"A THEORY OF FIRM SCOPE"*

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Abstract

The formal literature on firm boundaries has supposed that *ex post* conflicts are resolved through bargaining. In reality parties often simply exercise their decision rights. We develop a model, based on shading, in which the use of authority has a central role. We consider two firms deciding on whether to adopt a common standard. Non-integrated firms may fail to coordinate if one firm loses. An integrated firm can internalize the externality, but puts insufficient weight on employee benefits. We use our approach to understand why Cisco acquired StrataCom, a provider of new transmission technology. We also analyze delegation.

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 these matter in a world of incomplete contracts. In the standard property rights model, parties write contracts that are *ex ante* incomplete but 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 to make relationship-specific investments. As a consequence, it is optimal to assign asset ownership to those who have the most important relationship-specific investments.[1]

Although the property rights approach provides a clear explanation of the costs and benefits of integration, the theory has a number of features that have limited its applicability[2]. One that we focus on here is the assumption that *ex post* conflicts are resolved through bargaining with sidepayments. Although direct empirical evidence on this topic is not readily available, casual inspection suggests that bargaining with unrestricted sidepayments is not ubiquitous. Many decisions made in a firm will be carried out without consultation or negotiation with other firms even when these decisions impact the other firms in a major way. It is rare, for instance, for a

[1] 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).
[2] For a discussion of this, see Holmstrom and Roberts (1998) and Holmstrom (1999).

firm to go to a competitor with the intention of extracting sidepayments for avoiding aggressive moves.[3]

We present a new model of firm boundaries, which is designed to deal with strategic decisions that are taken in the absence of *ex post* bargaining. To justify the use of authority rather than bargaining, we adopt the "contracts as reference points" approach of Hart and Moore (2008). According to this approach, a contract (in our model, an organizational form), negotiated under competitive conditions, circumscribes or delineates parties' senses of entitlements. Parties do not feel entitled to outcomes *outside the contract*, but may have different views of what they are entitled to *within the contract*. More specifically, each side interprets the contract in a way that is most favorable to him. When he does not get his most favored outcome within the contract, he feels aggrieved and shades by performing in a perfunctory rather than a consummate fashion, creating deadweight losses. Given these assumptions, a more open-ended contract leads to more aggrievement, implying that *ex post* bargaining with sidepayments is costly.[4] We rule out renegotiation on these grounds.

Our model comprises two units that have a lateral relationship (this is another departure from the literature, which has focused on vertical integration). We think of a unit as an irreducible set of activities that it would be meaningless to break up further. Each unit is operated by a manager and has a decision that affects the other unit, i.e., there are externalities. We have in mind

[3] Of course, where there is an opportunity for mutual gains, a firm may approach another firm to explore various ways of cooperating, either through the market or through a joint venture or merger. However, it is also possible that the parties will simply do what is unilaterally in their best interest.
[4] For a discussion, see Hart (2008).

strategic decisions that are so significant that they warrant consideration of an organizational structure that best supports them. For example, the units may be deciding whether to adopt a common standard or platform for their technology or product.

As an application, we will use the model to understand Cisco's approach to acquisitions, especially its decision to purchase StrataCom. Ciscos's Internet Operating System (IOS) is a platform that came to dominate the network industry in the 1990s. StrataCom emerged as the leading provider of a small, but rapidly expanding, new transmission technology, Asynchronous Transmission Mode (ATM). The question for Cisco and StrataCom was whether to coordinate their technologies. Initially they tried to do this as separate firms, but apparently this did not work out. Cisco then acquired StrataCom.[5]

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. That is, each party can veto coordination by choosing No.

The decision in each unit is *ex ante* non-contractible, but *ex post* contractible. Each unit has a boss. The boss has the right to make the decision in that unit *ex post*; that is, the boss has residual control rights. In the simplest version of our model the boss is equivalent to an owner; however, in extensions the boss and owner can be different. We will compare two leading organizational

[5] There is thus a parallel between Cisco-StrataCom and the famous case of General Motors and Fisher Body. General Motors and Fisher Body initially transacted as separate firms but General Motors then acquired Fisher Body. See, e.g., Klein (2007).

forms. In the first, *non-integration*, the units are separate firms, and the unit managers are the bosses. In this case the unit managers take the Yes/No decisions. In the second, *integration*, the units are part of a single firm, and an outside manager is the boss. In this case the boss instructs the managers whether to choose Yes or No, and the managers must follow these instructions (they are contractible); however, the managers may shade on performance.[6]

A key ingredient in our model is the assumption that each unit generates two kinds of benefit: monetary profit, which is transferable with ownership, and private benefits, which are non-transferable. Private benefits represent job satisfaction broadly defined. They may arise from various sources. Employees often have their human capital tied to particular technologies. They like to work with technologies with which they are familiar. If a new technology is introduced the employees need to learn new skills, which is costly. Also, the future wages and career prospects of employees may depend on how well their human capital fits the firm's needs: the firm's choices will therefore affect them. In sum employees care about the decisions of the firm they work for. The evidence that smaller companies pay less on average than larger companies (see, e.g., Schoar [2002] on pay in conglomerate versus stand alone plants) is consistent with the idea that employees are affected by the size and scope of their company.

Private benefits can also be viewed as a way of capturing different beliefs held by managers and workers about the consequences of strategic choices (for an explicit analysis of differences in beliefs with organizational implications, see Van den Steen [2005]). In high-tech industries

[6] These are not the only possibilities. For example, one could consider another form of integration where one of the unit managers is the boss. We discuss this in Section 3.

different visions about the future path of particular technologies are held with passion and influence both the costs of hiring and the decisions undertaken. Our discussion of the Cisco case suggests that private benefits were very important to Cisco and influenced its decision making.

The role of the two types of benefits in our analysis can be illustrated as follows. 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. To simplify the analysis, assume that the manager is the only worker and hence private benefits refer to his job satisfaction.[7] As well, assume that the boss of a unit can use her residual rights of control to divert all the profit from that unit to herself. This rules out profit-sharing as a way to influence incentives. Profit-sharing would alleviate, but not eliminate, the effects we describe.[8] Then, if the units are non-integrated and manager A is the boss of unit A and manager B the boss of unit B, manager A's payoff will be $v_A + w_A$ since he diverts the profit from unit A and cares about his own private benefits, and manager B's payoff will be $v_B + w_B$ for similar reasons. In contrast, if units A and B are integrated, then, if a (professional) outsider is the boss, her payoff will be $v_A + v_B$, since she diverts all the profit and does not care about private benefits. As a benchmark, note that social surplus is given by $v_A + v_B + w_A + w_B$.

The key point 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 fail to appear in the overall objective function. However, this

[7] The interpretation that private benefits are enjoyed by a single manager is restrictive. In the Conclusions we discuss briefly the case where the units are large companies, and private benefits refer to the aggregate job satisfaction of workers.

[8] We return to this issue briefly in Section 5.

diminished influence of private benefits is offset by the fact that, under integration, *total* profits, rather than individual unit profits, are maximized.

The actual analysis is more complicated because the deadweight losses from shading must be taken into account. Shading causes some internalization of externalities: a boss puts some weight on the payoffs of other parties, given their ability to shade.

We assume that the opportunity to shade under non-integration also depends on the nature of the relationship between the parties. We make a distinction between two forms of non-integration. In one, "non-integration without cooperation", the relationship between the units is a limited one that terminates if non-coordination occurs; and the units cannot shade against each other in this eventuality. In the other, "non-integration with cooperation", the relationship persists and shading can occur under non-coordination. In contrast we suppose that shading is always possible under integration: the parties continue to have a relationship.

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 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 can lead to *too little* coordination when 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.[9] [10]

We analyze the above model in Sections 2 and 3. 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 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. The presence of aggrievement can help here. We assume that reversing delegation is regarded by subordinates as a "breach of promise" and leads to increased levels of aggrievement. 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.

[9] In our model the boss of an integrated firm has relatively broad objectives because he diverts (all of) the profit from the units under his control. We believe that a boss may have broad objectives for other reasons: he may be judged according to how well the units under his control perform, or obtain job satisfaction from their success.

[10] In a previous version of the paper we assumed that decisions were non-contractible both *ex ante* and *ex post*, and did not adopt the "contracts as reference points" approach. We obtained a similar trade-off between non-integration and integration but our approach raised some questions. (In independent work, Baker et al. (2008) also obtain a similar trade-off to ours under the assumption that decisions are *ex post* non-contractible.) First, if a decision is *ex post* non-contractible, how does a boss get it carried out except by doing it herself? Second, even if decisions are *ex post* non-contractible, as long as decision *rights* can be traded *ex post*, then it is unclear why *ex ante* organizational form matters (in the absence of non-contractible investments). The parties could just rely on *ex post* bargaining of decision rights to achieve an optimum. Finally, the "*ex post* non-contractibility" approach by itself does not yield an analysis of delegation (see below).

Our paper is related to a number of ideas that have appeared 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 boss's 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), or consider standard setting. 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, several recent works explore firm boundaries and internal organization using 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). We have discussed in footnote 10 some reasons why we have not followed the "*ex post* non-contractibility" approach here.

We should point out how our analysis of delegation differs from the treatment of authority in Aghion and Tirole (1997) (see also Baker et al. [1999]). In Aghion and Tirole, a boss defers to a subordinate in situations where the subordinate has superior information. In this case, even though the boss has "formal" authority, the subordinate has "real" authority. In contrast, we are interested in situations where *allocating* authority to someone inside a firm has meaning. As Baker et al. (1999) point out, this corresponds to real rather than formal authority: if the boss appoints someone as unit head, say, she can legally change her mind and take the authority back. In our model allocating authority inside a firm nonetheless has meaning. The reason is that there is a friction: designating someone as unit head and then reversing the decision is costly given that reversal increases aggrievement (by the unit manager, and possibly by unit workers to the extent that the new boss's preferences are less aligned with theirs).[11]

The paper is organized as follows. The basic model is presented in Sections 2 and 3. 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* that have a lateral relationship: they operate in the same

[11] In Baker et al.(1999), reversal is also costly given that it is a breach of a relational contract.

output or input markets. A unit has a manager and no workers. Each unit makes a decision that affects the other unit. For example, the units may be deciding whether to adopt a common standard or platform for their technology or products. It is natural to model such a strategic coordination decision as a binary choice. Each unit can choose "Yes" (Y) or "No" (N). There are two aggregate outcomes: "coordination" or "non-coordination". Coordination occurs if and only if both units choose Y. The timeline is as in Figure I. 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 chooses Y or N. Finally, the payoffs are realized.

--- Figure I about here ---

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Each unit generates two kinds of benefit: monetary profit v and private (non-transferable) benefits w in the form of job satisfaction for the manager working in the unit (private benefits are measured in money). We suppose that the boss of the unit can divert all the profit from that unit to herself.[12] In contrast, the private benefits always reside with the managers. We represent payoffs from different outcomes in the following matrix. We assume that these payoffs are non-verifiable and, for simplicity, perfectly certain. Without loss of generality we normalize so that monetary profit and private benefits under non-coordination are zero in both units.

[12] One justification is that the boss can use her residual control rights to authorize side-deals with other companies she owns, and this enables her to siphon profit out of the unit.

--- Table I about here ---

Here, unit A is the row player, and unit B is the column player. Subscripts refer to units, with *v* representing profit and *w* private benefits.

It will be convenient to introduce the notation

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

Here, Δz_A (resp., Δz_B) refers to the change in total surplus in unit A (resp., unit B) from coordination, and $\Delta z_A + \Delta z_B$ equals the change in aggregate social surplus. Note that (2.1) *does not* account for the costs of aggrievement, which depend on the *ex ante* contract as well as the *ex post* decision.

As discussed 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:

(2.2) $\Delta w_A \leq 0, \Delta w_B \leq 0$.[13]

[13] Our main results generalize to the case $\Delta w_A + \Delta w_B \leq 0$. We make the stronger assumption (2.2) for expositional

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.

We will focus on two leading organizational forms:

(1) Non-integration:[14] Manager *A* is the boss of unit *A* and manager *B* is the boss of unit *B*. Each manager diverts profit and receives private benefits from his unit, and so manager *A's* payoff is $v_A + w_A$, and manager *B's* is $v_B + w_B$.

(2) Integration: A professional manager (an outsider) is the boss of both units and managers *A* and *B* are subordinates. The boss receives $v_A + v_B$. The unit managers are under fixed wage employment contracts and each manager receives the sum of the wage and private benefit in his unit.

Organizational form and contracts are determined *ex ante*. We will assume, as in the standard incomplete contracts literature, that at this stage the coordination decisions are too complicated to specify; however, authority over these decisions can be allocated. We will take the view that the boss of each unit has residual rights of control, which gives her the legal authority to take the

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simplicity.

[14] We will actually consider two subcases of non-integration: one without cooperation and one with cooperation, as discussed below.

Y/N decisions in her unit. *Ex post* the *Y/N* decisions can be contracted on. Under non-integration each unit manager chooses *Y* or *N* in his unit. Under integration, the overall boss instructs the unit managers to choose *Y* or *N*. We will suppose that the unit managers must follow these instructions— they are contractible—but the managers may choose to shade.[15]. Shading may also occur under non-integration.

As discussed in the Introduction, we use the "contracts as reference points" approach of Hart and Moore (2008) to justify the particular contracting assumptions that we make. According to this approach a contract – an organizational form in this case – negotiated under *ex ante* competitive conditions delineates or circumscribes parties' feelings of entitlement *ex post*. In particular, a contracting party does not feel entitled to an outcome *outside* those specified by the contract or organizational form. However, parties may feel entitled to different outcomes *within* the contract or organizational form. A party who does not receive what he feels entitled to is aggrieved and shades on performance. We suppose that shading reduces the payoff of the shaded against party but does not affect the payoff of the party doing the shading. Shading creates deadweight losses.[16]

Specifically, following Hart and Moore (2008), we assume that each party feels entitled to his most preferred outcome or decision within the contract, and that a party who receives k_i less than his maximum payoff will be aggrieved by k_i and will shade to the point where the other

[15] We do not allow managers to quit within a period; see footnote 22.
[16] The reference points approach resembles in some respects relational contracting (see, e.g., Baker et al. (2008)). Shading is like punishment in relational contracting models, but shading does not hurt the person doing the shading.

parties' payoffs fall by θk_i. Here θ is an exogenous shading parameter, assumed the same for all parties, and $0 < \theta < 1$. Thus the total deadweight loss from shading is $\theta \sum_i k_i$.

The assumption that contracts are reference points provides a natural reason for parties to pin things down in an initial contract. A contract that is too flexible, that is, that specifies too little, can lead to a lot of aggrievement and shading *ex post.* The downside of a rigid contract is that it is harder for the parties to adjust to new circumstances. Even though there is no payoff uncertainty in our model, our assumption that decisions become contractible only *ex post* implies a change in circumstances that makes the *ex ante* choice of organizational form relevant for the deadweight losses from aggrievement, as will become clear below.

There is a further consideration about shading: the ability of a party to shade may depend on the nature of the transaction that the party is engaged in. For example, under non-integration if the units fail to coordinate on a standard or platform they may no longer have dealings with each other, which will reduce shading possibilities. For this reason we will distinguish between two forms of non-integration. In one, "non-integration without cooperation", the parties' relationship ends in the absence of adoption of a standard and so shading is not possible under non-coordination. In the second, "non-integration with cooperation", the parties have a broader relationship that continues beyond the standardization decision and so shading is possible even under non-coordination. In contrast, under integration, we suppose that shading is always possible: the parties continue to have a relationship.[17]

[17] In our discussion of the Cisco-StrataCom relationship in Section 5 we suggest that, before StrataCom was aquired, their relationship was probably best described as "non-integration with cooperation."

Under the shading assumption *ex post* renegotiation is not costless since each party will feel entitled to the best possible outcome in the renegotiation, and they cannot all be satisfied and will shade. Moreover, to the extent that renegotiation reopens consideration of the terms and entitlements underlying existing contracts, renegotiation can make all parties worse off. In the analysis below, we will rule out *ex post* renegotiation on these grounds. However, we believe that our results could be generalized to *ex post* renegotiation along the lines of Hart (2009).

We assume that bargaining at the *ex ante* stage ensures that organizational form is chosen to maximize expected future surplus net of *ex post* shading costs (lump sum transfers are used to redistribute surplus). In particular, we suppose that at least one side of the market is competitive *ex ante* so that each side achieves the best outcome they can get in the negotiation. Therefore there is no shading at the *ex ante* stage. In contrast, there is the potential for shading at the *ex post* stage, since the parties are then locked in.

The *ex ante* bargaining also determines managerial wages. In the special case where there is a competitive market for managers, wages plus expected private benefits will equal the reservation utility for managers. An implication of this is that an organizational change that reduces private benefits will lead to an increase in wages.[18]

3.Optimal Organizational Form

[18] 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.

In this section we analyze optimal organizational form. We compare "non-integration without cooperation", "non-integration with cooperation", and "integration".[19] In each case we suppose that the *ex ante* incomplete contract that the parties write fixes prices or wages and allocates authority.[20] Also there is no renegotiation.

From now on, we will use S to denote the *social surplus net of shading costs*, that is, the relevant payoff from Table 1 less any costs of shading. For simplicity, we refer to S as social surplus. *First-best* refers to cases where aggregate surplus is maximized *and* shading costs are zero. Similarly, we say that a decision is *first-best efficient* if it maximizes total surplus ignoring shading costs.

Non-integration without cooperation

Under non-integration, manager *A's* payoff is $v_A + w_A$, manager *B's* payoff is $v_B + w_B$, and either manager can veto coordination by choosing *N*.

It is useful to distinguish three cases.

Case 1: $\Delta z_A \leq 0, \Delta z_B \leq 0$.

The managers' preferences are aligned. Coordination does not occur since nobody wants it, and given that there is no disagreement there is no aggrievement. Social surplus is given by:

[19] We take the view that both forms of non-integration are feasible choices. In reality, past and expected future interactions between the parties may dictate the nature of their relationship under non-integration. In other words, whenever non-integration is chosen, its type is determined.

[20] We do not consider contracts that specify a price range rather than a single price. For a discussion of such contracts, see Hart and Moore (2008).

(3.1) S = 0.

Case 2: $\Delta z_A \geq 0, \Delta z_B \geq 0$.

The managers' preferences are aligned. This time both parties want coordination and so coordination occurs without aggrievement.[21] Social surplus is given by:

(3.2) S = $\Delta z_A + \Delta z_B$.

Case 3: $\Delta z_i < 0, \Delta z_j > 0 \left(i \neq j\right)$.

Now there is a conflict. Manager i does not want coordination and can veto it by choosing *N*. Since under "non-integration without cooperation" shading by manager j is infeasible if the parties do not coordinate, manager i will not hesitate to exercise his veto and the outcome will be non-coordination. Social surplus is given by:

(3.3) S = 0.

We see that the first-best, coordinate if and only if

(3.4) $\Delta z_A + \Delta z_B \geq 0$,

[21] Note that, in Case 2, (N, N) is a Nash equilibrium along with (Y, Y); however, we will suppose that parties do not pick a Pareto-dominated equilibrium.

is achieved in Cases 1 and 2, but may not be achieved in Case 3. This is the critical problem of winners and losers. Even though aggregate surplus may rise, the distribution of the gains may be such that one party loses out, and this party will veto coordination.

In summary, there is too little coordination under "non-integration without cooperation". Whenever coordination occurs it is first-best efficient (Case 2 implies (3.4)); but coordination may not occur when it is first-best efficient ((3.4) does not imply Case 2). Finally, there is no shading in equilibrium under "non-integration without cooperation", whether the outcome is coordination or non-coordination.

Non-integration with cooperation

Now shading is possible even under non-coordination. Cases 1 and 2 remain the same and achieve first-best (in particular, no shading). However, under Case 3, manager i may choose not to veto coordination given that manager j will be aggrieved if i does this – by the difference between manager j's payoff under his preferred outcome, coordination, and what he actually gets – and will shade in proportion to this difference. That is, manager j will be aggrieved by Δz_j and will shade by $\theta \Delta z_j$. Coordination will occur if manager i's utility from coordination exceeds the costs of shading imposed on i by manager j, $\Delta z_i \geq -\theta \Delta z_j$, that is,

(3.5) $\Delta z_i + \theta \Delta z_j \geq 0$.

If (3.5) holds, manager i is a reluctant coordinator and will be aggrieved by $-\Delta z_i$ because the best outcome for him would have been *not* to coordinate. Thus manager i will shade by $-\theta \Delta z_i$, and there will be deadweight losses of that amount. Note that (3.5) implies

(3.6) $\Delta z_j + \theta \Delta z_i > 0,$

and so manager j still wants to coordinate in spite of this shading. On the other hand, if (3.5) does not hold, coordination will not occur but manager j will shade by $\theta \Delta z_j$.

Social surplus is thus given by

(3.7) S = $\Delta z_A + \Delta z_B + \theta \Delta z_i$ if (3.5) holds (coordination),

$-\theta \Delta z_j$ if (3.5) does not hold (non-coordination).

While first-best is achieved in Cases 1 and 2, Case 3 does not lead to first-best. It is easy to see that (3.5) => (3.4) so there is too little coordination relative to first-best. In addition, social surplus, given in (3.7), always entails a strictly positive cost of shading; regardless of the decision one side will be unhappy.

It is evident that "non-integration with cooperation" is potentially desirable (to the extent it is a

choice) only if coordination is the outcome (i.e., (3.5) holds), When (3.5) does not hold, the parties are better off with "non-integration without cooperation". In the case where there is uncertainty (to be discussed later) it is possible that parties attempt "non-integration with cooperation", only to find that (3.5) fails.

Integration

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 [2.2]). Coordination does not occur since no one wants it, and, given that there is no disagreement, there is no shading. Social surplus is given by:

(3.8) S = 0.

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

Now the boss wants coordination, but the managers do not, 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:

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

In other words, the boss partly internalizes the wishes of her subordinates. If (3.9) does not hold, the boss will go along with what the managers want and will not coordinate. 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

$$(3.10)\quad S = \Delta z_A + \Delta z_B + \theta(\Delta w_A + \Delta w_B) \qquad \text{if (3.9) holds (coordination)}$$

$$-\theta(\Delta v_A + \Delta v_B) \qquad \text{if (3.9) does not hold (non-coordination)}$$

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 ((3.4) => (3.9) but not vice versa), and too much shading.

We have established

Proposition 1. *Non-integration errs on the side of too little coordination (when coordination occurs it is first-best efficient, but it may be first-best efficient and not occur), while integration errs on the side of too much coordination (when coordination is first-best efficient it occurs, but it may occur even when it is not first-best efficient). If non-coordination is first-best efficient, "non-integration without cooperation" achieves the first-best. If coordination is first-best efficient then (a) integration leads to coordination, but may not be optimal given the deadweight*

losses from shading; (b) integration is optimal if the changes in private benefits from coordination are sufficiently small; and(c) integration is uniquely optimal if in addition the distribution of profits is sufficiently uneven.[22]

An extension.

So far we have supposed that the integrated firm is run by a professional manager. We now consider whether it might be better to put manager *A*, say, in charge. Case 1 remains unchanged. However, Case 2 will be different. Instead of (3.9), manager *A*'s decision rule will be to coordinate if and only if

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

So manager *A*, like the professional manager, coordinates too often. However, since (3.11) implies (3.9), manager *A* is less biased towards coordination. This is an improvement. The social surplus in the event that manager *A* coordinates will be

(3.12) $S = \Delta z_A + \Delta z_B + \theta \Delta w_B$,

[22] We assume that unit managers are locked in for a period and cannot quit, that is, we suppose that their employment contract is binding for one period. (See Hart and Moore (2008) and Van den Steen (2009) for discussions of the employment contract, and Hart and Moore (2008) for a model where quitting can occur within a period.) 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 to retain workers. 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.

which is greater than the social surplus when the professional manager coordinates (see [3.10]). The reason is that when manager *A* coordinates he does not shade against himself. The upshot is that it is always at least as good to have manager *A* (or manager *B* by symmetry) run the integrated enterprise as to have a professional boss.

One way to rationalize our assumption that the boss of the integrated firm is a professional manager is to assume that as well as the strategic decision that we have focused on, there are additional 0-1 decisions that need to be taken, which will be chosen in an inefficient way if manager *A* or manager *B* becomes the boss in the integrated firm. To illustrate, suppose that there is an *auxiliary decision* that has no financial consequences, just private ones. Specifically, let the effects of going ahead with the decision be

(3.13) $\Delta\hat{w}_A > 0 > \Delta\hat{w}_B$ and $\Delta\hat{w}_A + \Delta\hat{w}_B < 0.$

Thus, manager *A* would like to see the decision taken, even though it is inefficient. As the boss, he will go ahead with the decision whenever

(3.14) $\Delta\hat{w}_A + \theta\Delta\hat{w}_B > 0.$

The social payoff of going ahead is

(3.15) $\Delta\hat{w}_A + \Delta\hat{w}_B + \theta\Delta\hat{w}_B < 0.$

A professional manager would never go ahead with the decision. Manager *A*, but not manager *B*, will feel aggrieved by this, which results in a social payoff $-\theta\Delta\hat{w}_A < 0.$ Comparing this with (3.15), we see that social surplus from the auxiliary decision is strictly higher when a professional manager is in charge than when manager *A* is in charge.

Manager *B* would make the same auxiliary choice as the professional manager and be more effective than the professional manager with respect to the strategic decision, as we argued earlier. So, when both the strategic decision and the auxiliary decisions are considered together, manager *B* would be the best boss. To avoid this conclusion, we can add a second auxiliary decision, with the payoffs for *A* and *B* reversed. This decision would be just as inefficient, but favor manager *B* rather than *A*. With both decisions thrown in, it is easy to see that the professional manager can be the best boss. The benefit of a professional boss is that she will not make decisions that are inefficient and exclusively favor one or the other manager. This is an economically plausible argument for having a professional boss run the integrated firm, though obviously there are interesting cases where manager *A* or manager *B* would do better.

Finally, we note that instead of introducing auxiliary decisions, we can add uncertainty about private benefits into our original model, allowing them to be negatively correlated as in the discussion above. This requires that we replace our earlier assumption that both *A*'s and *B*'s private benefits suffer from coordination, condition (2.2), with the assumption that the sum of the

changes in private benefits is negative. With uncertainty and negatively correlated private benefits, a professional manager can be the optimal choice, exactly for the reasons illustrated by considering auxiliary decisions.

4. Delegation

We now consider delegation, a form of governance that is intermediate between integration and non-integration, where a professional boss delegates her formal authority over decision rights to the unit managers.[23] 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 make their decisions. We suppose that the subordinates regard a reversal as a "breach of promise", and this leads to increased levels of aggrievement and shading: the shading parameter rises from θ to $\bar{\theta}$, where $1 \geq \bar{\theta} \geq \theta$. If $\bar{\theta} > \theta$, and there is uncertainty, we will see that 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 does not occur, and there is no shading. Social surplus is given by S = 0.

[23] Although the boss delegates the right to make *Y/N* decisions we suppose that she retains the ability to divert unit profit.

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 that the boss divides her shading 50:50 between the two parties[24]. Then the managers' payoffs are given by $-\frac{\theta}{2}(\Delta v_A + \Delta v_B), i = A, B$. So the managers will choose to coordinate if

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

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

$$S = \Delta z_A + \Delta z_B + \theta(\Delta w_A + \Delta w_B). \tag{4.2}$$

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 θ to $\bar{\theta}$. Thus, the boss reverses if and only if

[24]This is a simplifying assumption and other possibilities could be explored.

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

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

(4.4) $S = -\theta(\Delta v_A + \Delta v_B)$,

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

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

We summarize this discussion in the following proposition.

Proposition 2. *In the delegation model*,

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

$S = 0$.

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

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

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

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

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*

$$S = -\theta(\Delta v_A + \Delta v_B).$$

It is useful to compare the outcome under delegation with that under integration. It is easy to see that (4.1) implies (3.9), given that $\theta < 1$. Also (4.3) implies (3.9). It follows that, whenever coordination occurs under delegation, i.e., in cases B) or C) above, coordination occurs under integration too. However, since (3.4) 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 aggrievement 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 without cooperation" 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 without cooperation" 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 (3.9), 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 (3.9) 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 without cooperation" 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 without cooperation", 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 (3.9) are equivalent. Thus, cases B) and C) above are both ones where (3.9) holds. A comparison of cases B)-D) and (3.10) 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, (3.4), is $\Delta v \geq |\Delta w|$, where $|\ |$ 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 II about here ---

The situation is illustrated in Figure II, where Δw is fixed and Δv varies. For low values of Δv, $\Delta v \leq \theta|\Delta w|$, there is no coordination under integration or delegation. For values of Δv above $\theta|\Delta w|$, there is coordination under integration. In contrast, under delegation, Δv 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 Δv is such that Δv 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 integration with delegation is superior to integration without delegation, integration with 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) (as well as Gawer and Cusumano [2002]) 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 independent parties to agree to a standard is often difficult, because the benefits from adopting a single standard tend to be unevenly distributed. Instead, standards are often 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 determination of standards, sometimes to the extent that they may be able to dominate 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) is a technological platform that came to dominate the network industry in the course of the 1990s. Cisco had originally been successful and grown rapidly thanks to its router technology that served the core network of the Internet. Over time, IOS, designed to run the routers, became the de facto technology platform on which Cisco built its industry dominance (Gawer and Cusumano [2002] pp. 164-176). This was no accident. When John Chambers became the CEO of Cisco in 1992, his goal was to make Cisco "the architect of a new worldwide communication system for the twenty-first century" (Bunnell [2000], p. xv). The value of controlling the architecture of the network ecosystem 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 a 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 non-router based technology that was very different from the packet based router technology (Internet Protocol) that IOS was built for. For ATM to work with Cisco equipment, IOS and ATM had to be made compatible. 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 to get 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.

In terms of our model, Cisco had three main ways to respond to the ATM threat:

(a) *Non-integration without coordination.* Cisco could decide not to make IOS and ATM compatible 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 Cisco could face a risky and costly battle that it might lose.

(b) *Non-integration with coordination.* Cisco could make IOS and ATM compatible without a major acquisition such as the purchase of StrataCom. (Cisco had already bought Lightstream, a smaller ATM player, as a safety play, but this had worked out poorly,

because of skeptical customer reception; Lightstream's size was too insignificant and customers were not sure that Cisco would support the technology in the long run – a valid concern as it turns out.) 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 evidently these efforts did not work out. (In the context of our model this agreement is probably best interpreted as "non-integration with cooperation".)

(c) *Integration with coordination.* Cisco could buy StrataCom (or some other major ATM player), make IOS and ATM compatible 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. Nevertheless, Cisco's stock price jumped 10% on the announcement of the deal. (It seems plausible that Cisco had the bargaining power in the

acquisition — Cisco had several alternatives to StrataCom, whereas StrataCom had few alternatives to Cisco.)

How well does this case fit our model?

The value 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. Next one has to ask whether coordination would have been feasible across the market. But, as noted in the description of option (b), coordination across the market appeared difficult. We surmise that the reason was the reluctance of StrataCom, the dwarf in the relationship, to choose *Y*, 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, a key driver in our model. [25]

Our analysis emphasizes that private benefits also should be considered in making strategic decisions. Embracing the new ATM technology met with much internal resistance at Cisco, because Cisco had been "emphatically biased toward IP [technology]" (Bunnell [2000], p.84). Also, Cisco's sales force disliked ATM, because it was a less sophisticated, cheaper technology,

[25] One possibility that we have not considered is that Cisco and StrataCom could have entered into some sort of profit sharing agreement to align incentives. Given that Cisco and StrataCom were both public companies at the time, profit sharing was obviously feasible. We ruled out profit sharing in our basic model by supposing that there is 100% diversion of monetary profit. In reality, profit sharing may not have been a very effective way of aligning the incentives of Cisco and StrataCom, because of the big difference in company size and substantial uncertainty about payoffs.

which resulted in lower commissions (Bunnell [2000], p.85). The private losses on StrataCom's side were probably small, and there may even have been private gains (in contrast to [2.2]), given that StrataCom's technology was adopted. One common reason why entrepreneurial firms 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, enhancing the private benefits enjoyed from the development and increased recognition of their product. Seeing one's product succeed on a large scale can be a big source of satisfaction for entrepreneurs.

Cisco's acquisition strategy, and the rules that Cisco used to select its favored partners, make clear that Cisco was sensitive to the issue of private benefits. Chambers' five criteria for partners were these: a common vision; cultural compatibility; a quick win for the shareholders; a long-term win for all constituencies; and geographic proximity (Bunnell [2000], p. 65). Chambers also went to great length to avoid alienating employees of the acquired company, partly, we may assume, to minimize shading[26]. His strategy was to allow acquired firms to stay as independent as possible within Cisco to retain the spirit of entrepreneurship. Typically, a newly acquired firm only had to make its products compatible with IOS and submit to the purchase and sales systems in Cisco. Otherwise it was largely 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 employees from the acquired company

[26] Another important motive for not alienating employees is to prevent them from quitting. Employees may quit because they are disgruntled or because they have better prospects elsewhere, or for a combination of these reasons. Although quitting is not part of our formal model it could be incorporated into a multi-period version (see also footnote 22).

(Bunnell [2000], p. 37). The rule, named after the CEO of Crescendo, Mario Mazzola, stated that no employee of a newly acquired company could be terminated without the consent of Chambers *and* the CEO of the acquired company. We interpret the *Mario rule* as a form of delegation (regarding decision rights other than coordination). 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 recession in the IT industry. 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 traditional, hold-up based property rights theories fit the Cisco story as well or better than ours. 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 clear that there are hold-up concerns in this broad sense also in the Cisco-StrataCom deal. But we do think the essence of the deal was less about hold-ups in the sense of financial extraction – the hallmark of traditional hold-up models – and much more about the ability to control the path of the ATM-IOS integration and its successful development. This is supported by the whole rationale for Cisco's acquisition strategy. In Chambers' own words: "With a combination of IP (internet protocol) routing and ATM we can define the Internet of the future" (Bunnell [2000], p. 88). Also, the five key criteria for acquisitions seem to have little to do with traditional hold-up stories, but they, together with the meticulous attention to employees in acquired firms, bear witness to the great significance of private benefits.

6. Conclusions

In the traditional property rights model asset ownership affects incentives to invest in human capital, but not *ex post* outcomes conditional on these investments. 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 non-transferable 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.

The aggrievement approach of Hart and Moore (2008) has two important benefits relative to models based on "*ex post* non-contractibility". First, aggrievement plays a central role in explaining the need for an initial choice of ownership: without aggrievement costs (i.e., setting $\theta = 0$) one could equally well choose the optimal ownership structure *ex post*. Second, in a dynamic model with uncertainty, one would expect to see continuous reallocations of decision rights in the absence of aggrievement. Aggrievement brings a natural source of inertia into dynamic models. That this source of inertia is empirically relevant is suggested by Cisco's concern for cultural fit – reorganization can make employees 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. Firms do a lot of internal restructuring and many carry

out 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. Restructurings do not come without a cost. Our approach could be fruitful for analyzing internal organization and restructurings.

One of the features of our current model is that the outcome of integration does not depend on whether firm *A* takes over firm *B* or the other way around. But this is true only because of our assumption that the integrated firm is always run by a professional manager. As we discussed in Section 3, this is not the only possibility. If firm *A* acquires firm *B* and the manager of firm *A* becomes the boss of the integrated firm the integrated firm's decisions and direction will undoubtedly reflect manager *A*'s preferences, private benefits, and views of the world, and vice versa if the manager of firm *B* becomes the boss. Since a boss with skewed preferences is likely to take decisions that will cause aggrievement for employees with different preferences, our theory suggests that the cultural compatibility and fit of an acquisition partner may be of first order importance, something that we saw in Section 5 is consistent with Cisco's strategy and experience.

Our model does not currently have workers. However we could interpret a manager's private benefits as reflecting an alignment of preferences with the workers resulting either from shared interests or a concern for the workers' well-being. To pursue this line further, it would be worthwhile thinking about what makes bosses biased towards their workers. One force is that 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 Rotemberg and Saloner [1994, 2000], 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. With a broader range of activities, the firm's workforce will be more heterogeneous, making the boss experience less empathy for any given group. The intensity of contact with any particular group will go down, reducing the ability of that group's workers to influence the boss.[27]

Let us observe finally that giving private benefits a pivotal role in the analysis moves the focus of attention away from assets towards activities in the determination of firm boundaries. 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 goes on to say that "the costs of organizing an

[27] Note that a boss who can divert less than one hundred percent of profits for private gains will put relatively more weight on worker preferences in all cases discussed above.

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" (p.63). The model we have proposed is in this spirit. In our analysis asset ownership is the means for acquiring essential control rights, but the underlying reason why such control rights are acquired in the first place is that activities need to be brought together under the authority of one boss in order to accomplish strategic goals, such as sharing the same technological platform.

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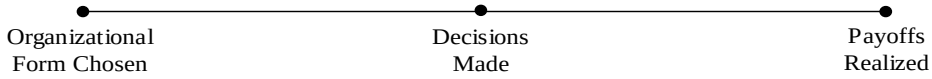

Figure I

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Unit B

Unit A	Y	N
Y	A: $\Delta v_A, \Delta w_A$	A : 0, 0
	B : $\Delta v_B, \Delta w_B$	B : 0, 0
N	A : 0, 0	A : 0, 0
	B : 0, 0	B : 0, 0

Table I

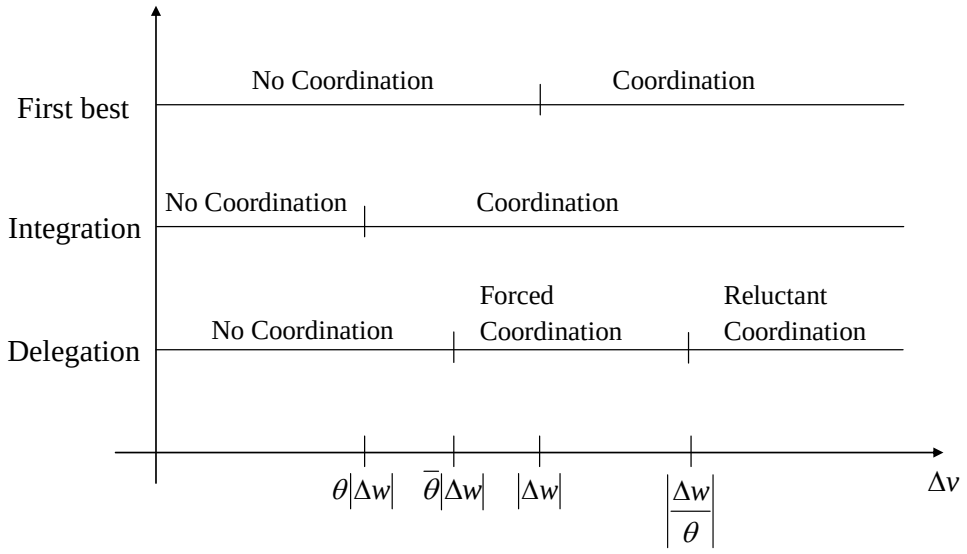
First best
No Coordination
Coordination
Integration
No Coordination
Coordination
Delegation
No Coordination
Forced Coordination
Reluctant Coordination
$\theta|\Delta w|$
$\overline{\theta}|\Delta w|$
$|\Delta w|$
$\left|\frac{\Delta w}{\theta}\right|$
Δv

Figure II