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A THEORY OF FIRM SCOPE

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### **ABSTRACT**

The existing literature on firms, based on incomplete contracts and property rights, emphasizes that the ownership of assets - and thereby firm boundaries - is determined in such a way as to encourage relationship-specific investments by the appropriate parties. It is generally accepted that this approach applies to owner-managed firms better than to large companies. In this paper, we attempt to broaden the scope of the property rights approach by developing a simple model with three key ingredients: (a) decision rights can be transferred ex ante through ownership, (b) managers (and possibly workers) enjoy private benefits that are non-transferable, and (c) owners can divert a firm's profit. In our basic model decisions are ex post non-contractible; in an extension we use the idea that contracts are reference points to relax this assumption. We show that firm boundaries matter. Nonintegrated firms fail to account for the external effects that their decisions have on other firms. An integrated firm can internalize such externalities, but it does not put enough weight on the private benefits of managers and workers. We explore this tradeoff in a model that focuses on the difficulties companies face in cooperating through the market if the benefits from cooperation are unevenly divided; therefore, they may sometimes end up merging. We show that the assumption that contracts are reference points introduces a friction that permits an analysis of delegation.

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## 1. Introduction

In the last twenty years or so, a theoretical literature has developed that argues that the boundaries of firms--and allocation of asset ownership--can be understood in terms of incomplete contracts and property rights. The basic idea behind the literature is that firm boundaries define the allocation of residual control rights and, in a world of incomplete contracts, these matter. In the standard property rights model, parties write contracts that are *ex ante* incomplete but that can be completed *ex post*; the ability to exercise residual control rights improves the *ex post* bargaining position of an asset owner and thereby increases her incentive, and the incentive of those who enjoy significant gains from trade with her, to make relationship-specific investments, and as a consequence, it is optimal to assign asset ownership to those who have the most important relationship-specific investments or who have indispensable human capital.<sup>1</sup>

Although the property rights approach provides a clear explanation of the costs and benefits of integration, as a number of people have argued, the theory seems to describe owner-managed firms better than large companies.<sup>2</sup> There are several ways to see this. First, according to the theory, the major impact of a change in ownership is on those who gain or lose ownership rights; however, in a merger between two large companies, it is often the case that the key decision-makers (the CEO's, for example) do not have substantial ownership rights before or after the merger. Second, the relationship-specific investments analyzed are made by individuals rather than by firms; this again resonates more with the case of small firms than that of large companies. Third, and perhaps most important, the approach envisions a situation of "autarky," in which all the relevant parties meet and bargain *ex post* over the gains from trade and the only

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<sup>1</sup> See Grossman and Hart (1986), Hart and Moore (1990), and Hart (1995). This literature builds on the earlier transaction cost literature of Williamson (1975, 1985) and Klein et al. (1978). Extensions of the model show that it is sometimes optimal to take assets *away* from someone to improve their incentives to make relationship-specific investments (e.g., to discourage rent-seeking behavior). On this, see Baker et al. (2002), Chiu (1998), de Meza and Lockwood (1998), and Rajan and Zingales (1998).

<sup>2</sup> For a discussion of this and related points, see Holmstrom and Roberts (1998) and Holmstrom (1999).

issue is who has the right to walk away with which assets; there are no other decisions in the model. As it stands, the model has no room for “organizational structure,” “hierarchy” or “delegation”; in an important sense, the model continues to describe a pure market economy, although one enriched by the idea that individuals can be empowered through the ownership of key nonhuman assets.

The purpose of the current paper is to modify the property rights approach so that it can be applied to a broader set of organizational issues, including the organization of large firms. We will develop a model in which contracts cannot be completed costlessly *ex post* and where therefore the final outcome depends on who has decision-making authority. We begin by describing the key ingredients of our approach.

We will focus on two units that have a horizontal or lateral relationship. We think of a unit as an irreducible set of activities that it would be meaningless to break up further. We will be interested in the case where each unit makes a decision that affects the other unit, i.e., there are externalities. For example, the units may be deciding whether to adopt a common standard for their technology or product. Or the units might represent two departments or schools in a university that must choose whether to make their curriculum requirements compatible or synchronize their academic calendars. Later in the paper we will use the model to interpret Cisco’s approach to platform leadership through acquisitions.

For simplicity we focus on the case where each unit has a binary decision: it can choose “Yes” or “No”. Moreover, we simplify matters further by supposing that there are only two aggregate outcomes, which we term “coordination” or “non-coordination”. Coordination occurs if and only if both units choose Yes. Non-coordination occurs if one or both units choose No. Later in the paper we briefly discuss more general decisions.

The decision in each unit is *ex ante* non-contractible. The owner of a unit has the right to make the decision in that unit *ex post*; that is, the owner has residual control rights as in the property rights literature. We will refer to the owner as the boss. In the simplest version of the model each

unit's decision is also *ex post* non-contractible. We will compare two leading organizational forms. In the first, *non-integration*, the units are separate firms, and each unit is owned by its manager. In the second, *integration*, the units are part of a single firm, and a professional manager is the owner. These are not the only possibilities. For example, one could consider another form of integration where one of the unit managers is the owner. However, the main insights of our analysis can be obtained from considering the two leading forms.

Full integration would always be optimal if all the benefits and costs from decisions were transferable through contract or ownership. To avoid this uninteresting conclusion, we assume that each unit generates two kinds of benefit: monetary profit and private (nontransferable) benefits in the form of job satisfaction for those working in the unit. For the most part, we will assume that the manager is the only worker and hence private benefits refer to her job satisfaction. We assume that the boss of a unit can divert all the profit from that unit to herself. This simplifies the analysis by ruling out profit-sharing as a way to influence incentives. Profit sharing would alleviate, but not eliminate, the effects we describe.

To illustrate how firm boundaries affect decision making, consider the simplest setting, where *ex post* decisions, as well *ex ante* decisions, are non-contractible. Denote the pair of profits and private benefits (measured in money) accruing to each unit by  $(v_A, w_A)$  and  $(v_B, w_B)$ , respectively. Then, if the units are nonintegrated and manager  $A$  is the boss of unit  $A$  and manager  $B$  the boss of unit  $B$ , manager  $A$  will maximize  $v_A + w_A$  since she diverts the profit from unit  $A$  and cares about her own private benefits, and manager  $B$  will maximize  $v_B + w_B$  for similar reasons. In contrast, if units  $A$  and  $B$  are integrated, then, if a (professional) outsider is the boss, she will maximize  $v_A + v_B$ , since she diverts all the profit and does not care about private benefits.

As a benchmark, note that social optimality is achieved by maximizing total surplus:

$$v_A + v_B + w_A + w_B.$$

The important point here is that integration results in less weight being placed on private benefits than non-integration. Under non-integration,  $w_A, w_B$  each appears in one boss's objective function. In contrast, under integration, the  $w$ 's fails to appear in the overall objective function. However, this diminished influence of private benefits is offset by the fact that, under integration, *total* profits, rather than individual unit profits, are maximized.

In summary, under non-integration, bosses have the right balance between private benefits and profits, but are parochial (they do not take into account their effect on the other unit), while, under integration, they have the right balance between units, but ignore private benefits. In our basic model, where the only issue is whether the units coordinate, we show that non-integration and integration make the opposite kind of mistake. Non-integration leads to *too little* coordination. This happens if the benefits from coordination are unevenly divided across the units. One unit may then veto coordination even though it is collectively beneficial. In contrast, under a weak assumption—specifically, that coordination represents a reduction in “independence” and therefore causes a fall in private benefits—integration leads to *too much* coordination.

To return to the example of two departments or schools in a university deciding whether to make their curriculum requirements compatible or synchronize their academic calendars: under non-integration, compatibility or synchronization may not occur when it should, given that each unit values autonomy and the gains are unevenly divided; under integration, compatibility or synchronization may occur when it shouldn't, given that the dean or president puts too little weight on a unit's autonomy.

We analyze the above model in Section 2. We go on to argue that the model has some undesirable features. One of them is that, even if decisions are *ex post* non-contractible, it is not clear why decision rights cannot be traded *ex post*. But if such trading is possible, then *ex ante* organizational form will not matter (given the absence of *ex ante* investments). To deal with this and related difficulties, in Section 3 we drop the assumption that decisions are *ex post* non-contractible. At the same time we embellish the model by introducing some behavioral features

along the lines of Hart and Moore (2008). In particular, we suppose that a contract (or organizational form) is a reference point for parties' entitlements: parties do not feel entitled to outcomes outside those specified by the contract but may disagree about outcomes within the contract. A person who does not get what he is entitled to is aggrieved and shades on performance in non-contractible ways, creating deadweight losses. In these circumstances, *ex post* bargaining about decisions or decision rights is not costless, and *ex ante* organizational form matters. We show that the main elements of our analysis are unchanged. The new feature is that, under integration, the boss will put some weight on the private benefits of the unit managers, given their ability to shade. Thus the boss's decisions will partly internalize unit managers' preferences.

In Section 4, we generalize the model to allow for delegation of decision-making authority under integration. We argue that it is hard to make sense of delegation in the model of Section 2, or for that matter in much of the literature, since it is unclear why the boss cannot change her mind *ex post* and take back the decision rights that she has delegated.<sup>3</sup> The behavioral approach in Section 3 can help here. We assume that reversing delegation is regarded by the subordinates as a "breach of promise" or "hold-up" and leads to increased levels of grievement and shading. This makes delegation a credible commitment device: the boss will reverse herself only in "extreme" states of the world. We show that integration with delegation can be a valuable intermediate organizational form between non-integration and integration. Under delegation, managers get their way in states of the world where decisions matter significantly more to them than to the boss. However, in states of the world where the boss cares a lot about the outcome, either managers will do what the boss wants of their own accord, given the threat of shading by the boss, or the boss will take back the decision rights.

The interpretation that private benefits are enjoyed by a single manager is restrictive in that it implies that the units are in effect sole proprietorships under non-integration. In Section 2 we briefly consider a second interpretation of the model that applies to the case where the units are large companies, and private benefits refer to the aggregate job satisfaction of workers.

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<sup>3</sup> But see Aghion and Tirole (1997) and Baker et al. (1999).

Our paper is related to a number of ideas that have appeared elsewhere in the literature. First, there is an overlap with the literature on internal capital markets; see particularly Stein (1997, 2002), Scharfstein and Stein (2000), Rajan et al. (2000), Brusco and Panunzi (2005), and Inderst and Laux (2005). This literature emphasizes the idea that the boss of a conglomerate firm, even if she is an empire builder, is interested in the overall profit of the conglomerate, rather than the profits of any particular division. As a result, the conglomerate boss will do a good job of allocating capital to the most profitable project (“winner-picking”). Our idea that the professional boss of an integrated firm maximizes total profit is similar to this; the main differences are that the internal capital markets literature does not stress the same cost of integration as we do – the insufficient emphasis on private benefits – or allow for the possibility that the allocation of capital can be done through the market (in our model, the market is always an alternative to centralized decision-making). Second, the idea that it may be efficient for the firm to have narrow scope and/or choose a boss that is biased toward particular workers is familiar from the work of Shleifer and Summers (1988), Rotemberg and Saloner (1994, 2000), and Van den Steen (2005). These papers emphasize the effect of narrow scope and bias on worker incentives rather than on private benefits or wages, but the underlying premise, that workers care about the boss’s preferences, is the same. However, none of these papers analyzes firm boundaries. Third, there are several recent works that use the idea that some actions are non-contractible *ex ante* and *ex post* but may be transferable through ownership; see, e.g., Aghion et al. (2004), Alonso et al. (2008), Baker et al. (2008), Bolton and Dewatripont (2005), Hart and Moore (2005), Holmstrom (1999), Mailath et al. (2004), and Rantakari (2008). Mailath et al. (2004) is perhaps the paper closest to ours. They analyze a model in which the boss of an integrated firm maximizes total profit and so internalizes externalities. However, the cost of integration in their paper is a decline in worker initiative resulting from hold-up, rather than an insufficient emphasis on private benefits.

The paper is organized as follows. The basic model is presented in Section 2. Section 3 introduces reference points. In Section 4 we analyze delegation. Section 5 illustrates the model using Cisco’s approach to platform leadership through acquisitions. Finally, Section 6 concludes.



## 2. A Basic Model of Coordination

Our model concerns two units  $A$  and  $B$ . For simplicity, we focus on a basic coordination choice. Each unit has a binary decision: it can choose “Yes” or “No.” There are two aggregate outcomes: “coordination” or “non-coordination”. Coordination occurs if and only if both units choose Yes. The timeline is as in Figure 1. At the beginning, an organizational form is selected—specifically, whether the units should be separate firms (non-integration, i.e., there are two bosses) or should merge into one firm (integration, i.e., there is one boss). Next, each unit decides whether to choose Yes or No. Finally, the payoffs are realized.



Figure 1

We assume that the decision in each unit is made by the owner or boss of that unit. We will also assume in this section that the Yes/No decisions are non-contractible, both *ex ante* and *ex post*, and furthermore that the right to make these decisions is nontransferable *ex post* (in contrast, it can be transferred *ex ante* through the integration choice). In the next section, we will show that these assumptions can be relaxed in a more elaborate version of the model. An implication of these assumptions is that a contract in which one unit agrees to choose Yes, say, in return for a side-payment from the other unit cannot be enforced. In other words, Coasian bargaining will *not* ensure efficiency of the coordination choice.

We represent payoffs from different outcomes in the following matrix. We assume that these payoffs are non-verifiable and, for simplicity, perfectly certain.

		Unit <i>B</i>	
		<i>Y</i>	<i>N</i>
Unit <i>A</i>	<i>Y</i>	<i>A</i> : $v_A(Y, Y), w_A(Y, Y)$	<i>A</i> : $v_A(N, N), w_A(N, N)$
	<i>N</i>	<i>B</i> : $v_B(Y, Y), w_B(Y, Y)$	<i>B</i> : $v_B(N, N), w_B(N, N)$
		<i>A</i> : $v_A(N, N), w_A(N, N)$	<i>A</i> : $v_A(N, N), w_A(N, N)$
		<i>B</i> : $v_B(N, N), w_B(N, N)$	<i>B</i> : $v_B(N, N), w_B(N, N)$

Table 1

Here, unit *A* is the row player, and unit *B* is the column player. The entries are the payoffs. Note that the outcome when one party chooses No is the same as when both parties choose No: non-coordination. The first coordinate “*v*” refers to profit and the second coordinate “*w*” to private benefits (private benefits are measured in money). Subscripts refer to units, i.e.,  $(v_A, w_A)$  denotes unit *A*’s payoffs and  $(v_B, w_B)$  unit *B*’s.

It will be convenient to introduce the notation

$$(2.1) \quad z_A \equiv v_A + w_A, z_B \equiv v_B + w_B.$$

Here,  $z_A$  refers to total surplus in unit *A*,  $z_B$  to total surplus in unit *B*, and  $z_A + z_B$  equals aggregate social surplus. Also, define

$$(2.2) \quad \begin{aligned} \Delta v_i &= v_i(Y, Y) - v_i(N, N), i = A, B, \\ \Delta w_i &= w_i(Y, Y) - w_i(N, N), i = A, B, \\ \Delta z_i &= z_i(Y, Y) - z_i(N, N), i = A, B, \end{aligned}$$

to be the changes in profit, private benefits and surplus resulting from coordination.

As noted in the introduction, private benefits refer (broadly) to job satisfaction or on-the-job consumption. It is reasonable to suppose that part of job satisfaction stems from the ability to pursue an independent course or agenda. Thus, we will assume that coordination leads to a

reduction in private benefits:

$$(2.3) \quad \Delta w_A \leq 0, \Delta w_B \leq 0.$$

We put no restrictions on whether coordination increases or decreases profits; moreover, even if coordination increases total profits, profits may rise by more or less than the fall in private benefits, i.e.,  $(Y, Y)$  may be more (socially) efficient than  $(N, N)$ ,  $(\Delta z_A + \Delta z_B > 0)$ , or less  $(\Delta z_A + \Delta z_B < 0)$ . We begin by considering the case where each unit contains one individual (a manager), who enjoys the private benefits. In addition, we suppose that a boss can divert all the profit from the units she operates. Then there are two leading organizational forms:

- (1) Non-integration: Manager  $A$  is the boss of unit  $A$ , and manager  $B$  is the boss of unit  $B$ , i.e., the units are sole proprietorships. Manager  $A$  maximizes  $z_A$ , and manager  $B$  maximizes  $z_B$ .
- (2) Integration: A professional manager (outsider) is the boss of both units, and managers  $A$  and  $B$  are subordinates. The professional manager maximizes  $v_A + v_B$ .

Note that, in (1), the managers play a non-cooperative game, while, in (2), no strategic elements are involved: the professional manager simply maximizes total profit.

Note also the critical role played by the assumption that the Yes/No decisions are non-contractible. In the absence of this, the parties would negotiate to an efficient *ex post* outcome using side-payments, i.e.,  $z_A + z_B$  would be maximized under all organizational forms.

(1) and (2) are not the only possible organizational forms. If the units are under common ownership, manager  $A$  (resp., manager  $B$ ), rather than a professional, could be the boss; she would then maximize  $v_A + v_B + w_A$  (resp.,  $v_A + v_B + w_B$ ). Furthermore, even if the units are separately owned, they could be run by a professional manager (it is even possible that manager  $A$  could be the boss of unit  $B$  and vice versa). However, in the case of certainty, the first-best

can always be achieved by (1) or (2). Thus, we focus on these.

Although the decisions Yes or No are non-contractible *ex ante* and *ex post*, we will assume that organizational form is contractible at the beginning of the period. Coasian bargaining will then ensure that organizational form is chosen efficiently, i.e., to maximize total surplus ( $z_A + z_B$ ) (there are no wealth constraints, and information is symmetric). To spell this out a little more: if the units are initially manager-owned but integration is more efficient, then a professional manager will purchase control rights from managers  $A$  and  $B$  at prices such that all three parties are better off (in particular, manager  $i$ 's private benefit under the professional manager plus the lump sum she receives for her control rights is at least equal to her payoff under non-integration); and if the units are initially owned by a professional manager and non-integration is more efficient, then managers  $A$  and  $B$  will purchase control rights from the professional manager at prices such that all three parties are better off.

In summary, organizational form is chosen at the beginning of the period to maximize the value of  $z_A + z_B$  in the subsequent game.

It is easy to understand the tradeoff between non-integration and integration. Under non-integration, each boss has a veto on coordination. Thus,  $(Y, Y)$  will occur if and only if  $(Y, Y)$  Pareto dominates  $(N, N)$ :

$$(2.4) \quad \Delta z_A \geq 0, \Delta z_B \geq 0.$$

Note that, even if (2.4) holds,  $(N, N)$  is always a Nash equilibrium along with  $(Y, Y)$ ; however, we will suppose that parties do not pick a Pareto-dominated equilibrium.

It is, of course, immediate that (2.4) implies that  $(Y, Y)$  maximizes social surplus:

$$(2.5) \quad \Delta z_A + \Delta z_B \geq 0.$$

However, equally clearly, the converse is not true: (2.5) does not imply (2.4). This is the problem of winners and losers. Even though aggregate surplus may rise, the distribution may be such that one party loses out, and this party will then veto coordination, leading to the outcome  $(N, N)$ .

To stress what should be obvious by now: Coasian bargaining does not solve this problem, given that the  $Y/N$  decisions are non-contractible (and so is the outcome of these decisions).

Let us now turn to integration. Under integration, a single boss chooses the outcome that maximizes total profit. This outcome will be  $(Y, Y)$  or  $(N, N)$  according to whether

$$(2.6) \quad \Delta v_A + \Delta v_B > 0.$$

It follows from (2.3) that, under integration,  $(Y, Y)$  is always the outcome if it is efficient but may be the outcome even if it is inefficient.

Figure 2 illustrates the outcomes under non-integration and integration.<sup>4</sup> We have drawn the figure keeping  $\Delta w_A, \Delta w_B$  fixed and letting  $\Delta v_A, \Delta v_B$  be variable, but this, of course, is done merely to stay within two dimensions. In general, we are interested in the mapping from profits  $v$  and private benefits  $w$  into the choice of organizational form.

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<sup>4</sup> We thank George Baker for suggesting this picture.

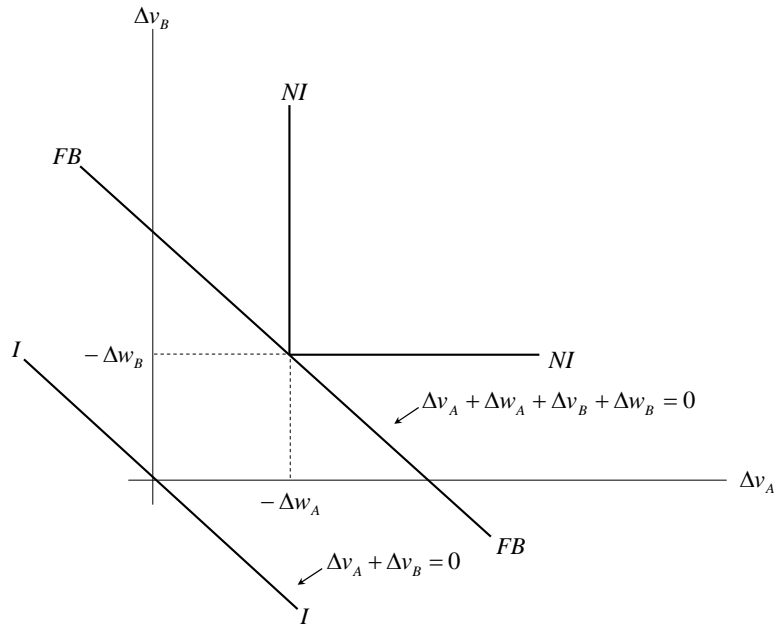


Figure 2

The first-best decision rule (2.5) is represented by the line  $FB - FB$ ; all pairs of profit gains  $(\Delta v_A, \Delta v_B)$  that fall above this line call for coordination. In a similar way, line  $I - I$  represents the decision rule (2.6) and the quadrant  $NI - NI$  the decision rule under non-integration. Note that  $FB - FB$  is above  $I - I$ , because the sum of the changes in private benefits is negative by (2.3).

The figure shows that non-integration and integration make the opposite kind of mistake. Under non-integration, there is *too little* coordination in the sense that  $(Y, Y)$  never occurs if it is inefficient but may not occur if it is efficient. Under integration, there is *too much* coordination in the sense that  $(Y, Y)$  is always the outcome if it is efficient but may be the outcome even if it is inefficient. It follows that non-integration achieves the first-best if  $(N, N)$  is efficient (since non-integration errs on the side of too little coordination but never too much), while integration achieves the first-best if  $(Y, Y)$  is efficient (since integration errs on the side of too much

coordination but never too little).<sup>5</sup>

It is also clear from Figure 2 that, for some parameter values, non-integration and integration *both* achieve the first-best. This is the case when  $(Y, Y)$  is the outcome under non-integration or when  $(N, N)$  is the outcome under integration. In all other cases, it is essential to choose the right organizational form. Non-integration will lead to inefficiency if profit gains from coordination are sufficiently unevenly distributed between the two firms; staying above the  $FB - FB$  line and moving in parallel with it will eventually take us outside the  $NI - NI$  acceptance region. Integration will lead to inefficiency if private costs from coordination are large enough; raising private costs will move the  $FB - FB / NI - NI$  part of the figure to the northeast and eventually make  $(N, N)$  the first-best choice.<sup>6</sup>

We summarize the discussion in

Proposition 1. If  $(N, N)$  is efficient, non-integration (with unit managers as bosses) achieves the first-best. If  $(Y, Y)$  is efficient, integration (with a professional manager as boss) achieves the first-best. Furthermore, taking as given the profit gains from coordination and supposing them to be large, integration will be uniquely optimal if these profit gains are sufficiently unevenly divided between units. Non-integration will be uniquely optimal if private costs from coordination are sufficiently high in aggregate.

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<sup>5</sup> We have made the assumption that unit managers are locked in for a period and cannot quit. If quitting were possible, then under integration the boss would be forced to internalize some of the managers' private benefits since if she pursued profit too much at the expense of private benefits, managers would leave. Obviously, quitting becomes more of an issue in a multi-period model where decisions are long-term, and a decision that reduces managerial independence might force the boss to pay higher wages in the future. In many interesting situations, however, it is plausible that managers and workers are not on the margin of quitting, perhaps because they have made relationship-specific investments or they are paid efficiency wages. When managers and workers are not on the margin, our analysis is likely to generalize.

<sup>6</sup> In Figure 2, the region of inefficient integration could be reduced by letting manager  $B$  run the integrated unit. This way,  $B$ 's private benefits would be accounted for, something manager  $A$  would be happy with as long as she also dislikes coordination. However, if, in contrast to (2.3),  $A$  enjoys private benefits from coordination but  $B$  does not, then manager  $B$  would coordinate too little relative to first-best, and hence the comparison to a professional manager would be ambiguous. We do not explore these options here, since we get first-best either way.

### *A More General Analysis of Coordination*

We have made the strong assumption that not only are unit decisions binary but there are only two aggregate outcomes: the outcome when one party chooses  $N$  is the same as when both choose  $N$ . If the latter assumption is relaxed, new features arise. We briefly describe these. There are now four outcomes:  $(Y, Y), (Y, N), (N, Y), (N, N)$ . Suppose that private benefits are weakly lower when a unit chooses  $Y$ , rather than  $N$ . Also assume that total surplus and profit are maximized either if both units choose  $Y$  or if neither does. Finally, suppose that, if a unit chooses  $N$ , then total surplus in that unit is weakly higher if the other unit chooses  $Y$ , and that if the other unit chooses  $N$ , total surplus in the first unit is weakly higher if it chooses  $N$ .

These assumptions capture the idea that choosing  $Y$  means accommodating your actions to suit the other party and that this may be collectively beneficial but privately costly. They all hold in the model of pure coordination described above. However, they also cover cases where units are deciding on the prices or characteristics of their products.

Given these assumptions, one can show that non-integration achieves efficiency if  $(N, N)$  is efficient, but may not if  $(Y, Y)$  is efficient; and that integration achieves efficiency if  $(Y, Y)$  is efficient, but may not if  $(N, N)$  is efficient. As before,  $(Y, Y)$  may not be a Nash equilibrium under non-integration even if it is efficient because the benefits are unevenly divided between the units. But now,  $(Y, Y)$  may fail to be a Nash equilibrium for another reason: even if  $(Y, Y)$  Pareto dominates  $(N, N)$ , a unilateral deviation may be in the interest of one party. In other words, one party may free-ride on the other party's accommodation decision.

In summary, many of our results hold in this more general model of coordination.

### *An Alternative Interpretation of Private Benefits*

So far, we have emphasized the interpretation where the private benefits  $w_i$  are enjoyed by a



single manager in each unit, who is the boss under non-integration and a subordinate under integration. However, there is a second interpretation of the model that is of interest. We can imagine that the private benefits refer to the job satisfaction of unit  $i$  workers and that some bosses have goals that are (partially) congruent with those of the workers, i.e., they care about the same things. In particular, suppose that there are three types of bosses, unit  $A$  enthusiasts with preferences  $m + \lambda_A w_A$ ; unit  $B$  enthusiasts with preferences  $m + \lambda_B w_B$ ; and professional managers with preferences  $m$ . Here,  $m$  is money and  $\lambda_A, \lambda_B$  represent congruence between a boss's goals and those of unit  $A$  and  $B$  workers.<sup>7</sup>

Suppose now that a boss can divert a fraction  $\alpha < 1$  of total profit toward herself; one can imagine that she uses this profit for perks or empire-building activities that benefit her alone - fancy offices, secretaries, pet projects, etc. Denote profit by  $v$ . Then a unit  $i$  enthusiast will maximize

$$(2.9) \quad \alpha v + \lambda_i w_i$$

while a professional manager will maximize  $v$ .<sup>8</sup> If we make the simplifying assumption that  $\alpha = \lambda_A = \lambda_B$ , this yields the same objective function for the different kinds of bosses as in the model without workers described above.<sup>9</sup>

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<sup>7</sup> A boss may be biased toward its workforce because sustained contact with workers fosters friendship and empathy. Wrestling with the same problems, sharing the same information, and having a similar professional background are all conducive to a common vision that aligns interests, particularly on issues such as the strategic direction of the firm. Shleifer and Summers (1988) argue that it may be an efficient long-run strategy for a firm to bring up or train prospective bosses to be committed to workers and other stakeholders (on this, see also Blair and Stout (1999)). Milgrom and Roberts (1988) argue that frequent interaction gives workers the opportunity to articulate their views and influence the minds of their bosses, sometimes to the detriment of the firm. All these explanations are consistent with our assumption that the boss of a firm with broad scope will put less weight on private benefits than a boss of a firm with narrow scope. The reason is that, with a broader range of activities, the firm's workforce will be more heterogeneous, making the boss experience less empathy for any given group. Also, the intensity of contact with any particular group will go down, reducing the ability of that group's workers to influence the boss.

<sup>8</sup> With partial diversion, it may be desirable to give the manager of unit  $A$  a share of the residual profits of unit  $B$  in order to get closer to first-best, but we will not pursue this possibility here.

<sup>9</sup> It is obviously important that there is no boss who is an enthusiast for both units  $A$  and  $B$ . Under integration, such a boss would maximize  $\alpha(v_A + v_B) + \lambda_A w_A + \lambda_B w_B$ , and if  $\alpha = \lambda_A = \lambda_B$ , this would yield the first-best.

In this interpretation, the choice of organizational form is made by the initial owner(s) of units  $A$  and  $B$  at the beginning of the period. They must decide whether the units should be separate (non-integration) or together (integration) and what kind of boss to put in charge. Assume that owners face a competitive labor market and wages are agreed up front. Then the (total) wage  $\omega_i$  for unit  $i$  workers will satisfy

$$(2.10) \quad \omega_i + w_i = U,$$

where  $U$  is the (total) market clearing reservation wage and  $w_i$  refers to (expected) worker private benefits. In other words, a reduction in anticipated private benefits leads to an increase in the wages the firm needs to pay.<sup>10</sup> Suppose that the initial owner(s) wish to sell out and retire, i.e., they are interested only in money. Then, given that side-payments are possible, organizational form will be selected to maximize the total value of the two units net of wages, i.e., given (2.10),  $v_A + v_B + w_A + w_B$  (we ignore the private benefits and remuneration of bosses).

We may conclude that the analysis of this second interpretation of the model is identical to the previous one.

### 3. A Variation —The Aggrievement Model

The model of Section 2 has some unpalatable features. First, the assumption that decisions are non-contractible *ex post* seems very strong. Most decisions are contractible at least in part, and the assumption has an unfortunate implication: essentially a boss has to do everything herself! If a boss tells a subordinate to do something, the subordinate will turn round and do what *he* wants without the fear of any legal sanction (at least in a one-shot game). This does not seem very plausible.

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<sup>10</sup> There is some evidence consistent with this. Schoar (2002), in a study of the effects of corporate diversification on plant level productivity, finds that diversified firms have on average 7% more productive plants, but also pay their workers on average 8% more than comparable stand alone firms.

Furthermore, even if decisions are non-contractible *ex post*, it is not clear why decision *rights* cannot be bought and sold (they are, after all, contractible *ex ante*). To put it another way it is not clear why ownership rights cannot be traded *ex post*. But this also creates problems for the model of Section 2 since it suggests that Coasian bargaining will ensure an efficient *ex post* allocation of decision rights regardless of the initial allocation, i.e., *ex ante* organizational form will not matter.

Finally, as we will argue in the next section, the model of Section 2 does not permit an interesting analysis of delegation.

In this section, we argue that one way to begin to deal with all of these problems is to introduce some behavioral features along the lines of Hart and Moore (2008). Hart and Moore (2008) take the view that contracts are reference points for parties' entitlements and that a person who does not get what he feels entitled to is aggrieved and shades on performance, which hurts other parties and creates deadweight losses. That is, *ex post* performance is only partially contractible: "perfunctory" performance can be enforced but "consummate" performance cannot be. In the present context we will suppose that organizational form, negotiated under competitive conditions *ex ante*, is a reference point for *ex post* entitlements. If a party is allocated an ownership right *ex ante* then this gives that party the legal right to take (residual) decisions *ex post*. However, to the extent that another party does not like the *ex post* decision, the second party will feel aggrieved and will shade (if he can). Specifically, we will assume that a party who receives a payoff that is  $k_i$  less than his payoff under his most preferred outcome or decision will be aggrieved by  $k_i$  and that this party will shade to the point where the other parties' payoffs fall by  $\theta k_i$ . Here  $\theta$  is the shading parameter, assumed the same for all parties, and  $0 < \theta < 1$ . Shading does not change the payoff of the party doing the shading. Thus, the total deadweight loss from shading is  $\theta \sum_i k_i$ .

Under the assumptions of the Hart-Moore model, *ex post* Coasian bargaining is no longer costless since each party will feel entitled to the best possible outcome in the negotiation, and

they cannot all be satisfied and will shade. Thus, *ex ante* organizational form, presumed to be negotiated under relatively competitive conditions, will matter. In the analysis below, we will, as a shortcut, rule out any sort of Coasian renegotiation (as in Hart-Moore (2008), but in contrast to Hart (2009)), but we just wish to observe here that renegotiation, because it is costly, is unlikely to overturn our results.

Let's revisit the model of Section 2. Assume now that, as in the standard incomplete contracts literature, the  $Y/N$  decisions are too complicated to specify *ex ante*, although they can be contracted on *ex post*. Thus the boss has the right to choose them *ex post*. However, as explained above shading is possible: only perfunctory performance by a subordinate is guaranteed. We assume that shading occurs only between parties who have dealings with each other. We suppose that horizontal units do not fall into this category, and so there is no shading under non-integration. However, there is shading under integration: the boss and each subordinate are in a vertical relationship and each can shade against the other.

Let's start with non-integration. The analysis of Section 2 does not change. Coordination occurs if and only if both parties want it, i.e., if and only if (2.4) holds. Given our assumption that horizontal units cannot shade against each other, there is no shading.

Integration is slightly more complicated. We divide the analysis into two cases.

Case 1:  $\Delta v_A + \Delta v_B \leq 0$ .

The managers' and bosses' preferences are aligned (given (2.3)). Coordination doesn't occur since no one wants it, and, given that there is no disagreement, there is no shading. Social surplus is given by:

$$(3.1) \quad S = z_A(N, N) + z_B(N, N).$$

Case 2:  $\Delta v_A + \Delta v_B > 0$ .

Now the boss wants coordination, but the managers don't, and they will be aggrieved by  $\Delta w_A + \Delta w_B$  and will shade by  $\theta(\Delta w_A + \Delta w_B)$  if it occurs. The boss will coordinate if and only if her payoff net of shading costs is higher:

$$(3.2) \quad \Delta v_A + \Delta v_B + \theta(\Delta w_A + \Delta w_B) \geq 0.$$

In other words, the boss partly internalizes the wishes of her subordinates. On the other hand, if (3.2) doesn't hold, the boss will go along with what the managers want and will not coordinate. However, in this case, the boss is aggrieved by  $\Delta v_A + \Delta v_B$  since *she* is not getting her preferred outcome, and so she will shade to the point where the unit managers' payoffs fall by  $\theta(\Delta v_A + \Delta v_B)$ .

Social surplus is thus given by

$$(3.3) \quad S = z_A(Y, Y) + z_B(Y, Y) + \theta(\Delta w_A + \Delta w_B), \text{ if (3.2) holds,} \\ z_A(N, N) + z_B(N, N) - \theta(\Delta v_A + \Delta v_B), \text{ if (3.2) doesn't hold.}$$

The first-best is achieved in Case 1 but not in Case 2. In Case 2, there is too much coordination relative to the first-best ( $\Delta z_A + \Delta z_B \geq 0 \Rightarrow (3.2)$  but not vice versa), and too much shading.

Define an outcome to be efficient if it maximizes total surplus ignoring shading costs (in other words use the same definition as in Section 2). Then we have established

Proposition 2. In the Aggrievement Model, if (N, N) is efficient, non-integration achieves the first-best. If (Y, Y) is efficient, integration leads to coordination, but integration may not be optimal given the deadweight losses from shading. Finally, if (Y, Y) is efficient and is an equilibrium under non-integration, then non-integration achieves the first-best, since there is no shading.

We see that, qualitatively, the tradeoffs of the basic model in Section 2 continue to hold in the Aggrievement Model, but there is an extra cost under integration due to shading. Because we have assumed that the managers will feel aggrieved in integration, but not in non-integration, the hurdle for coordination is higher ((3.2), rather than (2.6), must hold). However, it is still true that integration leads to too much coordination and non-integration to too little coordination.

#### 4. Delegation

We now consider a form of governance that is intermediate between integration and non-integration: integration with delegation, which we will refer to as delegation for short. Under delegation, the professional boss delegates her formal authority over decision rights to the unit managers. However, because the boss is legally in charge, there is nothing to stop her from changing her mind and taking back the decision rights *ex post*. We refer to the taking back of decision rights as a reversal: we assume that the timing is such that a reversal takes place *ex post* before managers actually make their decisions. We suppose that the subordinates regard a reversal as a “breach of promise” or a “hold-up”, and this leads to increased levels of aggrievement and shading: the shading parameter rises from  $\theta$  to  $\bar{\theta}$ , where  $1 \geq \bar{\theta} \geq \theta$ . In the model of Section 2, where, implicitly,  $\theta = \bar{\theta} = 0$ , delegation has no value since the boss can costlessly change her mind. In contrast we will see that, with aggrievement and shading, delegation can have value as a partial commitment device.

As in our discussion of integration in Section 3, there are two cases:

Case 1:  $\Delta v_A + \Delta v_B \leq 0$ .

Preferences are aligned, and no one wants coordination. So coordination doesn't occur, and there is no shading. Social surplus is given by (3.1).

Case 2:  $\Delta v_A + \Delta v_B > 0$ .

Now there is a conflict. Ignore reversal for the moment. If the managers do not coordinate, the

boss will be aggrieved. Suppose for simplicity that the boss observes only the outcome that coordination did not occur and not who was responsible for it (i.e., she does not observe managers' individual decisions). Given that she does not know whom to blame, her shading is divided 50:50 between the two parties. Then the managers' payoffs are given by

$w_i(N, N) - \frac{\theta}{2}(\Delta v_A + \Delta v_B), i = A, B$ . So the managers will choose to coordinate if

$$(4.1) \quad \begin{aligned} \Delta w_A + \frac{\theta}{2}(\Delta v_A + \Delta v_B) &\geq 0, \\ \Delta w_B + \frac{\theta}{2}(\Delta v_A + \Delta v_B) &\geq 0. \end{aligned}$$

When (4.1) holds, the managers coordinate reluctantly. They feel aggrieved and will shade, reducing the social surplus down to

$$(4.2) \quad S = z_A(Y, Y) + z_B(Y, Y) + \theta(\Delta w_A + \Delta w_B).$$

Suppose next that (4.1) does not hold. Then coordination will not occur unless the boss reverses the decision and forces coordination. Forced coordination leads to aggrievement levels of  $\Delta w_A + \Delta w_B$  for the managers. Shading costs equal  $\bar{\theta}(\Delta w_A + \Delta w_B)$ , given that the shading parameter rises from  $\theta$  to  $\bar{\theta}$ . Thus, the boss reverses if and only if

$$(4.3) \quad \Delta v_A + \Delta v_B + \bar{\theta}(\Delta w_A + \Delta w_B) \geq 0.$$

So if neither (4.1) nor (4.3) holds, coordination does not occur and

$$(4.4) \quad S = z_A(N, N) + z_B(N, N) - \theta(\Delta v_A + \Delta v_B),$$

whereas, if (4.1) does not hold but (4.3) does, coordination occurs, and

$$(4.5) \quad S = z_A(Y, Y) + z_B(Y, Y) + \bar{\theta}(\Delta w_A + \Delta w_B).$$

### Summary of Delegation

A) If  $\Delta v_A + \Delta v_B \leq 0$ , coordination does not occur and social surplus is given by

$$S = z_A(N, N) + z_B(N, N).$$

B) If  $\Delta v_A + \Delta v_B > 0$  and (4.1) holds, managers will coordinate reluctantly and

$$S = z_A(Y, Y) + z_B(Y, Y) + \theta(\Delta w_A + \Delta w_B).$$

C) If  $\Delta v_A + \Delta v_B > 0$  and (4.1) does not hold but (4.3) does, the boss forces coordination and

$$S = z_A(Y, Y) + z_B(Y, Y) + \bar{\theta}(\Delta w_A + \Delta w_B).$$

D) If  $\Delta v_A + \Delta v_B > 0$  and neither (4.1) nor (4.3) holds, then coordination does not occur, but the boss is aggrieved and

$$S = z_A(N, N) + z_B(N, N) - \theta(\Delta v_A + \Delta v_B).$$

It is useful to compare the outcome under delegation with that under integration. It is easy to see that (4.1) implies (3.2), given that  $\theta < 1$  and also that (4.3) implies (3.2). It follows that, whenever coordination occurs under delegation, i.e., in cases B) or C) above, coordination occurs under integration too. However, since (2.5) implies (4.3) (given that  $\bar{\theta} \leq 1$ ), there is still too much coordination under delegation relative to the first-best, i.e., coordination occurs whenever it is efficient, but also sometimes when it is inefficient.

Proposition 3. Under delegation there is (weakly) less coordination than under integration, but still too much coordination relative to the first-best.

Proposition 3 is intuitive. If unit managers reluctantly coordinate under delegation, i.e., reversal is not required, then a professional manager would also coordinate under integration. And if a professional manager would reverse delegation to achieve coordination, incurring higher grievement and shading costs, then she would surely coordinate if reversal were not required.



Finally, since  $\bar{\theta} \leq 1$ , if coordination is efficient, the boss will be prepared to incur the costs of reversal to achieve it.

Thus, the tradeoff between integration and delegation is the following: Both yield coordination too much of the time, but delegation yields it less of the time and therefore comes closer to the first-best. However, to the extent that the boss reverses delegation to achieve coordination, the deadweight losses from shading are higher under delegation than under integration.

The next proposition shows that delegation is never strictly optimal under certainty.

Proposition 4. Under perfect certainty, non-integration or integration can be strictly optimal, but delegation is never strictly optimal.

Proof. Suppose first that the equilibrium outcome under delegation is  $(N, N)$ . Then the equilibrium outcome under non-integration cannot be worse than this: either it is  $(N, N)$  with less shading, or it is  $(Y, Y)$ , which is Pareto superior.

Suppose next that the equilibrium outcome under delegation is  $(Y, Y)$ . If (4.1) holds, so does (3.2), and so coordination occurs under integration with the same shading costs. On the other hand, if (4.1) does not hold, then (4.3) must hold, since otherwise the outcome would be  $(N, N)$ . But if (4.3) holds, then (3.2) holds, and so coordination again occurs under integration with lower shading costs.

Finally, it is easy to find parameters such that  $(N, N)$  is socially optimal, and non-integration yields  $(N, N)$ , while integration and delegation yield  $(Y, Y)$ ; and parameters such that  $(Y, Y)$  is socially optimal, and integration yields  $(Y, Y)$ , while non-integration and delegation yield  $(N, N)$ . In other words, non-integration and integration can each be uniquely optimal.

Q.E.D.

Delegation may, however, be superior to either non-integration or integration in a world of uncertainty. For delegation to be better, it is important that  $\bar{\theta} > \theta$ . To see this, note that if  $\bar{\theta} = \theta$ , (4.1) implies (4.3), and (4.3) and (3.2) are equivalent. Thus, cases B) and C) above are both ones where (3.2) holds. A comparison of cases B)-D) and (3.3) then shows that the outcome under integration with delegation is identical to that under integration. From now on, therefore, we suppose  $\bar{\theta} > \theta$ .

Assume that payoffs are drawn from a commonly known probability distribution, and are observed by both parties *ex post* (there is symmetric information). To understand how delegation can be strictly optimal, it is useful to focus on the special case where  $\Delta w_A = \Delta w_B = \Delta w$ . Also, write  $\Delta v = \frac{1}{2}(\Delta v_A + \Delta v_B)$ . Then the first-best condition for coordination (2.5) is  $\Delta v \geq |\Delta w|$ , where  $|\cdot|$  denotes absolute value. If  $\Delta v \leq 0$ , all organizational forms – non-integration, integration and delegation – yield the same outcome: non-coordination. So assume  $\Delta v > 0$ . Then the condition for coordination without reversal under delegation (reluctant coordination) becomes  $\theta \Delta v \geq |\Delta w|$ , while the condition for coordination with reversal under delegation (forced coordination) becomes  $\Delta v > \bar{\theta} |\Delta w|$ . In contrast, the condition for coordination under integration can be written as  $\Delta v \geq \theta |\Delta w|$ .

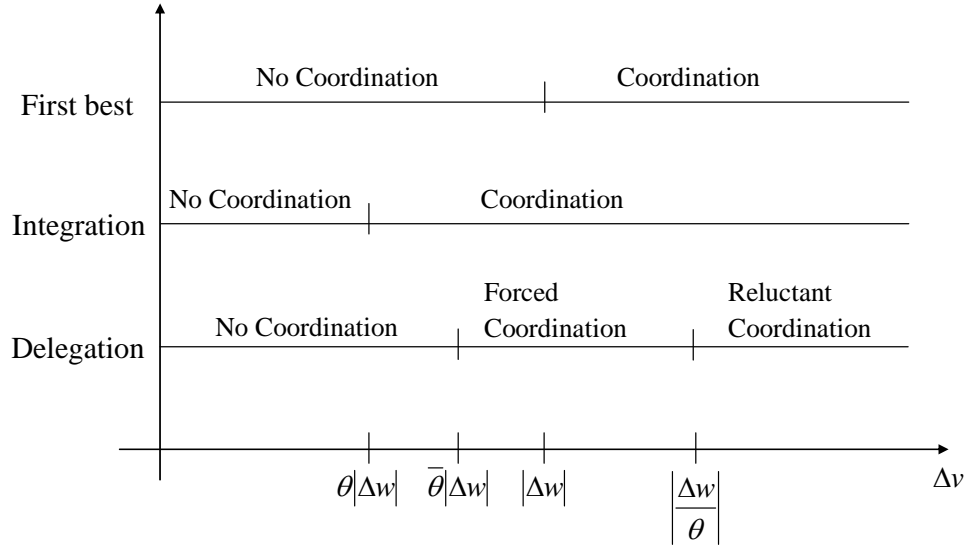


Figure 3

The situation is illustrated in Figure 3, where  $\Delta w$  is fixed and  $\Delta v$  varies. For low values of  $\Delta v$ ,  $\Delta v \leq \theta|\Delta w|$ , there is coordination under neither integration nor delegation. For values of  $\Delta v$  above  $\theta|\Delta w|$ , there is coordination under integration. In contrast, under delegation,  $\Delta v$  has to reach  $\bar{\theta}|\Delta w|$  before coordination occurs. The good news about delegation relative to integration, then, is that, in the range  $\theta|\Delta w| \leq \Delta v \leq \bar{\theta}|\Delta w|$ , it achieves a more efficient outcome. The bad news is that, in the range  $\bar{\theta}|\Delta w| \leq \Delta v \leq \frac{|\Delta w|}{\theta}$ , delegation achieves coordination, but with higher shading costs since reversal is required.

It is fairly clear when delegation will dominate integration. Suppose that the probability distribution of  $\Delta v$  is such that  $\Delta v$  is either in the range  $\theta|\Delta w| \leq \Delta v \leq \bar{\theta}|\Delta w|$  or in the range  $\Delta v \geq \frac{|\Delta w|}{\theta}$ . Then delegation achieves non-coordination when this is efficient, and coordination when this is efficient; moreover, the shading costs are low when coordination occurs since reversal is not required. In contrast under integration coordination would occur also when it is

inefficient – i.e., in the range  $\theta|\Delta w| \leq \Delta v \leq \bar{\theta}|\Delta w|$ .

The intuition is simple. Delegation can be a good way for the boss to commit not to intervene when this is inefficient, given that the costs of intervening, i.e, reversal, are high. Note finally, that over the range where delegation is superior to integration, delegation will also be superior to non-integration if, when the gains from coordination are large, they are unevenly divided.

### 5. Platform Leadership and Standards – Cisco’s purchase of StrataCom

In this section we describe a context where we think our approach, broadly interpreted, is particularly relevant – the struggle for platform leadership in the network industry. We use Cisco as an example, because Bunnell (2000) provides a detailed, informative account of Cisco’s acquisition strategy. We illustrate this strategy with Cisco’s acquisition of StrataCom.

Standards are very important in rapidly evolving industries like information and communication technology. The social benefits from a common standard can be huge, but getting parties to agree to a standard is often difficult, because the benefits from adopting a single standard tend to be unevenly distributed. Instead, standards tend to be supported through self-enforcing, multi-lateral cross-licensing agreements and industry consortia.

Naturally, the players owning key technological platforms have a disproportionate say in the evolution of the industry. Therefore, the rewards from winning the battle for platform leadership are huge (Gawer and Cusumano (2002)) and result in complex strategic games among the contenders. In these games, acquisition strategies play an important role, for reasons that our model captures at least in part.

Cisco’s Internet Operating System (IOS) illustrates a technological platform that came to dominate its industry (the network industry) in the course of the 1990s. This was no accident. When John Chambers became the CEO of Cisco in 1992, he set as his goal to make Cisco “the

architect of the Internet” (Bunnell (2000), p. 79) by getting control of how the network ecosystem would evolve. The value of controlling the architecture was accentuated by the customers’ desire to buy end-to-end solutions that integrated the underlying technologies into a seamless user experience.

Acquisitions played a key role in achieving Cisco’s goal. Under Chambers’ leadership, Cisco became the ultimate serial acquirer. Between 1993 and 2000, it bought a total of 71 companies – 23 companies in 2000 alone. Most of the acquired companies were start-ups, bought to fill gaps in the expanding technological space that Cisco wanted to control. Arguably, the most critical acquisition that Cisco made in this period was the purchase in 1996 of StrataCom, the leading provider of a small, but rapidly expanding, new transmission technology, ATM (Asynchronous Transmission Mode). It is instructive to look at this acquisition in some detail.

ATM was a new, cheaper technology that was quite different from the packet based technology (Internet Protocol) that IOS was built for. For ATM to work with Cisco equipment, IOS had to be adapted. Integrating ATM into IOS meant a major change in Cisco’s leading industry platform.

Deciding what to do about ATM became a big strategic decision for Cisco. The main concern was that ATM might eventually displace significant pieces of Cisco’s own router-based technology. Customers were keen on getting ATM into their networks, because it was a more cost efficient technology. Even though the major ATM players (including StrataCom) were still small, they were growing fast. Cisco concluded that ATM had the potential to derail its plans to be the architect of the networking industry and felt it had to respond.

Cisco had three main ways to respond to the ATM threat:

- (a) *Non-integration without coordination.* Cisco could decide not to adapt IOS to the ATM standard and hope that ATM would not take hold. ATM’s incompatibility with IOS

would make it tough for ATM players to grow very large given IOS's significant customer base, but it could be a risky and costly battle that Cisco might lose.

- (b) *Non-integration with coordination.* Cisco could adapt IOS to ATM without making a major acquisition such as StrataCom. (Cisco had already bought Lightstream, a smaller player, as a safety play, but this had worked out poorly, because of skeptical customer reception; its size was too insignificant and customers weren't sure that Cisco would support the technology in the long run – as it turns out, a valid concern.) This strategy would require Cisco to work with the leading ATM firms, making it much easier for ATM to grow and usurp Cisco's technology. In fact, three years earlier Cisco had made an agreement with StrataCom and AT&T to collaborate on the definition of standards and the development of products for ATM, but apparently these efforts did not work out.
- (c) *Integration with coordination.* Cisco could buy StrataCom (or some other major ATM player), adapt IOS to ATM internally, and become an industry leader in the ATM market. This would support Cisco's ambitions to be the architect of the network industry. By holding the decision rights to both technologies, Cisco could determine how the two technologies should be integrated to provide a seamless customer experience and maximize overall surplus – much of which would flow into Cisco's pockets, of course, if it could win the platform game.

Cisco chose option (c), the same strategy that it had successfully followed when the switching technology became a threat and it bought Crescendo. Cisco paid 4.7 Billion dollars for StrataCom – by far the most expensive acquisition that it had made until then and an incredibly high price for a start-up with modest earnings. Cisco's stock price jumped 10% on the announcement of the deal.

How well does this case fit our model?

The price of the deal makes clear that significant joint benefits from coordination were

anticipated. Integrating ATM and IOS seamlessly, and in a way that maximized the joint benefits of Cisco and StrataCom rather than those of the whole industry, would give Cisco and StrataCom a much better shot at winning the platform game. Thus, from a financial point of view, coordination was the preferred option. Next one has to ask whether coordination would have been feasible across the market, since then Proposition 2 states that this is better than coordination through integration. But, as noted in the description of option (b), cooperation across the market appeared difficult; the earlier attempts to cooperate with StrataCom and AT&T were not successful. One can guess that the reason was the reluctance of StrataCom, the dwarf in the relationship, to cooperate (press the Y button), because this would have tilted the playing field too much in favor of the giant Cisco. Arguably, option (b) failed because of an uneven split of the surplus.<sup>11</sup>

For integration to be desirable, the effects on private benefits also have to be considered. Adapting Cisco's IOS to the new ATM technology was something many Cisco employees disliked, both because ATM was "not invented here," and because ATM was a cheaper, less sophisticated technology to which Cisco's sales people strongly objected. But given the enormous acquisition price, it is evident that the strategic and financial benefits were judged to be so large that they overwhelmed perceived losses in private benefits within Cisco. The private losses on StrataCom's side were probably small, and there may even have been private gains (in contrast to (2.3)), given that StrataCom's technology was adopted. One common reason why entrepreneurial firms may sell out to a large player like Cisco (besides the money they get from selling their shares) is that access to a huge customer base brings their projects onto a large stage quickly.

Cisco's acquisition strategy, and the rules that Cisco used to determine its favored partners, make clear that Cisco was sensitive to the issue of private benefits. Chambers' five desiderata for partners were these: a common vision, culturally compatible, would deliver a quick win for the

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<sup>11</sup> Our model considers only one binary decision. In reality there is of course a long vector of decisions. StrataCom may have coordinated along some dimensions for modest joint gains, but not at the technological level that would be possible under integration. We are equating sub-par coordination with non-coordination.

shareholders, a long-term win for all constituencies, and be geographically close (Bunnell (2000) p. 65). Chambers went to great length to avoid losses to employees, to minimize, we may assume, quits and shading. He wanted the acquired firms to stay as independent as possible within Cisco to maintain the spirit of entrepreneurship and worker motivation. Typically, the newly acquired firm only had to make its products compatible with IOS and submit to the purchase and sales systems in Cisco. Otherwise it would be rather free to pursue its own agenda. The commitment worked: Cisco had a reputation for being a benevolent, well-liked acquirer.

The *Mario rule* illustrates Chambers' efforts to protect entrepreneurial employees (Bunnell (2000), p. 37). The rule, named after the CEO of Cresendo, Mario Mazzola, stated that no employee of a newly acquired company could be terminated without the consent of Chambers and the former CEO. We interpret the *Mario rule* as a form of delegation. Interestingly, Cisco abandoned this rule after the dot.com crash in 2000 when it was forced to lay off thousands of employees because of the deep technology recession. Evidently, delegated rights are not as secure as ownership rights, but they are not valueless either, a distinction that fits our delegation model well.

It is worth asking whether hold-up based property rights theories fit the Cisco story as well or better than ours. It is true that, in hold-up models as well as our model, there is concern about being locked in and becoming unduly dependent on an outsider – for a service or a key element in one's strategy. It is also clear that there are hold-up concerns in this broad sense in the Cisco-StrataCom deal. But we do think the essence of the deal was less about hold-ups and financial extraction than it was about the ability to control the path of ATM-IOS integration and its future development. In Chambers' own words: "With a combination of IP [internet protocol] routing and ATM we can define the Internet of the future" (Bunnell (2002), p 88). Also, the meticulous attention to employees in both firms and the key rules for acquisitions are evidence in favor of the centrality of private benefits.



## 6. Conclusion

In the traditional property rights model asset ownership affects incentives to invest in human capital, but not *ex post* outcomes. In our model decision rights directly affect what happens *ex post*. Our structure is in many ways close to the traditional view of the firm as a technologically defined entity that makes decisions about inputs, outputs and prices. The difference is that our firm does not necessarily maximize profits, either because a boss cares directly about nontransferable private benefits or because the boss is forced to internalize them given that employees can shade. It is this relatively small wrinkle in the traditional model that opens the door to a discussion of boundaries. In the traditional model, barring regulatory constraints, it would be optimal to organize all activity in a single firm.

We have also found it useful to embellish the basic model in Section 2 with the aggrievement approach of Hart and Moore (2008). There are two important benefits that we think more than off-set the added complexity. First, the basic model does not explain the need for an initial choice of ownership: one could equally well have chosen the optimal ownership structure *ex post*. Furthermore, in a dynamic model with uncertainty, one would expect to see continuous reallocations of decision rights. Reference points and aggrievement bring a natural source of inertia into the model that makes the *ex ante* choice relevant. That this source of inertia is empirically relevant is suggested by the Cisco example – restructuring makes some people aggrieved, sometimes so much that acquisitions will not happen.

Inertia is also what makes delegation distinct from ownership. How one allocates decision rights within the firm will make a difference.<sup>12</sup> Firms do a lot of internal restructuring and many do major ones several times a decade in response to changes in their strategic situation. These restructurings have powerful effects not only on how the organization operates, but also on how employees feel. They do not come without cost. The section on delegation is an indication that

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<sup>12</sup> Aghion and Tirole's (1997) distinction between formal and real authority has some similarities with the approach we have taken, but their model does not feature inertia, which we think is a critical feature for studying restructurings. At a more basic level, in their model the boss does not delegate decision rights. She decides not to use her right when she doesn't have the information to do so.

the approach here could be fruitful for analyzing internal organization and restructurings.

Private benefits play a pivotal role in our analysis. An alternative would have been to let incentive effects counter-balance the benefits from integration (as in Mailath et al, 2004). We chose the current path, because the analysis seems more tractable and the framework more flexible – among other things it permits an investigation of delegation. It remains to be seen how important private benefits are empirically.

One of our objectives in writing this paper has been to move the focus of attention away from assets towards activities. Asset ownership is at the core of the property rights theory and it will remain important for understanding boundaries. At the same time it is remarkable how few practitioners, organizational consultants, or researchers studying organizations within other disciplines than economics (e.g. sociology and organizational behavior) ever talk about firms in terms of asset ownership. For most of them a firm is defined by the things it does and the knowledge and capabilities it possesses. Coase (1988) makes clear that he too is looking for “a theory which concerns itself with the optimum distribution of activities, or functions, among firms” (p. 64). He further notes that “the costs of organizing an activity within any given firm depend on what other activities the firm is engaged in. A given set of activities will facilitate the carrying out of some activities but hinder the performance of others.” The model we have proposed is in this spirit.

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