

# Managerial Firms, Organizational Choice, and Consumer Welfare\*

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## Abstract

We show that important organizational decisions – such as whether to integrate – undertaken by managerial firms may adversely affect consumers, even in the absence of monopoly power in supply and product markets. A key observation is that the price of output helps to determine the organizational form chosen. At low prices, managers may be resistant to integration, even if it efficiently coordinates decisions, because it imposes high private costs on them. At higher prices, they may choose integration even if nonintegration would produce more output, because nonintegration leads to a managerially undesired *distribution* of private costs. Since shocks to industries affect product prices, reorganizations are likely to take place in coordinated fashion and be industry specific, consistent with the evidence. The model identifies conditions under which hostile (shareholder initiated) versus friendly (manager initiated) takeovers are more likely, and show that there are instances in which entry

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of suppliers can hurt consumers by changing the terms of trade in the supplier market and thereby inducing harmful reorganizations. Measures of the welfare loss due to managerial control are discussed. The welfare effects may be exacerbated by market power, and are likely to be an order of magnitude larger than conventional losses due to market power. The results have implications for current policy debates about corporate governance and international outsourcing.

## 1 Introduction

Do consumers have an interest in the internal organization of the firms that make the products they buy? Conventional economic wisdom says no, at least if product markets are characterized by a reasonable degree of competition: firms that fail to deliver the goods at the lowest feasible cost, whatever the reason, including inappropriate organization, will be supplanted by their more efficient competitors.

Yet if the sheer volume of scholarship is any indication, that same wisdom readily acknowledges conflicting interests among the various stakeholders in the firm. For instance, the corporate finance literature, born of the separation of shareholder ownership and managerial control that characterizes the modern corporation, focuses on how private organizational responses such as compensation packages or corporate governance rules can help mitigate the potential for managers to cheat shareholders. Recent corporate scandals in the US and in England have vividly illustrated that these private remedies will not always keep these interest conflicts in check, and they have led to a resurgent public debate about appropriate corporate governance regulation in order to protect shareholder interests.

There are also potential interest conflicts between the firm and the consumer: this is a central concern of the industrial organization literature and the antitrust authorities. But the predominant view of the firm there is the classical one of the unitary profit maximizer; as a consequence, the effects of organizational design and/or managerial discretion on market performance are generally absent from the analysis, and both the economic literature and policy practice have focused instead on the adverse effects of market power. In this context, mergers or other major reorganizations are worthy of concern only insofar as they increase the firm's market power. In particu-

lar, it is hard from this point of view to see how firms might be characterized by *too little* integration.

In reality, of course, even in “small” firms, top managers have considerable discretion in designing the organization of their enterprises, and they can be prime movers of merger, acquisition and divestiture decisions. The motives behind these reorganizations or mergers may have more to do with managers’ interests than those of shareholders or consumers. Indeed, forty years ago, Leibenstein (1966) argued that the power of managers could have a considerable impact on consumer welfare: in particular, he suggested that losses due to “X-inefficiency,” attributable in large measure to managerial slack, might be an order of magnitude larger than losses due to the exercise of market power. More recently, Bertrand and Mullainathan (2003) provide evidence that managers prefer a “quiet life” at the possible expense of productivity-enhancing re-organizations.

Though the evidence offered by these studies is suggestive, the question remains whether and how organizational decisions rendered by the managerial firm – in which there is a separation of ownership and control – can affect consumer welfare in ways that do not involve market power. After all, if firms compete both in the product market and factor markets, those that do not minimize costs are at a competitive disadvantage. Nevertheless, as we shall show in this paper, a competitive world of managerial firms may indeed be characterized by organizational outcomes that benefit managers at the expense of consumers. Both too much and too little integration are possible outcomes from the consumer point of view.

We build on the insights of the literature on the firm (Grossman and Hart, 1986; Hart and Moore, 1990; Hart and Holmström, 2002) that views organizational decisions as the purview of managers who trade off the usual pecuniary costs and benefits such as profits with private ones such as effort, working conditions or corporate culture. The thrust of this literature is that in environments with imperfect or incomplete contracting, managerial firms may make organizational decisions that have little to do with profit maximization and the interests of shareholders. What we emphasize here is that these same choices can also have significant negative impacts on *consumer welfare*: mergers and divestitures that enhance managerial welfare may reduce output and raise prices, hurting consumers.

To make this point as simply as possible, we (initially) rule out market foreclosure

effects altogether by assuming competitive product and supplier markets.<sup>1</sup> In the model we consider, production of consumer goods requires the combination of exactly two complementary suppliers, each consisting of a manager and his collections of assets. When the suppliers form a joint enterprise (or “firm”), the managers operate the assets by taking noncontractible decisions.

As in some recent models of managerial firms, in particular Hart and Holmström (2002), the production technology essentially involves the adoption of standards. While there is no objectively “right” decision, output is higher on average the more decisions are in the same “direction.” The problem is that managers disagree about which direction they ought to go. For instance, a content provider may be enthusiastic about his programs, and feel that mass market programs will serve many localities well; the local distributor may disagree, thinking that programming must be specifically tailored to a local market (Ghemawat 2001). Each party will find it costly to accommodate the other’s approach, but if they don’t agree on something, the market will be poorly served.

Under nonintegration, managers make their decisions separately, and this may lead to inefficient production. Integration solves this problem by bringing in an additional party, call it HQ, which is motivated by monetary compensation to maximize the enterprise’s output.<sup>2</sup> HQ accomplishes this by enforcing a common standard. But delegating decision rights to HQ does not come for free, and generates two types of losses. First, as in Hart and Holmström (2002) this solution to the coordination problem may lead to high private costs for the initial managers. Second, using HQ to enforce coordination may have direct costs in terms of foregone output. For instance, HQ may not be specialized in all the tasks carried out by the suppliers, (e.g., Hart and Moore 1999), there may be additional communication and delay costs (e.g., Radner 1993, Bolton and Dewatripont 1994), or HQ may have its own moral hazard problems.

In our model, the ownership structures (integration versus nonintegration) are decided by managers when the firms form; this takes place in a competitive supplier

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<sup>1</sup>The model is inspired by earlier work (Legros and Newman 1996, 1999) where we show how competitive market conditions determine organizational design such as the degree of monitoring or the allocation of control. Those papers do not consider the interaction of organization with the product market or consumer welfare, however.

<sup>2</sup>Other models that take this view of integration include Alchian and Demsetz (1972), Hart and Holmström (2002), Mailath et al. (2002).

market in which the two types of suppliers “match.” The firms’ output is sold in a competitive product market, wherein all firms and consumers are price-takers.

The decision whether to integrate will depend on the market price of output. If the value of output is low because the price low nonintegration becomes less efficient, since managers are less willing to concede when the value of output, and therefore their financial stakes, become low relative to their private costs. Thus a fall in the output price may induce a flurry of integration.

As this example illustrates, this “pecuniary” mechanism for organization choice provides a natural explanation for the tendency for organizational restructuring to be *widespread*. There is considerable evidence that firms integrate (or divest) in “waves” and that reorganizations of this sort are most pronounced at the industry level. Since product price is common to a whole industry, anything that changes it will not only have the classical price-theoretic quantity and consumer welfare effects, but will have organizational effects as well. And as we have suggested, these organizational effects will in turn feed back to quantity and welfare.

In particular, at low product prices, there will be too little integration. In this situation, revenue is small, and under nonintegration managers concede very little to producing high output; integration would raise output, but generate little extra revenue for the managers and entail a significant increase in private costs. Consumers would certainly benefit if firms integrated, since this would raise output and lower prices.

Shareholders of each firm would also like integration, since in this competitive world, from their point of view there would be an increase in revenue (and they neglect the impact on price when all firms integrate). Thus, the model identifies situations in which firms are ripe for “hostile” takeover.

As prices rise, managers gain increased interest in revenue and recognize that nonintegration will fall short in this dimension, since the only way to raise output under nonintegration is by a large and unbalanced allocation of private costs. At this point they will switch to integration, since the output gain is more cheaply accomplished this way: firms invite “friendly” takeovers. As prices rise further, nonintegration would actually generate higher output than integration, but only by imposing a large private cost on one of the managers, and both consumers and shareholders of individual firms would prefer divestiture. The managers, however, remain integrated, until

prices become so high that the revenue advantages of nonintegration outweigh the bounded private costs. Thus there is a switch back to nonintegration at sufficiently high prices. In this range the competitive outcome is second-best efficient.

We go on to show that the welfare losses due to inefficient organizational choices can be quantitatively significant – an order of magnitude larger than the losses due to monopoly power, as Leibenstein argued.

## 2 Model

There are two types of supplier, denoted  $A$  and  $B$ . Production of marketable output requires the coordinated input of exactly one  $A$  and one  $B$  provider, and we call their union a firm. Examples of  $A$  and  $B$  might include game consoles and game software, upstream and downstream enterprises, or manufacturing and customer support. For each provider, a decision is rendered indicating the way in which production is to be carried out. For instance software can be elegant or user friendly, or a product line and its associated marketing campaign can be mass- or niche-market oriented. Denote the decision in an  $A$  provider by  $a \in [0, 1]$ , and a  $B$  decision by  $b \in [0, 1]$ . Overseeing each provider is a manager, who bears a private cost of the decision made in his unit. We assume that the  $A$  manager's preferences are increasing in  $a$ , while the  $B$  manager's preferences are decreasing in  $b$ : formally,  $C_A(a) = \frac{1}{2}(1-a)^2$  for the manager  $A$  and  $C_B(b) = \frac{1}{2}b^2$  for manager  $B$ .

It is important that decisions made in each part of the firm do not conflict, else there is loss of output. More precisely, the enterprise will succeed with a probability equal to  $1 - \frac{1}{2}(a-b)^2$ , in which case it generates a unit of output; otherwise it fails, yielding 0. For instance, if  $A$  finds Macintosh aesthetically pleasing while  $B$  finds PCs practical, and each adopt large quantities of their preferred machines, the resulting incompatibilities will reduce expected output.

Decisions are not contractible, but *the right to make them* can be reassigned by contract. In addition, the output generated by the firm is contractible, which allows monetary incentives to be created. Managers bear the cost of decisions even if they don't make them because their primary function is to implement decisions and to convince their workforces to agree.

Managers can *integrate* by engaging the service of a headquarters (HQ). HQ can

aid in coordinating decisions, but the cost of ceding control from the managerial point of view is a loss of “quiet life,” that is to say, a higher private cost. From the consumer point of view, the benefit of integration is to improve coordination and therefore increase output and decrease prices; but since they don’t choose organization, they may not enjoy these benefits.

The divergence between consumer and managerial interests is governed by the efficacy of HQ. Typically, employing an HQ comes at a cost in terms of foregone output that we model as reduction  $\sigma \geq 0$  in the success probability. As discussed in the Introduction, HQ may reduce potential output through the direct costs of communication, additional management personnel, or losses from delegating decisions from  $A$  and  $B$  to staff who are not experts. In this case, HQ could take a share of the (reduced) revenue, leaving the residual for the managers to share.

Other costs could be linked to a moral hazard problem: since HQ has control over both suppliers resources, it also may have opportunities to divert those resources into other activities (including private benefits, other divisions, or pet projects).<sup>3</sup>

To summarize, *expected output* is

$$Q(a, b) = 1 - \frac{1}{2}(a - b)^2 \text{ if there is nonintegration}$$

$$Q(a, b) = [1 - \frac{1}{2}(a - b)^2](1 - \sigma) \text{ if there is integration.}^4$$

Managers are compensated via shares of the revenue. Denote by  $P$  their total compensation in case of success. The actual price in the product market is  $\lambda P$ , where  $\lambda$  is the reciprocal of the managerial share. By a managerial firm, we simply mean one in which major decisions on behalf of the firm are made by individuals with low financial stakes in the enterprise. Thus we think of  $\lambda$  as being “large,” on the order of 100 or so. The rest of the revenue accrues to “shareholders” who remain passive.

<sup>3</sup>For instance, suppose that after output is realized, there is a probability  $\sigma$  that HQ has a chance to divert whatever output there is to an alternative use valued at  $\nu$  times its market value, where  $\sigma < \nu < 1$ . If output is diverted, it doesn’t reach the market, and the verifiable information is the same as if the firm had failed. Managers could prevent diversion by offering a share  $\nu$  to HQ, leaving  $(1 - \nu)$  of the revenue to be shared between the managers, but since  $\nu > \sigma$ , it is actually better for them to give HQ a zero share of market revenue and let him divert when he is able, so that successfully produced output reaches consumers only  $(1 - \sigma)$  of the time.

<sup>4</sup>There is an alternative form of integration which does without HQ, instead delegating full control to one of the managers, who will subsequently perfectly coordinate the decisions in his preferred direction. It is straightforward to show that this form of integration is dominated by nonintegration.

Before production,  $B$  managers match with  $A$  managers in order to benefit from the synergies; at the time of matching, they sign contracts indicating

- the share  $s$  of managerial revenue  $P$  accruing to manager  $A$ , with  $1 - s$  going to  $B$  (in case of failure each receives zero); and
- the ownership structure of the relationship.

There are only two relevant structures to consider here: non-integration ( $N$ ), where each manager takes the decision on his activity, and integration ( $I$ ), where the headquarters HQ takes decisions on each activity. Once a contract is given, managers (or HQ) make their decisions, output is realized and shares are distributed.

The demand side of the product market is modelled as a decreasing demand function  $D(\lambda P)$ , and except in Section 5, the market price  $\lambda P$  is taken as given by all firms when they make decisions.

In the supplier market, there is a continuum of both types of suppliers. The  $A$ 's are on the long side of the market: their measure is  $n > 1$ , while the  $B$ 's have unit measure.

## 2.1 Integration

With integration, HQ receives an expected surplus proportional to  $(1 - \frac{1}{2}(a - b)^2)P$  and therefore makes decisions for both activities in order to maximize profits of the integrated firm, that is chooses  $a = b$ . When  $a = b$ , total managerial private cost  $C_A(a) + C_B(a)$  is lowest when  $a = 1/2$  and we assume that HQ will choose these decisions (indeed this is exactly what  $A$  and  $B$  would want her to do: since it maximizes the joint payoff, which is perfectly transferable via the sharing rule  $s$ , it Pareto dominates any other choice). The cost to each manager is then  $\frac{1}{8}$ , and the payoffs to the  $A$  and  $B$  managers are

$$\begin{aligned}\pi^A(s, P) &= (1 - \sigma) sP - \frac{1}{8} \\ \pi^B(s, P) &= (1 - \sigma) (1 - s) P - \frac{1}{8}.\end{aligned}$$

Total managerial welfare under integration is  $W^{int}(P) = (1 - \sigma) P - \frac{1}{4}$  and is fully transferable. With non-integration things are a little more involved and we turn to

this case now.

## 2.2 Nonintegration

Since each manager keeps control of his activity,  $A$  chooses  $a \in [0, 1]$ ,  $B$  chooses  $b \in [0, 1]$  in Cournot-Nash fashion. Using the expression for output under nonintegration yields payoffs

$$\begin{aligned}\pi^A &= \left(1 - \frac{1}{2}(a - b)^2\right) sP - \frac{1}{2}(1 - a)^2 \\ \pi^B &= \left(1 - \frac{1}{2}(a - b)^2\right) (1 - s)P - \frac{1}{2}b^2.\end{aligned}$$

The unique Nash equilibrium is:

$$\begin{aligned}a^{no} &= \frac{1 + (1 - s)P}{1 + P} \\ b^{no} &= \frac{(1 - s)P}{1 + P}.\end{aligned}$$

Note that  $a^{no} > b^{no}$  and that the coordination loss is

$$a^{no} - b^{no} = \frac{1}{1 + P}, \quad (1)$$

which is *independent* of  $s$ . This loss is decreasing in the price  $P$ : as  $P$  becomes larger, the revenue motive becomes more important for managers and this pushes them to better coordinate.

The Nash equilibrium output is

$$Q^{no} = 1 - \frac{1}{2(1 + P)^2} \quad (2)$$

and the equilibrium payoffs are

$$\begin{aligned}\pi^A(s, P) &= Q^{no} sP - \frac{1}{2}s^2 \left(\frac{P}{1 + P}\right)^2 \\ \pi^B(s, P) &= Q^{no} (1 - s)P - \frac{1}{2}(1 - s)^2 \left(\frac{P}{1 + P}\right)^2.\end{aligned} \quad (3)$$

Varying  $s$ , one obtains the Pareto frontier in the case of nonintegration. We have  $\partial\pi^A/\partial s = Q^{no}P - s\left(\frac{P}{1+P}\right)^2$ ,  $\partial\pi^B/\partial s = -Q^{no}P + (1-s)\left(\frac{P}{1+P}\right)^2$  and simple computations show that the Pareto frontier is decreasing and concave.

Total welfare is

$$W^{no}(s, P) = Q^{no}P - \frac{1}{2}(s^2 + (1-s)^2) \left(\frac{P}{1+P}\right)^2 \quad (4)$$

The maximum surplus is obtained at  $s = 1/2$  and the minimum surplus is obtained at  $s = 0$  (or  $s = 1$ ). Note that when  $s = 0$ ,  $a = 1$ : the  $A$  manager makes no concession, and only the  $B$  bears a positive private cost.

### 2.3 Choice of Organizational Form

The frontier under integration is a straight line, while the frontier under nonintegration is concave. The relative positions of these frontiers depend on the price. Figure 1 below represents a situation where neither integration nor nonintegration dominates globally, but one form may dominate for some levels of payoffs. If the frontiers are as in the figure, the organization that managers choose depend on where they locate along the frontiers, i.e., on the terms of trade on the supplier market.

As the following proposition establishes, nonintegration may dominate integration when price is low or high, but integration never dominates nonintegration. There is a range of prices where integration is preferred to nonintegration when  $B$ 's share of surplus is large enough.

Contrary to managers, consumers are indifferent between all values of  $s$  *if the organization is given*. Hence, conditions in the supplier market affect consumers only insofar as they affect the choice of organizations.

**Proposition 1** *When  $\sigma$  is positive, managerial welfare with integration*

*(i) is smaller than the minimum total welfare with non integration if and only if  $P$  does not belong to the interval  $[\underline{P}(\sigma), \overline{P}(\sigma)]$ , where  $\underline{P}(\sigma)$  and  $\overline{P}(\sigma)$  are the two solutions of the equation  $\sigma = \frac{P-1}{4P(1+P)}$ .*

*(ii) is smaller than the maximum welfare with non integration.*

**Proof.** (i) Managerial welfare under integration is smaller than the minimum

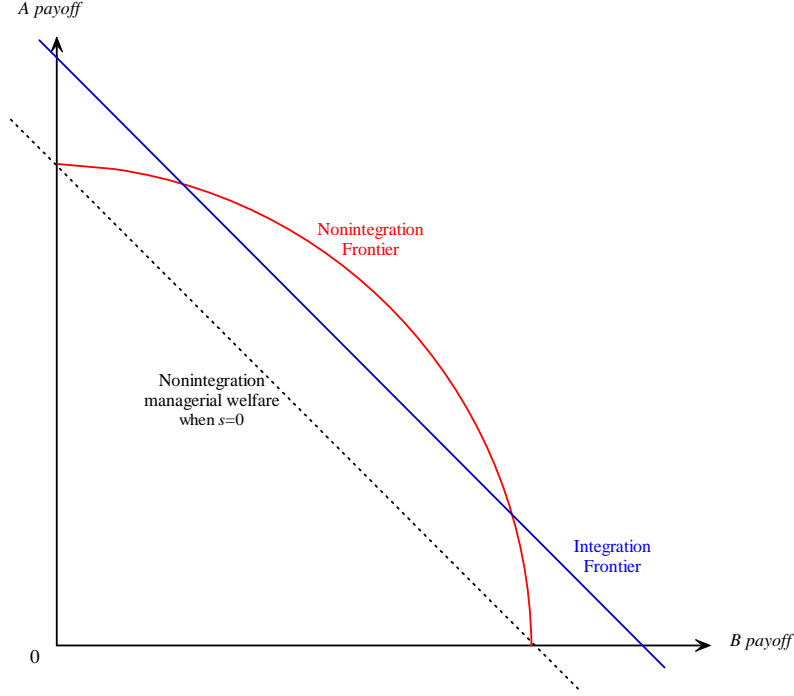


Figure 1: Frontiers

managerial welfare under nonintegration when

$$\begin{aligned}
 (1 - \sigma)P - \frac{1}{4} &< \left(1 - \frac{1}{2(1+P)^2}\right)P - \frac{1}{2} \left(\frac{P}{1+P}\right)^2, \\
 \Leftrightarrow \sigma &> \frac{P-1}{4P(1+P)} \Leftrightarrow 4\sigma P^2 + (4\sigma - 1)P + 1 > 0, \quad (5)
 \end{aligned}$$

which holds whenever  $P$  is outside the interval  $[\underline{P}(\sigma), \overline{P}(\sigma)]$ , where  $\underline{P}(\sigma)$  and  $\overline{P}(\sigma)$  are the two solutions of the equation  $\sigma = \frac{P-1}{4P(1+P)}$ .

(ii) Managerial welfare under integration is always smaller than the maximum non-integration welfare. From (4), maximum welfare under nonintegration is obtained at  $s = 1/2$ , and welfare with integration is smaller than this maximum welfare when  $(1 - \sigma)P - \frac{1}{4} < \left(1 - \frac{1}{2(1+P)^2}\right)P - \frac{1}{4} \left(\frac{P}{1+P}\right)^2$  which simplifies to  $\sigma > -\frac{1}{4P(1+P)^2}$ , which is true for all nonnegative  $\sigma$ . ■

It is straightforward to see that  $[\underline{P}(\sigma), \overline{P}(\sigma)]$  is nonempty when

$$\sigma \leq \bar{\sigma} \equiv 3/4 - \sqrt{2}/2,$$

and that  $\underline{P}(\sigma)$  is increasing and  $\overline{P}(\sigma)$  is decreasing in  $\sigma$ . Note that  $\underline{P}(0) = 1$ , while  $\overline{P}(0)$  is unbounded.

## 3 Industry Equilibrium

### 3.1 The “Organizationally Augmented” Supply Curve

Industry equilibrium comprises a general equilibrium of the supplier market and product market. In the supplier market, an equilibrium consists of “matches” of one upstream firm and one downstream firm, along with a surplus allocation among all the managers. Such an allocation must be stable in the sense that no  $(A, B)$  pair can form an enterprise that generates surpluses that exceed their equilibrium levels. In the product market, the large number of firms implies that the industry supply is almost surely equal to its expected value of output given the product price; equilibrium requires that the price adjust so that the demand equal the supply.

Since the  $A$  agents are in excess supply and would earn zero when unmatched, their competitive payoff must be equal to zero. Then if frontiers are as in Figure 1, integration would be chosen since it maximizes  $B$ 's payoff given that  $A$  get zero. At other product prices, the maximum payoff to  $B$  may be generated through nonintegration. The maximum payoff to  $B$  under integration is equal to the total welfare  $(1 - \sigma)P - \frac{1}{4}$  and the maximum payoff to  $B$  under nonintegration obtains when  $s = 0$  in (4), that is  $\left(1 - \frac{1}{2(1+P)^2}\right)P - \frac{1}{2}\left(\frac{P}{1+P}\right)^2$ .

From Proposition 1, there are three cases of interest, depending on the size of  $\sigma$ . When  $\sigma = 0$ , managers (strictly) prefer nonintegration if and only if  $P < \underline{P}(0) = 1$ . When  $\sigma \in (0, \bar{\sigma})$ , managers prefer nonintegration if and only if  $P \notin [\underline{P}(\sigma), \overline{P}(\sigma)]$ . And when  $\sigma > \bar{\sigma}$ , managers never integrate. Integration will be chosen by managers in equilibrium only when  $P \in [\underline{P}(\sigma), \overline{P}(\sigma)]$ .

We note that output supplied to the product market under integration  $(1 - \sigma)$  is

smaller than output under non-integration  $(1 - \frac{1}{2(1+P)^2})$  if and only if

$$\sigma > \frac{1}{2(1+P)^2} \quad (6)$$

that is when

$$P > P^*(\sigma) = \sqrt{\frac{1}{2\sigma}} - 1. \quad (7)$$

It is straightforward to see that  $P^*(\sigma) \in (\underline{P}(\sigma), \bar{P}(\sigma))$  whenever  $\sigma < \bar{\sigma}$ .

The reason nonintegration generates higher output as price increases is straightforward enough: the higher is  $P$ , the more revenue figures in managers' payoffs. This leads one to "concede" to the other's decision in order to reduce output losses.

The nonmonotonicity of managers' organizational preference in price when  $\sigma \in (0, \bar{\sigma})$  is more subtle. At low prices, despite integration's better output performance, revenue is still small enough that the managers (in particular the manager of  $B$ ) are more concerned with their private benefits, i.e., they like the quiet life. At high prices, nonintegration performs well enough in the output dimension that they do not want to incur the cost  $\sigma$  of HQ. Only for intermediate prices do managers prefer integration. In this range, the  $B$  manager knows that revenue is large enough that he will be induced to bear a large private cost to match the perfectly self indulgent  $A$  manager, who generates little income from the firm ( $s = 0$ ) and therefore chooses  $a = 1$ .  $B$  prefers the relatively high output and moderate private cost that he incurs under integration.<sup>5</sup>

As discussed above, the demand side of the product market is represented by the demand function  $D(\lambda P)$ . To derive industry supply, suppose that a fraction  $\alpha$  of firms are integrated and a fraction  $1 - \alpha$  are nonintegrated. Total supply at price  $\lambda P$  is then

$$S(\lambda P, \alpha) = \alpha(1 - \sigma) + (1 - \alpha) \left( 1 - \frac{1}{2} \left( \frac{1}{1+P} \right)^2 \right). \quad (8)$$

For  $\sigma < \bar{\sigma}$ , when  $P < \underline{P}(\sigma)$ ,  $\alpha = 0$  and total supply is just the output when all firms choose nonintegration. At  $P = \underline{P}(\sigma)$ ,  $\alpha$  can vary between 0 and 1 since man-

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<sup>5</sup>For this outcome, it is crucial that the supplier market be unbalanced, i.e. that  $A$  or  $B$  be accruing the preponderance of the surplus. For as we already noted, the total surplus under nonintegration when it is equally shared ( $s = \frac{1}{2}$ ) always exceeds that generated by integration. Thus if surplus is (nearly) equally shared by  $A$  and  $B$ , they never integrate.

agers are indifferent between the two forms of organization; however because  $\underline{P}(\sigma) < P^*(\sigma)$ , output is greater with integration and as  $\alpha$  increases total supply increases. When  $\alpha = 1$  output is  $1 - \sigma$  and stays at this level for all  $P \in (\underline{P}(\sigma), \bar{P}(\sigma))$ . At  $P = \bar{P}(\sigma)$ , managers are again indifferent between the two ownership structures and  $\alpha$  can decrease from 1 to 0 continuously; because  $P^*(\sigma) < \bar{P}(\sigma)$ , output is greater the smaller is  $\alpha$ . Finally for  $P > \bar{P}(\sigma)$  all firms remain nonintegrated and output increases with  $P$ .

When  $\sigma \geq \bar{\sigma}$ , managers always choose nonintegration and  $\alpha = 0$  for all prices.

We therefore write  $S(P, \alpha(P))$  to represent the supply correspondence, where  $\alpha(P)$  is described in the previous paragraph. The supply curve for the case  $\sigma \in (0, \bar{\sigma})$  is represented in Figure 2. The dotted curve corresponds to the industry supply when no firms are integrated.

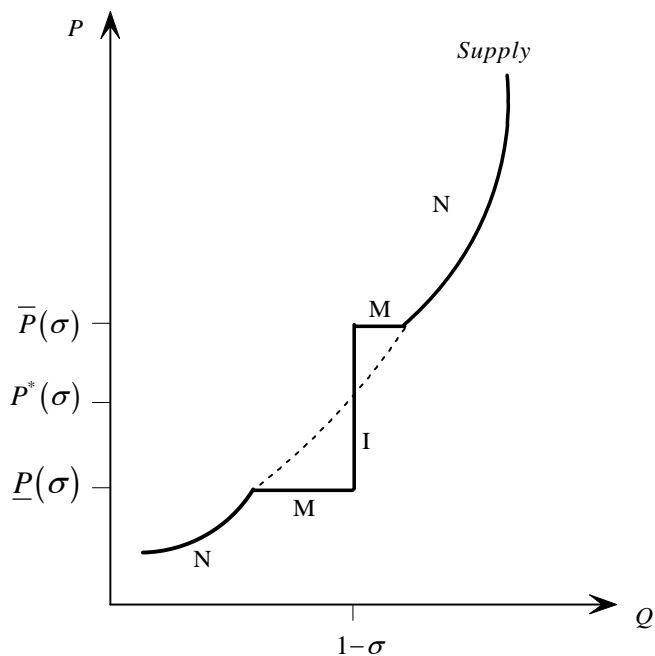


Figure 2: Supply

An equilibrium in the product market is a price and a quantity that equate supply and demand:  $D(\lambda P) \in S(P, \alpha(P))$ . There are three distinct types of industry equilibria, depending on where along the supply curve the equilibrium price occurs: those in which firms integrate (I), the mixed equilibria in which some firms integrate

and others do not (M), and a pure nonintegration equilibrium (N).

The product market supply embodies organization choices by managers. The model suggests that industries in which product prices are high or low will be predominately composed of nonintegrated firms, while those with intermediate prices will tend to be integrated. The model is also useful for illuminating sources of *changes* in organization.

### 3.2 Comparative Statics

The fact that all firms face the same price means that anything that affects that price – a demand shift, foreign competition, entry of new suppliers – can lead to widespread and simultaneous reorganization, e.g., a merger wave or mass divestiture. (An additional channel of coordinated reorganization is the supplier market: changes in the relative scarcities of the two sides, or to outside opportunities on one side, will change the way surplus is divided between managers, and this too will lead to reorganization. This mechanism is explored in detail in Legros-Newman, 2004.)

In the left panel, we illustrate the effects of shifts in supply while in the right panel we illustrate the effects of demand shifts.

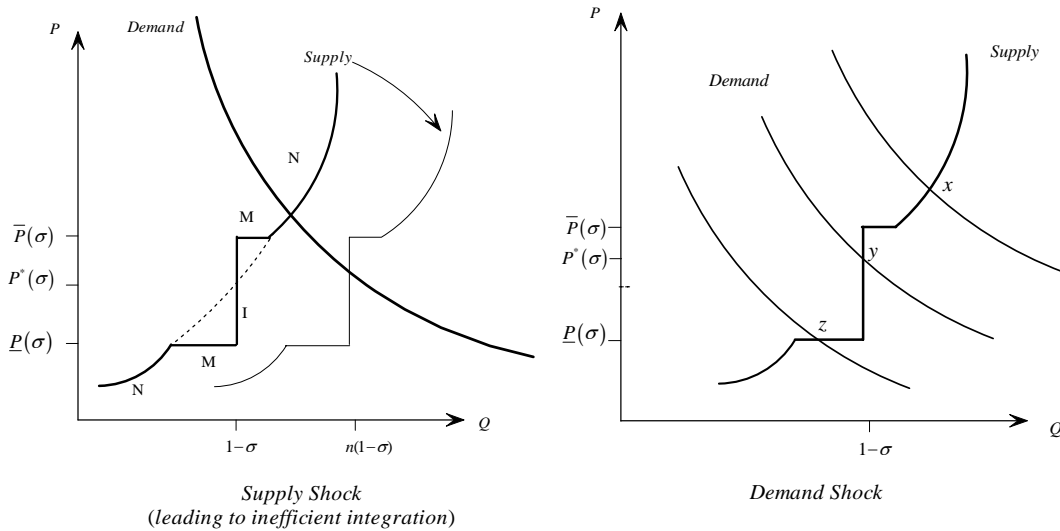


Figure 3:

**Supply Shock.** To simplify assume a balanced supply shock – both sides of the supplier market expand so as to keep the ratio of  $A$ 's to  $B$ 's the same, or alternatively assume that the measure of  $B$  firms increase, while staying inferior to that of  $A$  firms. This increase in the number of  $A$  and  $B$  firms could come for opening of international trade barriers for instance. The sequence of events can be gleaned from Figure 3 when we are initially in a regime of high demand. As illustrated in the left panel, following the increase in supply, the industry moves from a nonintegration equilibrium to an integration equilibrium. Hence, in industries when demand is high and firms are nonintegrated, balanced positive supply shocks yield merger activity. Hence, globalization can be a force for the generation of merger activity without further assumption about changes to technology or regulation.

Notice that in this example, the mergers are *inefficient*: though prices fall following entry, they do not fall as far as they might if somehow the managers were prevented from integrating.

**Demand Shocks:** Consider demand shocks that are multiplicative, that is the demand schedule becomes  $\beta D(\lambda P)$ , where  $\beta < 1$  represents shrinking demand, say due to entry of substitute products, while  $\beta > 1$  corresponds to growing demand, say over the industry life cycle.

The right panel of Figure 3 illustrates how shrinking demand may lead the industry from a nonintegrated equilibrium (point  $x$ ) to an integrated one (point  $y$ ). Moreover, when demand is high and firms are nonintegrated, negative demand shocks can lead to inefficient integration in the industry. Further decreases will eventually lead to a move away from integration (point  $z$ ).

The reverse process gives some indication of how organization should be expected to evolve over the industry life cycle. When demand is initially low and the product begins to mature, firms will begin to integrate (move from  $z$  to  $y$ ) and the synergies will first benefit all stakeholders (managers, shareholders and consumers). As demand continues to grow, integration becomes detrimental to consumers, and later in the the life cycle of the product, when demand is high enough, we will observe a series of “divestitures” and the firms will be nonintegrated (point  $x$ ).

A number of authors have emphasized the empirical regularities surrounding “clustering” of takeovers and divestitures. For instance, Mitchell and Mulherin (1996) argue that for the US at least, merger waves are best explained empirically by the

joint effects of macroeconomic and industry-level variables. In particular, Powell and Yawson (forthcoming), looking at data from the UK, emphasize growth in sales and foreign competition as important explainers of takeovers, while divestitures are associated with negative demand shocks.

## 4 Welfare

Since managers give weight to their private costs in making decisions about which organization to adopt, either form of organization can be inefficient from an output point of view. In general the degree of inefficiency will depend on the market price.

### 4.1 Inefficient Nonintegration

As we saw,  $B$ 's surplus is maximum when  $s = 0$ . Since  $A$  has no stake in the revenue of the firm, he will always set  $a = 1$ , and therefore  $B$  bears the cost of coordination. When  $P$  is small,  $B$  does not concede much under non-integration and incurs only a small private cost. From his point of view, integration has neither an advantage in terms of generating output (since at low price, this is not worth much), nor in guaranteeing  $B$  a small cost. Thus, when  $P$  is small,  $B$  will choose non-integration even if integration would yield a larger output. As we saw, when  $\sigma < \bar{\sigma}$ , this happens as long as  $P$  is lower than  $\underline{P}(\sigma)$ , and when  $\sigma > \bar{\sigma}$  when  $P$  is smaller than  $P^*(\sigma)$ . We represent this situation when  $\sigma = 0$  and  $\underline{P}(0) = 1$ , that is inefficient nonintegration is chosen when the market price is less than  $\lambda$ .

In a second-best allocation, in which the noncontractibility of decisions is taken for granted but organizational choice might be imposed by a planner, if the organization was chosen in order to maximize output, the industry equilibrium should be at point  $y$  in Figure ???. Letting  $\phi = D^{-1}$  be the inverse demand, the change in consumer surplus is

$$\Delta CS = Q^{no}\phi(Q^{no}) - \phi(1) + \int_{Q^{no}}^1 \phi(Q) dQ.$$

The change in revenues going to the firm (shareholders and managers) is

$$\Delta R = \phi(1) - Q^{no}\phi(Q^{no}). \tag{9}$$

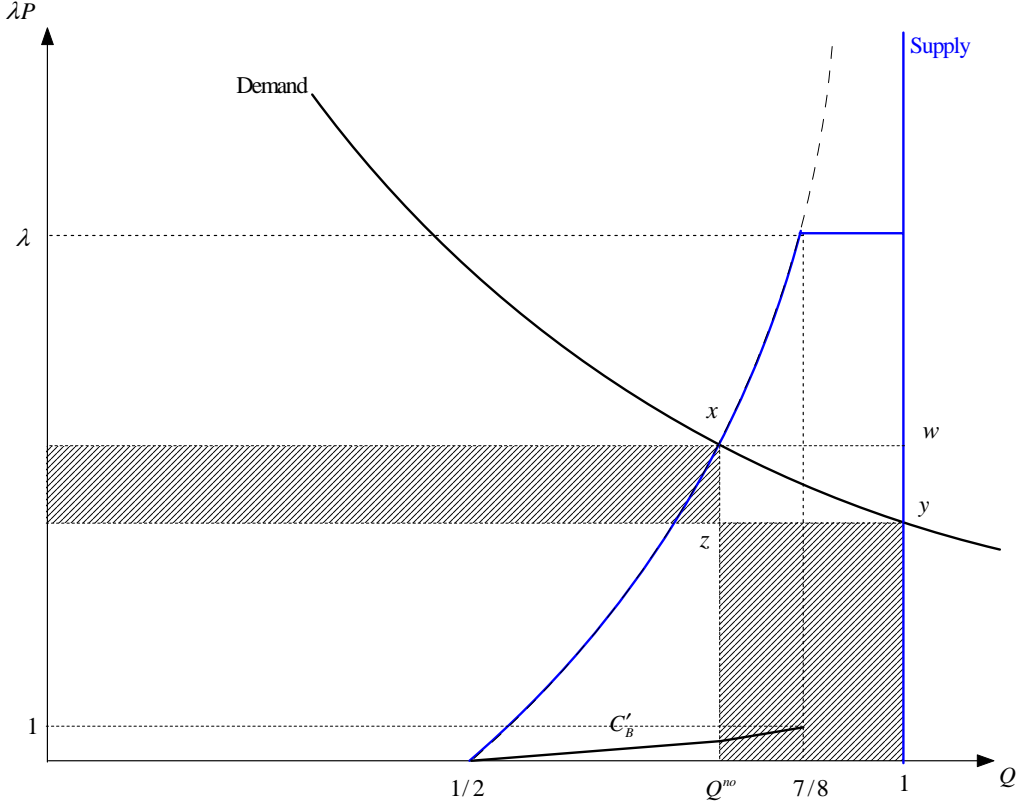


Figure 4: Organizational Loss

Hence, total welfare increases by

$$\Delta CS + \Delta R = \int_{Q^{no}}^1 \phi(Q) dQ. \quad (10)$$

The increase in managerial private costs is  $\frac{1}{4} - C_B$ , where  $C_B = \frac{1}{2}b^2$  with  $b$  solving  $Q^{no} = 1 - \frac{1}{2}(1 - b)^2$ . For  $\lambda$  large, this cost difference is small relative to  $\Delta R$ . Hence for  $\lambda$  large (10) is a good approximation of the welfare loss from insufficient integration.

Consumers would value a change in organization, in particular would value hostile takeovers that would put a HQ in place and integrate, contrary to the wishes of their managers. The model identifies an incentive for shareholders of *an individual firm* to favor integration. Indeed, an individual firm shareholders would take the price as given and would value the increase in output that results from integration.

However, as (9) suggests, if *all* firms in the industry choose integration – e.g., after a wave of takeovers – the total revenue going to these firms may in fact decrease if  $\phi(1) < Q^{no}\phi(Q^{no})$ . If somehow these hostile takeovers happen, we would have a simple explanation for the frequent observation that there can be overbidding in takeovers: overbidding is a natural consequence of competition and downward sloping demand.

## 4.2 Inefficient Integration

When the price is high enough, since  $A$  chooses  $a = 1$  under non-integration,  $B$ 's high revenue stake will induce him to follow along, leading him to bear a high private cost. He would just as soon cede control to HQ and enjoy the benefits of coordinated production and a moderate private cost. Eventually, for  $P$  sufficiently large,  $B$  prefers again nonintegration, since as long as  $\sigma > 0$  nonintegration becomes asymptotically output efficient, and the extra revenue swamps the (bounded) private costs.

As we saw in Section 3.1, there is inefficient integration when  $\sigma \in (0, \bar{\sigma})$  and  $P \in (P^*(\sigma), \bar{P}(\sigma))$ . Changes in welfare for consumers and shareholders can be computed as we did in the case of inefficient nonintegration. Here, consumers and shareholders would value a move to nonintegration, which could be achieved by forcing the firm to divest.

## 5 Monopoly

In a competitive world, inefficiencies in organizational choice take the form of a reduction in output brought to the market. As Leibenstein suggested, such “X-inefficiency” may be more important for consumers than the exercise of market power. If managerial firms are in situation of market power, we should expect to have losses both from the usual effect and from managerial discretion.

Our model can be modified straightforwardly in order to account for market power. Suppose that there is a multiplant monopoly  $B$ , having a measure 1 of  $B$  “plants,” and a number of  $A$  suppliers, each having a measure 1 of  $A$  “plants.” Since there are at least two  $A$  suppliers, the  $B$  monopoly will be able to choose the organization that maximizes its own payoff subject to the  $A$  supplier getting a nonnegative payoff.

Let  $Q_i = 1 - \frac{1}{2}(a_i - b_i)^2$  where  $a_i$  and  $b_i$  are the choices in plants of index  $i$ . Let  $Q = \int Q_i di$  be the total production (by the law of large numbers,  $Q$  should still be interpreted as a quantity). The price of output is  $\lambda P(Q)$  and  $P(Q)$  is the price going to the managers.<sup>6</sup> Let  $s$  be the share of the firm  $A$  matched with the firm  $B$ . Payoffs are

$$\begin{aligned}\pi_B &= (1-s)QP(Q) - \int_i C_B(b_i) di \\ \pi_A &= sQP(Q) - \int_i C_A(a_i) di.\end{aligned}$$

We consider for simplicity a situation where competition and monopoly yield the same outcome under integration: this happens for demand functions for which the monopoly quantity is greater than 1, the maximum capacity of the monopoly. For instance, linear demand functions that are linear  $D(P) = (\alpha - P)/\beta$  with  $\alpha > 2\beta$ , or exponential  $D(P) = \beta/(P - \alpha)$ , or have constant elasticity  $D(P) = P^{-\varepsilon}$  have this property.

Consider now non-integration. It is straightforward to show that for any  $s$ ,  $a_i = a$  and  $b_i = b$  for all  $i \in [0, 1]$  and that

$$\begin{aligned}a &= \frac{1 + (1-s)P(1+\eta)}{1 + P(1+\eta)}; b = (1-s) \frac{P(1+\eta)}{1 + P(1+\eta)} \\ a - b &= \frac{1}{1 + P(1+\eta)},\end{aligned}\tag{11}$$

where  $\eta$  is the elasticity of demand at  $P$ .

The share that maximizes  $B$ 's payoff under the constraint that  $A$  gets a nonnegative payoff is still  $s = 0$ , and therefore  $a = 1$  and  $b = \frac{1}{1+P(1+\eta)}$ .

As in the case of competition the loss of coordination in the case of nonintegration is independent of  $s$ . Comparing (11) with (1), it is immediate that for any  $P$  the loss from coordination is greater here than in the case of a competitive market. However this comparison is only partial since the monopoly will typically choose a quantity different from its competitive counterpart. Under competition, the equilibrium price  $P^0$  under non integration solves  $1 - \frac{1}{2}\left(\frac{1}{1+P}\right)^2 = D(\lambda P)$ . Under monopoly a revealed

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<sup>6</sup>Hence we assume for simplicity that the share of price going to managers is linear in price and is the same under competition and monopoly.

preference argument shows that the managerial welfare is strictly greater than at  $P^0$ ; by (11), output under non-integration is strictly smaller with the monopoly than with the competitive firm.

Because welfare under integration is the same, it follows that nonintegration is chosen more often by a monopoly supplier. Loosely speaking, nonintegration helps the monopolist restrict output.

As for consumers, if nonintegration was the outcome under competition, then the loss to consumers will be greater under monopoly than under competition: in addition to the welfare loss that we had identified before there is an additional loss due to market power. Depending on the elasticity of demand, the loss due to market power may be smaller or greater than the loss due to managerial discretion.

With non-integration we have  $a = 1$  and  $Q = 1 - \frac{1}{2}(1 - b)^2$ . Then,  $b = 1 - \sqrt{2(1 - Q)}$ , and the managerial cost of generating  $Q$  under non-integration is  $C(Q) = \frac{1}{2} \left(1 - \sqrt{2(1 - Q)}\right)^2$ . Let  $\phi(Q)$  be the inverse demand function.

Under competition, the supply function is  $P = C'(Q)$  and equilibrium output solves

$$\frac{\phi(Q^c)}{\lambda} = C'(Q^c). \quad (12)$$

With monopoly, manager  $B$  maximizes his surplus by choosing  $Q$  to solve the first order condition

$$\frac{\phi(Q^m) + Q^m \phi'(Q^m)}{\lambda} = C'(Q^m). \quad (13)$$

Under integration,  $Q = 1$  with monopoly or with competition; the welfare loss of consumers and shareholders from monopoly can be decomposed as in Figure 5 in a “Harberger loss”  $\Delta^H$  due to monopoly power *conditional on non-integration* and a “Leibenstein loss”  $\Delta^L$  due to inefficient organizational choice. From (12), as  $\lambda$  increases,  $Q^c$  declines and converges to  $1/2$ . From (13), as long as the profit function is concave,  $Q^m$  also decreases and converges to  $1/2$ . Therefore for  $\lambda$  sufficiently large, the “Harberger loss”  $\Delta^H$  becomes negligible since  $Q^c - Q^m$  goes to zero while the “Leibenstein loss”  $\Delta^L$  approaches  $\int_{1/2}^1 \phi(x) dx$ .

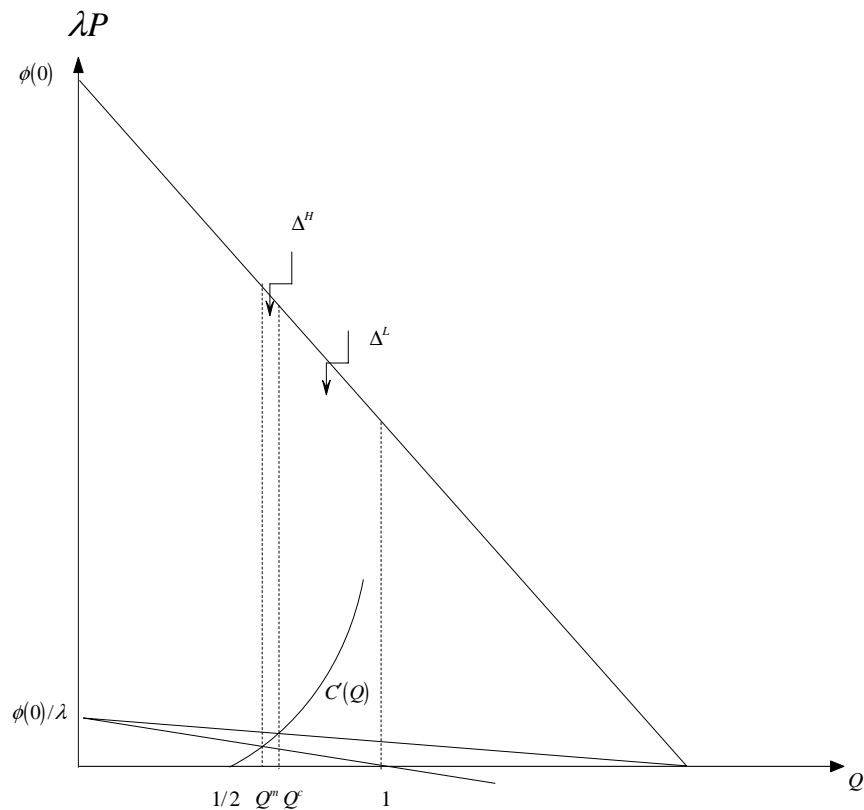


Figure 5:

## 6 Conclusion

In our basic model, managers trade off the coordination benefits brought by reallocation of decision rights with the losses from a third party (HQ) to coordinate for them. The main result of the analysis is that the organizational decisions rendered by managers acting in their own interests can lead to lower output levels and higher prices than would occur if they were forced to act in consumers' interests. This result is obtained even with a competitive product market, i.e., firms or managers do not take into account the effect of reorganization or vertical integration on product prices. Similar conclusions can be drawn in the case of monopolistic product markets. It is the desire of managers to minimize their private costs that leads them to over internalize the benefits of coordination brought by vertical integration or to over internalize the benefits of specialization brought by nonintegration.

As for surplus division, integration is more flexible than nonintegration at distributing surplus between the managers. Nonintegration achieves its maximal efficiency when the surplus division is relatively equal, since the private costs, which are assumed to be convex, are shared equally. When the surplus division is skewed, nonintegration maintains high output only by distorting decisions and imposing high private costs on one of the managers. By contrast, under integration, HQ makes all the decisions and these are unaffected by how surplus is distributed between the two managers. Thus, a shift in bargaining power toward one side of the supplier market can also be a force for integration.

We believe that these effects can be identified in practice. For instance, we show conditions under which inefficient integration is most likely to be present : when a nonintegrated industry is subject to positive supply shocks that push the market price down or when there are positive demand shocks that push the market price up.

Our analysis also suggests policy remedies in cases in which managers' organizational choice is inconsistent with maximizing consumer welfare. When managers favor integration either because the terms of trade in the supplier market are extreme or because product prices are moderately high, reduced specialization can dominate improved coordination, and output is lower than without integration, hurting consumers. Merger policies that are conventional in the sense that they assume the form of blocking a potentially harmful merger may be effective in increasing output and lowering market prices. (They are surely unconventional, though, in the sense that they do nothing to enhance competition, which by assumption is perfect both before and after a proposed merger!) In other ranges of prices, managers prefer *not* to vertically integrate, and now because of lack of coordination, output is smaller than with integration. This is a case where conventional merger policy is rather ineffective (there is no merger to prevent).

But corporate governance regulation that strengthens shareholders' ability to force integration may improve consumer welfare. In our competitive world, shareholders and consumers interests are aligned.<sup>7</sup> Shareholders take the product price as given and favor organizations that increase output, hence leading eventually to lower in-

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<sup>7</sup>Subject to the caveat that if they can imperfectly control organizational choice through control of managerial shares, their interests will typically diverge somewhat from those of consumers, particularly at higher product prices, where they will tend to favor integration more than consumers would. Details to be added in a future draft.

dustry prices. Consumers favor industry equilibria with low product prices, hence organizational choices that increase output. When managerial discretion yields to inefficient integration, competition policy is a sufficient instrument to correct these inefficiencies. When managers inefficiently do not integrate, corporate governance codes making shareholders active participants in the integration decision may be a sufficient instrument for correcting the inefficiency. Hence we may be tempted to view corporate governance and competition policy as substitute instruments in a competitive world. This is subject to the caveat that corporate governance may be subject to a commitment problem with respect to the dividend policy or other forms of “bribery.”

Though the effects we have identified can occur absent market power, this is not to say that market power is irrelevant to the effects of – or its effects on – major organizational decisions. When firms have market power, incentives to integrate may be also linked to efficiency enhancements, such as the desire to eliminate double markups. However firms may also recognize that by reducing output they will raise prices, and some of the effects we describe happen all the more strongly. Indeed our results suggest that in an oligopolistic product market, firms may use the organizational decision as a way to commit to lower output levels, thereby facilitating the collusive outcome.<sup>8</sup> Moreover, the effects of “effective” corporate governance may be quite different in this case. In a noncompetitive world, shareholders and consumers interests are no longer aligned, and as we have already noted, managerial discretion may be a way for shareholders to commit to low output and therefore high profits. The relative effects of corporate governance regulation and competition policy may therefore depend non trivially on the intensity of product market competition. These points warrant further investigation.

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<sup>8</sup>Obviously, commitments to limit competition could take other forms, e.g. product bundling, or capacity investments. Nevertheless, there are appealing reasons for policymaker to take an interest in mergers as commitment devices: first, mergers are easy to identify and, second, they are easy to prevent, which is not the case with other forms of (explicit or implicit) commitments.

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