Informal Authority in Organizations

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We assert that decision rights in organizations are not contractible: the boss
can always overturn a subordinate's decision, so formal authority resides only
at the top. Although decision rights cannot be formally delegated, they might
be informally delegated through self-enforcing relational contracts. We examine
the feasibility of informal authority in two informational environments. We show
that different information structures produce different decisions not only because
different information is brought to bear in the decision-making process, but also
because different information creates different temptations to renege on relational
contracts. In addition, we explore the implications of formal delegation achieved
through divestitures.

Authority is the defining feature of hierarchy. The boss can restrict the sub-
ordinate's actions, overturn his decisions, and even fire him (unless the boss's
boss objects, in which case the boss herself may be fired). Tracing this chain
of authority up the hierarchy, we eventually reach a person (sole proprietor) or
group (shareholders) who can be thought of as owning all the decision rights
in the organization. In short, formal authority resides at the top.

Of course, few organizations are run by tyrants who actively exercise their
ownership of all the decision rights in the organization. To the contrary, many
middle managers wield substantial authority. But we assert that such authority
is always informal, in the sense that it can be retracted by those higher up the
hierarchy, ultimately by those at the top who hold the formal authority. That is,
we see all subordinates' decision rights as loaned, not owned.

Given that formal authority resides at the top of organizations, when and
how will bosses delegate informal authority to subordinates? To begin to study
these questions, we construct a simple model in which a subordinate develops a
project to propose to a boss. The boss has the formal authority over whether to
ratify the project (i.e., over whether to allow the project to be implemented), but
the boss may informally delegate this ratification authority to the subordinate.
We see this ratification decision as a metaphor for a wide range of decisions

that might be informally delegated, including decisions about human resources (hiring, training, job design), decisions about production (sourcing, capital and operating expenditures), decisions about competition (pricing, advertising, product design), and so on.

We analyze our model in two environments: in the first, the boss has the information necessary to assess the project before it is ratified; in the second, the boss does not have this information. For certain parameters in the "informed-boss" model, the boss informally delegates authority by promising to ratify all projects that the subordinate proposes, even if they are not in the boss's (or even the firm's) best interest. If this promise is believed, it induces superior effort from the subordinate in the initiation stage (i.e., in searching for and developing projects). These benefits from increased effort can outweigh the *expected* costs of the poor projects that are sometimes ratified, in which case delegation is efficient. But the boss has the information to assess a *particular* project before it is ratified, and so will be tempted to renege on the promise by rejecting a project that is not in her (or the firm's) interest; that is, delegation may not be feasible, even if it is efficient. As in other repeated-game models, informal delegation is feasible in our informed-boss model if the boss values her reputation for delegating authority more than she would save by reneging on her promise to ratify all proposals.

A different problem arises in the "uninformed-boss" model. Here the boss does not have the information necessary to assess a proposed project before it is ratified, but she does observe the results from the project after it has been ratified and implemented. Therefore the boss may informally delegate authority by promising to ratify all projects that the subordinate proposes, but also threatening to retract the subordinate's future authority if the eventual results from the current project are sufficiently poor. In this model it is the subordinate's reputation for using his authority appropriately that is at stake, whereas in the informed-boss model it is the boss's reputation for delegating authority that is on the line.

We believe that these models capture two familiar and important features of authority in organizations. First, a boss frequently finds herself choosing not to overturn a subordinate's bad decision because doing so would reduce the subordinate's effort and enthusiasm in the future. Our model thus captures an important aspect of delegation: bosses often feel "regret" as they knowingly allow bad decisions to be made. Second, subordinates frequently face the opportunity to abuse their authority (for instance, by using an expense account for unauthorized expenditures) but opt not to because such abuse would lead to the retraction of authority in the future. This model thus captures the tension felt by subordinates in exercising their authority "responsibly."[1]

At a more abstract level, our two models differ in who is tempted to renege on whom. This distinction produces a key insight from our analysis: different

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1. The analogies to parenting and childhood, although not lost on us, are beyond the scope of this article.

information structures produce different decisions not only because different information is brought to bear in the decision-making process but also because different information creates different reneging temptations. As an example of this idea, we show that costlessly moving the boss from no information to full information can make the parties worse off, because it changes who is tempted to renege and how sorely. Thus our analysis begins to illuminate not only when informal delegation should be observed (e.g., when the relevant party is patient, as in other repeated-game models) but also how informal delegation should be achieved (e.g., in tandem with what information structure).

Our modeling of informal delegation draws on two existing arguments concerning formal delegation. The first is due to Fama and Jensen (1983), who decompose decision rights into a four-step process: initiation, ratification, implementation, and monitoring. Fama and Jensen argue that organizations in which decision rights are held by nonowners will always separate the first and third of these steps (the decision management rights) from the second and fourth (the decision control rights). Our model assumes a simplified version of this separation, focusing on only the first two steps: the subordinate searches for and develops a project proposal (initiation), but the boss retains the formal authority over whether the project will be implemented (ratification). We ignore the latter two steps (the implementation of the project once it is ratified and monitoring of its results), which are the focus of the classic agency model. Thus, Fama and Jensen analyze a richer environment (one that concatenates our model and the classic agency model), but they argue that decision management will always be separated from decision control. We accept their assertion that decision management will be formally separated from decision control, but ask when and how the boss can informally delegate her control rights (ratification) to induce the subordinate to make better use of his management rights (initiation).

We also draw on Aghion and Tirole (1997), who examine the distinction between formal and real authority and ask how delegation affects incentives for information gathering by the subordinate. Unlike Fama and Jensen, Aghion and Tirole argue that bosses may choose formal delegation in order to give subordinates stronger incentives. That is, by giving the subordinate formal authority over both initiation and ratification, the boss may greatly improve the subordinate's incentive to search for and develop projects, and these benefits can outweigh the costs of the poor projects that are sometimes implemented. As noted above, informal delegation also has this effect in our model. But the fact that informal delegation can be retracted in our models leads to different predictions for when delegation will be feasible. We elaborate on such differences below.

In sum, we see this article as a simple but realistic reconciliation of the contradictory theoretical arguments by Fama and Jensen and Aghion and Tirole concerning delegation of authority in organizations. Our assumption that the boss always has the formal authority to ratify projects matches not only Fama and Jensen's theoretical argument but also countless descriptions of real organizations. But our focus on the boss's delegation of ratification authority to the subordinate matches not only Aghion and Tirole's theoretical argument

but yet more descriptions of real organizations: middle managers often have substantial authority. We reconcile the two by emphasizing that delegation in organizations is informal.

Although we emphasize throughout this article that subordinates' authority is informal, we conclude by briefly sketching a third model in which we reconsider formal delegation. Following Grossman and Hart (1986), we argue that there is a way to achieve formal delegation, but it occurs between rather than within organizations: for a boss to convey formal authority to a subordinate, she must make the subordinate the owner of the assets that the subordinate would otherwise have merely managed. To be concrete, we envision an R&D lab that generates new products. If the parent company owns the lab then the parent has formal authority over which products come to market; if the lab is divested then it has that formal authority. In either case, however, there can be a useful relationship (formally, a repeated-game equilibrium) between the parent and the lab. Analogous to our related work on internal versus external supply relationships (Baker, Gibbons, and Murphy, 1997), formal authority is allocated through asset ownership, but informal authority can still be delegated in a repeated game, and the allocation of formal authority affects the set of equilibria in the repeated game. We hope to pursue a model along these lines in future work.

1. The Economic Environment

We study an infinitely repeated game involving a boss and a subordinate. Both players are risk neutral and live forever (in the usual repeated-game sense). Each period, the subordinate investigates a potential project and makes a recommendation to the boss, who either accepts or rejects the recommended project. Potential projects offer noncontractible benefits of X and Y to the subordinate and the boss, respectively. The subordinate discovers a project's payoffs by investigating the project. For simplicity, we assume that the benefits take only two values, positive or negative: $X_H > 0 > X_L$ and $Y_H > 0 > Y_L$. Thus, it is in the subordinate's private interest to recommend projects yielding X_H and ignore projects yielding X_L, and it is in the boss's private interest to accept projects yielding Y_H and reject projects yielding Y_L.

The subordinate can take actions that affect the probability of discovering a project he likes, such as searching across more potential projects and considering alternative ways to implement a given project. We define the subordinate's "search intensity" as the probability of discovering a good project, $a \equiv \mathrm{Prob}(X_H)$. The conditional probability that the boss's payoff is Y_H when the subordinate's payoff is X_H is $p \equiv \mathrm{Prob}(Y_H|X_H)$; the conditional probability that the boss's payoff is Y_H when the subordinate's payoff is X_L is $q \equiv \mathrm{Prob}(Y_H|X_L)$. Thus, given the subordinate's search intensity, the probability of each (X,Y) state is:

$$\mathrm{Prob}(X_H, Y_H) = ap, \qquad \mathrm{Prob}(X_l, Y_H) = (1-a)q, \qquad (1)$$

$$\mathrm{Prob}(X_H, Y_L) = a(1-p), \qquad \mathrm{Prob}(X_L, Y_L) = (1-a)(1-q).$$

We assume the following timing each period. First, the boss chooses an amount s to pay the subordinate (where $s < 0$ means the subordinate pays the boss), so that the subordinate's utility equals or exceeds his reservation utility. Second, the subordinate chooses an unobservable search intensity at cost $c(a) = \gamma a^2$, thereby discovering a project. The subordinate observes the project's payoffs (X, Y). If the project yields X_L, the subordinate ignores the project, and its existence is not disclosed to the boss.[2] If the project yields X_H, the subordinate recommends the project to the boss, who in turn decides to either accept or reject the recommendation. In our informed-boss model, this recommendation reveals the boss's payoff to her, Y_H or Y_L. In our uninformed-boss model, however, the boss lacks the prior information necessary to discern her payoff from the subordinate's recommendation.

To pave the way for our repeated-game analysis of informal authority, we begin with two static analyses as benchmarks. First, we consider the static version of our informed-boss model, which we label "informed centralization" (or simply "centralization" where there is no risk of confusion). Second, even though the major premise of our repeated-game analysis is that decision rights in organizations must be loaned rather than owned, we consider a static model in which the boss can transfer formal authority to the subordinate; we label this second benchmark model "contractible delegation" (or simply "delegation").

1.1 Informed Centralization

In the static case of our informed-boss model, the subordinate would like the boss to ratify projects yielding either (X_H, Y_H) or (X_H, Y_L), but the subordinate will rationally anticipate that the boss will reject projects yielding $Y_L < 0$. Because only projects yielding $Y_H > 0$ will be accepted, the subordinate will choose the search intensity that maximizes the expected utility

$$\max_a s + apX_H - c(a). \tag{2}$$

The subordinate's optimal search intensity under centralization therefore solves

$$c'(a^C) = pX_H. \tag{3}$$

Efficient search under centralization (i.e., the search intensity that maximizes joint welfare, conditional on selecting only (X_H, Y_H) projects) solves $c'(a^*) = p(X_H + Y_H)$. Because $Y_H > 0$, search under centralization is less than efficient.

The expected payoff to the boss under centralization is $a^C pY_H - s$, so the total expected welfare is

$$V^C \equiv a^C p(X_H + Y_H) - c(a^C). \tag{4}$$

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2. That is, the event $X = X_L$ can be interpreted as the subordinate not discovering a project. Alternatively, we could assume that the boss knows that a project was discovered and rejected by the subordinate, but that its expected payoff to the boss (conditional on being rejected by the subordinate) is negative: $E(Y|X = X_L) = qY_H + (1-q)Y_L < 0$.

1.2 Contractible Delegation

Suppose for this subsection only that the right to ratify projects has been contractually delegated to the subordinate. He will therefore adopt both (X_H, Y_H) and (X_H, Y_L) projects, and so will select the search intensity that maximizes the expected utility

$$\max_a s + aX_H - c(a). \tag{5}$$

The subordinate's optimal search intensity under delegation therefore solves

$$c'(a^D) = X_H. \tag{6}$$

Because $c''(a) > 0$ and $X_H > pX_H$, we replicate Aghion and Tirole's result that delegation strengthens incentives.

Result 1. Delegation strengthens incentives: the subordinate's search intensity under delegation [Equation (6)] exceeds his intensity under centralization [Equation (3)].

We are careful to state that delegation "strengthens" incentives rather than "improves" incentives, because the subordinate may search too much under delegation. In particular, the efficient incentives under delegation are given by $c'(a^*) = p(X_H + Y_H) + (1 - p)\max(0, X_H + Y_L)$, which can imply either higher or lower search intensities than Equation (6). For example, if $X_H + Y_L < 0$ and Y_H is small then the social marginal benefit from search, $p(X_H + Y_H)$, is smaller than the private marginal benefit, X_H.

The expected payoff to the boss under delegation is $a^D(pY_H + (1-p)Y_L) - s$, so the total expected welfare under delegation is

$$V^D \equiv a^D p(X_H + Y_H) + a^D(1 - p)(X_H + Y_L) - c(a^D). \tag{7}$$

If delegation were contractible, the parties would agree to delegate the right to ratify projects whenever $V^D > V^C$, but would leave this right with the boss whenever $V^D < V^C$.

The relative efficiency of centralization and contractible delegation depends on two effects: ex ante incentives and ex post project choice. Result 1 shows that incentives are stronger under delegation. The efficacy of project choice depends on the sign of $X_H + Y_L$. When $X_H + Y_L > 0$, project choice under contractible delegation is superior to that under centralization, because it is efficient to adopt both (X_H, Y_H) and (X_H, Y_L) projects; when $X_H + Y_L < 0$, however, delegation produces inefficient project choice, because (X_H, Y_L) projects reduce joint welfare but are nonetheless adopted.

Figure 1 shows how the relative efficiency of centralization and contractible delegation varies with $-Y_L$ (the absolute value of the boss's cost from delegation) and p (the probability that the boss will realize a good outcome conditional on the subordinate realizing a good outcome). The conditional probability p can be interpreted as both (1) a measure of the difference in the subordinate's incentives under centralization and delegation and (2) the correlation between the subordinate's and the boss's outcomes. For example, when p is close to
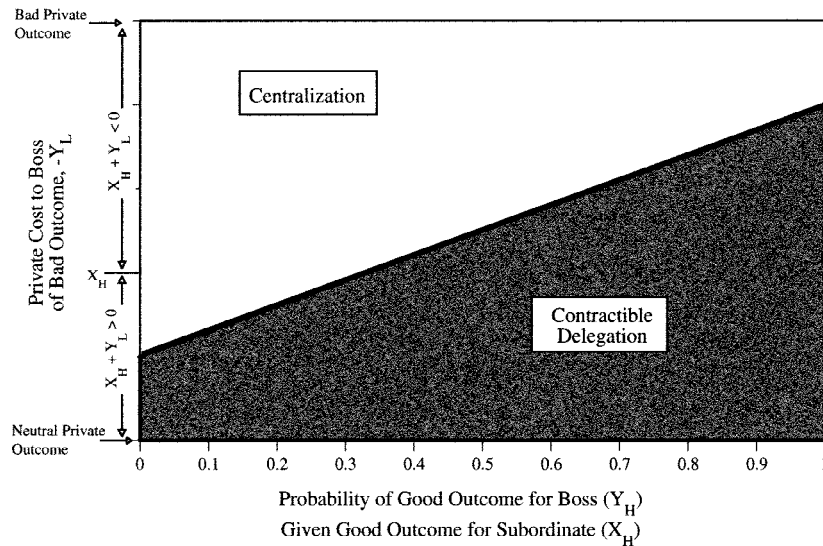
Figure 1. Relative efficiency of centralization and contractible delegation for different values of Y_L and p. The centralization region includes all combinations of Y_L and p yielding $V^D - V^C < 0$; contractible delegation includes all combinations yielding $V^D - V^C > 0$. Figure is drawn assuming $X_H = Y_H$.

one, the incentives from centralization approach the incentives from delegation [compare Equations (3) and (6)] and high private benefits for the subordinate (X_H) are almost always associated with high private benefits for the boss (Y_H). Figure 1 shows that contractible delegation is more likely to dominate centralization when the parties' interests are aligned (i.e., p is large) and the boss's cost from delegation is low (i.e. $-Y_L$ is small).

2. Two Models of Informal Authority

For the rest of this article, we return to our assertion that formal authority cannot be delegated within organizations. In this section we consider two repeated-game models of informal authority. These models differ in their information structure: when the boss decides whether to ratify a proposed project, she may or may not have information about the benefits she will realize after the project is implemented. In our first model—pertaining to projects that lend themselves to careful analysis, due diligence, and relatively informed ratification decisions—we assume that the boss becomes fully informed about her benefits from the project, Y, prior to ratifying the project. In the second model—pertaining to projects that arise opportunistically and require quick judgments based on incomplete information—the boss is poorly informed about the project's benefits and must therefore either rubber-stamp or veto the project based on only prior information.

2.1 Informal Delegation with an Informed Boss

In this subsection we assume that the boss observes her potential private benefits, Y_H or Y_L, prior to deciding whether to ratify a proposed project. Although the right to ratify projects is noncontractible, this decision can be informally delegated: the boss can "promise" to ratify all the subordinate's proposed projects, regardless of whether a given project yields high or low benefits to the boss. If the subordinate believes that the boss will honor her informal commitment to ratify all proposals, the subordinate will follow Equation (6) in choosing the search intensity a^D that maximizes his expected utility.

After the subordinate proposes a project, the boss must decide whether to honor or to renege on her promise to ratify all proposals. The boss is eager to accept projects yielding Y_H, but will be tempted to renege on her promise when the project yields Y_L. We assume that the subordinate will no longer trust a boss with a tarnished reputation, so we focus on trigger-strategy equilibria, as follows.

Define X^D and Y^D as the expected payoffs per period to the subordinate and boss when the promise of informal delegation is honored, so $X^D + Y^D = V^D$ from Equation (7). Similarly, define X^C and Y^C as the expected payoffs per period if the promise is broken, so $X^C + Y^C = V^C$ from Equation (4). Then the boss's choice is between (1) receiving $Y_L < 0$ this period (by honoring to her promise to ratify all proposals) but earning Y^D forever after and (2) receiving nothing this period (by reneging on the promise) but earning Y^C forever after. The boss will honor her promise if

$$Y_L + \tfrac{1}{r}Y^D > \tfrac{1}{r}Y^C, \text{ or } Y^D - Y^C > -rY_L. \tag{8}$$

The subordinate will accept informal delegation (in particular, the subordinate will make or accept the initial payment) only if his expected payoff from delegation exceeds his payoff from centralization:

$$X^D - X^C > 0. \tag{9}$$

Combining Equations (8) and (9) provides the necessary and sufficient condition for the existence of self-enforcing informal delegation (i.e., a subgame-perfect Nash equilibrium of the infinitely repeated game):

$$V^D - V^C > -rY_L, \tag{10}$$

where r is the boss's discount rate. In short, informal delegation is self-enforcing if the surplus from delegation over centralization ($V^D - V^C$) is sufficiently large. Formally, we have the standard repeated-game result:

Result 2. There are economic environments where informal delegation is efficient ($V^D - V^C > 0$) and feasible ($V^D - V^C > -rY_L$).

When informal delegation is feasible, the boss will sometimes allow bad decisions to be made, even though she has the authority to overrule the decision. Some of these decisions are joint-welfare maximizing ($X_H + Y_L > 0$); others decrease total welfare ex post ($X_H + Y_L < 0$). Thus, under informal delegation, the boss may feel regret over a decision that she allows the subordinate to make,

Figure 2. Relative efficiency of centralization and informal delegation for $r > 0$ and for different values of Y_L and p. The centralization region includes all combinations of Y_L and p yielding $V^D - V^C < -rY_L$; informal delegation includes all combinations yielding $V^D - V^C > -rY_L$. Figure is drawn assuming $X_H = Y_H$ and $r = 30\%$.

ratifying a project that she knows is bad in spite of her ability to overrule. The boss does this because, by accepting all the subordinate's recommendations, she may greatly improve the subordinate's incentive to search for and develop projects, and these benefits can outweigh the costs of the poor projects that are sometimes implemented.

Figure 2 shows how the relative efficiency of centralization and informal delegation varies with $-Y_L$ and p, assuming a positive discount rate. For comparative purposes, the linear boundary between centralization and *contractible* delegation is also depicted. As illustrated, there are circumstances where the boss would like to delegate formal authority to the subordinate ($V^D - V^C > 0$) but cannot because she cannot be trusted to honor her promise. In particular, informal delegation becomes infeasible when p is high. As p approaches one, the welfare difference between delegation and centralization ($V^D - V^C$) approaches zero, because the subordinate's search intensity and the resulting distribution of proposed projects are nearly identical under centralization and under delegation. In this sense, the boss's fallback after reneging on an informal-delegation promise is relatively attractive when p is high, so she cannot be persuaded to ratify projects yielding Y_L.

The result that informal delegation becomes infeasible when p is high illustrates a more general point: the attractiveness of contractible delegation over centralization depends solely on the expected surplus ($V^D - V^C$), but the feasibility of informal delegation depends also on the size of the extreme payoffs

that might be realized, because these extreme payoffs determine the reneging temptation.

Result 3. Holding the expected net surplus constant ($V^D - V^C = k$), informal delegation becomes infeasible as the temptation to renege ($-rY_L$) increases.

Result 3 suggests several potentially testable differences between models of contractible delegation [such as Jensen and Meckling (1992) and Aghion and Tirole (1997)] and our model of informal delegation. First, as in most repeated-game models, Equation (10) in our model predicts that informal delegation will be infeasible at sufficiently high discount rates, whereas the feasibility of contractible delegation is independent of discount rates. More interestingly, our model predicts that the feasibility of informal delegation depends on the boss's reneging temptation, which in turn depends on both the expectation and extreme realization of payoffs. To be concrete, consider a change in the boss's payoffs that increases Y_H and decreases Y_L in such a way that the expected net surplus ($V^D - V^C$) remains unchanged. Such a change makes informal delegation less likely to be feasible because it increases the boss's reneging temptation. Finally, when delegation is contractible, both Jensen and Meckling and Aghion and Tirole argue that decision rights will be delegated if the interests of subordinates and bosses are sufficiently highly correlated. In our model, however, informal delegation is infeasible when the subordinate's interests are too highly correlated with the boss's, because the fallback is too attractive.

2.2 Informal Authority with an Uninformed Boss

We now consider situations where the boss must decide whether to ratify a project before she becomes informed about her benefit from the project, Y_H or Y_L. This model pertains to three situations: large investments where the boss relies heavily on subordinate expertise when ratifying projects; small decisions (such as expenditures under subordinate expense accounts) that do not warrant monitoring prior to implementation; and decisions over investment opportunities that arise quickly and would disappear before the boss could conduct a careful analysis.

When the boss is uninformed about whether the project will ultimately yield Y_H or Y_L, she must either veto all projects proposed by the subordinate (including those yielding Y_H) or give "rubber stamp" approval to all proposed projects (including those yielding Y_L). Her expected benefit from rubber-stamping a proposed project is $E(Y|X_H) = pY_H + (1 - p)Y_L$, whereas her benefit from vetoing a project is zero. Thus, in a one-shot game, the boss would veto a proposed project if $E(Y|X_H) < 0$ but rubber stamp a proposed project if $E(Y|X_H) > 0$.

Although we assume that the boss does not observe her benefit until the project has been ratified and implemented, we assume that the subordinate observes both his benefit and the boss's benefit before proposing a project. This information structure suggests an informal agreement that could dominate both vetoing and rubber-stamping: the subordinate could be granted informal authority to recommend only projects yielding Y_H, and the boss could ratify

all proposed projects but threaten to retract the subordinate's future authority if Y_L is realized. Since the boss's benefit Y is not contractible (and is not even observable to the boss until after implementation), this informal agreement must be enforced through rent sharing in a long-run relationship. That is, the subordinate will receive an "efficiency wage" payment so long as he does not abuse his informal authority (i.e., as long as he recommends only Y_H projects), and the agreement will be terminated if he abuses his authority. Following termination, the subordinate and boss will interact through one-shot games characterized by either veto or rubber stamp, depending on the sign of $E(Y|X_H)$.

We label such a repeated-game equilibrium *informal authority*, to distinguish it from informal delegation in the informed-boss model. The two equilibria differ in an important respect. Under informal delegation, the boss is tempted to renege on her promise to ratify a proposal that is bad for her. Although she feels regret over particular decisions, she ratifies them in order to maintain her reputation as a delegator. Under informal authority, in contrast, it is the subordinate who is tempted. He would like to propose (and have rubber stamped) a project that is good for him and bad for the boss, but knows that if he does so his reputation for using his authority responsibly will be lost.

This uninformed-boss model is a bit more complicated to analyze than was the informed-boss model. As before, it matters whether centralization or contractible delegation is more efficient (V^C versus V^D, as in Figure 1). Now it also matters whether the fallback after reneging (i.e., the equilibrium of the one-shot game) is rubber stamping or vetoing ($E(Y|X_H)$ versus 0). Figure 3 illustrates the four relevant regions. Rubber stamping dominates vetoing below the curve $E(Y|X_H) = 0$ (regions A and B), while vetoing dominates above the curve (regions C and D). Centralization dominates contractible delegation in regions B and C, while delegation dominates in A and D. The interesting results on informal authority occur in regions A, B, and C, so we focus only on these.

2.2.1 Region A.   In region A of Figure 3, the equilibrium of a one-shot game would involve the uninformed boss ratifying all proposed projects. Also, contractible delegation is more efficient than centralization [i.e., both (X_H, Y_H) and (X_H, Y_L) projects should be ratified]. Consequently, rubber stamp approval results in ex post efficient ratification decisions, so there is no gain to relational contracts in this region. Although decision rights appear to be fully delegated in this region, the delegation is illusory: the boss approves all proposed projects only because she has no information with which to evaluate particular projects, and she knows that the expected value of her payoffs is positive ($E(Y|X_H) > 0$).

Recall from Figure 2 that in the corresponding region for the informed-boss model (high p, low $-Y_L$), informal delegation is infeasible for sufficiently high r and p, so the informed boss is stuck with centralization (and consequently low incentives). In this part of region A, therefore, total welfare is higher with an uninformed boss than with an informed boss, because the latter will be tempted to renege when facing $Y_L < 0$.
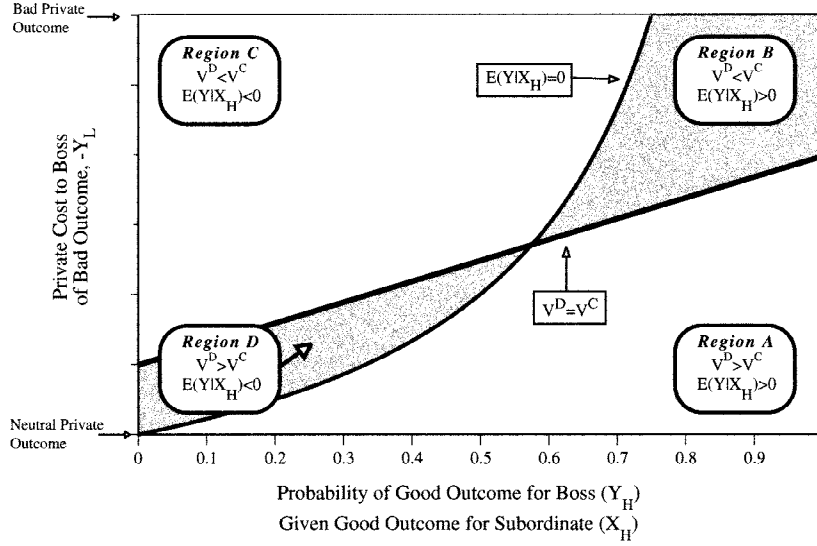
Figure 3. Relevant regions for analysis of decision authority when the boss is uninformed. The two lines depict all combinations of Y_L and p yielding $V^D - V^C = 0$ and $E(Y|X_H) = pY_H + (1-p)Y_L = 0$.

2.2.2 Region B.
Region B is more interesting. Here the equilibrium of a one-shot game is again rubber stamping, but centralization is more efficient than contractible delegation [i.e., only (X_H, Y_H) projects should be ratified]. Assuming that informal authority is feasible, the joint surplus from informal authority is the same as the joint surplus from centralization, V^C in Equation (4).

Recall the definitions of X^C, X^D, Y^C, and Y^D from Section 2.1. A subordinate who abuses his authority by recommending a project yielding (X_H, Y_L) will receive X_H in the current period and X^D thereafter. The subordinate will honor rather than abuse his informal authority if the present value from honoring exceeds the present value from abusing:

$$\frac{1}{r}X^C > X_H + \frac{1}{r}X^D, \text{ or } X^C - X^D > rX_H, \tag{11}$$

where r is the subordinate's discount rate. The boss will grant informal authority only if her expected payoff from informal authority exceeds her expected payoff from the fallback:

$$Y^C - Y^D > 0. \tag{12}$$

Combining Equations (11) and (12) provides the necessary and sufficient condition for the existence of self-enforcing informal authority:

$$V^C - V^D > rX_H. \tag{13}$$

We therefore have the standard repeated-game result for the uninformed boss
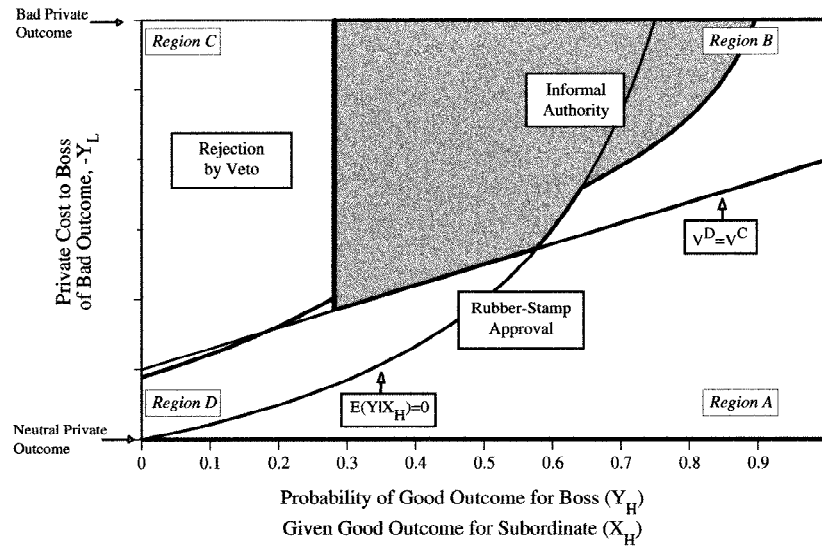
Figure 4. Relative efficiency of rubber stamping, vetoing, and informal authority for different values of Y_L and p. Figure is drawn assuming $X_H = Y_H$ and $r = 30\%$.

model, analogous to Result 2 in the informed-boss model:

Result 4. There are economic environments where informal authority is efficient ($V^C - V^D > 0$) and feasible ($V^D - V^C > rX_H$).

Figure 4 shows parameter values where informal authority is feasible and parameter values where it is not. In the shaded part of region B, the subordinate proposes only Y_H projects and the boss rubber stamps all proposals (even though she is uninformed about the actual payoff until the project is ratified and implemented). More generally, Equation (13) implies that informal authority is feasible whenever r and X_H are not too large—that is, when the subordinate's temptation to propose Y_L projects is not too great.

Result 5. Holding the expected net surplus constant ($V^C - V^D = k$), informal authority becomes infeasible as the temptation to renege (rX_H) increases.

Result 5 for the uninformed boss complements Result 3 for the informed boss. As with Result 3, the role of extreme payoff realizations (as well as payoff expectations) in the repeated-game analysis suggests testable differences between models of contractible delegation versus informal authority.

To an outsider, the decision rights in the shaded area of region B would appear to be as fully delegated as in the rest of region B or in region A, but there is an important difference. In all three areas the boss rubber stamps all proposals, but in the shaded area of region B the subordinate proposes only Y_H projects, whereas in the other two areas the subordinate proposes both Y_H and Y_L projects. In the shaded area of region B, the boss is paying the subordinate

an efficiency wage (through the fixed payment s) that gives him an incentive to propose only Y_H projects. The threat of losing this payment induces the subordinate to use his informal authority responsibly.

2.2.3 Region C. Region C is much like region B. The difference is the fallback: now the equilibrium of a one-shot game would involve vetoing (yielding zero benefits to both parties) rather than rubber stamping. A subordinate who has informal authority to recommend (X_H, Y_H) projects will honor rather than abuse this authority if the present value from honoring exceeds the present value from abusing: $X^C > rX_H$. Similarly, the boss will grant informal authority only if $Y^C > 0$. Combining these constraints yields the necessary and sufficient condition for the existence of self-enforcing informal authority in region C:

$$V^C > rX_H. \tag{14}$$

This inequality leads to results analogous to Results 4 and 5 in region B. Because neither V^C nor rX_H depends on Y_L, the condition in region C under which informal authority is feasible is independent of Y_L. Thus, as illustrated in Figure 4, the dividing line between "informal authority" and "rejection by veto" is a vertical line.[3]

In the shaded area of region C, the repeated-game equilibrium is the same as in the shaded area of region B: the subordinate proposes only Y_H projects and the boss accepts all proposals. The two areas differ only in the fallback after reneging. In region C, reneging by the subordinate is followed by vetoing all proposals. In this sense, abuse of informal authority leads to retraction of that authority. In region B, in contrast, the fallback is for the boss to rubber stamp all proposals, understanding that the subordinate will propose both Y_H and Y_L projects. In this sense, abuse of informal authority leads to reduction of the subordinate's responsibility rather than full retraction of his authority.

3. Divestiture as Contractible Delegation

Throughout this article we have asserted that if a boss gives a subordinate authority then the boss can take it away. That is, a subordinate's authority is informal, no matter how strong and secure it appears. But informal authority is not always strong or secure. To the contrary, Result 3 shows that even if delegation would be efficient, it is sometimes impossible to sustain informal delegation as a repeated-game equilibrium.

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3. Even when informal authority is infeasible, it may be possible to support a "rubber stamp" equilibrium where the boss accepts all projects [even though $E(Y) < 0$ so that it is in her short-run interest to reject all projects]. Intuitively, this corresponds to the case where $V^C > V^D > 0$; informal authority (generating V^C) dominates rubber stamp (generating V^D), but rubber stamp approval is better than nothing. This equilibrium is shown in Figure 5 as the "sliver" of rubber stamp approval in region C. Full equilibrium conditions for regions C and D are available from the authors on request.

In this section we suggest that when informal delegation is efficient but infeasible, the boss can formally delegate decision rights to the subordinate by selling him the assets that go with the decision rights. Ownership of these assets gives the (former) subordinate the right to make decisions without the threat that the (former) boss will overturn his decision. More concretely, a CEO cannot give a division manager formal authority because the CEO can always intervene, but if the division is divested then the former division manager holds the formal authority in the new firm. We thus provide a new rationale for divestiture.[4]

Our purposes here are to sketch a model in which divestiture achieves the delegation of formal authority and to suggest how informal delegation within an organization ("empowerment") differs from formal delegation via divestiture. To fix ideas, we describe a model of product development that can be conducted either by an internal R&D lab or by a spin-off from the parent company. When the lab is owned by the parent company, the lab may have substantial informal authority to develop and market new products, but formal authority ultimately rests with the parent company, whereas if the lab is divested then it retains final decision rights over its product choices.

The model is very close to the informed-boss model described in Section 2.1: the subordinate (the R&D lab) expends effort to identify a project; if the subordinate proposes a project then the boss (the parent company) observes the project's payoffs; finally, the boss decides whether to ratify the proposed project. In the context of product development, think of Y as the payoff to the parent company from its existing products and X as the payoff to the R&D lab from introducing a new product. Thus a product that is good for the subordinate ($X > 0$) might either complement or substitute for the parent company's existing products ($Y > 0$ or $Y < 0$). As a result of this externality, there may be gains from a relational contract between the parties even after a divestiture.

To analyze divestitures, we introduce the idea of an asset that plays a critical role in implementing any project. This asset is the source of formal authority. That is, if the boss owns the asset then she can decide whether or not to implement a project, whereas if the subordinate owns the asset then he can make that decision.

In addition to introducing an asset to define the allocation of formal authority, we make one small change to the informed-boss model: while the subordinate's payoff remains either X_H or X_L, where $X_H > 0 > X_L$, the boss's payoff is now either Y_H, Y_M, or Y_L, where $Y_H > 0 > Y_M > Y_L$. We introduce this third possible payoff for the boss in order to create a role for informal authority that cannot be duplicated by either formal authority held by the boss (internal R&D lab) or formal authority held by the subordinate (spin-off), as follows.

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4. Obviously, this approach owes much to Grossman and Hart (1986). Analogous to our related work on internal versus external supply relationships (Baker, Gibbons, and Murphy, 1997), we emphasize here that relational contracts (both within and between firms) are as important as formal ownership structures and that different formal ownership structures support different relational contracts.

If the boss owns the asset then she will be tempted to implement only (X_H, Y_H). Alternatively, if the subordinate owns the asset then he will be tempted to implement (X_H, Y_H), (X_H, Y_M), and (X_H, Y_L). Neither allocation of formal authority can implement (X_H, Y_H) and (X_H, Y_M) but not (X_H, Y_L) in the one-shot game. But it might be efficient to implement only these two kinds of projects (for example, even though $Y_M < 0$, it could be that $X_H + Y_M > 0$). We therefore turn to the repeated game, where the question becomes which allocation of formal authority can more easily achieve this implementation rule?

Relational contracts to accept (X_H, Y_H) and (X_H, Y_M) projects but to reject (X_H, Y_L) projects are feasible if the expected surplus exceeds the reneging temptation faced by the party owning the asset. The relative efficiency of boss or subordinate ownership therefore depends on which party would be less likely to renege on the relational contract. If the boss owns the asset (and so has formal authority over product development and marketing decisions) then she will be tempted to renege by refusing to ratify (X_H, Y_M) projects, earning a private benefit of $-Y_M$. Thus the boss will renege if $-Y_M > V/r$, where V is the expected net surplus per period from honoring the relational contract (relative to the fallback) and r is the discount rate. On the other hand, if the subordinate owns the asset then he will be tempted to renege by accepting (X_H, Y_L) projects, earning a private benefit of X_H, and so reneging when $X_H > V/r$. Comparing these two reneging constraints shows that if $-Y_M > X_H$ then there are discount rates for which the desired implementation rule can be achieved by having the subordinate own the asset (divestiture) but not by having the boss own the asset (internal R&D lab). Likewise, if $-Y_M < X_H$ then there are discount rates for which the desired implementation rule can be achieved by an internal R&D lab but not by divestiture. In short, asset ownership affects reneging temptations.

More generally, formal authority determines who is tempted to renege and by how much. Thus the allocation of formal authority can influence whether a particular allocation of informal authority can be achieved in a repeated game. When the boss retains formal authority, the subordinate can nonetheless have substantial informal authority, as in the two models analyzed above. The contribution of this section, therefore, is to ask whether giving the subordinate formal authority (while impossible within the organization and so necessarily achieved via divestiture) makes it easier or harder to sustain the desired form of informal authority.

4. Conclusion

In this article we assert that formal authority resides at the top: decision rights in organizations are inherently noncontractible. We explore the implications of this assertion by modeling delegated authority as informal, arising from commitments enforced by reputation. We believe that this model of authority delivers a richer and more accurate sense of how delegation actually works in organizations. The model also makes some new predictions about how and when delegation will occur, and it allows us to make new distinctions between types of authority (which we have called informal delegation and informal

authority, depending on the information available to the boss). Finally, our approach suggests a new rationale for divestitures.

We derive a number of specific results on the informal delegation of authority. First, delegation "empowers" subordinates, giving them strengthened incentives to search for and develop proposals. This result, which replicates a result in Aghion and Tirole, holds whether or not the boss is informed about the details of the project before deciding on whether to ratify the subordinate's proposal.

Our more novel results relate to the ability of bosses and subordinates to sustain the repeated-game equilibria that constitute delegated authority in our model. We show that, in the informed-boss case, even though the boss is unable to delegate authority to the subordinate formally, she is able to delegate this authority informally for certain parameter values. Specifically, when the boss's discount rate is low, when she doesn't have too much to lose, and when the interests of the boss and subordinate are not too well aligned, informal delegation is possible. We also show that, in contrast to contractible delegation, the feasibility of informal delegation depends on the extreme values of *realized* outcomes rather than solely on *expected* outcomes. Holding the expected outcomes constant, raising the amount that the boss could lose from a bad decision by the subordinate lowers the likelihood that informal delegation is feasible.

In the case of an uninformed boss, a similar set of results holds. In this case, it is the subordinate whose reputation is on the line, and it is his short-run temptation to implement projects that hurt the boss that must be outweighed by the long-run value of using his authority responsibly. Now it is a low discount rate for the subordinate that makes informal authority possible, along with a low extreme value of the subordinate's good outcome. Again, temptation is induced by large realizations, rather than high expected values. Holding the expected outcome constant, raising the amount that the subordinate can gain from reneging on his commitment not to take projects that are bad for the boss lowers the likelihood that informal authority is feasible.

Finally, we argue that in circumstances where contractible delegation would be valuable but informal delegation is not feasible, the parties will find divestiture efficient. Asset transfer in this model achieves formal delegation of decision rights. By agreeing to sell the assets that a subordinate manages to the subordinate, the boss eliminates her right to overturn the subordinate's decisions. Such a formal commitment is not replicable within the firm. Thus we derive a new rationale for vertical disintegration, based on the way that formal ownership structures affect the feasibility of informal relational contracts.

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