to the workers.

Uninformed Manager as Decision Maker. Finally, if an uninformed manager chooses both actions, then

$$U_{\rm m} = \Pi^* - 2\sigma_{\theta}^2 + r(s') + r(s'')$$

and

$$U_{\mathbf{w}'} = U_{\mathbf{w}''} = \frac{\Pi^{\star}}{2} - \sigma_{\theta}^2.$$

Observe that an uninformed manager optimally delegates authority over a_s to worker *w* if and only if

$$\sigma_{\theta}^2 \ge \mu^2.$$

An uninformed manager, however, delegates only if

$$\sigma_{\theta}^2 \ge \mu^2 + r(s)$$

Whenever $r(s) > \sigma_{\theta}^2 - \mu^2$, there is moral hazard in delegation: the manager inefficiently hoards decision rights.

Remark 1. Assume that $\sigma_{\theta}^2 - \mu^2 > 0$, so delegation is optimal whenever the manager is uninformed. Whenever $r(s) > \sigma_{\theta}^2 - \mu^2$, there is moral hazard in delegation: an uninformed manager inefficiently holds on to decision rights.

2.4. When Is a (Power-Hungry) Manager Valuable?

With at most two layers, organization design is reduced to a single question: when is it optimal for the organization to have a manager? That is, when is centralized decision-making optimal?

If the manager has no preferences for power (r(s) = 0), she always adds value. With probability p she is informed, and she chooses the first-best action a_s^* . With probability 1 - p, she is uninformed, and she delegates to the worker below her whenever this is optimal, that is, whenever $\sigma_{\theta}^2 \ge \mu$.

With preferences for power, this need not be the case. On the plus side, the manager then internalizes externalities between activities. On the minus side, the manager may hoard decision rights because of her preference for power, and this creates an inefficiency. Formally, an uninformed manager delegates a_s if and only if

$$r(s) \leq \overline{r} \equiv \sigma_{\theta}^2 - \mu^2.$$

On the one hand, with probability $(1 - p)[1 - F(\overline{r})]$, the manager makes an uninformed decision, which reduces payoffs by $\sigma_{\theta}^2 - \mu^2$ relative to an organization in which authority is directly allocated to the workers. On the other hand, with probability *p*, the presence of a manager increases efficiency by μ^2 , as she internalizes externalities between activities when informed. Finally, with proba-

bility $(1 - p)F(\overline{r})$, the presence of a manager does not affect payoffs, as she delegates efficiently. It follows that a manager is valuable

$$\Leftrightarrow p\mu^2 \ge (1-p)[1-F(\overline{r})](\sigma_\theta^2 - \mu^2),$$

which can be rewritten as

$$p\sigma_{\theta}^{2} + (1-p)F(\overline{r})\overline{r} > \overline{r}.$$
(1)

This immediately leads to proposition 1.

Proposition 1. Assume that $\sigma_{\theta}^2 - \mu^2 > 0$. Decentralization of authority (no manager) is optimal whenever $p < \overline{p}$, with \overline{p} given by

$$\overline{p}\sigma_{\theta}^{2} + (1 - \overline{p})F(\overline{r})\overline{r} = \overline{r},$$

where $\overline{r} \equiv \sigma_{\theta}^2 - \mu^2$. The threshold \overline{p} is strictly positive whenever $F(\overline{r}) < 1$, in which case an increase in preferences for power (a downward shift in F(.) in the sense of first-order stochastic dominance) strictly increases \overline{p} .

Proposition 1 yields two compelling comparative statics. First, a manager (or centralization) is valuable only if she is sufficiently likely to be informed and when preferences for power are not too strong. Intuitively, hoarding decision rights is costly only when m is uninformed. If p = 1, the manager is always valuable, regardless of her preferences for authority. If p = 0, the manager is never valuable. Second, the value of a manager depends on her preferences for power. In particular, an upward shift in F(.) in the sense of first-order stochastic dominance makes it more likely that a manager is valuable. She then has weaker preferences for power and hence is less likely to inefficiently hoard decision rights when uninformed.

Perhaps surprisingly, comparative statics with respect to the other two parameters μ and σ_{θ}^2 are ambiguous. Inspecting expression (1), we see that a decrease in $\overline{r} = \sigma_{\theta}^2 - \mu^2$ not only reduces the value of decentralization to the workers (right-hand side) but also reduces the probability $F(\overline{r})$ that the manager delegates to the workers. Intuitively, an increase in the incentive conflict of the workers exacerbates the moral hazard in delegation faced by their manager: she is less willing to delegate, even though delegation remains optimal whenever she is uninformed. As a result, when workers become more biased (an increase in μ), it may become optimal to remove the manager and decentralize authority to workers.

Proposition 2. A decrease in $\overline{r} \equiv \sigma_{\theta}^2 - \mu^2$ —that is, an increase in the workers' bias or a decrease in their informational advantage—may result in removal of the manager and decentralization of authority to the workers.

Proposition 2 stands in contrast to standard models in the delegation literature (see Dessein 2002; Alonso, Dessein, and Matouschek 2008; Rantakari 2008). Those models have the unambiguous prediction that decisions are less likely to be delegated to the agent when conflicts of interest are larger.

S274

To provide more intuition for our result, we consider two distributions for r(s) and show that whenever p is small, an increase in the workers' bias μ initially results in a removal of the manager and decentralization of decision rights to those same workers.

Proposition 3. Assume that r(s) is uniformly distributed on [0, R] with $R < \sigma_{\theta}^2$ or that r(s) is deterministic, that is, $r(s) \equiv r < \sigma_{\theta}^2$. If p is sufficiently small, then decentralization (no manager) is optimal for intermediate values of workers' bias μ , whereas centralization (a manager) is optimal for μ sufficiently small or sufficiently large.

We first show this result for uniformly distributed decision rents. We subsequently consider deterministic decision rents.

Case 1: Uniformly Distributed Decision Rents. Assume first that r(s) is uniformly distributed on [0, R] with $R < \sigma_{\theta}^2$. For simplicity, we normalize all parameters so that σ_{θ}^2 equals 1. If $R < 1 - \mu^2$, an uninformed manager always delegates, so she is valuable regardless of p. In contrast, if $R > 1 - \mu^2$, an uninformed manager delegates with probability $F(\overline{r}) = (1 - \mu^2)/R$. From proposition 1, decentralization to the workers (no manager) is then optimal:

$$\Leftrightarrow p < \overline{p} \equiv (1 - \mu^2) \frac{R - (1 - \mu^2)}{R - (1 - \mu^2)^2}.$$
 (2)

It is now easy to verify that \overline{p} is hump shaped in μ : $\overline{p} = 0$ for $\mu^2 < 1 - R$, \overline{p} is increasing in μ for $\mu^2 \in [1 - R, \sqrt{1 - R}]$, and \overline{p} is decreasing in μ for $\mu^2 > \sqrt{1 - R}$. Let \hat{p} denote the maximized value of \overline{p} in expression (2). It follows that for $p < \hat{p}$, installing a manager is optimal if the workers' incentive conflict μ is small, but an increase in μ will eventually result in the manager's removal.

Result 1. There exists a $\hat{p} > 0$, such that

1) for $p < \hat{p}$, decentralization (no manager) is optimal for intermediate values of μ . Centralization is optimal for μ sufficiently small or large.

2) For $p > \hat{p}$, centralization (a manager) is always optimal.

Figure 2 plots \overline{p} as a function of μ and R = .9. When the manager is not likely to be informed (p is small), an initial increase in the agency conflict of the workers (an increase in μ) makes it optimal to remove the manager and decentralize authority to those workers. Intuitively, for intermediate values of μ , the moralhazard problem in the delegation of the decision then outweighs the agency problem in the decision.

Case 2: Deterministic Private Benefits. Assume now that r(s) = r, so an uninformed manager delegates if and only if $\mu^2 < \mu_L \equiv \sigma_{\theta}^2 - r$. If $\mu^2 > \mu_L$, the manager never delegates, and decentralization (no manager) is optimal whenever $\mu^2 < \mu_H \equiv (1 - p)\sigma_{\theta}^2$.

Result 2. Assume that $p < \hat{p} \equiv r/\sigma_{\theta}^2$; then decentralization (no manager) is



Figure 2. Optimal hierarchy when R = .9

optimal for $\mu^2 \in (\mu_L, \mu_H)$ with $\mu_L < \mu_H$, whereas centralization (a manager) is optimal for $\mu^2 < \mu_L$ or $\mu^2 < \mu_H$.

2.5. When the Top Manager Is Also the Organization Designer

A somewhat counterintuitive implication of proposition 1 is that an increase in the manager's preferences for power may result in more delegation of authority to workers, as it becomes optimal to remove the manager. In certain instances, however, such as family-run firms or owner-manager firms, the manager is the organization designer.

It is trivial to see that the manager never wants to remove herself.¹³ As a result, in a two-layer hierarchy, stronger preferences for power then unambiguously result in less worker authority. In multilayer hierarchies this is not necessarily the case. Indeed, the top manager may then inefficiently hold on to power, but she will optimally remove middle layers of management when preferences for power increase.

Example. Consider the same setup as above, but let there be one additional layer—the CEO—who observes θ_s with independent probability $p_0 > 0$ and derives a private benefit $r_0(s)$ from choosing a_s . When uninformed, the CEO delegates to manager m, delegates to the workers, or makes an uninformed decision.

Assume that $r_0(s)$ (private benefits for the CEO) and r(s) (private benefits for the manager) are independently and identically uniformly distributed on [0, R]. Proposition 1 still holds. The CEO removes manager m from the hierarchy whenever $p < \overline{p}(R)$, with $\overline{p}(R)$ given by expression (2) and increasing in R. What is now the impact of an increase in preferences for power (an increase in R)? To see this, let R_1 and $R_2 > R_1$ be such that $\overline{p}(R_1) . An increase in <math>R$ from R_1

¹³ This result stands in contrast to Aghion and Tirole (1997), Dessein (2002), and Alonso, Dessein, and Matouschek (2008), where a principal may (selfishly) benefit from such an ex ante commitment to delegate authority to an agent.

to R_2 then results in flattening and often more delegation to the workers. In contrast, an increase in *R* from R_0 to $R_1 > R_0$ unambiguously results in less delegation to the workers.

3. Three-Level Hierarchies

Section 2 shows how, when managers are power hungry, hierarchical decisionmaking is valuable only when the manager is sufficiently knowledgeable. Most hierarchical organizations, however, have multiple layers of management. In this section, we examine how preferences for power affect the structure of multilayered hierarchies. We consider the following generalization of the model presented in Section 2.

3.1. A Delegation Hierarchy with Three Levels

Consider an organization engaged in four activities $s \in \{1, 2, 3, 4\}$ that are partitioned into two divisions $D_A = \{1, 2\}$ and $D_B = \{3, 4\}$.¹⁴ Each activity *s* is associated with an action choice a_s that must be responsive to an activity-specific independently and identically distributed shock θ_s with variance σ_{θ}^2 but also take into account externalities on other activities Concretely, organizational payoffs are given by

$$\pi \equiv \sum \pi_s,$$

where the payoffs of activities $s \in D_A$ are given by

$$\pi_1 \equiv \pi_1(\theta_1, a_1, a_{-1}) = 2(\theta_1 a_1 - \mu_1 a_2) - \mu_E(a_3 + a_4) - a_1^2$$

and

$$\pi_2 \equiv \pi_2(\theta_2, a_2, a_{-2}) = 2(\theta_2 a_2 - \mu_1 a_1) - \mu_E(a_3 + a_4) - a_2^2,$$

where μ_{I} reflects externalities in the same division and μ_{E} reflects externalities between divisions. Similarly, the payoffs of activities $s \in D_{B}$ are given by

$$\pi_3 \equiv \pi_3(\theta_3, a_3, a_{-3}) = 2(\theta_3 a_s - \mu_1 a_4) - \mu_E(a_1 + a_2) - a_3^2$$

and

$$\pi_4 \equiv \pi_4(\theta_4, a_4, a_{-4}) = 2(\theta_4 a_s - \mu_{\rm I} a_3) - \mu_{\rm E}(a_1 + a_2) - a_4^2.$$

We further denote divisional payoffs $\pi_A \equiv \pi_1 + \pi_2$ and $\pi_B \equiv \pi_3 + \pi_4$.

The organization employs four workers $w \in \{1, 2, 3, 4\}$. Activity *s* is assigned to worker *w*, who observes θ_s (but not θ_{-s}). In addition, the organization can employ two middle managers $m_K \in \{m_A, m_B\}$ and/or one top manager M_0 . If employed, middle manager $m_K \in \{m_A, m_B\}$ observes θ_s with probability $p_m < 1$ if and only if $s \in D_K$. Similarly, if employed, top manager M_0 observes θ_s with independent prob-

 $^{^{14}}$ In a previous draft, we considered a more general model with *n* activities and *m* divisions and obtained a qualitatively similar result. Restricting attention to four activities substantially saves on notation.



Figure 3. Four possible organization designs

ability $p_0 < 1$ for all $s \in \{1, 2, 3, 4\}$. We denote the organizational hierarchy by the set of managers *M* in the organization.

Restricting attention to symmetric organizations (wlog), our model allows for four possible organizational designs, shown in Figure 3. The first is the three-level hierarchy $M = \{M_0, m_A, m_B\}$, in which a top manager sits above two middle managers, who in turn sit above four workers. A second possibility is an integrated two-level hierarchy in which, relative to the first organization, the two middle managers are removed, so the top manager sits directly above the four workers: $M = \{M_0\}$. A third possibility is an unintegrated two-level hierarchy in which the two middle managers sit above the workers, and the top manager is removed, that is, $M = \{m_A, m_B\}$. Finally, it is possible to have stand-alone activities, for which there are only the four workers in the organization; that is, $M = \emptyset$.

If $M_0 \in M$, then the initial decision right over a_s is owned by the top manger M_0 . An uninformed M_0 however may choose to delegate the decision right about a_s to either worker w or middle manager m_K (if $m_K \in M$). Similarly, if middle manager $m_K \in M$ is delegated the decision right over a_s , she may delegate it to worker w if she is uninformed. Worker w, finally, always selects a_s when delegated authority.

Section 3.1.2 discusses these assumptions in more detail, including how decision rights over activities can be conveyed through control over activity-specific, division-specific, and organization-wide assets. Neither decisions nor the delegation of decisions is contractible. Moreover, managers do not respond to monetary incentives. The organization designer decides only on the organizational hierarchy *M*. As we discuss in Section 3.1.2, given that manager M_0 is the only manager who is assigned all activities $s \in \{1, 2, 3, 4\}$, removing M_0 from *M* can be viewed as an unintegration decision.

Managers and workers maximize the payoffs of the activities assigned to them when choosing a_s . Thus, worker *w* maximizes π_s , middle manager m_A maximizes $E(\pi_1 + \pi_2)$, middle manager m_B maximizes $E(\pi_3 + \pi_4)$, and top manager M_0 maximizes $E(\Sigma \pi_s)$. Managers are also power hungry in that they derive a private benefit r(s) > 0 from choosing a_s . To simplify our analysis, we assume in this section that r(s) is deterministic and identical for all managers and workers.¹⁵ As a result, power rents are a zero-sum game, and decision rights do not directly affect overall surplus. Section 2 has a discussion of these preferences.

3.1.1. Expected Payoffs

Without loss of generality, we focus our analysis on one generic activity $s_K \in D_K$ and associated action a_s , taking the other actions a_{-s} as given. Note first that when worker *w* chooses a_s , her action choice equals

$$a_s^w \equiv \arg\max_s \pi_s = \theta_s.$$

If the middle manager m_K decides, then a_s equals

$$a_s^K \equiv \arg\max_{a_s} \pi_K = \theta_s - \mu_1$$

when informed (probability $p_m < 1$) and $\overline{a}_s^K = E(\theta_s) - \mu_1$ when uninformed. Finally, if the top manager M_0 chooses a_s , then her action choices are

$$a_s^0 \equiv \arg\max_{a_s} \pi = \theta_s - \mu_{\mathrm{I}} - \mu_{\mathrm{E}}$$

when informed (probability $p_0 \le p_m$ and $\overline{a}_s^0 = E(\theta_s) - \mu_I - \mu_E$ when uninformed.

In choosing whether to delegate a_s , the top manager maximizes the sum of her private benefits r(s) from choosing a_s and expected organizational payoffs $\Pi(a_s) \equiv E[\pi(a_s, a_{-s}, \theta_s)]$. Denoting organizational payoffs

$$\Pi^* \equiv \Pi(a_s^0),$$

when an informed top manager chooses a_s , we obtain that

$$\Pi(\overline{a}_{s}^{0}) = \Pi^{*} - \sigma_{\theta}^{2},$$
$$\Pi(a_{s}^{K}) = \Pi^{*} - \mu_{E}^{2},$$
$$\Pi(\overline{a}_{s}^{K}) = \Pi^{*} - \mu_{E}^{2} - \sigma_{\theta}^{2},$$

¹⁵ See Dessein and Holden (2019) for an analysis of when r(s) has a distribution F(.) on [0, R].

and

$$\Pi(a_{s}^{w}) = \Pi^{*} - (\mu_{\rm E} + \mu_{\rm I})^{2}$$

Similarly, middle manager $m_K \in \{m_A, m_B\}$ maximizes the sum of her private benefits r(s) when she chooses a_s and expected divisional payoffs $\Pi_K(a_s) \equiv E[\pi_K(a_s, a_{-s}, \theta_s)]$. Denoting divisional payoffs

$$\Pi_{\kappa}^{\star} \equiv \Pi(a_{s}^{\kappa}),$$

when an informed middle manager chooses a_s , we have that

$$\Pi_{K}(\overline{a}_{s}^{K}) = \Pi_{K}^{\star} - \sigma_{\theta}^{2},$$

and

$$\Pi_{\kappa}(a_{s}^{w})=\Pi_{\kappa}^{\star}-\mu_{I}^{2}.$$

The focus of our paper is to study the consequences of managers inefficiently holding on to authority. To make this analysis relevant, we make the following two assumptions, which imply that delegation by an uninformed (top or middle) manager to the next layer is socially efficient.

Assumption 1. Delegation to the division manager is socially efficient when the top manager is uninformed:

$$\Pi(\overline{a}_s^0) < p_m \Pi(a_s^K) + (1 - p_m) \Pi(\overline{a}_s^K).$$
(3)

Assumption 1 states that expected organizational payoffs are higher when a middle manager (informed with probability p_m), rather than an uninformed top manager M₀, chooses a_s . It is equivalent to $\mu_{\rm E}^2 < p_{\rm M} \sigma_{\theta}^2$.

Assumption 2. Delegation to the worker is socially efficient when the middle manager is uninformed:

$$\Pi(\overline{a}_s^K) < \Pi(a_s^w). \tag{4}$$

Assumption 2 states that total organizational payoffs are higher when an (informed) worker, rather than an uninformed middle manager, chooses a_s . It is equivalent to $2\mu_{\rm I}\mu_{\rm E} + \mu_{\rm I}^2 < \sigma_{\theta}^2$.

Our last assumption is that the bias in decision-making increases linearly as we move down the hierarchy. Assumption 3 simplifies our analysis by focusing on a setting in which there is a conflict of interest between the top manager and a middle manager that is identical to the one between the middle manager and a worker.

Assumption 3. The decision-making bias increases linearly across hierarchical levels:

$$a_s^0 - a_s^K = a_s^K - a_s^w \Leftrightarrow \mu_{\rm I} = \mu_{\rm E} = \mu.$$
(5)

S280

Power-Hungry Agents

3.1.2. Discussion

Delegation Hierarchies, Asset Ownership, and Unintegration. While alternative interpretations are possible, following the literature on incomplete contracts (Grossman and Hart 1986; Hart and Moore 1990), one can think of decision rights in our model being conveyed through control or ownership of assets. Consider our four activities $s \in \{1, 2, 3, 4\}$. Each activity *s* requires, at the minimum, the use of an activity-specific asset $S_s \in \{S_1, S_2, S_3, S_4\}$, which is operated by worker w. The organization however has the option to integrate its activities into two divisions $D_A = \{1, 2\}$ and $D_B = \{3, 4\}$ by letting activities belonging to the same division D_{κ} use a common asset $S_{\kappa} \in \{S_A, S_B\}$. While this divisional asset does not directly affect payoffs, such integration allows the organization to convey the decision right over $a_s \in D_K$ to manager m_K , who operates the asset. Finally, independent of whether its activities are integrated into divisions, the organization can employ an organization-wide asset S_0 that is required to operate all divisional assets S_A and S_B and all activity-specific assets S_1 , S_2 , S_3 , and S_4 . This type of organization-wide integration therefore allows the organization to assign the decision rights over all actions a_s to a single manager M_0 . Conversely, removing manager M₀ in a delegation hierarchy is equivalent to an unintegration decision in which one hierarchy is replaced by several smaller hierarchies (if divisional assets are being used) or by a set of stand-alone assets (if no divisional assets are in use).

Formal versus Real Authority. In our delegation hierarchy, the initial decision right over a_s is owned by manager M_0 , the top manager. One can think of this as M_0 having formal authority in the sense described in Aghion and Tirole (1997). An uninformed M_0 however may choose to delegate or loan the decision rights about $a_s \in D_K$ to the middle manager m_K or the worker w. One can view this as the delegation of real authority in which an uninformed manager optimally refrains from overturning the actions of her subordinate.

As in Aghion and Tirole (1997) but unlike in Dessein (2002), we implicitly assume that activity *s* is sufficiently complex that observing the choice of a_s by a middle manager or worker does not reveal the state of θ_s .¹⁶ Hence, in the absence of redelegation, the top manager has no commitment problem when loaning or delegating a decision right to a middle manager. Ex ante, a top manager optimally allows a middle manager to redelegate a decision right to the worker. Ex post, however, the top manager may have an incentive to reclaim the decision right if she observes redelegation. Our model therefore implicitly assumes that a top manager cannot observe whether a decision is being redelegated.¹⁷ Alternatively, if who makes the final decision is observable, then the top manager must be able to build a reputation for not reneging on delegation decisions, as in Baker, Gibbons, and Murphy (2002).

 $^{^{16}}$ Similarly, the choice of $a_{\rm s}$ by a subordinate does not reveal whether the subordinate was informed.

¹⁷ Consistent with this assumption of nonobservability, it is often lamented that middle managers claim ownership for actions and accomplishments that are achieved mainly by their subordinates.

The Journal of LAW & ECONOMICS

3.2. Optimal Hierarchical Structure

Our study of the optimal hierarchy *M* proceeds as follows. In Section 3.2.1, we first consider a natural benchmark at which managers do not have preferences for power (r(s) = 0). It is easy to show that more layers of management are always better; that is, $M = \{M_0, m_A, m_B\}$.

When managers do have preferences for power, Sections 3.2.2 and 3.2.3 show that power-hungry managers are part of an optimal hierarchy if they have sufficient expertise. An increase in preferences for power may then result in either flattening ($M = \{M_0\}$) or unintegration ($M = \{m_A, m_B\}$ or \emptyset), depending on $\{p_0, p_m\}$.

A central insight of Section 3.2.3 is that the moral-hazard-in-delegation problem is more severe for M_0 than for m_A and m_B : an uninformed top manager is more likely than is an uninformed middle manager to hoard decision rights. Section 3.2.4 uses this insight to show how preferences for power tend to result in the removal of the top manager M_0 rather than the middle managers m_A and m_B . In other words, stronger preferences for power tend to lead to small unintegrated organizations rather than large but flat ones; that is, $M = \{m_A, m_B\}$ rather than M $= \{M_0\}$.

3.2.1. Benchmark: No Preferences for Power

Consider first a natural benchmark at which managers do not have preferences for power. In this case, r(s) = 0.

Proposition 4. If there are no preferences for power, r(s) = 0, the optimal organization is $M = \{M_0, m_A, m_B\}$.

Under this organizational design, the top manager M_0 holds the initial decision right over $a_s \in D_K$ with $K \in \{A, B\}$ and $s \in \{1, 2, 3, 4\}$. If M_0 is uninformed, then given assumption 2, she delegates to the division manager m_K . Similarly, if m_K has been delegated the decision right by M_0 and she is uniformed, then given assumption 1, m_K delegates to worker w.

The top manager faces a relatively simple trade-off between the costs and benefits of delegation. The benefits of delegating to the division manager are that the division manager may become informed or delegate to the worker, whom we have assumed is always informed. The costs of delegation are, of course, the bias that comes from delegation. Assumption 2 ensures that the informational benefits of delegation to the division manager always dominate. This leaves open the possibility, however, that it is optimal for the top manager to delegate directly to the worker. This cannot be optimal since the division manager is less biased than the worker, and, given that there are no preferences for power, the division manager always delegates to the worker if the top manager would do so herself.

Finally, the organization designer finds it optimal to assign the initial decision right to the top manager rather than to the division manager. Again, because there are no preferences for power, there is no conflict between firm owners and the top manager. The top manager always delegates if she is uninformed but is valuable in the event that she is informed.

In contrast to our benchmark, when managers are power hungry, three-level hierarchies are no longer necessarily optimal. In what follows, we subsequently study the value of the middle layer (or middle manager) and the value of the top layer (or CEO).

3.2.2. When Is a (Power-Hungry) Middle Manager Valuable?

When are the middle managers m_A and m_B part of an optimal hierarchy? An uninformed middle manager $m_K \in \{m_A, m_B\}$ delegates a_s to worker w if and only if

$$r(s) < \overline{r}_{K} \equiv \prod_{K} (a_{s}^{W}) - \prod_{K} (\overline{a}_{s}^{K}) = \sigma_{\theta}^{2} - \mu^{2}.$$

If decision rents are small—that is, $r(s) < \overline{r_k}$ —the middle manager always delegates when uninformed and hence is always valuable. In contrast, if $r(s) > \overline{r_k}$, the middle manager keeps control when she is uninformed, and she is valuable if and only if

$$p_m \Pi(a_s^K) + (1-p_m) \Pi(\overline{a}_s^K) > \Pi(a_s^w)$$

or if and only if

$$3\mu^2 > (1 - p_m)\sigma_{\theta}^2.$$
 (6)

In expression (6), the left-hand side is the loss of control from directly delegating a_s to the worker (and bypassing the middle manager), and the right-hand side is the expected loss of information of having the middle manager choosing a_s .

Proposition 5. When $r(s) \leq \overline{r}_{k} \equiv \sigma_{\theta}^{2} - \mu^{2}$, middle managers are always valuable: $\{m_{A}, m_{B}\} \subset M$. When $r(s) > \overline{r}_{k}$, $\{m_{A}, m_{B}\} \subset M$ if and only if

$$(1-p_m)\sigma_\theta^2 < 3\mu^2 \tag{7}$$

or, equivalently, if and only if $p_m > \overline{p}_m = (\sigma_{\theta}^2 - 3\mu^2)/\sigma_{\theta}^2$.

Since condition (7) or $r(s) \le \overline{r_k}$ for the value of a middle manager in a threelevel hierarchy is qualitatively similar to that for a manager in a two-layer hierarchy, Section 2.4 can be consulted for a detailed discussion of the comparative statics. We content ourselves with reminding the reader that a middle manager is more likely to be valuable when she is more knowledgeable (higher p_m) or has weaker preferences for power (lower r(s)).

The analysis of the value of middle managers is of independent interest to that of the value of top managers. Indeed, in many organizations top managers are entrenched and cannot be easily removed by firm owners (for example, because boards are captive and/or shareholders are dispersed). Top managers, however, will not be shy about flattening their organizations by removing middle managers when those managers are often uninformed but fail to delegate efficiently because of preferences for power.

3.2.3. When Is a (Power-Hungry) Top Manager Valuable?

We now turn attention to the top manager M_0 . Let r(s) be the private benefits of control, as before. Consider first the incentives of the top manager M_0 to delegate a_s when

$$r(s) < \overline{r}_{K} \equiv \sigma_{\theta}^{2} - \mu_{I}^{2}$$
.

Since a middle manager then always redelegates a_s to worker w when uninformed, it is then never optimal for the top manager to directly delegate to the worker (who is more biased than the middle manager). It follows that an uninformed top manager M_0 prefers to delegate (to the middle manager) rather than make an uninformed decision if and only if

$$r(s) \leq \overline{r_0} \equiv p_m \Pi(a_s^K) + (1 - p_m) \Pi(a_s^w) - \Pi(\overline{a}_s^0)$$

or

$$\Leftrightarrow r(s) \leq \overline{r_0} = \sigma_\theta^2 - [1 + 3(1 - p_m)]\mu^2.$$

Note that $\overline{r_0} < \overline{r_K}$. Hence, for $r(s) < \overline{r_0}$, a top manager delegates a_s to the middle manager when uninformed, and in turn this middle manager delegates a_s to worker *w* when uninformed. Clearly, a top manager is always valuable then, and $M = \{M_0, m_A, m_B\}$. In contrast, for $r \in (\overline{r_0}, \overline{r_K})$, an uninformed top manager never delegates, whereas an uninformed middle manager would delegate: moral hazard in delegation is more severe at the top of the hierarchy.

Consider next the incentives of M_0 to delegate a_s when $r(s) > \overline{r_K}$, and hence the middle manager does not delegate when uninformed. Note first that the top manager then also does not want to delegate to worker *w*. Indeed, a necessary condition for M_0 to delegate to the worker is that

$$r(s) \leq r_0^w = \Pi(a_s^w) - \Pi(\overline{a}_s^0) = \sigma_\theta^2 - 4\mu^2 < \overline{r}_K.$$

More importantly, M_0 then also does not delegate to the middle manager. Indeed, for $r(s) > \overline{r_K}$, manager M_0 delegates to middle manager m_K if and only if

$$r(s) \le r_0^m \equiv p_m \Pi(a_s^K) + (1 - p_m) \Pi(\overline{a}_s^K) - \Pi(\overline{a}_s^0)$$

or

$$\Leftrightarrow r(s) \leq r_0^m = p_m \sigma_\theta^2 - \mu^2 < \overline{r_k}.$$

Since $r_0^m < \overline{r_K}$, it follows that if the middle manager never delegates—that is, $r(s) > \overline{r_K}$ —then the top manager also never delegates: $r(s) > r_0^m$. We summarize in proposition 6.

Proposition 6. Moral hazard in delegation is more severe at the top of the hierarchy: a top manager delegates authority when uninformed if and only if

 $r < \overline{r_0}$, with $\overline{r_0} < \overline{r_K}$. For $r \in (\overline{r_0}, \overline{r_K})$, a top manager never delegates, whereas a middle manager delegates when uninformed.

Proposition 6 shows that a top manager is less likely to delegate than a middle manager. Indeed for intermediate preferences of power *r*, an uninformed top manager hoards decision rights, whereas an uninformed middle manager delegates to the worker. Importantly, the above result holds despite the fact that both managers have the same preferences for power, as characterized by *r*, and despite the fact that the top manager has the option to delegate to either the middle manager or the worker, whereas the middle manager can delegate only to the worker.

What is the intuition for this result? Consider first the willingness to directly delegate to the worker. Both the top manager M_0 and the middle manager m_K have the option to do so, but the worker is twice as biased from the perspective of M_0 than from the perspective of m_K :

$$a_s^0 - a_s^w = 2(a_s^K - a_s^w).$$

Clearly, M_0 is more reluctant than m_K to delegate to the worker. Consider next the willingness of both M_0 and m_K to delegate to an agent in the next layer (respectively, m_K and worker w). From the perspective of the delegator (M_0 or m_K), the delegee (m_K or worker w) is equally biased, but the delegee is more likely to become informed if she is further down the hierarchy. As a result, the value of delegation is $\overline{r_K} = \sigma_\theta^2 - \mu^2$ to the middle manager, whereas the value of delegation to the top manager is at most

$$\overline{r_0} \equiv p_m(\sigma_\theta^2 - \mu^2) + (1 - p_m)(\sigma_\theta^2 - 4\mu^2).$$

Note that this result would hold even if worker *w* is not perfectly informed, as long as she is more likely to be informed than the middle manager.

While the top manager faces a larger temptation to hoard decision rights than the middle manager does, this does not necessarily imply that she is less valuable. Indeed, while the middle manager is more likely to delegate efficiently (she faces less of a moral-hazard-in-delegation problem), the top manager is less biased when making the decision (she faces no agency problem as far as the decision is concerned). Proposition 7 characterizes when top manager M_0 is valuable:

Proposition 7

1) Whenever $r < \overline{r_0}$, the top manager is always valuable: $M_0 \in M$.

2) Whenever $r \in (\overline{r_0}, \overline{r_K})$, then $M_0 \in M$ if and only if

$$p_0 \Pi(a_s^0) + (1 - p_0) \Pi(\overline{a}_s^K) > p_m \Pi(a_s^K) + (1 - p_m) \Pi(a_s^W).$$

3) Whenever $r > \overline{r_{\kappa}}$, then $M_0 \in M$ if and only if

$$p_0 \Pi(a_s^0) + (1 - p_0) \Pi(\overline{a}_s^K) > \max\{\Pi(a_s^w), p_m \Pi(a_s^K) + (1 - p_m) \Pi(\overline{a}_s^K)\}.$$

As was the case for the middle manager, the top manager M_0 is more likely to be valuable if p_0 is higher—that is, if she is more likely to be informed. Re-

The Journal of LAW & ECONOMICS

call that in the benchmark setting with no preferences for power, a top manager is always valuable since she internalizes externalities whenever she is informed, and she delegates authority to the middle manager whenever she is uninformed. The same result still holds provided that preferences for power are small, $r < \overline{r_0}$. Once the top manager is sufficiently power hungry, however, she is valuable if and only if she is sufficiently likely to be informed, that is, when p_0 is sufficiently large. As was the case in a two-level hierarchy (and with the middle manager), comparative statics with respect to the bias in decision-making μ and 2μ of the middle manager and worker are ambiguous. On the one hand, an increase in the biased μ makes centralized decision-making more attractive. On the other hand, an increase in μ exacerbates moral hazard in delegation. Similarly, an increase in the variance σ_{θ}^2 makes decentralized decision-making more attractive, but it also makes it more likely that the top manager is willing to delegate when uninformed. See Section 2.4 for a detailed discussion of these comparative static results.

3.2.4. Optimal Hierarchies: Flattening versus Unintegration

The key result of the analysis above is that moral hazard in delegation is more severe at the top of the organization: an uninformed top manager is less likely to delegate than an uninformed middle manager (proposition 6). Since delegation by an uninformed manager is efficient (assumptions 1 and 2), this insight suggests that as preferences for power become stronger, organizations are more likely to deintegrate (remove the top manager) than to flatten (remove the middle manager). It is useful to state the following condition.

Condition 1. A lone manager $M = \{M_0\}$ who never delegates is dominated by a hierarchy $M = \{m_A, m_B\}$ of middle managers and workers in which the middle manager delegates to the workers when uninformed:

$$(1 - p_0)\sigma_{\theta}^2 > [p_m + 4(1 - p_m)]\mu^2.$$
(8)

Condition 1 states that the loss of information due to moral hazard in delegation—the top manager does not delegate when uninformed—is more harmful than the expected bias in decision-making by an informed middle manager (probability p_m) or an informed worker (probability $1 - p_m$). The following result holds.

Proposition 8. Assume that condition 1 holds.

1) If $r < \overline{r_0}$, an integrated three-layer hierarchy is optimal: $M = \{M_0, m_A, m_B\}$. In this hierarchy, the top manager delegates to the middle manager when uninformed, and the middle manager delegates to the worker when uninformed.

2) If $r \in (\overline{r_0}, \overline{r_K})$, a deintegrated two-layer hierarchy is optimal: $M = \{m_A, m_B\}$. In such a hierarchy, the middle managers delegate to the worker when uninformed.

3) If $r > \overline{r_k}$, it is optimal to allocate initial decision rights to the best standalone decision maker: $M \in \{\emptyset, \{m_A, m_B\}, \{M_0\}\}$. No delegation ever takes place. Intuitively, when $r < \overline{r_0}$, the top manager M_0 is not too power hungry and is thus willing to delegate to the middle manager m_K . And since there is a chance that she will become informed, the top manager M_0 adds value to the hierarchy, regardless of p_0 . When preferences for power are in an intermediate range, $r \in (\overline{r_0}, \overline{r_K})$, a two-layer hierarchy with a middle manager and a worker is optimal since the middle manager is willing to delegate to the worker, but the top manager will not delegate and thus is optimally excluded from the hierarchy. Finally, when preferences for power are large, $r > \overline{r_K}$, neither middle manager nor top manager ever delegates when uninformed. In that case, it is optimal to allocate the initial decision right to whomever is the best stand-alone decision maker.

A corollary to proposition 8 is that even when M_0 and m_K have equal expertise—that is, $p_0 = p_m = p$ —there exists a range of decision rents *r* such that $M = \{m_A, m_B\}$. In that case, the top manager M_0 is not part of the optimal hierarchy even though M_0 is less biased than m_A and m_B and has equal expertise. Indeed, condition 1 then becomes

$$\frac{1-p}{4-3p}\sigma_{\theta}^2 > \mu^2,\tag{9}$$

which is satisfied if μ and/or p are sufficiently small or σ_{θ}^2 is sufficiently large. For intermediate values of decision rents, the top manager then never delegates, whereas the middle manager and the worker cooperate effectively and yield a decision of higher expected quality than the one made by the top manager alone. By continuity, the following corollary holds.

Corollary 1. Assume that condition 1 holds but $p_0 > p_m$; that is, M_0 is more likely to be informed than m_A and m_B . For intermediate preferences for power, $r \in (\overline{r_0}, \overline{r_k}), M = \{m_A, m_B\}$, and M_0 is not part of the hierarchy, even though M_0 is both less biased and better informed than m_A and m_B .

The intuition for corollary 1 is that moral hazard in delegation is most severe at the top of the hierarchy. Hence, whereas the middle managers m_A and m_B may be more biased and have less expertise than the top manager, they are also less likely to hoard decision rights (they are more likely to delegate when uninformed).

Put differently, for intermediate preferences for power, a firm's owner prefers to delegate authority to middle managers who are biased rather than to a top manager who shares his or her objectives, even in the absence of an information advantage ($p_m \le p_0$). The reason is that middle managers are more willing to delegate to the better-informed workers when uninformed. This result is reminiscent of Dessein (2002, sec. 5), which shows that for intermediate conflicts of interest, a principal optimally delegates authority to an uninformed intermediary (for example, a middle manager) with preferences in between her and an informed but biased agent. In Dessein (2002) there are no preferences for power, but the agent is more willing to communicate soft information to the middle manager than to the principal. In the present paper the middle manager is more willing than the top manager to delegate authority to the agent when uninformed.

4. Concluding Remarks

We have analyzed a model of organizational hierarchies with the novel, but realistic, component that managers have preferences for making decisions themselves regardless of the decision. That is, they are power hungry. Introducing this component into an otherwise standard model provides a novel theory of the role and limits of middle management and an intuitive response to the Williamson (1985) critique: why is integration not always value increasing? Our model predicts optimal hierarchies to be smaller and less integrated in environments in which preferences of power are more pronounced and top or middle managers have less information.

It is natural to think that there is heterogeneity in how power hungry managers are across different environments. Political organizations, for-profit firms, and not-for-profit firms might plausibly differ in how power hungry their agents are. Our comparative static results shed light on some of the forces shaping the structure of these organizations. We also suggested in Section 1 that developing countries may have different organizational forms in part because of decision rents dissimilar to those in developed countries.

Cultural differences may also be an important determinant of how much underdelegation there is in organizations. The World Values Survey finds a large heterogeneity in attitudes toward authority. Relatedly, Bloom, Sadun, and Van Reenen (2012) show a strong correlation between the power distance index of a country described in Hofstede (2001), which captures cultural attitudes toward power and hierarchy in a large multinational firm, and the delegation of authority in a cross section of industries.

Our model shows that larger decision rents, or stronger preferences for power, affect decentralization of decision-making both directly for a given organizational structure and indirectly by making smaller and less integrated firms optimal. An implication therefore is that empiricists studying the extent of delegation must be careful when they control for organizational size and the number of managerial layers.

Given the problems that hoarding decision rights can cause, it is natural to think that organizations would seek to develop ways of discouraging such behavior. The most obvious is a direct reward for delegation.¹⁸ But of course there may be more complex and subtle ones. Understanding these mechanisms may help shed light on other features of organizational design and culture. Another fascinating avenue for future research is the endogenous selection of managers into positions of power. When there is substantial (unobserved) heterogeneity among

¹⁸ Unless decision rents are deterministic, however, subsidizing delegation decisions provides only a partial solution and will unavoidably result in both overdelegation and underdelegation in equilibrium.

agents, one would expect the most power-hungry managers to devote the most resources and effort to gaining access to positions of power. Following this logic, it is likely that the most power hungry and hence least suitable agents rise to the top of the hierarchy, which exacerbates organizational inefficiencies.

Finally, our model speaks to a novel source of path dependence in organizations. Gibbons (2006, p. 381) began a literature seeking to provide a theoretical foundation for the empirical fact that he calls "persistent performance difference among seemingly similar enterprises." In our framework, firms can get stuck with an inefficient governance structure. In our framework path, dependences can stem from the fact that top managers may be in control of organizational design. For instance, if an organization begins with two layers being optimal but then a change in the environment leads to one or three layers becoming optimal, the change will not occur because it is not in the interest of the top manager. That is, firm boundaries are path dependent. A top manager may resist the breakup of the firm she leads and the takeover by another firm.

Of course, if organization designers realize that the environment is subject to shocks, then they will account for this ex ante. This suggests to us that the dynamics of governance structures in settings in which delegation decisions are not contractible is an interesting avenue for future work.

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