

# Organizations with Power-Hungry Agents

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## Abstract

We analyze a model of hierarchies in organizations where neither decisions themselves nor the delegation of decisions are contractible, and where power-hungry agents derive a private benefit from making decisions. Two distinct agency problems arise and interact: Subordinates take 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 de-integrate an organization by removing top layers (eliminate top managers). We show that stronger preferences for power result in smaller, more de-integrated hierarchies. Our key insight is that hoarding of decision rights is especially severe at the top of the hierarchy.

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# 1 Introduction

Hayek (1945) famously argued that decisions are best made by agents who have relevant, local information.<sup>1</sup> Taking this information to be 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 has studied the *optimal design* of organizations both in the presence of agency costs, and without them.<sup>2</sup> 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.

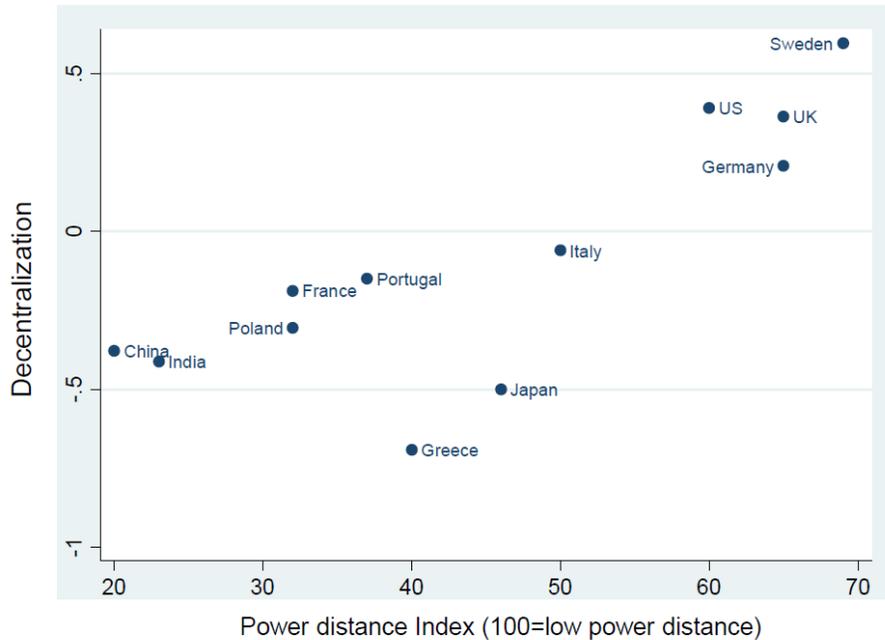
Yet a significant body of experimental evidence points to an agency problem in the design of organizations. For many individuals, decision rights carry an *intrinsic value*, beyond their instrumental benefits for achieving certain outcomes (Bartling, Fehr and Herz 2014). This literature finds a substantial under-delegation 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, Hofstede (2001) documents substantial variation in cultural attitudes towards hierarchy and authority, summarized in a country-specific ‘power distance index’. As shown in Figure 1, Bloom, Sadun, and Van Reenen (2012) find that this index is strongly correlated with actual delegation in manufacturing firms in a cross-section of industries.

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 a subordinate. A

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<sup>1</sup>As he put 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.”

<sup>2</sup>Early important contributions include Chandler (1962) who emphasized the link between a firm’s organization structure and the strategy it pursues; Marschak and Radner (1972) introduced the formal analysis of working in teams, leading to an entire literature on “team theory”. The importance of agency costs in organizational design was first noted by Berle and Means (1932), and these have played an important role in much of the organizational economics literature as they have in corporate finance in thinking about the private benefits of control and the optimal structure of voting rights.



**Figure 1** – Correlation between the Decentralization Index (Bloom et al. 2012) and the Power Distance Index (Hofstede 2001) is 0.8. The Decentralization Index is z-scored autonomy of plant managers in a 2006 cross-industry survey, averaged by country. The Power Distance index measures cultural attitudes towards hierarchy and authority, averaged by country, as reported by 10K IBM managers in the 1970s. The figure is reproduced from Bloom et al.

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

Our model can be used to shed light on two important questions. First, what is the optimal number of layers in a hierarchy? When do middle managers destroy value? Second, 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 larger “power rents” results in excessive centralization for a given hierarchical organization and firm size, the presence of power-hungry managers also results in a de-layering of the organization and in smaller, more de-integrated firms. Intuitively, the anticipation of a lack of delegation makes it optimal to delayer, forcing 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 (where decision rents are arguably larger) tend to be both smaller and more centralized (Bloom et al. 2012, and Hsieh and Klenow 2014).

*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 CEO, followed by a division manager, a sub-division manager, 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.<sup>3</sup> 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 on 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 itself. Managers are power hungry in that they earn a private benefit if they, themselves, take the decision. 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<sup>4</sup>, neither decisions nor the delegation of decisions are contractible. Moreover, managers do not respond to monetary incentives. The organization designer, however, can remove *layers of management* to avoid 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 delay 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 with other activities. This limit corresponds to a set of de-integrated, stand-alone activities.

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<sup>3</sup>See, for example, Aghion and Tirole (1997), and Dessein (2002).

<sup>4</sup>The pioneering contributions are Grossman and Hart (1986) and Hart and Moore (1990). See Aghion and Holden (2011) and Dessein (2015) for an overview of the ensuing literature.

*Results.* In the absence of preferences for power, additional layers always improve outcomes and, similarly, integrating disjoint 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, preventing better-informed lower level managers from taking informed, albeit somewhat biased, decisions. Our setup thus gives a rather direct answer to Williamson's selective intervention puzzle: 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, more power-hungry managers 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 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, however, as she mainly cares about the well-being of the business school. The Chair is even more biased as she mainly cares about the glory of her division. The Chair, however, is also perfectly informed about the decision at hand. Say a new professor in healthcare economics must be hired, who will also lead a university-wide center in which the Business School is a key partner.

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 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 higher willingness to delegate to the Chair than the President. 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 taking an informed (albeit biased) decision. In contrast, the President knows that the Dean is often uninformed and then delegates to the Chair. Such re-delegation 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-Chair rather than President-Dean-Chair, may then result in better decision-making. Note that in the latter case, a Dean-Chair hierarchy is also strictly preferred over a President-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 delegate. 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 of the magnitude of decision rents – which generally result in smaller, more de-layered organizations – we show that the value of both top and middle managers tends to be non-monotonic in the uncertainty surrounding the decision and in the bias and expertise of their subordinates. Intuitively, while say 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 subordinate. This yields the counter-intuitive 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).

**Literature on hierarchies and firm boundaries** Our paper follows Alchian and Demsetz (1972) 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 (p.778). As argued by Alchian and Demsetz, team production makes it often hard to meter the productivity of individual agents, who may shirk as 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 residual claimant and coordinates the production of the lower-level 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 their centralized position.

We further deviate from Alchian and Demsetz in recognizing the role of non-contractible decisions (Grossman and Hart 1985) and, hence, decision rights in organizations. As such, the paper perhaps closest to ours is Hart and Moore (2005), who analyze a model of the design of hierarchies in a setting where 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 or not to delegate. In this setting, they 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) who consider a setting where there are two agents, one of whom has “formal authority” to make a decision.<sup>5</sup> The agents, however, are probabilistically informed about a decision and the likelihood depends on privately costly, non-contractible effort. They show that the agent who has formal authority may not have “real authority”, in the sense that she will not take the actual decision very frequently because she optimally puts in little effort to having an idea. Unlike us, however, they focus on *ex ante* incentives for effort rather than delegation of decision rights in a multi-layer hierarchy.

The two papers above focus on the role of hierarchies in making decisions when in-

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<sup>5</sup>Baker, Gibbons and Murphy (1999) analyze a repeated-game version of 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.

formation is dispersed and agents have conflicting preferences. Other models in this class of decision hierarchies include Dessein (2002), Alonso et al. (2008), Rantakari (2008), Hart and Holmstrom (2010) and Dessein, Garicano and Gertner (2010).<sup>6</sup> Decentralization or ‘removing the top layer’ in a decision hierarchy may be optimal because centralization results in a distortion of information (Dessein 2002), de-motivates information acquisition (Aghion and Tirole 1997) or because the top-manager is biased (Hart and Holmstrom 2010). Unlike in our model, however, 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 also novel in offering a theory of multi-layered 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, and Garicano 2000).<sup>7</sup> While this approach allows the study of large, multi-layered organizations, communication costs (such as delay) rather than incentive conflicts determine the optimal organizational structure.<sup>8</sup>

**Literature on preferences for power** Social psychologists have long argued that power is a basic human need. Power is one of five *need categories* in Murray (1938)’s system of needs. In his human motivation theory, David 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 (e.g. Aghion and Bolton, 1992, Hart and Moore, 1995, and Dyck and Zingales, 2004) and the organizational economics literature (Aghion and Tirole, 1997).<sup>9</sup>

Perhaps the cleanest evidence that decision rights carry an *intrinsic value*, beyond

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<sup>6</sup>Harris and Raviv (2002) and Alonso, Dessein and Matouschek (2015) study decision hierarchies in a team theoretical setting where there are no incentive conflicts, but where communication is limited.

<sup>7</sup>See Garicano and Van Zandt (2013) for a comprehensive review of this literature.

<sup>8</sup>Calvo and Wellisz (1978) emphasize the role of hierarchies in monitoring effort. Their focus is on explaining wage differentials across layers, rather than organizational structure.

<sup>9</sup>In those literatures, control may either convey tangible benefits or be more ‘psychic’ in nature. Both interpretations are consistent with our model.

their instrumental benefits for achieving certain outcomes, is presented in an experimental paper by Bartling et al. (2014). They develop an approach which rules out alternative explanations based on regret and ambiguity aversion, and show that the intrinsic value of decision rights is both significant (on average 17 percent of the monetary payoffs associated with a decision<sup>10</sup>) and correlated across individuals and game parameterizations. Interestingly, higher stakes are associated with proportionally higher intrinsic values. These results confirm similar findings in Owens, Grossman and Fackler (2014), who also find that individuals are willing to sacrifice expected earnings to retain control,<sup>11</sup> and Fehr et al. (2013), who find a significant under-delegation of decision rights from principals to agents in settings where delegation is clearly optimal.<sup>12</sup> Evidence on the private benefits of autonomy can also be found in the entrepreneurship literature. Non-pecuniary motives such as the desire “to be one’s own boss” are a major self-reported driver of the decision to enter self-employment (Pugsley and Hurst 2011) and entrepreneurs typically forego substantial earnings when becoming self-employed (Hamilton 2000, and Moskowitz and Vissing-Jorgensen 2002).

**Outline** The paper proceeds as follows. Section 2 illustrates the model for the simplest case when there are just two workers and, potentially, one manager. This section 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 where there are both middle-managers and a top manager. Section 4, finally, concludes by discussing some empirical implications of our model and future avenues of research.

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<sup>10</sup>Bartling et al. compare the certainty equivalents of delegation lotteries and non-delegation lotteries, as all decisions are risky.

<sup>11</sup>They find that the average participant is willing to sacrifice 8 percent to 15 percent of expected earnings in order to control their own payoff. Interestingly, Pikulina and Tergiman (2020) show how individuals are willing to accept a lower pay-off for themselves in exchange for power over the pay-off of *others*.

<sup>12</sup>See also Sloof and von Siemens (2018), who point to overconfidence and an “illusion of control” as a source of preferences for power.

## 2 Two-level hierarchies

In order to illustrate the basic assumptions which lead to moral-hazard-in-delegation, we first consider a simple example in which 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  $a_s$  and generates a payoff

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

where  $\theta_s$  is an activity-specific i.i.d. shock with variance  $\sigma_\theta^2$ , and where  $\mu > 0$  is an exogenous parameter which 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  $\theta_s$ . In addition, both activities may be assigned to a manager,  $m$ , who observes  $\theta_s$  with probability  $p < 1$ . If  $m$  is part of the organization (see subsection on ‘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 about  $a_s$  to the relevant worker who always observes  $\theta_s$ .

**Managerial Preferences:** 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, manager) to divert a fraction of the profits of activities assigned to them, or the intrinsic reward agents experience when these 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 et al. 2014). Alternatively, one can think of  $a_s$  as a complex, multi-dimensional 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 c.d.f.  $F(\cdot)$  on support  $[0, R]$  or  $[0, \infty)$ . As shown by Bartling et al. (2014), situational determinants may affect the intrinsic value of decision rights.<sup>13</sup> Similarly, non-psychological private benefits of control may depend on opportunities which arrive stochastically or are specific to individual managers.

**Organization Design.** The organization designer has limited instruments. Neither decisions themselves, nor the delegation of decisions are contractible. Moreover, the workers nor the manager respond to monetary incentives. The organization designer, however, can decentralize decision-making by removing the manager.

## 2.2 Discussion of 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 (1982) we abstract from monetary incentives to motivate managers and instead assume managers focus on maximizing the payoffs of the activities assigned to them. The novel ingredient 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 for the firm in the richer setting where the firm needs to satisfy the manager's participation constraint and cash incentives are required to be used 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 (e.g. Grossman and Hart, 1986 or Hart and Moore, 1990) and those of the allocation of authority in organizations (e.g. Aghion and Tirole, 1997) we do not put firms in a market setting. This is both for reasons of tractability and clarity. Embedding second-best models in equilibrium environments make it hard to understand the important within-firm effects of the main features of such models.<sup>14</sup>

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<sup>13</sup>In fact, people prefer to delegate if it allows to shift responsibility for unpleasant outcomes (Bartling and Fischbacher, 2012), suggesting  $r(s)$  may even be negative. More generally, there are many other situational determinants that likely affect how much agents (intrinsically) value making decisions.

<sup>14</sup>Two partial exceptions are Fershtman and Judd (1987) consider a principal-agent model in a Cournot oligopoly setting; and Gibbons, Holden and Powell (2012) study an incomplete contracting model in the spirit of Grossman and Hart (1986) in rational expectations equilibrium.

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 by many authors, such as Osterman (1996), Whittington et al (1999), and Rajan and Wulf (2010). 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 delaying 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 ameliorated 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 both 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 only care about the payoffs of the activity assigned to them. When delegated authority, they therefore choose  $a_s = \theta_s$ .

**Informed manager as decision-maker.** Let us denote by  $U_m$  the expected payoffs of the manager and by  $U_{w'}$  and  $U_{w''}$  the expected pay-off of workers  $w'$  and  $w''$ . If an *informed manager* chooses both actions, this yields expected payoffs

$$\begin{aligned} U_m &= \Pi^* + r(s') + r(s'') \\ U_{w'} &= U_{w''} = \Pi^*/2, \end{aligned}$$

where  $\Pi^*$  are first-best profits:

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

**Workers as decision-makers.** By contrast, if workers  $w'$  and  $w''$  are the decision-makers, then payoffs are given by

$$\begin{aligned} U_m &= \Pi^* - 2\mu^2 \\ U_{w'} &= \Pi^*/2 - \mu^2 + r(s') \\ U_{w''} &= \Pi^*/2 - \mu^2 + r(s'') \end{aligned}$$

Note that shifting decision-rights from an informed manager to the workers results both in an efficiency loss,  $\mu$ , 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

$$\begin{aligned} U_m &= \Pi^* - 2\sigma_\theta^2 + r(s') + r(s'') \\ U_{w'} &= U_{w''} = \Pi^*/2 - \sigma_\theta^2 \end{aligned}$$

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

$$\sigma_\theta^2 \geq \mu^2$$

An uninformed manager, however, only delegates if

$$\sigma_\theta^2 \geq \mu^2 + r(s)$$

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

**Remark 1.** Assume  $\sigma_\theta^2 - \mu^2 > 0$  so that 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? i.e. 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  $\sigma_\theta^2 \geq \mu$ .

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

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

On the one hand, with probability  $(1 - p)(1 - F(\bar{r}))$ , the manager takes an uninformed decision, reducing payoffs by  $\sigma_\theta^2 - \mu^2$  relative to an organization where authority is directly allocated to the workers. On the other hand, with probability  $p$ , the presence of a manager increases efficiency by  $\mu^2$ , as she internalizes externalities between activities when informed. Finally, with probability  $(1 - p)F(\bar{r})$ , the presence of a manager does not affect payoffs, as she delegates efficiently. It follows that a manager is valuable

$$\Leftrightarrow p\mu^2 \geq (1 - p)(1 - F(\bar{r}))(\sigma_\theta^2 - \mu^2),$$

which can be rewritten as

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

This immediately leads to the following proposition

**Proposition 1.** *Assume  $\sigma_\theta^2 - \mu^2 > 0$ . Decentralization of authority (no manager) is optimal*

whenever  $p < \bar{p}$ , with  $\bar{p}$  given by

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

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

The above proposition yields two compelling comparative statics: First, a manager (or centralization) is only valuable if the manager is sufficiently likely to be informed and when preferences for power are not too strong. Intuitively, hoarding decision-rights is only costly 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  $F(\cdot)$  in the sense of FOSD makes it more likely that a manager is valuable. The manager 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  $\mu$  and  $\sigma_\theta^2$  are ambiguous. Inspecting (1), a decrease in  $\bar{r} = \sigma_\theta^2 - \mu^2$  not only reduces the value of decentralization to the worker (RHS of (1)), but also reduces the probability  $F(\bar{r})$  that the manager delegates to the worker. Intuitively, an increase in the incentive conflict of the workers exacerbates the moral-hazard-in-delegation faced by their manager: the manager is less willing to delegate, even though delegation remains optimal whenever the manager is uninformed. As a result, when workers become more biased (an increase in  $\mu$ ) it may become optimal to remove the manager and decentralize authority to workers.

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

The above proposition stands in contrast with standard models in the delegation literature (see Dessein 2002, Alonso et al. 2008, Rantakari 2008), which have the unambiguous prediction that decisions are less likely to be delegated to the agent when

conflicts of interest are larger.

To provide more intuition for the above result, we consider two specific distributions for  $r(s)$  and show that whenever  $p$  is small, an increase in the worker's bias  $\mu$  initially results in a removal of the manager and decentralization of decision-rights to those same workers:

**Proposition 3.** *Assume  $r(s)$  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 worker bias  $\mu$ , whereas centralization (a manager) is optimal for  $\mu$  sufficiently small or sufficiently large.*

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

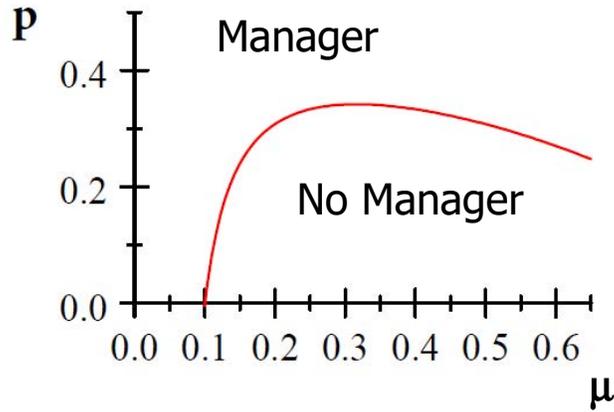
**Case 1 (Uniformly distributed decision rents).** Assume first that  $r(s)$  is uniformly on  $[0, R]$  with  $R < \sigma_\theta^2$ . For simplicity, we normalize all parameters so that  $\sigma_\theta^2$  equals 1. If  $R < 1 - \mu^2$ , an uninformed manager always delegates so that she is valuable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

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

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

**Result:** *There exists a  $\hat{p} > 0$ , such that*

- *For  $p < \hat{p}$ , decentralization (no manager) is optimal for intermediate values of  $\mu$ . Centralization is optimal for  $\mu$  sufficiently small or large.*
- *For  $p > \hat{p}$ , centralization (manager) is always optimal.*



**Figure 2** – Assume  $r(s) \sim U[0, R]$  and  $\sigma_\theta^2 = 1$ . Figure 2 plots the optimal hierarchy (Manager, no manager) as a function of the externality parameter  $\mu$  when  $R = 0.9$ . A boss is valuable if  $p > \bar{p}$  (red curve), while she destroys value when  $p < \bar{p}$ .

Figure 2 plots  $\bar{p}$  as a function of  $\mu$  and this for  $R = 0.8$  (green curve) and  $R = 0.9$  (red curve). When manager is not likely to be informed ( $p$  is small), an initial increase in the agency conflict of the workers (an increase in  $\mu$ ) makes it optimal to remove the manager and decentralize authority to those workers. Intuitively, for intermediate values of  $\mu$ , the moral hazard problem in the delegation of the decision then outweighs the agency problem in the decision itself.

**Case 2 (deterministic private benefits).** Assume now that  $r(s) = r$ , so that 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:** Assume  $p < \hat{p} \equiv r/\sigma_\theta^2$ , then decentralization (no manager) is optimal for  $\mu^2 \in (\mu_L, \mu_H)$  with  $\mu_L < \mu_H$ , whereas centralization (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 counter-intuitive 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 then never wants to remove herself.<sup>15</sup> As a result, in a two-layer hierarchy, stronger preferences for power then unambiguously result in less worker authority. In multi-layer hierarchies, however, 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 set-up as above, but let there be one additional layer – the CEO – who observes  $\theta_s$  with independent probability  $p_0 > 0$  and derives a private benefit  $r_0(s)$  from choosing  $a_s$ . When uninformed, the CEO either delegates to manager  $m$ , or delegates to the worker, or takes an uninformed decision.

Assume both  $r_0(s)$  (private benefits CEO) and  $r(s)$  (private benefits manager) are i.i.d. uniformly distributed on  $[0, R]$ . Proposition 1 still holds. The CEO removes manager  $m$  from the hierarchy whenever  $p < \bar{p}(R)$ , with  $\bar{p}(R)$  given by (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  $\bar{p}(R_1) < p < \bar{p}(R_2)$ . An increase in  $R$  from  $R_1$  to  $R_2$  then results in delaying and, often, more delegation to the worker. In contrast, an increase in  $R$  from  $R_0$  to  $R_1 > R_0$  unambiguously results in less delegation to the worker.

### 3 Three-level hierarchies

The previous section shows how, when managers are power-hungry, hierarchical decision-making is only valuable when the manager is sufficiently knowledgeable. Most hierarchical organizations, however, have multiple layers of management. In this section, we study how preferences for power affect the structure of multi-layered hierarchies. We consider the following generalization of the model presented in Section 2:

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<sup>15</sup>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.

### 3.1 A delegation hierarchy with three levels

Consider an organization engaged in four activities  $s \in \{1, 2, 3, 4\}$  which are partitioned into two divisions  $D_A = \{1, 2\}$  and  $D_B = \{3, 4\}$ .<sup>16</sup> Each activity  $s$  is associated with an action choice  $a_s$  who must be responsive to an activity-specific i.i.d shock  $\theta_s$  with variance  $\sigma_\theta^2$ , but also take into account externalities on other activities. Concretely, organizational payoffs are given by

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

where the pay-offs of activities  $s \in D_A$  are given by

$$\begin{aligned} \pi_1 &\equiv \pi_1(\theta_1, a_1, a_{-1}) = 2(\theta_1 a_1 - \mu_I a_2) - \mu_E(a_3 + a_4) - a_1^2, \\ \pi_2 &\equiv \pi_2(\theta_2, a_2, a_{-2}) = 2(\theta_2 a_2 - \mu_I a_1) - \mu_E(a_3 + a_4) - a_2^2, \end{aligned}$$

where  $\mu_I$  reflects externalities within the same division and  $\mu_E$  reflects externalities between divisions. Similarly, the pay-offs of activities  $s \in D_B$  are given by

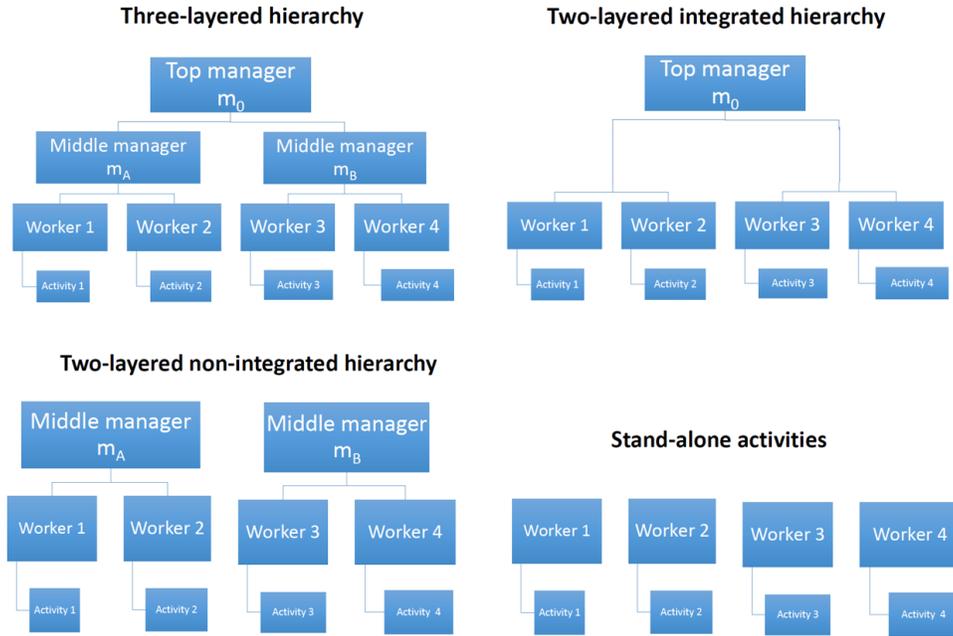
$$\begin{aligned} \pi_3 &\equiv \pi_3(\theta_3, a_3, a_{-3}) = 2(\theta_3 a_3 - \mu_I a_4) - \mu_E(a_1 + a_2) - a_3^2, \\ \pi_4 &\equiv \pi_4(\theta_4, a_4, a_{-4}) = 2(\theta_4 a_4 - \mu_I a_3) - \mu_E(a_1 + a_2) - a_4^2. \end{aligned}$$

We further denote divisional pay-offs as  $\pi_A \equiv \pi_1 + \pi_2$  and  $\pi_B \equiv \pi_3 + \pi_4$

**Organization Design and Information:** The organization employs four workers  $s \in \{1, 2, 3, 4\}$ . Activity  $s$  is assigned to worker  $s$  who observes  $\theta_s$  (but not  $\theta_{-s}$ ). 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  $\theta_s$  with probability  $p_m < 1$  if and only if  $s \in D_K$ . Similarly, if employed, top manager  $m_0$  observes  $\theta_s$  with independent probability  $p_0 < 1$  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 organization designs, illustrated in Figure 3. The first is a *three-level hierarchy*  $M = \{m_0, m_A, m_B\}$  where a top-manager sits above two middle managers, who in turn

<sup>16</sup>In a previous draft, we considered a more general model with  $n$  activities and  $m$  divisions, obtaining qualitatively similar result. Restricting attention to 4 activities substantially saves on notation.



**Figure 3** – Four possible organization designs.

sit above four worker. A second possibility is an *integrated two-level hierarchy* where, relative to the first organization, the two middle managers are removed so that the top-manager sits directly above the four workers:  $M = \{m_0\}$ . A third possibility is a *non-integrated two-level hierarchy* where the two middle managers sit above the workers and the top manager is removed i.e.  $M = \{m_A, m_B\}$ . Finally, it is possible to have *stand-alone activities*, where there are only the four workers in the organization i.e.  $M = \phi$ .

If  $m_0 \in M$ , then the initial decision-right over  $a_s$  is owned by the top manager  $m_0$ . An uninformed  $m_0$ , however, may choose to delegate the decision right about  $a_s$  to either worker  $s$  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  $s$  if she is uninformed. Worker  $s$ , finally, always selects  $a_s$  when delegated authority.

Section 3.1.2 discusses the above 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 themselves, nor the delegation of decisions are contractible. Moreover, managers do not respond to monetary incentives. The organization designer only decides 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 a de-integration decision.

**Managerial Preferences:** Managers maximize the payoffs of the activities assigned to them when choosing  $a_s$ . Thus, worker  $s$  maximizes  $\pi_s$ , 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  $E(\sum \pi_s)$ . Managers, however, 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.<sup>17</sup> As such power rents are a zero-sum game and decision rights do not directly affect overall surplus. We refer to Section 2 for a discussion of these preferences.

### 3.1.1 Expected payoffs

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

$$a_s^w \equiv \arg \max_{a_s} \pi_s = \theta_s$$

If the middle manager  $m_K$  decides, then  $a_s$  equals

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

when informed (probability  $p_m < 1$ ), and  $\bar{a}_s^K = E(\theta_s) - \mu_I$  when uninformed. Finally, if the top manager  $m_0$  chooses  $a_s$ , then her action choices are respectively

$$a_s^0 \equiv \arg \max_{a_s} \pi = \theta_s - \mu_I - \mu_E$$

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

In choosing whether or not to delegate  $a_s$ , the top manager maximizes the sum of her private benefits  $r(s)$  from choosing  $a_s$  and expected organizational payoffs  $\Pi(a_s) \equiv$

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<sup>17</sup>We refer to our working paper draft for an analysis of when  $r(s)$  has a distribution  $F(\cdot)$  on  $[0, R]$ .

$E(\pi(a_s, a_{-s}, \theta_s))$ . Denoting organizational payoffs by

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

when an informed top manager chooses  $a_s$ , we obtain that

$$\begin{aligned}\Pi(\bar{a}_s^0) &= \Pi^* - \sigma_\theta^2 \\ \Pi(a_s^K) &= \Pi^* - \mu_E^2 \\ \Pi(\bar{a}_s^K) &= \Pi^* - \mu_E^2 - \sigma_\theta^2 \\ \Pi(a_s^w) &= \Pi^* - (\mu_E + \mu_I)^2\end{aligned}$$

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  $\Pi_K(a_s) = E(\pi_K(a_s, a_{-s}, \theta_s))$ . Denoting divisional payoffs by

$$\Pi_K^* \equiv \Pi(a_s^K)$$

when an informed middle manager chooses  $a_s$ , we have that

$$\begin{aligned}\Pi_K(\bar{a}_s^K) &= \Pi_K^* - \sigma_\theta^2 \\ \Pi_K(a_s^w) &= \Pi_K^* - \mu_I^2\end{aligned}$$

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 un-informed (top or middle) manager to the next layer is socially efficient:

**Assumption A1: Delegation to the division manager is socially efficient when the top manager is uninformed**

$$\Pi(\bar{a}_s^0) < p_m \Pi(a_s^K) + (1 - p_m) \Pi(\bar{a}_s^K) \quad (\text{A1})$$

The above assumption states that expected organizational pay-offs are higher when a middle manager (informed with probability  $p_m$ ) chooses  $a_s$  rather than an uninformed top manager  $m_0$ . It is equivalent to  $\mu_E^2 < p_m \sigma_\theta^2$ .

**Assumption A2: Delegation to the worker is socially efficient when the middle manager is uninformed**

$$\Pi(\bar{a}_s^K) < \Pi(a_s^w) \quad (\text{A2})$$

The above assumption states that total organizational payoffs are higher when an (informed) worker chooses  $a_s$  rather than an uninformed middle manager. It is equivalent to  $2\mu_I\mu_E + \mu_I^2 < \sigma_\theta^2$ .

Our last assumption, finally, is that the bias in decision-making increases linearly as we move down the hierarchy

**Assumption A3: The decision-making bias increases linearly across hierarchical levels**

$$a_s^0 - a_s^K = a_s^K - a_s^w \Leftrightarrow \mu_I = \mu_E = \mu \quad (\text{A3})$$

Assumption A3 simplifies our analysis by focusing on a setting where there is an identical conflict of interest between the top manager and a middle manager as there is between the middle manager and a worker.

### 3.1.2 Discussion

**Delegation hierarchies, asset ownership and de-integration:** 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  $s$ . The organization, however, has the option to integrate its activities in two divisions  $D_A = \{1, 2\}$  and  $D_B = \{3, 4\}$  by letting activities belonging to the same division  $D_K$  use a common asset  $S_K \in \{S_A, S_B\}$ . 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 this asset. Finally, independent of whether its activities are integrated into divisions or not, the organization can employ an organization-wide asset  $S_0$  which 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 de-

cision rights over all actions  $a_s$  to a single manager  $m_0$ . Conversely, removing manager  $m_0$  in a delegation hierarchy is equivalent to a de-integration decision, where 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 of 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  $s$ . One can view this as the delegation of “real authority” where an uninformed manager optimally refrains from overturning the actions of her subordinate.

As in Aghion and Tirole, but unlike in Dessein (2002), we implicitly assume that the activity  $s$  is sufficiently complex so that observing the choice of  $a_s$  by a middle manager or worker does not reveal the state of nature  $\theta_s$ .<sup>18</sup> Hence, in the absence of re-delegation, 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 re-delegate a decision right to the worker. Ex post, however, the top manager may have an incentive to reclaim the decision right if she observes re-delegation. Our model therefore implicitly assumes that a top manager cannot observe whether a decision is being re-delegated or not.<sup>19</sup> Alternatively, if who makes the final decision is observable, then the top manager must be able to build a reputation for not renegeing on delegation decisions, as in Baker, Gibbons and Murphy (1999).

## 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 in 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  $M = \{m_0, m_A, m_B\}$ .

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<sup>18</sup>Similarly, the choice of  $a_s$  by a subordinate does not reveal whether or not this subordinate was informed.

<sup>19</sup>Consistent with this assumption of non observability, it is often lamented that middle managers claim “ownership” for actions and accomplishments which are mainly achieved by their subordinates.

When managers do have preferences for power, Section 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 layering ( $M = \{m_0\}$ ) or de-integration ( $M = \{m_A, m_B\}$  or  $\phi$ ), depending on  $\{p_0, p_m\}$ .

A central insight of Section 3.2.3, however, 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 to hoard decision rights than an uninformed middle manager. 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 non-integrated organizations rather than large-but-flat ones, i.e.  $M = \{m_A, m_B\}$  rather than  $M = \{m_0\}$ .

### 3.2.1 Benchmark: No preferences for power

Consider first a natural benchmark where managers do not have preferences for power:  $r(s) = 0$ .

**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 A2, she delegates to the division manager  $m_K$ . Similarly, if  $m_K$  has been delegated the decision right by  $m_0$ , and she is uninformed herself, then given A1,  $m_K$  delegates to worker  $s$ .

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: (a) become informed; or (b) delegate to the worker—who we have assumed is always informed. The costs of delegation are, of course, the bias that comes from delegation. Assumption A2 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 not necessarily optimal anymore. 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  $s$  if and only if

$$r(s) < \bar{r}_K \equiv \Pi_K(a_s^w) - \Pi_K(\bar{a}_s^K) = \sigma_\theta^2 - \mu^2$$

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

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

or still, if and only if

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

In the above expression, the LHS is the loss of control from directly delegating  $a_s$  to the worker (and bypassing the middle manager) and RHS is the expected loss of information of having the middle manager choosing  $a_s$ .

**Proposition 5.** *When  $r(s) \leq \bar{r}_K \equiv \sigma_\theta^2 - \mu^2$ , middle managers are always valuable:  $\{m_A, m_B\} \subset$*

*M. When  $r(s) > \bar{r}_K$ ,  $\{m_A, m_B\} \subset M$  if and only if*

$$(1 - p_m)\sigma_\theta^2 < 3\mu^2, \quad (4)$$

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

Since conditions (4) or  $r(s) \leq \bar{r}_K$  for the value of a middle manager in a three-level hierarchy is qualitatively similar to that for a manager in a two-layer hierarchy, we refer to Section 2.4 for a detailed discussion of the comparative statics. We content ourselves to remind 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 owner (e.g. because boards are captive and/or shareholders are dispersed). Top managers, however, will not be shy to delayer the 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

$$r(s) < \bar{r}_K \equiv \sigma_\theta^2 - \mu_I^2$$

Since a middle manager then always re-delegates  $a_s$  to worker  $s$  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 making an uninformed decision if and only if

$$r(s) \leq \bar{r}_0 \equiv p_m \Pi(a_s^K) + (1 - p_m) \Pi(a_s^w) - \Pi(\bar{a}_s^0)$$

or still where

$$\Leftrightarrow r(s) \leq \bar{r}_0 = \sigma_\theta^2 - (1 + 3(1 - p_m)) \mu^2$$

Note that  $\bar{r}_0 < \bar{r}_K$ . Hence, for  $r(s) < \bar{r}_0$ , an top manager delegates  $a_s$  to the middle manager when uninformed and, in turn, this middle manager delegates  $a_s$  to worker  $s$  when uninformed. Clearly a top manager is always valuable then and  $M = \{m_0, m_A, m_B\}$ . In contrast, for  $r \in (\bar{r}_0, \bar{r}_K)$ , 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  $r(s) > \bar{r}_K$  and, hence, the middle manager does not delegate when uninformed. Note first that the top manager then neither wants to delegate to worker  $s$ . Indeed, a necessary condition for  $m_0$  to delegate to the worker is that

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

More importantly,  $m_0$  then also does not delegate to the middle manager. Indeed, for  $r(s) > \bar{r}_K$ , manager  $m_0$  delegates to middle manager  $m_K$  if and only if

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

or still

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

Since  $r_0^m < \bar{r}_K$ , it follows that if the middle manager never delegates, that is  $r(s) > \bar{r}_K$ , then also the top manager never delegates:  $r(s) > r_0^m$ .

We summarize as follows:

**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  $r < \bar{r}_0$  with  $\bar{r}_0 < \bar{r}_K$ . For  $r \in (\bar{r}_0, \bar{r}_K)$ , 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 managers delegates to the

worker. Importantly, the above result holds despite the fact that (i) both managers have the same preferences for power, as characterized by  $r$ , and despite the fact that (ii) the top manager has the option to delegate to either the middle manager or the worker, whereas the middle manager can only delegate 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 to delegate to the worker than  $m_K$ . Consider next the willingness of both  $m_0$  and  $m_K$  to delegate to agent in the next layer (respectively  $m_K$  and worker  $s$ ). From the perspective of the delegator ( $m_0$  or  $m_K$ ) the delegee (respectively,  $m_K$  or worker  $s$ ) 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  $\bar{r}_K = \sigma_\theta^2 - \mu^2$  to the middle manager, whereas the value of delegation to the top manager is at most

$$\bar{r}_0 \equiv p_m(\sigma_\theta^2 - \mu^2) + (1 - p_m)(\sigma_\theta^2 - 4\mu^2),$$

to the top manager. Note that this result would hold even worker  $s$  was 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, 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 itself is concerned). The following proposition characterizes when top manager  $m_0$  is valuable:

**Proposition 7.** (i) *Whenever  $r < \bar{r}_0$ , the top manager is always valuable:  $m_0 \in M$ .*

(ii) *Whenever  $r \in (\bar{r}_0, \bar{r}_K)$ , then  $m_0 \in M$  if and only if*

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

(iii) Whenever  $r > \bar{r}_K$ , then  $m_0 \in M$  if and only if

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

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. Recall 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 delegates authority to the middle manager whenever she is uninformed. The same result still holds provided preferences for power are small,  $r < \bar{r}_0$ . 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  $p_0$  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  $\mu$  and  $2\mu$  of the middle manager and worker are ambiguous – on the one hand, an increase in the bias  $\mu$  makes centralized decision-making more attractive. On the other hand, an increase in  $\mu$  exacerbates the moral hazard in delegation. Similarly, an increase in the variance  $\sigma_\theta^2$  makes decentralized decision-making more attractive, but it also makes it more likely that the top manager is willing to delegate when uninformed. We refer to Section 2.4 for a detailed discussion of these comparative static results.

### 3.2.4 Optimal hierarchies: delayering versus de-integration

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 (Assumption A1 and A2), this insight suggests that, as preferences for power become stronger, organizations are more likely to de-integrate (remove the top manager) than to delayer (remove the middle manager).

It will be useful to state the following condition

**Condition D1:** A lone manager  $M = \{m_0\}$  who never delegates is dominated by a hierarchy  $M = \{m_A, m_B\}$  of middle managers and workers, where the middle manager delegates to the

worker when uninformed:

$$(1 - p_0)\sigma_\theta^2 > [p_m + 4(1 - p_m)]\mu^2 \quad (5)$$

Condition 1 states that the loss of information due to ‘moral hazard in delegation’ – the fact that 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 Condition D1 holds:*

1. *If  $r < \bar{r}_0$ , 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  $r \in (\bar{r}_0, \bar{r}_K)$ , a dis-integrated 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  $r > \bar{r}_K$ , it is optimal to allocate initial decision rights to the best stand-alone decision-maker:  $M \in \{\phi, \{m_A, m_B\}, \{m_0\}\}$ . No delegation ever takes place.*

Intuitively, when  $r < \bar{r}_0$  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 becomes informed, the top manager,  $m_0$ , adds value to the hierarchy, regardless of  $p_0$ . When preferences for power are in an intermediate range,  $r \in (\bar{r}_0, \bar{r}_K)$ , 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,  $r > \bar{r}_K$ , neither middle manager nor top manager ever delegates when uninformed. In that case it is optimal to allocate the initial decision right to the whomever is the best stand-alone decision maker.

A first 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 this 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 D1 then becomes

$$\frac{1-p}{4-3p}\sigma_\theta^2 > \mu^2 \quad (6)$$

which will be satisfied if  $\mu$  and/or  $p$  are sufficiently small or  $\sigma_\theta^2$  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 by herself. By continuity, the following corollary holds.

**Corollary 1.** *Assume D1 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,  $r \in (\bar{r}_0, \bar{r}_K)$ ,  $M = \{m_A, m_B\}$  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 the above result 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, firm owners prefer to delegate authority to middle managers, who are biased, rather than to a top manager who share their objectives, even in the absence of an information advantage ( $p_m \leq p_0$ ). 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), Section 5, which shows that for intermediate conflicts of interest, a principal optimally delegates authority to an uninformed intermediary (e.g. middle manager) with preferences inbetween her and an informed but biased agent. In the latter paper, 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, ingredient that managers have preferences for making decisions themselves regardless of the decision itself. That is, they are power-hungry. Introducing this ingredient in an otherwise standard model provides a novel theory of the role and limits of middle management, as well as an intuitive response to the Williamson critique: why is integration not always value-increasing? Our model predicts optimal hierarchies to be smaller and more de-integrated in environments where 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 the introduction that developing countries may have different organizational forms, in part, due to differences in decision rents to those in developed countries.

Cultural differences, too, may be an important determinant of how much under-delegation there is in organizations. The world value survey finds a large heterogeneity in attitudes towards authority. Relatedly, Bloom, Sadun, and Van Reenen (2012) show a strong correlation between Hofstede (2001)'s power distance index of a country, which captures cultural attitudes towards power and hierarchy in a large multi-national firm, and the actual delegation of authority in a cross-section of industries.

Our model shows that larger decision rents/stronger preferences for power affect decentralization of decision-making both directly, for a given organizational structure, and indirectly, by making smaller and more de-integrated firms optimal. An implication, therefore, is that empirical papers which study 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 ob-

vious is a direct reward for delegation.<sup>20</sup> 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 agents, one would expect the most power-hungry managers to devote most resources and effort to gain access to positions of power. Following this logic, it is likely the most power-hungry and, hence, least suitable agents who rise to the top of the hierarchy, exacerbating organizational inefficiencies.

Finally, our model speaks to a novel source of path dependence in organizations. Gibbons (2006) began a literature seeking to provide a theoretical foundation for the empirical fact that he called '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 themselves may be in control of organizational design. For instance if an organization begins with 2 layers being optimal, but then a change in the environment leads to 1 or 3 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 both the break-up of the firm she leads as well as the take-over by another firm.

Of course, if an organizational designer realizes 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 where delegation decisions are not contractible is an interesting avenue for future work.

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<sup>20</sup>Unless decision rents are deterministic, however, subsidizing delegation decisions provides only a partial solution and will unavoidably result in both over- and under-delegation in equilibrium.

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