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BENEFITS OF NARROW BUSINESS STRATEGIES

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Abstract

Firms often claim that they concentrate on a narrow range of activities while other activities are shunned even though the firm could make positive profits in them. The pursuit of such narrow strategies receives applause from some academics who study strategic management. We present two related theoretical models in which firms do indeed benefit from pursuing narrow strategies and foregoing apparently profitable opportunities. One benefit of a narrow strategy in these models is that it enables the firm to motivate its employees to search for valuable profit-enhancing innovations. We obtain this result in an environment where contracts are incomplete so that employees can only be remunerated for their ideas when their innovations are adopted. The disadvantage of broad firms in this setting is that they are tempted to make *ex post* inefficient adoption decisions.

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Benefits of Narrow Business Strategies

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Many firms have narrow objectives. Consider the Great Atlantic and Pacific Tea Company (A&P) which, until the late 1960's was the largest chain of grocery stores in the U.S. Its considerable growth and profitability was based on a strategy of providing consistently good quality foods at low prices. When consumer tastes changed and other grocery stores profited from selling other items as well, A&P did not follow suit. As a divisional president put it: "I think our primary purpose is to sell food cheaply, and tangents tend to hurt the food operation. There is a higher profit margin on non-foods, but it's *just not our business*"[1] Perrow (1970) cites many other examples of companies that seem to give up profitable ventures because they do not fit in well with "what the company does".

A narrow emphasis is applauded by some academics working in the field of strategic management. In his classic book, Andrews (1971 p. 23) says "Our theory begins with the simple proposition that every business organization ... should have a clearly defined set of goals which keeps it moving in a deliberate direction and prevents its drifting in undesired directions". When Andrews says that the goals must be "clearly-defined" he means quite narrow as is evident from the examples he gives of well- formulated strategies. One example, a watchmaker "plan[s] to produce watches of the highest quality – in a price range between the hand-made ultraexclusive level and Omega and Rolex".

Narrow objectives need not be synonymous with narrow product lines, however. The firm may have a broad product line yet set itself narrow objectives in the *kind* of product line it has. Porter (1980), for example, strongly advocates that firms restrict themselves to pursuing either high-quality or low cost. Within those general constraints, however, the firm may pursue a broad product line or "focus" on a narrow one. Firms are cautioned against attempting to pursue both a high quality and a low cost strategy, however, even if that means having to forego profitable opportunities. For example, the power tool company, Skil, which repositioned its product line in the early 1980s receives praise for turning down a substantial amount of business (estimated at around $100m) from a distribution channel that was no longer in keeping with the firm's stated

[1] Quoted in Perrow (1970 p. 160) who added the emphasis.

narrow objectives.[2]

This emphasis by some companies on the steadfast pursuit of narrow objectives seems to run counter to the prescription that tends to emerge from economics. In economics, firms are deemed to be doing their job when they maximize the expected present discounted value of profits. Turning away profitable opportunities is not generally recommended, certainly not on the basis that it would lead to "drifting" away from corporate objectives. If anything, economic models tend to suggest that diversification is valuable even when it reduces expected profits discounted at market discount rates.[3]

One seemingly plausible rationale for narrowness is that there are increasing returns to specialization. Another is that narrow objectives promote coordination. For example, Milgrom and Roberts (forthcoming) study a coordination game among managers within a firm. This coordination game sometimes has multiple equilibria. They argue that a broad statement of strategy can avoid the dominated equilibria in this game. Neither of these possible candidates can, by itself, explain why one firm cannot have different groups each of which pursues a narrow objective and achieves the economies of specialization and coordination. Nor do these theories explain why firms fear that their existing lines of business will suffer if they branch off into other lines.

Narrowness may be attractive if the proliferation of specialized groups within the same organization generates diseconomies. Top management might find it difficult to monitor such groups and these monitoring difficulties might even reduce the performance of the groups that initially constituted the core of the firm. In other words, monitoring may be subject to diminishing returns to scope. The difficulty with this view is that, in practice, narrow firms coexist with broader firms. Perrow (1970) provides an example from the textile industry in the early 1960s. He contrasts companies like Indian Head Mills which dispassionately pursued a strategy of manufacturing a range of different textiles with others who pursued a single textile with great devotion.[4]

In the theory we present, a firm that sets narrow objectives and thereby restricts the scope of its activities is better able to motivate its employees in the activities it *is* engaged in. This attribute of setting narrow objectives has been anticipated by Andrews (1971) who says: "He (the manager) needs clearly articulated corporate purposes in order to provide the incentive and control systems that will reward the specialist contributions in proportion to their organizational value" (p.25).

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[2] See the video program *Michael Porter on Competitive Strategy*.

[3] While such diversification is not desirable when financial markets are perfect it is attractive when bankruptcy is costly.

[4] Some of the specialized firms seem to be emotionally attached to their product. Perrow (1970) recounts a meeting in the early 1960's of the Fashion Institute of Technology where an "executive of one large textile company was hissed by "silk men" in the audience when they felt that their true love had been slurred". According to Mintzberg (1987), these emotional links justify narrowness. He argues that a focused strategy helps both insiders and outsiders to understand the organization. It is needed "to aid cognition, to satisfy intrinsic needs for order..."(p. 26). In other words, having narrow objectives makes it easier to get employees to "rally around the flag". The difficulty with this theory is, once again, that it does not explain why some broad firms who lack emotional attachment to their product, are successful. James Robinson, the chairman of Indian Head Mills, said of the broad strategy that they pursued: "We have no emotional involvement ..." (p. 164).

This is in contrast to the standard principal-agent setting, where there is actually a presumption that having different agents work for the same principal is beneficial. This is advantageous whenever the actions of one agent affect the payoffs of other agents.[5] It is also generally profitable insofar as it facilitates making the compensation of one agent depend on the profits from other agent's activities.[6] In the environments we study there is a countervailing cost which is exacerbated by increasing the number of activities the firm is involved in.

We study a setting in which the firm's employees can generate ideas for improving profitability. To do this, they must exert effort researching innovative ways of increasing sales or cutting costs. A key element in our setting is that, as in the sequential R&D model of Roberts and Weitzman (1981) the employees' innovation must be implemented by the firm before it can reap the increase in profits. In our model, the decision of whether to implement the innovation rests with senior management, perhaps in part because top management is in a better position to know whether the idea is useful.

In order to exploit the possibilities for innovation, the firm must find ways of compensating its employees for generating innovative ideas in the first place. We study a setting in which firms have only an indirect method of doing this. In particular, the most effective incentive device the firm has at its disposal is to reward employees who generate innovations that are actually implemented by the firm. Since the employees who exert effort are not always successful, however, this means that employees' rewards take the form of occasional large incentive payments.

This feature of the available incentive scheme has an unfortunate characteristic. Once the employee generates an innovative idea, that idea should be implemented if the benefit from the innovation exceed the costs of implementation. The firm, however, will only implement it if the benefits of the innovation plus the compensation to the innovative employee exceeds the implementation costs. *Ex post* therefore, profit maximizing senior management may not implement the innovation when it should from an efficiency point of view.[7] As a consequence of this, employees may be reluctant to exert effort in the first place. That is, the firm may have difficulty motivating employees *ex ante*.

The point of the paper is that this distortion of the firms *ex post* implementation decision is exacerbated if the scope of the firm's activities is broad. Therefore, broad firms might, in addition, find it difficult to provide appropriate incentives *ax ante*.

We study two circumstances in which these deleterious consequences of breadth arise. Following Hart and Moore (1990) we treat the firm as consisting of a profit maximizing manager (or owner) and some (specific) assets. The firm has a choice over the number of activities in which to

[5] See, for example, Holmstrom and Milgrom (1989).

[6] See Holmstrom (1982).

[7] Profit maximization by managers is to be expected if managers are risk neutral, care only about their income and can be paid a proportion of total firm profits. We show in Rotemberg and Saloner (1990) that these inefficiencies can be resolved to some extent by hiring top managers whose utility function also depends directly on the welfare of their employees.

deploy these specific assets. In particular, we suppose that there are two activities a and b in which the assets can be put to profitable use. Each activity requires the employment of an employee and this employee is capable of generating profit enhancing innovations, i.e. methods for deploying the specific assets more profitably.

The first circumstance in which breadth creates difficulties is where the innovation in activity b, if one arises, can sometimes also be used in activity a. For example both employees might be working on improving inventory control systems for their activity and the innovation in b might be applicable in a. Then the firm is tempted to apply the innovation in b to a and thereby save itself the incentive compensation of the employee in activity a. It might do this even when the innovation from b raises profits by less once one ignores incentive payments. Consequently the employee in a will rationally expect that he will be compensated only when he is successful and the other employee's innovation is not useful in a. When that is the case there are two possible outcomes. One is that it is impossible to motivate him at all. The other is that he can be motivated with an even higher incentive payment when he alone produces an innovation which raises the profits of activity a.

Each of these possible outcomes may be inefficient. In the first case the inefficiency is of an *ex ante* kind; it may be impossible to motivate the employee in a even when his innovation is profitable *ex ante*. The other is an *ex post* inefficiency, both employees exert effort but the innovation of the employee in activity b is implemented in a even though it is an inferior one. The firm does this simply to conserve on incentive payments. These inefficiencies can provide a rationale for narrowness. By choosing to be narrow, and focusing only on activity a, the firm commits itself not to research innovations that could jeopardize the effort of its innovative employee in activity a. Obviously this advantage of narrowness does not arise if firms are not actively engaged in research. We would therefore expect innovation oriented firms to be narrow while others, such as Indian Head Mills, are not.

One issue that arises at this point is whether narrowness is a credible commitment. In other words, why is it harder for a narrow firm to replace the innovation generated in a by another innovation? Why can't the narrow firm simply import innovations from outside the firm? There are two reasons why narrowness is credible as a commitment. First, to be valuable, an innovation must raise the productivity of the firm's specific assets. Therefore, people who do not work with these assets are not in a good position to generate valuable innovations. Only by having employees with experience deploying the firm's assets can innovations that are useful be developed. Second, the top manager of a firm that is involved in b must, in any event, spend resources to evaluate the innovation in b. Having spent those resources, he knows both the value of the innovation for b as well as its applicability in a. He thus know more about applicability in a of ideas generated elsewhere in the firm than he does about the applicability of ideas generated on the outside.

The second circumstance where breadth can be detrimental is where employees in two unrelated activities can pursue innovations but, if they both succeed, only one can be implemented because the firm faces financial constraints. Here again the firm will implement the innovation that gives it the highest *ex post* profits net of incentive payments. Once more *ex ante* and *ex post* inefficiencies arise. The former inefficiency arises when the employee in the *ex ante* more profitable activity does not make an effort because he rationally anticipates that his innovation will not be implemented when both employees succeed. Even when he does make an effort, the *ex post* inefficiency may be present as a result of having to offer him large incentive payments when his innovation is adopted. This occurs when his innovation is the more profitable one *ex post* when one ignores incentive payments but, at the same time, is the less profitable one after incentive payment are taken into account.

The firm may again be better off by setting narrow objectives and restricting the scope of the firm to the *ex ante* more profitable activity. The setting of narrow objectives commits firms not to supplant the ideas of their innovative employees by the ideas of employees in unrelated activities. This commitment is credible insofar as those who do not work with the firm's specific assets cannot discover new ways of deploying these assets profitably as easily as those who do. It is also credible if top management finds it more difficult to evaluate ideas developed without the firm's specific assets.

An example of a decision that is consistent with this form of commitment is presented in Donaldson (1984 p.115). He discusses the case of a company who had to choose between renovating an aging plant or scrapping the plant and acquiring a different company. A Donaldson interviewee commented: "Internal management really doesn't want acquisitions. There is nothing in it for them. All they get is newcomers who will compete with them [for resources]". The company chose to renovate the plant even though this decision could only be rationalized by applying a much lower hurdle rate than the company usually required.

The above discussion supposes that ideas that result in losses net of incentive payments are ignored even when they are valuable. This would not occur if there was efficient recontracting. When the employee realizes that his idea would not be implemented under the original contract, he would presumably accept to rewrite the contract so that the idea is implemented while he receives a lower payment. Moreover, when the idea produces positive profits gross of the employee's compensation a new contract of this type can make both the employee and the firm better off. It should be apparent that efficient recontracting solves the problem of *ex post* inefficiency but not that of inefficient *ex ante* effort. Efficient recontracting ensures that the most valuable ideas get adopted. But, whenever the contract has to be renegotiated because the profits from the idea are less than the incentive payments, the payments to the worker fall. Indeed, if the bargaining position of the firm is strong (the situation we examine), the payment to the employee is quite low

in these circumstances. Thus, from the point of view of the employee making the effort, efficient renegotiation is not very different from lock-out of valuable ideas.

The case of efficient recontracting provides a slightly different intuition for the result that a narrow focus can be profitable. Broad firms have a wider range of investment projects *ex post*. Insofar as employee compensation depends on whether projects are adopted, broad firms are *ex post* in a stronger bargaining position vis-a-vis their employees. They can reduce what the employees get by pitting them against each other. While this raises profits *ex post* it also reduces the effort employees make *ex ante* to find valuable projects.

Our models hinge on the effects of the scope of the firm on employee effort in the absence of complete contracts. In this, they are closely related to Grossman and Hart (1986) and Hart and Moore (1990). The difference is that in those models the main incentive problems involve the potential owners of firms. Because they do not consider incentive contracts with their workers, their models imply that firms always benefit from becoming involved in profitable activities. Their framework is thus unable to explain the sort of statement made by the A&P Vice-President where entering a new activity worsens performance on existing activities.

Our paper proceeds as follows. In Section 1 we show that the synergy between two projects can make it profitable for a firm to concentrate only on one of them. In Section 2 we show that financial constraints can have this effect as well. In Section 3, we conclude by relating our findings to the empirical literature on the consequences of diversification.

1. Synergy

We consider senior management which can potentially involve its risk neutral firm in two related activities, a and b. To begin with, we suppose that it focuses exclusively on a. After showing what the firm can achieve with a alone, we consider the effects of expanding its scope by adding b. We show that the addition of b can reduce the firm's profits even if b is profitable on its own. We consider synergies between a and b such that the carrying out both activities in the same firm under complete contracting is attractive. We show that these very synergies make the joining of these activities within the same firm unattractive when contracts are incomplete.

The Narrow Firm

In activity a, there exist opportunities for improving the product, reducing its costs, increasing its market, etc. For the firm to take advantage of these opportunities, it must innovate. Innovations can be discovered in two ways. First, employees in activity a can exert effort e and thereby have some chance of finding ways to raise profits. While we have in mind that there a number of employees involved in activity a, for simplicity we explicitly examine the case where there is only one who is in a position to make such a discovery. We call this employee A and assume that the required effort lowers his utility by d.

The other source of innovative ideas is senior management itself. By observing industry practices, senior management learns about the industry and routinely finds methods that raise the profitability of a. Since we think of these ideas as being externally generated (at negligible cost to the firm) we shall refer to them as "outside improvements". We want to consider situations where the outside improvements are, at least sometimes, substitutes for an the ideas being developed by A. For example, if A comes up with a new way to market the product, the firm can implement his method or choose another method that it has come up with on its own.

After the firm discovers a profit-enhancing innovation its managers typically have an opportunity to evaluate it before proceeding with its implementation. For example, managers may conduct surveys or trial runs to refine their knowledge of its likely value. Because this information is not all learned by the employees, senior management information in this area is likely to be substantially superior to that of its employees. In part for this reason, management is given the right to decide whether or not to proceed with implementation.

We thus envisage a three period model. In the first period, A decides whether or not to exert effort. In the second period, top management decides whether to implement the innovation uncovered by A or whether to implement an outside improvement. Finally, in the third period, the firm's actions bear fruit.

For concreteness we assume that the profit-enhancing innovation affects revenues, S, though it could equally well affect costs. We assume that third period revenues from activity a equal S_a if A does not make the effort. Thus S_a incorporates the value of the firm's best outside improvement. If A does make the effort then he is successful with probability P. In this event he has an idea which is superior to the firm's best outside improvement. In particular, the implementation of his idea leads to revenues which equal $S_a + g$, where $g > 0$. With probability $1 - P$ he is unsuccessful and the firm's revenues are S_a, as when he does not exert effort.

We wish to concentrate on situations in which A's efforts are worthwhile on average. We therefore assume that:

$$Pg - d \geq 0, \tag{1}$$

so that the expected benefit to the firm of A's effort exceeds the cost to him. If the firm could ensure that the employee made the effort by paying him d in the initial period it would do so since (1) implies that it would thereby raise its profits on average.

We are concerned with situations where the offer of a payment of d in the initial period is not sufficient to ensure that A searches actively for an innovation. In other words, we focus on the case (common in the literature on the principal-agent problem) where effort is non-contractible.[8]

[8] Lack of contractibility does not require that senior management be unable to observe the level of effort. It requires only that effort not be observable by those outsiders who are responsible for enforcing contracts. If they cannot observe effort, then it is not possible to sign a contract with A that guarantees that he is paid d if he makes the effort.

The impossibility of enforcing contracts which specify payments that depend directly on A's effort need not create losses. We show that, indeed, when the firm has access to a alone, a rather simple contract leads A to exert as much effort as when effort is contractible. The simple contract we consider has A's payment depend on whether or not his innovation is implemented. This contract is feasible as long as the parties responsible for enforcing contracts can verify the implementation of A's innovation. The most logical candidates for these parties are the other employees in activity a. They realize when the innovation that A has been working on is implemented and they expect the firm to compensate him accordingly. If the firm fails to do so, its reputation for fairness suffers. Instead of modelling this reputational mechanism explicitly, we simply assume the enforceability of contracts in which A's compensation depends on the implementation of his ideas.

With access to such contracts the firm may be able to motivate A as well as if it could pay him directly for his effort. In particular, suppose as we shall throughout, that A's preferences have the following two characteristics: he must be paid a minimum wage w in every period and he is risk-neutral concerning income beyond w. Now consider a contract which specifies that A earns w (the minimum wage) if his innovation is not implemented and that he earns $w + k$ if it is.

In this setting a contract of the above type with $k = d/P$ enables the firm to generate the same outcome as if e were contractible. To see this, notice first that with such a contract in place the firm chooses to implement A's innovation whenever he is successful. If A is successful, the firm earns $g - d/P$ more if it implements his idea than if it implements an outside improvement. This is a positive increment by (1). Knowing that his idea is implemented whenever he is successful, A is indifferent between making the effort and not making it; doing so raises his expected utility by $P(d/P) - d = 0$. Finally, the firm's *ex ante* expected gain from putting this incentive scheme in place is $P(g - d/P) = Pg - d$. Thus the firm's profits are indeed the same as if it had access to contracts that paid d to A in exchange for his effort. The firm is able to achieve the "first-best" outcome.[9]

The Broad Firm

We now consider a firm that pursues a broader strategy, in particular one that includes activity b in addition to a. We suppose that activity b is analogous to activity a in every respect. In particular, we suppose that employee B is able to generate new opportunities that enhance the revenues of b. We denote by S_b, g', d', e' and P' the variables that are analogous to S_a, g, d, e and P respectively. We assume that $S_b = w$ so that, even absent any effort, the expansion into activity b does not reduce profits.

We assume, by analogy with a, that $P'g' \geq d'$. Then by implementing the analogous contract for B to the one explored above for A, that is where $k' = d'/P'$, the firm is able to make nonnegative

[9] This result depends on our assumption that the random outcome that follows A's effort has a two point distribution. For the general case where profit maximizing managers do not achieve the first best, see Rotemberg and Saloner (1990).

profits in b. Adding b to the range of activities is not detrimental even without complementarities.

One would think that the attractiveness of adding activity b only becomes more pronounced if there are synergies (or economies of scope in the sense of Panzar, Baumol and Willig (1982)) between activities a and b. That is not always the case. To see this, we consider the following synergy. We suppose that, when B is successful, *i.e.*, has an idea that raises revenues in activity b to $S_b + g'$, his idea may also be useful in a. Conditional on B's success in raising profits in activity b, there is a probability P'' that his invention can be applied in a and raise revenues there to $S_a + \bar{g}$ (where $\bar{g} > 0$). However, because B's idea, when applied to a, is a substitute for A's the firm cannot profitably implement both ideas in a. One way to think of this synergy is that B sometimes increases the "outside improvements" available for activity a. To motivate this, imagine that A and B are each trying to invent superior promotion or distribution methods for their products. It is then possible that, if B is successful, his method is also applicable to the products of a at no additional cost.

Because the two methods are substitutes, top management must choose which innovation to implement in a when A is successful and B's idea is applicable in A. If it implements A's, average revenues in a become $S_a + g$; if it implements B's they become $S_a + \bar{g}$. We suppose that g exceeds $\bar{g}$ so that the firm would implement A's if it had access to complete contracts that would enable it to pay d and d' to motivate its two employees.

Suppose that such contracts are enforceable. The firm must still choose which, if any, employee to motivate. If it has only A exert effort it earns $S_a - w + Pg - d$. If it motivates B alone, it earns

$$P'(g' + P''\bar{g}) - d'. \tag{2}$$

Finally, it earns $S_a - w + Pg - d + P'g' - d' + (1 - P)P'P''\bar{g}$ if it induces both to search for ideas. Expression (2) is strictly positive both because B is worthwhile on its own ($P'g' \geq d'$) and because B's innovation adds value to a on average ($P''(1 - P)\bar{g} > 0$). This implies both that the firm is certain to motivate B and that its involvement in activity b is profitable. Our model is thus one where, with complete contracts, the firm chooses to be broad.

After inducing B to make the effort, the firm gains from motivating A as well if

$$Pg - d - PP'P''\bar{g} > 0. \tag{3}$$

Otherwise, the firm is better off if it gives up on A's effort altogether. This can happen even when $Pg - d$ is positive because A's invention is worth less (only $g - \bar{g}$) when B's innovation is useful in a. The line corresponding to (3) holding as an equality is represented graphically in Figure 1. Points above this line satisfy the inequality (3).

We now consider the equilibrium outcome when the firm is broad and contracts are incomplete. Our key assumption in what follows is that the firm's contractual payments with its employees

can only depend on whether their innovations are implemented in their own activities. Thus A's compensation can depend on whether his innovation is implemented in a. It *cannot* depend on whether B's innovation is implemented in a. In principle, A's compensation might also depend on whether B's idea is implemented in b. We ignore this possibility in this subsection but show in the last subsection of this Section that the main results obtained here are robust to the introduction of more complicated contracts of this kind.

The motivation for the assumption that A's payments are independent of the implementation of B's idea in a is the following. The "outside parties" who are responsible for enforcing the terms of A's contract are his co-workers in activity a. Their sense of "fair dealing" requires that A be compensated when he is successful *i.e.*, when the project he has been working on is implemented. This test is the only one that they can apply since they cannot conclude simply from A's presence on the job that he has generated surplus for the firm. When A's idea is not implemented, they cannot tell from the accounting profits in a whether management implemented any idea at all.[10] They thus cannot base their compensation on the effect of B's inventions on a.

The firm's contract with A thus stipulates a payment k that A receives when his innovation is implemented. The contract with B specifies a payment k' which accrues to B when his innovation is implemented in b. Because $P'g' \geq d'$, and A provides no synergies for b, the equilibrium contract with B is identical to the equilibrium contract of the narrow firm we considered in the previous subsection. In particular, the contract specifies that $k' = d'/P'$. The result is that the firm implements B's idea in b whenever B succeeds and that B makes the effort. We do not consider the possibility that B gets paid for having his ideas implemented in a as well. We neglect this possibility not only because it may be impractical but also because such contracts are not necessary to motivate B. Their only possible role is in convincing A that the firm has no incentive to substitute A's innovation with B's. However, insofar as this substitution is profitable with our basic contracts, the firm has an incentive to sign a secret contract with B whose payments do not depend on the implementation of B's idea in a.

Given that B makes the effort, there are three possible equilibrium outcomes that can emerge from the contract that the firm offers A. In the first, A chooses to exert effort and, if he is successful, the firm implements his innovation regardless of what B does. In the second, A exerts effort but the firm only implements his innovation if B fails to generate a useful innovation for a. In the third, A does not exert effort at all.

For an outcome of the first kind to be an equilibrium, the firm must be willing to implement A's idea *ex post* when both he and B produce viable innovations. This requires that $g - k \geq \bar{g}$.

[10] We could have considered a more complicated model where the co-workers have access to accurate accounting information. Then, compensating A as a function of the implementation of B's ideas in A would still be problematic if management also had access to other ideas that are substitute for A's. It would be hard for A's co-workers to determine the origin of the imported idea.

Moreover, for A to be willing to exert effort, his expected payment from exerting effort must exceed the cost to him, i.e., $Pk \geq d$. Putting these two expressions together, an equilibrium of the first kind exists only if:

$$g - d/P - \bar{g} \geq 0. \tag{4}$$

When the firm had access to a alone, it proceeded with implementation of A's idea whenever $g > d/P$. Inequality (4) is different because, now, the firm has access to revenues of $S_a + \bar{g}$ without A's innovation. In Figure 1 we draw a line where (4) holds as an equality. The inequality (4) is satisfied by all points above this line.

For an outcome of the second type to be an equilibrium the firm must be willing to implement A's innovation in the event that only A is successful. Therefore g must exceed k. In this equilibrium A expects to be compensated only when he is successful *and* B does not generate a useful innovation for a. Therefore, A is prepared to exert effort only if

$$P(1 - P'P'')k \geq d \tag{5},$$

i.e., if $k \geq d/P(1 - P'P'')$. Note that A must be offered higher compensation when he is successful in this equilibrium because he is compensated less often. Combining (5) with the condition that $g \geq k$, for an equilibrium of this kind to exist we must have:

$$g - \frac{d}{P(1 - P'P'')} \geq 0. \tag{6}$$

Clearly (6) may be violated even if $Pg > d$. Equation (6), holding with equality, appears as a horizontal line in Figure 1 since it is independent of $\bar{g}$. The inequality holds in the region above that line.

If neither (4) nor (6) holds there does not exist an equilibrium in which A is motivated to exert effort. The unique equilibrium then has only B exerting effort. This occurs in the region below (4) and (6) in the figure. There are only two scenarios in which the firm can hope to motivate A. In the first, the firm must pay A whenever he is successful. However the incentive payment required may be so large that *ex post* the firm will, instead, implement B's innovation in a whenever it can. If that is the case, i.e., , if (4) is violated, A rationally expects to be compensated only if B does not generate a useful innovation for a. Since A then expects to be compensated less often, he requires an even higher incentive payment (equation (5)). However that incentive payment may be so high that the firm would not implement A's innovation even when it has no other innovation available (equation (6)).

The firm's incentive compensation is thus a two-edged sword. A commitment to make a large payment to A when his innovation is implemented has the desirable effect of motivating him *ex ante* to put forth effort. However, *ex post* the incentive compensation looms as a large penalty

that the firm must pay if it does implement his innovation. At that stage the firm is hungry to implement other opportunities which do not require the payment of this "penalty". Management thus cannot resist searching for opportunities developed elsewhere in the company which might be substitutes for A's idea.

We now wish to consider whether the equilibrium outcomes with incomplete contracts are inefficient. In other words, we ask whether the equilibrium reproduces the outcome with complete contracts (as it did for the narrow firm). The answer is generally in the negative. Two inefficiencies now emerge. The first arises whenever equilibria of the second kind exists. Then, (6) holds while (4) does not. So, the broad firm is able to motivate A even though it only implements his innovation when he alone is successful. The inefficiency here is that, because $g > \bar{g}$, A's innovation should be implemented also when B's innovations is useful in a. We call this inefficiency the *ex post* inefficiency. In Figure 1, the region where this inefficiency arises is shaded with horizontal lines.

The second kind of inefficiencies arises when (4) and (6) are violated while (3) holds. In this case, the broad firm abstains from inducing A to make an effort so that only B makes one. Given that (3) holds, the firm would gladly pay d in exchange for A's effort. Thus, here the incompleteness of contracts reduces A's effort. Because this effort takes place in the first period we call this the *ex ante* inefficiency.

To understand the parameters for which this inefficiency exists consider Figure 1. In this Figure, the parameters where it arises are inside the vertically shaded region. It is apparent from the figure that the region where (4) fails while (3) holds is nonempty only if $P'P''$ is less than one. If $P'P''$ were equal to one so that B *always* generated spillovers, A's *ex ante* net marginal contribution would be $Pg - d - P\bar{g}$. However, his net *ex post* contribution when he is paid his marginal cost is $g - d/P - \bar{g}$. Thus if $P'P''$ is equal to one, A's effort is valuable to the firm under exactly the same circumstances *ex ante* and *ex post*. There is then no distortion induced by the firm's implementation decision.

For (3) to hold while (6) fails, $\bar{g}$ must not be too large. If $\bar{g}$ were very large then the firm with access to complete contracts would encourage A to search for innovations only if g was quite large as well. However as g gets very large it becomes possible for the firm to motivate A by promising him a large payment when he alone is successful ((6) becomes satisfied).

We now turn to demonstrating the major conclusion of this subsection, namely that the firm can earn higher profits by being narrow and giving up activity b, even though that activity is profitable on its own and has positive spillovers into a. There are two situations in which this can arise. The first is where both (4) and (6) are violated. Then if the firm is broad (pursues both a and b), it is able to motivate B but not A. Its profits are then $P'(g' + P''\bar{g}) - d'$. If the firm is narrow, on the other hand, and restricts attention to a, its profits are $Pg - d$. The firm is therefore more profitable when it is narrow if:

$$Pg - d - P'(g' + P''\bar{g}) + d' = [Pg - d] - [P'g' - d'] - P'P''\bar{g} > 0. \quad (7)$$

Here the desire for narrowness is driven by the *ex ante* inefficiency which leads A not to seek opportunities when he is employed by a broad firm.

It is also possible that the firm profits from being narrow when (4) is violated even though (6) is not. Then, the broad firm can motivate A as well as B, but it can only implement A's innovation when he alone is successful. If the firm chooses to be broad under those circumstances it earns $P'g' - d' + P'P''\bar{g} + P(1 - P'P'')g - d$. On the other hand, the narrow firm always implements A's innovation. It is more profitable if:

$$[P'g' - d'] + P'P''(\bar{g} - Pg) > 0. \quad (7')$$

This rationale for narrowness obtains because narrowness eliminates the *ex post* inefficiency.

Equation (7) applies below the horizontal line in Figure 1 (where (6) fails), while (7') applies above it. In Figure 1 the relevant parts of (7) and (7') are drawn for the instructive case where $P'g' - d'$ is zero. *Ex ante* inefficiency leads the firm to prefer a narrow strategy when (4) and (6) are violated while (7) holds. *Ex post* inefficiency has the same effect when (4) is violated while (6) and (7') hold. We consider these in turn.

It is instructive to look at the case where $P'g' - d' = 0$. Then, (4) is violated when (7) holds only if $P'P''$ is smaller than P, *i.e.*, the spillovers from B are less frequent than A's success. The intuition for this is the following. Broadening the scope to include b is undesirable when A's innovation is more valuable than B's *ex ante*, but the presence of b leads the firm to abandon A's innovation *ex post*. Ignoring $P'g' - d'$, A's innovation is more valuable than B's *ex ante* only if $Pg - d$ is bigger than $P'P''\bar{g}$, *i.e.*, if $g - d/P$ exceeds $\frac{P'P''}{P}\bar{g}$. On the other hand, the temptation to supplant A's innovation *ex post* is large only if the synergy $\bar{g}$ exceeds the *ex post* profits from A's invention, $g - d/P$. These two requirements are compatible only if the odds of B's success are low, *i.e.*, only if $P'P''$ is smaller to P.

For (7) to hold while (6) is violated, $\bar{g}$ cannot, once again, be too large. The intuition is similar to that for efficiency. If $\bar{g}$ is large (and the odds of B coming up with a useful innovation for a are not too unfavorable), g has to be large too or else the firm would fail to encourage A to invent even with complete contracts. However if g is too large, it is possible to motivate A by compensating him when he alone is successful ((6) holds).

As Figure 1 illustrates, provided $P'P'' < P$, there exists parameters (those in the cross-hatched region) where the firm restricts itself to the narrow strategy to avoid the *ex ante* inefficiency that results from breadth. This region is somewhat smaller but continues to exist when $P'g' - d'$ is

positive as long as $P'g' - d'$ is not "too large".

It is apparent in both our formulae and in Figure 1 that (3) is satisfied whenever (7) is. The reason is that, unless (3) holds, the firm would not encourage A to search for ideas when contracts are complete. But, if A's effort is not worthwhile with complete contracts ((3) fails), the elimination of b to obtain A's effort is surely not profitable either (so (7) fails).

We now consider the possibility that the narrow strategy is more profitable only because it eliminates the *ex post* inefficiency. This occurs when (4) is violated while (7') and (6) hold and we see in Figure 1 that this region is generally nonempty. However, when (6) does hold, it does in some sense become less likely that the firm would choose to be narrow when a broad strategy is more profitable with complete contracts. We see this in that (7') lies above (7) so the region is relatively small. The reason is that here the firm is at least able to obtain effort from A and implement his innovation when he alone is successful. While not first-best, this is better than not having him exert effort at all, which is what happens below the horizontal line.

We have shown that the firm may benefit from committing itself to stay out of b. There are two kinds of benefits from a narrow strategy. First, narrowness may be required to induce A to exert effort *ex ante*. Second, even when A can be induced to search for opportunities anyway, narrowness ensures that the firm takes advantage of A's ideas more often. In both cases the benefit of narrowness stems from the implied commitment not to supplant A's innovation with B's when both are successful. Firms that want to innovate might thus be led to take great pains in defining their objectives very narrowly and in erecting institutional barriers that prevent breadth.

That is not to say that firms would not supplant their own employees innovations *ex post* if they came to learn of valuable substitutes through other means. Thus, as Burgelman (forthcoming) reports, Intel eventually decided to enter the RISC processor business once its viability had been proven. It did this in spite of its having earlier tried hard to suppress the development of an in-house capability in RISC technology.

It might appear that our demonstration that synergy can be detrimental implies that the expansion of a firm into areas related to their core area is worse than expansion into unrelated areas. This is not the case. As two activities a and b become more related, $\bar{g}$ increases. The effect of these increases can be seen in Figure 1. Suppose that $d/P < g < d/P(1 - P'P'')$ and that we start with $\bar{g} = 0$. Increases in $\bar{g}$ from this point first make a broad strategy more attractive. Further increases in $\bar{g}$ lead us to the cross-hatched area where broad firms cannot induce A to make an effort and narrowness is profitable. But, as $\bar{g}$ gets very high, the abandonment of A's effort is also a feature of the first best. When the synergies are very high the efforts of A and B duplicate each other and having one employee make the effort is enough. At this stage expansion into b is attractive even with our incomplete contracts.

This argument can be generalized to explain why large scope can be detrimental in our analysis

whereas large scale is generally beneficial. The reason is that firms operating at a large scale do not necessarily require that many individuals generate innovative ideas. On the other hand, the value of the employees ideas is larger when the firms' scale is large. Thus firms whose scale is large are less likely to pass up a valuable opportunity *ex post*.

An additional implication of our analysis is that innovative firms that wish to be involved in a relatively broad range of activities may benefit from seeking ways of committing themselves to give up potential synergies. In practice this means creating a structure where B's innovations cannot be used in a. For instance, A's senior management might be kept ignorant of B's activities by the erection of a "Chinese wall" between a and b. Again, Burgelman's Intel study is relevant. He writes: "Some middle-level managers had the idea to develop add-on boards for personal computers. The strategic planning process initially rejected the idea ... The idea, however, was able to get support through Intel's internal corporate venturing program and *became a separate business.*" (p. 17, emphasis added). Of course, insofar as these walls are not credible to employees, incentives suffer.

The benefits from narrowness that we describe are entirely absent in firms that do not have access to projects where employee effort can lead to valuable innovations. Thus, our analysis is consistent with the experience of the textile industry outlined in the introduction. In that industry, narrow firms coexisted with Indian Head Mills which was proud to be broad. Indian Head Mills' strategy was to purchase nearly bankrupt textile companies, close down a large part of their operations and keep only the profitable pieces. Their objective was thus to extract revenues from existing technologies and not to innovate. In declining industries such a strategy can be profitable, even alongside a strategy of searching for innovations.

Renegotiation

So far, we have assumed that, when (4) is violated, the firm gives up A's innovation when both A and B are successful even though the innovation is valuable. *Ex post* this is inefficient, both A and the firm could make themselves better off by implementing A's innovation. In this event the contract between A and the firm would perhaps be renegotiated. For renegotiation to be possible, those in charge of enforcing the contract must realize that a new contract has been drawn and that the new schedule of payments does not simply represent a breach of the initial contract. Such renegotiation may thus be difficult when the contract is an implicit one that is enforced by the employees' co-workers.

We nonetheless consider efficient recontracting here. As in the related model of renegotiation of Hermalin and Katz (1990), this renegotiation eliminates the *ex post* inefficiency. However, we show that when the firm has all the bargaining power at the renegotiation stage, renegotiation does not resolve the *ex ante* inefficiency. With renegotiation, narrowness has no role in reducing the *ex post* inefficiency but continues to be attractive in the presence of the *ex ante* inefficiency. That recontracting eliminates *ex post* inefficiencies is not surprising. With perfect information there is no

reason to obtain an inefficient outcome at the renegotiation stage. The robustness of our conclusions regarding *ex ante* inefficiency may be more surprising since, in the previous subsection, this too stemmed from the firm's unwillingness to adopt A's invention when both employees succeeded. Nonetheless, we prove that adding activity b remains costly with renegotiation when (4) and (6) fail while (7) holds.

We show this in the context of a particularly simple game of efficient renegotiation. We suppose that the firm can make one new offer to the workers in period 2, after the success of the employees' effort is known to the firm. This offer specifies a payment to the employee if the firm implements his idea. The worker then has the choice of accepting this new offer or sticking to the original contract. If the worker accepts the offer, he accepts the new payment in exchange for implementation of the idea so that the old contract is voided. This form of renegotiation is particularly simple because it gives all the bargaining power to the firm. As will be apparent, this assumption of relative bargaining power is not crucial to our analysis.

We first show that, even with this form of renegotiation, B continues to make an effort if his initial contract specifies a payment of d'/P' whenever the firm implements B's idea in b. For suppose he succeeds and the firm offers him less than d'/P' at the renegotiation stage. He can then turn the offer down; the firm will proceed with implementation anyway since $g' \geq d'/P'$. He is thus sure to get d'/P' when he succeeds and is thus willing to make the effort.

The initial contract with A has, once again, a payment of w plus an incentive payment of k when his idea is implemented. Suppose first that (4) fails while (6) holds.[11] We show that, in this case, the existence of renegotiation enables the firm to reproduce the outcome that prevails with complete contracts. The initial contract with A must specify a k equal to $d/P(1-P'P'')$. Suppose that, with this contract, A is successful while B does not generate any knowledge useful in a. Then, the above argument implies that the firm pays k to A and implements his project. Thus A's effort nets him at least $\frac{P(1-P'P'')d}{P(1-P'P'')} = d$; he is thus willing to make the effort.

Suppose instead that A is successful and B's idea is useful in a. If (4) is violated A knows that his project will not be implemented under the terms of the initial contract. At the renegotiation stage he thus accepts any offer with a payment of w or greater.[12] Consequently the firm offers him w and A's idea is implemented. We have thus obtained the same outcome as with complete contracts. A and B make the effort while A's idea is implemented whenever he succeeds. This establishes that our renegotiation eliminates the *ex post* inefficiency.

We now show that renegotiation does not change the earlier subsection's analysis when (4) and (6) both fail. In this case, A never receives any incentive payment when k equals $d/P(1-P'P'')$.

[11] The case where (4) and (6) both hold is trivial in that the complete contracts outcome prevails whether we have renegotiation or not.

[12] Actually, with an offer of w he is indifferent between accepting or not. Since the firm could induce him to accept by offering him a trivial amount more than w, we assume that he accepts when he is indifferent.

With this value of k, the firm now offers him w at the renegotiation stage even when he alone is successful. He accepts this offer because, since (6) does not hold, the firm would fail to adopt his innovation under the original contract. Lower values of k do not solve the problem either. Consider any k between d/P and $d/P(1-P')$ and suppose that A is successful while B's idea is useful in a. Because (4) holds, the firm again offers w to A in exchange for the implementation of his idea and A accepts. So, at best, A is paid such values of k when he alone has an idea that is useful in a. But, this means that he earns less than $w+d$ after exerting himself and prefers not to make the effort.

Absent renegotiation, the difficulty that the firm faces is that it cannot commit to compensate A when both he and B are successful. As a result it is sometimes impossible to motivate him to exert effort. Renegotiation doesn't change that. When A and B both can raise profits in a, renegotiation ensures that an *ex post* agreement is worked out in which A's innovation is implemented. Thus the *ex post* efficient outcome obtains. Unfortunately for A, however, he does not reap the fruits of this added efficiency. Since the firm has all of the bargaining power it can ensure that, when B's idea is available for a, A allows it to implement his innovation without getting any compensation in return. Since A is forward-looking, he understands ahead of time that this situation will arise and he does not exert effort in the first place.

Clearly these conclusions change if A has all of the bargaining power. Then A is able to extract g in the event that he alone is successful, and $g-\bar{g}$ in the event that both his and B's ideas are valuable in a. As long as A's effort is profitable with complete contracts (3) holds and these payments are sufficient to motivate him *ex ante*.[13] This result is not surprising in our context since endowing A with a great deal of bargaining power is similar to committing the firm to pay him *ex post*. As long as A does not have "too much" bargaining power, however, the above results continue to hold.

More Complex Contracts

We now consider the more complicated contracts in which A's compensation can depend on whether B's innovation is adopted in b. Such contracts may seem quite natural; if the contracts that link A and B's compensation to the implementation of their own ideas are enforceable, some outside party must know that these implementations took place. But then, these outside parties ought to be able to enforce contracts that link A's income with the implementation of B's idea. The reason we have ignored such contracts up to this point is that we do not regard this reasoning as compelling. We have in mind situations where the enforcers of contracts are the employee's co-workers; these are in a good position to punish the firm if their information leads them to believe that an employee has been exploited. So, the workers in b know whether B's idea has been

[13] Note the similarity with Hermalin and Katz (1990). They show that, in their model, the equilibrium outcome can improve with renegotiation as long as the agent is given some bargaining power at the renegotiation stage.

implemented. It is much less plausible that workers in a, who enforce the contract with A, have access to this information.

We now show that the availability of these more complicated contracts can, but need not, change our conclusions. Our two forms of inefficiency become less prevalent with these contracts when P'' is high. In this case the probability that B has an idea that is useful in a is relatively high when B succeeds and his idea is implemented in b. Thus the linking of A's payments to the adoption of B's innovation in b allows A's payments to be contingent on the firm's outside opportunity for a.

With these more complex contracts, four different payments to A can be specified. The first is a payment when the firm adopts neither innovation. This is zero since, for incentive purposes, the firm would like to pay as little as possible in these circumstances. The second is a payment when only A's project is implemented, which we denote k^a. The third is a payment when A's innovation is implemented in a and B's is implemented in b. We denote that payment as k^b. The fourth is a payment when only B's idea is implemented, which we denote k^c.

Since, we had no trouble inducing B to search for profitable opportunities, we continue to assume that B is paid d'/P' when his idea is implemented. Our interest is in seeing whether a set of payments k^a, k^b, k^c can be specified which results in the first-best outcome. In other words is there an equilibrium such that A makes the effort and his idea is implemented whenever he is successful. For that to be the case, the following four conditions must be met.

First, the firm must prefer to implement A's idea when both employees generate ideas that are useful in a. This requires that $g - k^b \geq \bar{g} - k^c$, *i.e.*,

$$g - \bar{g} \geq k^b - k^c. \tag{8}$$

Second, the firm must prefer to implement A's innovation when only he succeeds. This requires that:

$$g - k^a \geq 0. \tag{9}$$

Third, it must be the case that when only B generates ideas that are useful in a, the firm is willing to implement his innovation in a, *i.e.*,

$$\bar{g} - k^c \geq 0. \tag{10}$$

Finally, A must be willing to exert effort. That condition is $P(1 - P')k^a + PP'k^b + (1 - P)P'k^c - d \geq P'k^c$. Simplifying, this gives:

$$P(1 - P')k^a + PP'(k^b - k^c) - d \geq 0. \tag{11}$$

The issue is whether (8)-(11) can be satisfied simultaneously. Notice first that as far as k^b is concerned it is only its difference with k^c that matters. Moreover, (10) is most likely to hold if k^c is small. Therefore, k^c should be set equal to zero and k^b should be adjusted accordingly. But then (8) implies that k^b should be set equal to $g - \bar{g}$. Finally, since (11) is increasing in k^a, k^a should be as large as possible without violating (9), *i.e.*, k^a should equal g. Substituting k^a and k^b in (11) using (8) and (9) gives the overall condition:

$$Pg - d - PP'\bar{g} \geq 0. \tag{12}$$

If equation (12) holds, the firm is able to obtain the first-best outcome with the more complex contracts considered here. It cannot only motivate A but can also use all his ideas. When (12) fails it may still be possible to motivate A. However, the more complex contracts do not help in this regard. When (12) fails, k's such that (8) and (9) hold as equalities are not sufficient to induce A to search for ideas. Raising k^a beyond this point leads the firm never to adopt A's innovation. Thus this cannot help in motivating A. The motivation of A can only be achieved, if at all, by raising k^b. Any increase in k^b beyond $g - \bar{g}$ means that the firm pays k^b only when B's idea is not useful in a. Hence A receives k^b only with probability $PP'(1 - P'')$. The only constraint on k^b is then that it be smaller than g. Using these facts and (9) we see that the motivation of A is now possible only if:

$$P(1 - P'P'')g - d \geq 0$$

which is identical to (6).

It is instructive to compare (12) to (3). Recall that (3), the condition under which it is worthwhile for the firm to have A exert effort if B is going to exert effort anyway, is $Pg - d - PP'P'' \geq 0$. If P'' is equal to one (3) and (12) are identical. That is, if it is worthwhile for the firm to have A exert effort in addition to B, it is possible to motivate him to do so with complex contracts. If P'' is smaller than one, however, (3) can be satisfied while (12) is violated. In that case, the more elaborate contracts do not necessarily resolve the difficulties encountered with the simpler contracts considered above.

These results follow from the fact that when P'' is equal to one the implementation of B's innovation in b is a perfect signal that the firm has the opportunity of implementing B's innovation in a. It is precisely when B's innovation can be implemented in a that the firm would like to be committed to paying A relatively little. In that way it is able to convince A that his effort will be rewarded and that the firm won't prefer to implement B's innovation *ex post*. Therefore the more complex contracts considered here are quite powerful in that case.

The case in which P'' equals one is very special however. It corresponds to the assumption that *all* innovations in b are useful in a. The more plausible case is where only a relatively small subset

of the inventions that are useful in b are useful in a as well. However, as P'' falls, implementation of B in b becomes a poorer signal and it becomes impossible to provide payments that induce A to exert effort and also make the firm willing to implement A's innovation *ex post*.

It is worth noting that the possibility that narrowness would benefit the firm in the previous Section depended on P' and P'' only via their product $P'P''$. This product equals the overall probability that B has an idea with wide applicability. By contrast, the validity of (12) hinges crucially on P' itself. If P' is sufficiently large, (12) is inconsistent with the failure of (4). In the special case where there are always innovations in activity b, the probability P' equals one and (12) is certainly violated when (4) is. So, if (4) is false and there is a relatively high probability that the employee in b has an idea that benefits b, the more elaborate contracts do not help.

2. Financial Constraints

In the previous Section we showed that a firm might be unable to combine two independently profitable activities if there are synergies between them because agency problems become more severe when the organization broadens. In this Section we show that even a firm that embarks on two unrelated lines of business may encounter difficulties if the firm is financially constrained.

In the presence of asymmetric information, it is easy to construct models where firms face such constraints. For instance, outsiders might have difficulty knowing whether a firm's request for credit is the result of low profits on existing activities or of high expected profits in new ventures. They may thus demand a premium on any new borrowing.[14]

Following Gale and Hellwig (1985), we give the simplest reason why the firm might be denied credit. This is that the extension of credit requires monitoring if the creditor wants to make sure that he is repaid. Therefore, the creditor must charge for the monitoring costs when extending credit. We simplify further to the point where the cost of funds inclusive of these monitoring costs exceeds the rate of return on the firm's projects. As a result, the firms do not borrow at all and use only internal funds for investment.

We start once again by supposing that the firm is involved only in activity a. If A makes no effort, no funds need be invested and, as before, revenues equal S_a. Also as before, A must make an effort e, which gives him a disutility d for revenues to increase. We now assume that there is a cost, F, to implementing A's innovation. In contrast to the previous Section, we suppose that, after implementation, the revenues from A's innovation are stochastic. If the firm does implement A's successful innovation, revenues rise to $S_a + \frac{F+g}{q}$ with probability q and are S_a with probability $1-q$. Thus, as before, the expected net benefit from implementing A's successful innovation is g.

Suppose that the firm did not have the necessary funds F to finance the implementation of A's idea. It could ask for credit from a financial institution. Following Gale and Hellwig, we assume

[14] See Myers and Majluf (1984).

that financial institutions must spend resources to ascertain *ex post* whether the implementation led to revenues of $(F+g)/q$ or not. Since the firm has no other resources, it would never admit that it was successful unless it was monitored. We assume that the costs of this needed monitoring exceed g. As a consequence, the firm is effectively unable to borrow.

We now assume that the firm has funds equal to C which are sufficient to finance the implementation of A's idea. As before we assume that contracts with A are restricted in that the only event that is contractible is the implementation of his innovation. If the innovation is not implemented, outsiders cannot know whether A was successful. As in Section 1, if the firm is only involved in a, it can motivate A and obtain the first-best outcome by signing a contract which offers him d/P whenever his innovation is implemented.

Now suppose that the firm also has access to activity b. In contrast to Section 1 but analogously with a, the firm must also spend F in order to implement B's innovation. This implementation leads to expected revenues from activity B equal to $S_b + F + g'$. We continue to assume that $S_b = w$ but now also have $P'g' > d'$. Therefore it would be profitable to motivate B to exert effort if b were the only activity that the firm was involved in.

Unfortunately, the firm's funds C are insufficient to implement both ideas when its two employees are both successful. With sufficiently high monitoring costs, outside funds continue to be unavailable. Whether the first-best outcome involves the firm having A, B, or both, exert effort depends on the values of the parameters. If the firm has only A exert effort it earns $Pg - d$. If it has only B exert effort it earns $P'g' - d'$. If it has both exert effort it earns

$$P(1-P')g - d + P'(1-P)g' - d' + PP'\max(g', g).$$

We wish to focus on the case where the first-best involves both A and B exerting effort and where a is more profitable than b *ex ante*. That is the case when

$$Pg - d > P'g' - d', \tag{13}$$

(which ensures that a is more profitable than b *ex ante*) and

$$(1-P)P'g' + PP'\max(g' - g, 0) > d', \tag{14}$$

(which ensures that having both A and B exert effort is better than having just A do so). We concentrate on this case because we want to show that the firm can be strictly better off by giving up a profitable venture b. This can only happen when, *ex ante*, a is more profitable than b. Inequalities (13) and (14) imply that the firm would certainly pursue both innovations if contracts were complete. The problem is, once again, that a broad firm might only be able to have B exert

effort when contracts are incomplete. As a result, the firm might find it profitable to commit itself to a narrow strategy which involves only a.

To derive the equilibrium of the model when the firm is broad, we analyze the natural analogue of the previous Section's three period model. At the beginning of the first period the firm simultaneously offers incentive contracts to A and B. During the first period, A and B decide whether to exert effort, knowing the terms of their own contracts, but not the other's. At the end of the first period their success or failure is realized and in the second period the firm makes its implementation decision. In the final period revenues are realized.

The critical assumption in this description is that A and B do not know the terms of each other's contracts at the time that they must make their effort decisions. The motivation for this, in part, is that we think of the co-workers as being responsible for enforcing contracts. It is then plausible that B's co-workers are apprised of the details of B's contract. It is much less plausible that A and his co-workers, who are involved in an unrelated activity and are quite possibly in a geographically separate location, are apprised of the details of B's contract.

More importantly, as we shall see below, B (and his coworkers) may have an incentive to cooperate with senior management in deceiving A about the terms of B's contract. For example, even if the terms of B's initial contract were common knowledge, B and senior management would sometimes have an incentive to "secretly" destroy that contract and replace it with another. A is very poorly positioned to monitor such coordinated activity against him. It is this ability of B and senior management to collude against A that is captured by the assumption that A must make his effort decision in ignorance of the terms of B's contract.

There are now two cases to consider. In the first it is efficient to implement A's innovation *ex post* when they both succeed. This occurs when g exceeds g'. We analyze this case first. In this case (14) implies that g' exceeds $d/P'(1-P)$. Therefore, inducing B to make an effort is straightforward. Relative to having B refrain from making an effort, the firm gains by offering him a contract with $k' = d'/P'(1-P)$. In the presence of this contract, the firm would surely implement B's innovation when he alone is successful. As a result, B is willing to make the effort and, on average, the firm gains $P'(1-P)g - d$ relative to the profits when B makes no effort. We thus start by imagining that B has such an incentive contract.

There are two kinds of equilibria in which A also makes an effort. In the first, A exerts effort and his innovation is implemented whenever he is successful. In the second, the firm implements A's innovation only when he alone is successful.

In the first type of equilibrium, A need only be offered an incentive payment of d/P since his innovation is implemented whenever he is successful. A should be concerned about two kinds of deviations by the firm, however. The first is an *ex post* deviation: the firm may implement B's

innovation when they are both successful. The firm elects to do that *ex post* unless

$$g - \frac{d}{P} \geq g' - \frac{d'}{P'(1-P)}. \tag{15}$$

The second deviation that A should be concerned about is an *ex ante* deviation: the firm (secretly) offers B a k' equal to d'/P' (or a little more) instead of a k' of $d/P'(1-P)$. The firm's plan here is to have A exert effort in the belief that his innovation will be implemented whenever he is successful, but then to implement B's innovation when both A and B are successful.

If A's incentive payment is d/P and B's is d'/P', the firm implements B's innovation when both A and B are successful unless

$$g' - \frac{d'}{P'} - \left(g - \frac{d}{P}\right) \leq 0$$

$$\text{or} \qquad Pg - d - \frac{P}{P'}\left(P'g' - d'\right) \geq 0. \tag{16}$$

B's innovation is also implemented *ex post* if only he is successful.[15] Thus B is willing to accept the firm's offer of d'/P' (or a little more) when (16) fails. Equation (16) is the equivalent of (4) in Section 1.

When (16) does not hold, this deviation is also profitable to the firm. If the firm does not deviate it earns $Pg - d + (1-P)P'(g' - \frac{d'}{P'(1-P)})$ whereas it earns $P'g' - d' + (1-P')P(g - \frac{d}{P})$ if it does deviate. Comparing these expressions, the firm finds it profitable to deviate if $g - \frac{d}{P} < g'$. That expression holds whenever (16) fails.

Thus unless (16) holds it is possible and profitable for the firm to deviate *ex ante* in this manner. It is worth noting that (16) is a weaker condition than (15) so that A should only be concerned about the *ex ante* deviation.

We now consider an equilibrium of the second kind. In an equilibrium of that kind A exerts effort but his innovation is only implemented when he alone is successful. That equilibrium, if one exists, is *ex post* inefficient since $g > g'$; with complete contracts, A's innovation would be implemented also when both employees succeed.

In order to motivate A to exert effort in this equilibrium, his incentive payment must be $d/P(1-P')$. For the firm to adopt the innovation *ex post*, this incentive payment must be smaller than g. Therefore, an equilibrium of this kind requires that

$$g - \frac{d}{P(1-P')} > 0$$

$$\text{or} \qquad Pg - d - PP'g > 0. \tag{17}$$

[15] B's innovation is implemented *ex post* when only he is successful if $g' - d'/P > 0$ which is always the case since $P'g' - d' > 0$.

When (17) is satisfied, the firm does implement A's innovation when he alone is successful. Moreover, offering this contract is profitable for the firm in this case since it earns gains $P(1-P')g-d$ on average by doing so. This requirement is the equivalent of (6) in Section 1.

Therefore if (14) holds while (16) and (17) do not, there does not exist any equilibrium in which the firm is broad and A exerts effort. The only equilibrium has B exerting effort and his innovation being implemented whenever he is successful. To see that this is an equilibrium note that, by the same logic applied above, the firm cannot secretly induce A to exert effort. As long as $Pg-d$ is positive, the resulting equilibrium exhibits the *ex ante* inefficiency we described in the Section 1. The firm would encourage A to search for new ideas but fails to do so with our incomplete contracts.

If, in addition, (13) holds, the firm would prefer to have only A searching for ideas than having just B. By restricting itself to a narrow strategy that includes only a, the firm would gain $Pg-d-(P'g'-d')$. To see that, indeed, (13) and (14) can hold while (16) and (17) fail, suppose that (13) holds as a near equality. Then (16) and (17) fail as soon as $P'<P$ and $P'<1$. The condition that P be bigger than P' is analogous to the one we found before. It is required to ensure that the idea which is more valuable *ex ante*, A's, is less valuable *ex post*. This is only possible if the success of the *ex ante* relatively less attractive venture is relatively unlikely. Finally, when $g>g'$ inequality (14) requires that $P'g'(1-P)$ be larger than d'. This is satisfied as long as d' is sufficiently small.

Ex post inefficient equilibria in which A makes an effort arise whenever (14) and (17) hold while (16) fails. As before (14) requires only that d' be small. If $P'g'-d'=Pg-d$, (16) fails whenever $P>P'$, while (17) holds as long as P' is sufficiently small. These conditions can thus be valid simultaneously. The resulting *ex post* inefficiency can, once again, be so severe that the firm is better off being narrow.

By remaining broad the firm earns $P'g'-d'+P(1-P')g-d$ whereas it earns $Pg-d$ by focusing only on a. A narrow strategy is therefore more profitable if $P'g'-d'<PP'g$. This condition can hold when (13), (14), and (17) do while (16) does not. To see this, suppose that $Pg-d=P'g'-d'+\epsilon=PP'g'+\epsilon$. It is immediate that (13) and (17) hold strictly and (14) holds exactly. Since $g>g'$ the second equality implies that $PP'g>P'g'-d'$ so that the condition for a narrow strategy to be more profitable is met. The additional requirement that (16) fail requires only that P be sufficiently greater than P'.

We now turn briefly to the case where g' exceeds g so that a firm with access to complete contracts implements B's invention when both employees succeed. When $g'>g$, (13) and (14) imply (17). The firm thus always gains by inducing A to make an effort and can do so with a contract whose k equals $d/P(1-P')$. While it is now easy to motivate A, there are two potential problems. First, the contracts with A and B might lead the firm to implement A's invention when

both employees find a useful innovation. This is now *ex post* inefficient. Second, the firm might find it impossible to motivate B to make an effort. The conditions under which these effects are absent area analogous to (16) and (17).

The main difference between the case where $g > g'$ and the one where $g' > g$ is that, in the latter, narrowness is not a palliative for our two inefficiencies. The reason is that, given (13), the firm is better off just motivating A than motivating only B. Thus it would not choose to focus exclusively on b when the *ex ante* inefficiency leads the broad firm to be unable to motivate B. Similarly, even when the *ex post* inefficiency sometimes leads the firm to abandon B's invention inefficiently, its equilibrium profits exceed $Pg - d$ so they must a *fortiori* exceed the profits from a narrow strategy that focuses on b.

We finally consider the knife edge case where $g = g'$. If, in addition, $P = P'$ and $d = d'$, broad firms cannot be inefficient. In this symmetric case, it does not matter which innovation is implemented *ex post* when both employees succeed. Even with complete contracts, inducing the second employee to make the effort is worthwhile only if g exceeds $d/P(1-P)$. But, in this case, it is possible to induce a second employee to make an effort even with incomplete contracts. No inefficiency is associated with the classic "rat race" case where two teams with the same *ex ante* characteristics research the same project with the knowledge that the firm will adopt the first innovation. In this symmetric case, our model suggests no benefits of narrowness. These benefits arise only when the two activities are so asymmetric that the activity with the *ex ante* more valuable projects has innovations which, net of incentive payments, are less valuable *ex post*.

In this Section, the attractiveness of narrow focus depends on credit market imperfections. If the firm can raise sufficient funds to finance both projects, narrow focus is not necessary since the firm can provide good incentives for both employees. Note that the role of credit market imperfections in creating a rationale for narrowness of focus goes beyond the statement that a firm with limited investable resources gains little from having a wide array of investment projects. In our model having access to alternative investment projects actually reduces overall profits in the presence of these financial imperfections.

This reduction would not take place if the firm could enter activity b while ensuring that only the employee in activity a makes the requisite effort. Then, the limited funds F would be used only to implement the inventions of the employee in activity a. To ensure that the employee in activity b does not make the effort, his contract must stipulate that he earns w in all circumstances. If the firm could commit itself to this when it is negotiating with its employee in activity a, then broadening the scope of the firm would not be detrimental.

Renegotiation

In this subsection we consider efficient renegotiation which, once again, eliminates the *ex post* inefficiency. The purpose of this subsection is to show that it need not eliminate the *ex ante*

inefficiency which arises with $g > g'$ when (13) and (14) hold while (16) and (17) fail. This was the case where the *ex ante* inefficiency made it more profitable to be narrow and involved only in a. We thus show that narrowness is just as useful to reduce *ex ante* inefficiency with as without renegotiation.

We model renegotiation, once again, by supposing that the firm makes take-it-or-leave-it offers to its employees. An offer specifies a payment the firm is prepared to make in exchange for the employee's cooperation in implementing his innovation. There are now more degrees of freedom concerning these offers since there are two employees. We consider a renegotiation stage whose timing is analogous to the one we considered before: the firm simultaneously makes offers to A and B. Then, after the firm makes its offer, the two employees simultaneously respond whether they accept the offer. Finally, the firm picks which, if any, project to go forward with.

Even with renegotiation, A does not make an effort unless the initial contract calls for a k that is at least as large as d/P. The reason is that lower values of k imply that A does not recoup d on average even if he receives this k every time he succeeds. With any k higher than or equal to d/P, it follows from (16) that $g - k$ is smaller than g'. We show below that the optimal initial contract with B calls for a k' equal to $g'/P'(1-P)$ but the analysis at the renegotiation stage is the same for lower values of k'.

Consider first the renegotiation stage if only A succeeds. If k is less than g, A turns down any offer that pays less than k. The reason is that he knows the firm will implement his project (and pay its contractual obligation of k anyway). The firm thus offers k at the renegotiation stage as well. If k exceeds g, the firm offers the employee w (or $w + \epsilon$ to break his indifference). Since A knows that the project would not be implemented under the original contract, he accepts this offer.

A similar analysis applies if only B succeeds. If k' equals $d'/P'(1-P)$ or less and $g > g'$ then (14) implies that g' exceeds k'. Therefore, B turns down any payment lower than k' and the firm offers k'.

The interesting case is where both succeed. The best outcome for the firm is now where it implements A's project and pays him (slightly over) w. It then gains g. We show that this is the unique equilibrium outcome.

We prove this in two steps by considering separately the case where $g - k > g' - k'$ and where the opposite holds. In the former case B knows that, if he turns down the offer, the firm adopts A's project whether A accepts his own offer or not. B thus expects to earn w if he rejects the offer. On the other hand, if A were to reject his offer and B accepted his own, the firm would implement B's idea and B would get slightly more than w. Therefore, acceptance is B's dominant strategy. Given B's acceptance, A is strictly better off by accepting as well. If he declines the offer, he will only earn w; the firm will implement B's innovation because k must equal at least d/P and $g - d/P < g'$.

In the case where $g - k < g' - k'$, A knows that, if he turns down the offer, the firm will adopt B's project for sure. Thus it is now A whose dominant strategy it is to accept. B's action in this case is irrelevant. We have thus shown that both employees get paid w (or a little more) when they both succeed.

Now consider the stage at which A and B must decide whether or not to exert effort. As long as the initial k' equals at least $d'/P'(1-P)$, B makes an effort. The reason is that he can be sure to receive this k' whenever he alone is successful. With this contract for B, it is not possible to motivate A. If the initial contract calls for a k of d/P, he receives w when both are successful (even though his project is now adopted). His average payment is thus less than d. Higher values of k do not help. For k between d/P and g, the firm pays k only when A alone is successful and the failure of (17) implies that these payments average to less than d. For k above g, the firm never pays more than w.

This argument establishes that A does not search for ideas if the contract with B induces B to make the effort. The question remains whether the firm cannot offer B a contract with a k' sufficiently low that B stops exerting himself. If A believes that B has such a contract, he accepts a k equal to d/P and makes the effort. The reason is that with $k = d/P$, the firm does pay k when A alone is successful. However, if the firm has access to activity b, A would not believe that B's contract calls for such a low k'. The reason is that (14) with $g > g'$ implies that the firm gains strictly by offering a k' equal to $d/P'(1-P)$ if this is required to induce B to make the effort.

It is thus impossible to motivate A. The resulting equilibrium thus has the firm offering B a contract whose k' equals d'/P'. When B succeeds, he receives this k' in spite of the existence of renegotiation.

The intuition for the appearance of *ex ante* inefficiency with renegotiation is slightly different from the intuition with binding contracts. In the former case, there is *ex post* bargaining between the parties. The inefficiency arises because the presence of B (with his attendant innovations) puts A in a poor bargaining position. This is the source of A's low *ex post* compensation which, in turn, makes it difficult for him to recoup his cost d. The benefit of the narrow strategy in which the firm gives up b altogether is that the firm's bargaining power is reduced and this makes it easier to provide large payments which are contingent on A's effort.

Integration

We have shown that, when firms are financially constrained, they may benefit from maintaining a narrow focus. Narrow focus avoids having employees involved in activity b with the firms' specific assets. This provides a measure of commitment because it makes it impossible for firms to introduce innovations into b *ex post*. Here we consider instead a somewhat more complicated problem in which activities a and b are carried out by separate firms each of which has some specific capital and is also financially constrained.

We ask whether, assuming that it can be done costlessly, it is attractive to merge the two firms and thereby create a firm with access to $2C$.[16] This is an interesting question given Williamson (1975 p.146-7) suggestion that the cost of allocating funds to high-value uses is lower inside firms than in transactions between a firm and outside agents. We want to know whether merger is attractive when it does indeed lead to better functioning (internal) capital markets.

We start with two separate firms each of which has resources C, one is pursuing a while the other which is pursuing b. If the firms are thus separated, A and B can both be motivated to exert effort and both of their innovations would be implemented if they were both successful. Now suppose these two firms integrate. This should not lead to any loss of funds, so the integrated firm can still implement both projects. Therefore, the two employees of the integrated firm would continue to make the effort knowing that, *ex post*, the firm would benefit from adopting both projects when they are both successful. It would thus seem that our theory has no implications for integration in this case.

However, this model gives no role for the internal capital market of the integrated firm. Suppose that, instead, it is possible for the integrated firm to spend all its funds on B's project. We modify activity b in our model as follows. If B exerts effort and produces an innovation, the firm can implement his project as before and receive revenues of $S_b + F + g'$. Conditional on his producing an innovation, however, with probability P'' his innovation is also profitable if implemented on a larger scale.

In that event the firm can earn revenues of $S_b + 2F + g' + \bar{g}$ by expending $2F$ on B's project. That is, the firm can earn additional revenues of $\bar{g} + F$ by expending F to expand the scale of B's project. One way to think of this is that B's innovation may have either a small or a large market. The conditional probability that it has a large market given that it at least has a small market is P''. With C smaller than $2F$, the separate firm that is involved in b can never implement it on a large scale. Whatever impediments exist for financial institutions to lend to the firm in b also prevent the firm in a from doing so.

We suppose that, if the firms integrate initially, transfers of funds between the firms become straightforward. With complete contracts, this is valuable. This can be seen by imagining that both employees make an effort but that only B succeeds. The integrated firm can now implement B's idea on a larger scale and thereby earn more. This ability to shift funds internally is now an advantage of integration.

Nonetheless, even when it has these favorable consequences on financing, integration can strictly reduce profits when contracts are incomplete in the way we have been describing. As

[16] It is not clear whether, in plausible models, costless mergers are consistent with the existence of financial constraints. The latter involve a failure of capital markets and mergers typically require transactions in capital markets as well. Nonetheless, it is possible to imagine mergers where capital markets play no role and where the merger is simply a relabeling of the original shares.

before we suppose that contracts can only depend on whether an employee's innovation is adopted. We thus rule out the possibility that they depend on the scale with which they are adopted. We also continue to rule out contracts that depend on whether other projects are adopted.

The structure of the model is now isomorphic to that of our synergy model of Section 1. Implementing B's innovation on a small scale is equivalent in the synergy model to implementing B's innovation only in activity b. Implementing B's innovation on a large scale is equivalent in the synergy model to implementing B's innovation both in b and in a. Here B threatens the implementation of A's innovation not because the firm implements B's innovation "in a", but because the firm uses the F that A hoped was earmarked for his innovation to expand the scale on which B's innovation is implemented.

Because the firm's incentives in selecting the scale of B's innovation are distorted by its desire to save itself A's incentive payment *ex ante* and *ex post* inefficiencies arise, as before, when $g > \bar{g}$. The *ex post* inefficiency arises when, (6) is satisfied but (4) fails so that A is encouraged to search for ideas but B's idea is implemented on a large scale when both employees succeed. The *ex ante* inefficiency arises when (3) holds but (4) and (6) fail. Then, the integrated firm is unable to motivate A.

Either of these inefficiencies can be so great that the firms are strictly better off remaining separate. This occurs whenever the firm preferred to remain narrow in the isomorphic synergy model. Preference for narrowness in that model as a result of *ex ante* inefficiency obtained when the value of the synergies generated by B's inventions were less than the lost profits from A's efforts. Here that corresponds to the profits from A's efforts exceeding the profits from being able to apply B's invention on a large scale. A similar analogy applies to the preference for narrowness that results from *ex post* inefficiency.

The other results obtained in the Section 1 also apply here. In particular, the conclusion that integration may be unprofitable survives renegotiation and the introduction of the more complex contract in which A's compensation can be made contingent on whether B's innovation is implemented (as long as the scale on which B's innovation is implemented is not contractible).

3. Conclusions

We have shown that innovation-oriented firms may earn higher profits by pursuing narrow objectives, even though this requires shunning some profitable opportunities. In these conclusions we discuss the relationship between our models and the empirical literature on diversification. This literature, which starts with Rumelt (1974), asks whether diversified companies have higher or lower profits than their undiversified counterparts. The results are rather mixed, in part because controlling for industry effects is difficult.[17] Overall, however, *unrelated* diversification seems to

[17] See Lubatkin and Rogers (1989) for a recent example and a discussion of this literature.

be associated with lower profitability and lower stock market prices.[18] Additional evidence for this view is provided by the case studies of Ravenscraft and Scherer (1987) which suggest that the divisions that conglomerates divest tend to become more profitable when they are on their own. One possible conclusion from this literature is that managers are too keen on diversifying. For example, Rumelt cautions against unrelated diversification as follows: "Management expecting the synergistic effects of bringing two [diversified but unrelated] firms together should be warned that the organizational problems rising from this type of merger have, on the average, nullified any beneficial gains due to scale or synergy."

We have stressed the possibility that the profits of a diversified firm are low because its agency problems are more severe. Alternatively, diversified firms might have low profits because it is impossible to manage a broad array of activities effectively. Or, the incentive for human capital investment might be lower in diversified organizations for the reasons stressed by Grossman and Hart (1986). However, these stories are not enough. A complete explanation of the cross sectional correlation between diversification and firm performance must include a rationalization for firms choosing to become diversified in the first place.

One possibility is that managers diversify by mistake. Another is that managers have non-profit-maximizing motives for diversification. They might be seeking prestige as in Jensen's (1986) "free cash flow" theory. A related theory mentioned in Rumelt (1974), is that inept managers (and managers who have access only to low-quality projects) seek to diversify while competent managers, who can create profits in their existing businesses, do not. Morck, Shleifer and Vishny (1989) provide some evidence for this theory. These "managerial" theories of diversification all suggest that shareholders would be better off curtailing this activity.

An alternative view of the low profits of diversifiers is due to Penrose (1959) and Montgomery and Wernerfelt (1988). They regard diversification as an efficient response by firms to their having excess capacity of productive factors. Firms who have more of some factors than they can use productively in their industry of choice diversify so that these factors can become productive. For example, a firm that has an underutilized "core competence" in its existing business might seek other arenas in which their basic resource can be put to work.

Our model provides a third rationale for the cross sectional correlation between stock prices and profits on the one hand, and diversification on the other. This rationale comes from our conclusion that innovative firms must remain narrow while less innovative firms can be broad.

In many industries firms pursuing innovations coexist with firms that are content with imitation. It is certainly possible for both these strategies to lead to the same level of economic profits. Our model has stressed the need to pay innovative employees after their effort bears fruit. However, innovative firms must presumably also purchase an infrastructure that makes innovation possible;

[18] The latter result is due to Montgomery and Wernerfelt (1988).

in other words they must also spend resources *ex ante*. For the innovative firms to have the same economic profits as their imitative counterparts, these *ex ante* expenditures must be matched by *ex post* rents. Accountants generally do not treat all these *ex ante* expenditures as capital. On the other hand, a rational stock market would value the future rents that accrue as a result of these expenditures. Thus, we would expect innovative firms to have high q's, and perhaps even high accounting profits, relative to their imitative rivals.

According to our model, imitative firms have nothing to lose from diversification. Thus we would expect innovative firms to be narrow while their q's, and even their conventionally measured profits, are high. By contrast broad firms would be exclusively imitative so that their q's and accounting profits would be low. Anecdotal evidence for this view is provided by Perrow (1970)'s description of the relatively broad firm Indian Head Mills. According to him, Indian Head had little interest in investment. Its strategy consisted of buying failing companies, closing a large part of their operations and keeping the profitable bits.

Sorting out the validity of these theories empirically requires more information than simply the correlation between profits and diversification. In particular, the analysis of which aspects of the firm's endeavors become easier and which become harder when firms either acquire or spin off divisions deserves further work. According to our theory, the spinning off of a division makes it easier for that division to innovate. Similarly diversification makes it harder for the existing lines of business to remain innovative. This latter implication is consistent with statements of the following kind: "If we start to turn this stuff out in quantity, now that we know how to make it, it is going to change the whole character of the company; we will become a production outfit, and our top R and D men will leave" (Quoted by Perrow (1970, p. 158)). The issue, then, is the extent to which statements of that kind describe a wide range of circumstances.

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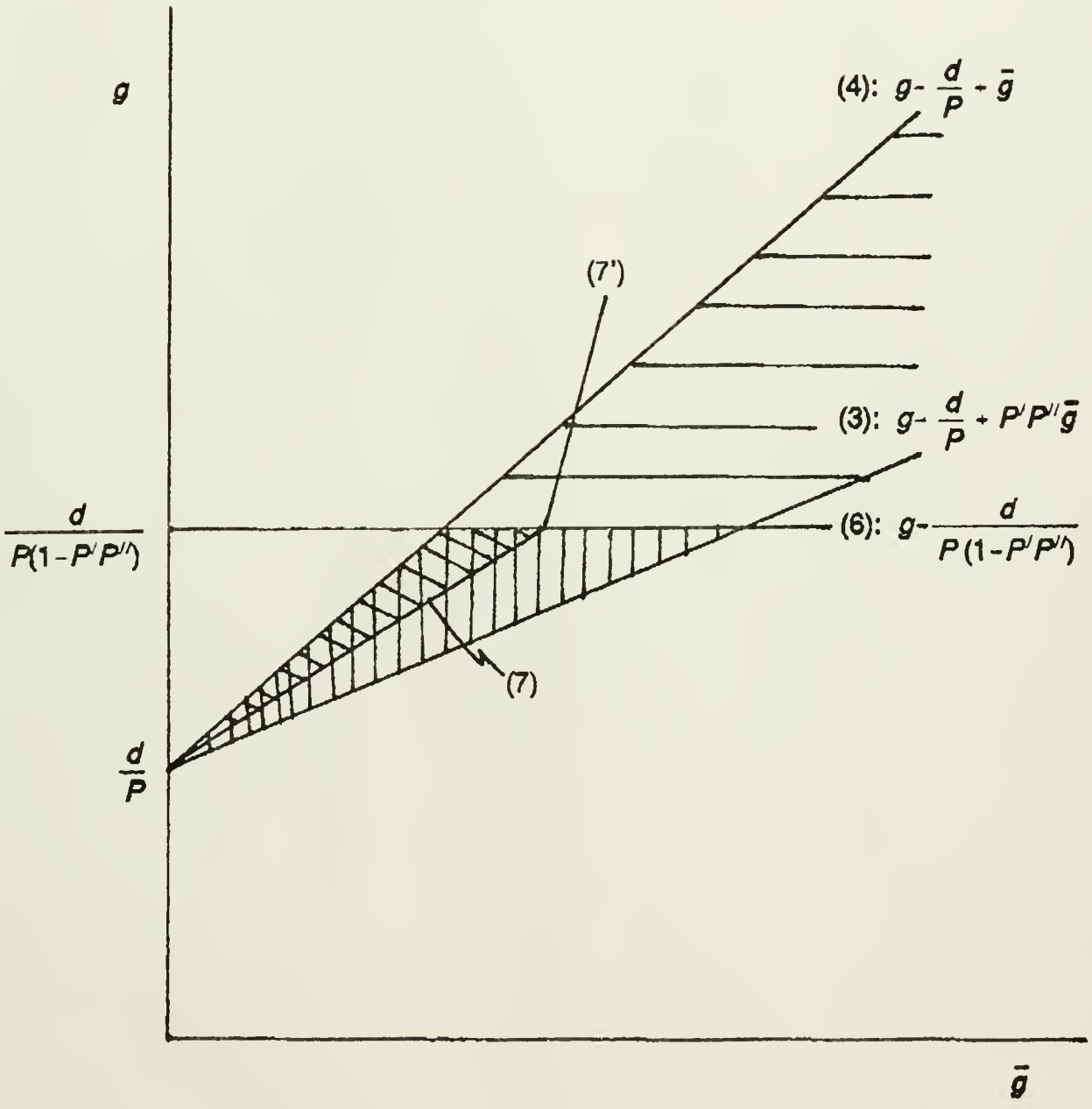

Figure 1: *Ex Ante* and *Ex Post* Inefficiency
(Inequalities Hold in the Direction of the Arrows)'

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