THE DYNAMICS OF LEARNING ALLIANCES: COMPETITION, COOPERATION, AND RELATIVE SCOPE

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We show how the tension between cooperation and competition affects the dynamics of learning alliances. ‘Private benefits’ and ‘common benefits’ differ in the incentives that they create for investment in learning. The competitive aspects of alliances are most severe when a firm’s ratio of private to common benefits is high. We introduce a measure, ‘relative scope’ of a firm in an alliance, to show that the opportunity set of each firm outside an alliance crucially impacts its behavior within the alliance. Finally, we suggest why firms might deviate from the theoretically optimal behavior patterns. © 1998 John Wiley & Sons, Ltd.

INTRODUCTION

Learning alliances, associations in which the primary objective of the partners is to learn from each other, constitute an important class of interfirm alliances (Hamel, Doz, and Prahalad, 1989; Hamel, 1991). We introduce a general theoretical framework to advance the study of such learning alliances in two major ways. First, the framework explicitly incorporates simultaneously competitive and cooperative behavior by participating firms, and identifies factors that may influence the incidence of each type of behavior. We show that the propensity to depart from purely cooperative behavior in a particular alliance is related to the portfolio of markets in which each participating firm is present, and to the degree to which these portfolios overlap. We point out that a firm’s behavior within an alliance is conditioned by its position in markets that may have little to do with that particular alliance.

Second, we direct our attention to understanding the dynamics of a learning alliance, as opposed to the decision to enter into such an alliance. We examine participant firms’ allocation of resources to learning from their alliance partners and the factors that may condition these choices. In particular, we show how asymmetric incentives to allocate resources to learning may arise, even where there are no ex ante asymmetries between firms. This analysis allows us to draw attention to behavioral predispositions arising from the tension between simultaneously competitive and cooperative behavior, and to suggest when these are most likely to arise. Our focus on the dynamics of alliances appears especially relevant given the recent spurt in alliance activity on the one hand (Anderson, 1990; Hergert and Morris, 1988; Hladik, 1985), and the reports of dissatisfaction with alliance performance on the other.1 We suggest that some

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1 In an in-depth study of 59 alliances, Bleeke and Ernst (1991) reported that, in about half the cases, at least one of...
of this dissatisfaction may be the result of poor understanding of the dynamics within alliances.

We introduce several conceptual elements for our framework. First, ‘private’ and ‘common’ benefits within alliances are those that accrue, respectively, to individual firms within the alliance (from activities in markets not governed by the alliance) and collectively to all participants in the alliance (from activities in markets that are governed by the alliance). We suggest that a higher ratio of private to common benefits leads to greater departures from cooperative and toward competitive behavior. Further, we introduce the concept of the ‘relative scope’ of a firm within an alliance to precisely measure the extent of activities in markets unrelated to the alliance as a proportion of all activities conducted by the firms. We argue that relative scope can help identify the ratio of private to common benefits. This framework allows us to establish some empirically testable propositions that depart significantly from existing theoretical and empirical work in suggesting that the opportunity set of each firm outside the particular alliance crucially impacts its behavior within the alliance.

We contend that an important reason for the disappointment of some firms with alliances is their poor understanding of the strategic dynamics within such partnerships. Firms often fail to recognize the existence or the magnitude of the asymmetric incentives to invest that inevitably arise as an alliance evolves. The differential incentives to invest are a result of the competitive aspects of what is simultaneously a cooperative and a competitive enterprise. The competitive aspect arises from the fact that each firm needs access to the other firm’s know-how, and that the firms can collectively use their knowledge to produce something that is beneficial to them all (common benefits). The competitive aspect is a consequence of each firm’s attempt to also use its partners’ know-how for private gains, and of the possibility that significantly greater benefits might accrue to the firm that ‘finishes’ learning from its partner(s) before the latter can do the same (as it is then free to leave the alliance and deny its partner(s) access to its know-how).

An argument that emphasizes the competitive aspects of alliances was made by Hamel et al., (1989), who suggested that it is crucial that firms not view alliances as passive opportunities to benefit from their partners’ skills, nor act as passive recipients of the results of those skills; rather, firms should treat alliances as opportunities to actually learn those skills. The implication is that the firm that is able to learn the most from its alliance partners while the alliance is in progress is the one that benefits the most in the long run. Our work builds on theirs by (a) clarifying when the racing dynamic is likely to arise and (b) by analyzing the nature of the incentives of each partner to learn as the alliance evolves.²

An underlying theme throughout this paper is that firms’ incentives to learn are driven by their expected pay-offs, and that the structure of pay-offs that each participant expects is complex, interdependent (on partners’ pay-off expectations), and changing over time. Gulati, Khanna and Nohria (1994) suggested that the way an alliance is managed should depend upon its pay-off structure. Furthermore, through an examination of different pay-off structures, they suggested that exogenous changes in the environment, through their effects on pay-off structures, may necessitate changes in the way that an alliance is managed. In this paper, we do not treat changes in pay-off structures as resulting from exogenous events. Rather, we suggest that changes in pay-off structures, and hence the incentives that affect resource allocation decisions, are triggered by endogenous changes brought about by the participants’ own decisions regarding resource commitments as the alliance evolves. Thus, we introduce a dynamic element into the determination of pay-off structures.

We start the paper by defining private and common benefits, clarifying when they might arise, and introducing the notion of relative scope.

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² Hamel (1991) also studies how a collaboration arrangement may lead to a ‘reapportionment of skills between the partners’ and suggests that the three broad determinants of the interf firm learning that causes this reapportionment are intent, transparency, and receptivity. Here ‘intent’ relates to a firm’s desire to use the alliance as a learning arena, ‘transparency’ to the openness of each firm in the alliance, and ‘receptivity’ to each firm’s ability to learn from its partners. While these factors are undoubtedly important, they do not shed light on our understanding of alliance dynamics.
We then demonstrate that resource allocation patterns are very different in purely cooperative and in purely competitive learning situations, and that these two poles of a continuum arise in alliances with pure common benefits and those with pure private benefits. Further, the organizational routines required to manage alliances vary with the mix of private and common benefits. For firms that have not historically relied on alliances, we argue that a high ratio of private to common benefits increases the likelihood of suboptimal behavior. We then outline a typology of ways in which firms might deviate from the theoretical ideal proposed by the previous analysis. Finally, we draw on recent research in behavioral decision theory to suggest reasons for such behavior.

PRIVATE BENEFITS, COMMON BENEFITS, AND RELATIVE SCOPE

We distinguish between two qualitatively different kinds of benefits available to participants in learning alliances: private benefits and common benefits. Although most alliances realize benefits that are combinations of these two kinds, we argue that the distinction is useful because of the different effects that the types of benefits received have on the evolution of partners’ incentives to invest in learning. Private benefits are those that a firm can earn unilaterally by picking up skills from its partner and applying them to its own operations in areas unrelated to the alliance activities. Common benefits are those that accrue to each partner in an alliance from the collective application of the learning that both firms go through as a consequence of being part of the alliance; these are obtained from operations in areas of the firm that are related to the alliance. Private benefits are unrelated to this joint knowledge creation. The common benefits earned by one firm need not be equal to those earned by the other. One way to think about this is to recognize that the creative synthesis of knowledge in an alliance creates a total amount of value. The common benefits of a particular firm are the proportion of this value that it appropriates, and is likely to be a function of the relative bargaining power of each firm. These concepts are all generalizable to learning alliances involving more than two firms, but we will stay with the two-firm situation for clarity.

Intuitively, the ratio of private to common benefits for a particular firm will be higher when it has more opportunity to apply what it learns to its businesses outside of the scope of the alliance (and thus earn private benefits), than opportunity to apply what it learns to businesses within the scope of the alliance (and thus earn common benefits). To be more precise about this, consider the following. Each firm operates in a set of markets, each element of which can, for our purposes, be described by its product and geographic characteristics. The scope of the alliance refers to a need that both partner firms have agreed to target (perhaps through the introduction of a new product or the provision of a new service), typically corresponding to some subset of markets in which the firms are themselves involved. The overlap between the scope of the alliance and the total market scope of each partner is likely to vary and influence the available private and common benefits. The greater the overlap between alliance scope and firm scope, the higher are the common benefits and the lower are the private benefits, ceteris paribus.

In order to help operationalize the concepts of private and common benefits, we introduce the notion of the relative scope of a firm *i* in an alliance *j*, denoted by $RS_{ij}$, to refer to the ratio of the scope of the alliance to the total set of markets in which the firm is active. This ratio lies between 0 and 1; its value is closer to 0 the smaller the scope of the alliance, and its value is 1 if the firm has no interests in markets not covered by the alliance. Thus, the relative scope is a measure that is particular to a given firm in a given alliance. Different firms in the same

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3 In two-firm agreements, a particular benefit stream is either completely common, when it accrues to both firms, or completely private, when it accrues to one or the other. With multifirm agreements, benefits accruing to subsets of firms are partially private (in the sense of not accruing to all firms) and partially common (in the sense of accruing to more than one firm).

4 Strictly speaking, if the firm plans to enter new markets other than the ones targeted by the alliance, then these should be included within the total set of markets that the firm is involved in. This is because private benefits will be earned by the firm’s application of learning to these new markets as well.

5 If one assumes that there has to be some overlap in interests for an alliance to be meaningful, then a value of exactly 0 is never actually attained.
alliance, and the same firm in different alliances, would have different relative scope values. *Ceteris paribus*, the smaller the relative scope, the greater the ratio of private to common benefits for the firm in question. Correspondingly, a greater ratio implies more opportunity for a firm to apply skills acquired in the course of the alliance to markets not involved in the alliance. Figure 1 depicts this link between relative scope and the nature of benefits.

Of course, factors other than relative scope affect the magnitude of private and common benefits, and thereby their ratio for a particular firm. Given a set of markets outside the scope of a particular alliance, a firm’s ability to earn private benefits by applying what it has learned to these markets is affected by (a) the extent to which these markets are related to those within the scope of the alliance and (b) the extent to which the firm has the skills to accomplish the transfer of learning. These factors can be summarized in a ‘transferability factor’, \( \tau_{ij} \), which is an increasing function of both the extent of relatedness and the presence of transfer skills. Then, if PB\(_{ij}\) denotes the private benefits of firm \( i \) in alliance \( j \), we have \( \text{PB}_{ij} = f(\text{RS}_{ij}, \tau_{ij}) \). As mentioned above, common benefits accruing to a firm are a function of the bargaining power that it has relative to its partner.

Let us clarify our conceptual framework by considering two sets of possible alliances. In the case of a joint product development agreement where two firms bring together different technological skills in order to introduce a product in a particular geographic market, each firm could use the skills it learns from its partner to (a) introduce the same product in other geographic markets that it operates in or to (b) introduce other products in various geographic markets. The greater the opportunity that a particular firm has to engage in either (a) or (b), the smaller is the ratio of benefits earned from activities within the scope of the alliance to all benefits accessible to the firm. This is also equivalent to its having a lower relative scope measure and, *ceteris paribus*, a greater opportunity to earn private benefits.

As another illustration of this concept, consider an alliance between a technologically advanced firm A with a firm B in a developing country with the objective of introducing a product, P, that A is familiar with into B’s country. Here firm A tries to learn about the market for P in the developing country from firm B, while firm B tries to access firm A’s superior technology. Firm A will have the opportunity to use what it learns from firm B (regarding marketing products in firm B’s country) to market other products that it is capable of producing, the more so the more transferable this marketing knowledge is to these other products. Similarly, firm B can use its product knowledge gained from firm A in other product or geographic markets beyond the scope of the alliance.

The essence of what determines the ratio of private to common benefits in these examples is, on the one hand, the magnitude of the opportunities within the scope of the alliance (common benefits), and, on the other hand, the magnitude of the opportunities that each partner firm has to apply what it learns in the alliance to contexts not governed by the alliance (private benefits).\(^7\)

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\(^6\) Cohen and Levinthal (1990) refer to a firm’s ‘absorptive capacity’ as being related to its ability to acquire know-how from other firms.

\(^7\) A simple numerical example is illustrative. Suppose firm A is in markets 1 and 2, firm B in markets 2 and 3, and an alliance between A and B is targeted towards market 2. Then firm A’s relative scope is the ratio of its size (as measured, say, by sales or assets) in market 2 to its total size (in...
Having now defined private and common benefits, in the next section we demonstrate how different kinds of benefits have different influences on incentives to invest in learning.

**STRATEGIC LEARNING BEHAVIOR**

In this section, we establish the very different kinds of incentives that private and common benefits create for alliance partners’ allocation of resources to learning (the second link in Figure 1). Our *modus operandi* is to rely on simple, stylized models from economic theory to illustrate the intuition behind our reasoning. In particular, we first examine, in sequence, the case of an alliance with pure common benefits and that of one with pure private benefits, and show that the incentives to allocate resources to learning are very different in the two cases. These cases represent two poles of a continuum along which alliances vary in their mix of private and common benefits. These extremes afford convenient anchors for an analysis of resource allocation in alliances that have both private and common benefits, which we develop later in the section. Finally, we discuss a variety of modifications of the basic analysis and demonstrate the robustness of its basic conclusions.

The learning process postulated in these economic models is that a firm earns private benefits as soon as it has learned enough to apply this learning to its operations (modeled as benefits being earned following the completion of some threshold amount of learning). Common benefits, however, are available only once both partners have learned enough to be able to creatively synthesize their knowledge bases (the assumption is that such a synthesis is only likely to occur after each firm completes its learning). Thus, private benefits are realized by a firm prior to common benefits being realized by both firms.

**Alliances with only common benefits**

Now, consider an alliance from which only common benefits will result. All firms must finish learning in order for any of them to derive the common benefits. Thus, there is no incentive for firms to try to get ahead of each other, or to try and finish learning in an effort to reap private benefits before their partners have finished learning. In such a situation of pure cooperation, resource allocation decisions are best made jointly. Both firms agree on the amount of resources that it is optimal to allocate given the particular stage of the learning process; in effect, for the purposes of resource allocation, they act exactly as one firm would. To characterize the optimal resource allocation in this type of situation, we appeal to existing results in economic theory. These results characterize a single firm’s optimal allocation of resources in particular situations that we believe are illustrative of a more general feature of resource allocation under unilateral (single-firm) learning.

Consider a single firm’s resource allocation decisions when it receives benefits once it has completed all stages. We distinguish between the case in which the available resources are project-specific (where a project has a budget) and where there is effectively no resource constraint (as in some large company laboratory situations where the funding for any one project is a small fraction when compared to the large amounts of research projects in progress at any given time). Then

**Result 1.** If there is no overall budget for the project, the firm will allocate more resources as it completes more stages (Grossman and Shapiro, 1986).

**Result 2.** If there is a fixed budget constraint, then the firm will split the available resources equally among all the stages (Dutta, 1992).

These two results establish the resource allocation...
patterns when a firm is engaged in a project unilaterally or when two firms jointly determine profit-maximizing resource allocations. The first result can be interpreted as referring to a situation where there is an abundant supply of the critical resource needed to implement the project, as long as one is willing to pay the (factor) market price for these resources. In contrast, the second result refers to a situation where there is no way of alleviating the scarcity of a given resource.\(^\text{11}\) Thus, the first situation might correspond to, say, a need for general-purpose computer programmers (for whom there is a competitive labor market) while the second situation might correspond to computer programmers with a particular speciality that is in scarce supply (of whom there might be only a fixed number that is not adjustable in the immediate term).

The intuition behind these results is as follows. For result 1, the firm simply varies its allocation in proportion to the expected value of completing the project. As more stages are completed, less effort is needed to finish the stages and earn the same benefits, and the firm steps up its allocation every period.\(^\text{12}\) For result 2, the intuition is simply that decreasing returns in the innovation production function imply that it is optimal to spread out the budget evenly. For instance, in a two-stage process, it would be better to allocate half the resources to each stage rather than, say, three-quarters to one stage and one-quarter to the other. The gains from shifting more than half the resources to one stage in this example would be more than outweighed by the losses from shifting resources away from the other stage.

The important point in both these stylized examples is that there is a fundamental pre-

\(^{11}\) Technically, one can think of the distinction between the two cases in terms of cost curves for the factor input in question. Then Result 1 corresponds to a cost curve that is flat or only slightly increasing as a function of the quantity of resource demanded, while Result 2 corresponds to a cost curve that is flat up to a point and then rises very sharply thereafter (corresponding to an infinite cost of using resources in excess of the capacity constraint).

\(^{12}\) Additionally, if there is uncertainty about the size of the prize to be earned when the multistage process is completed, the passage of stages may provide information about how good the project is. The extreme situations would correspond to (a) getting bad news as the stages progressed and eventually dropping out and (b) getting good news and thereby increasing resource expenditures. Under some assumptions about the nature of this uncertainty, firms that choose not to drop out will increase their resource expenditure with the passage of stages.

Alliances with only private benefits

Consider now the polar opposite: an alliance from which the partners can earn only private benefits. The firms set out to access each other’s knowledge but there is no common purpose to which they expect this knowledge to be applied. Instead, each firm wishes to access the knowledge of the other in order to apply it to situations in which it can reap benefits that accrue only to it, and not to its partner. In such a situation, once one firm has learned enough from its partner, it has no incentive to continue to incur the costs of staying in the alliance (since there are no common benefits, which only accrue once both firms have finished learning, to continue to hold out for), and the firm will choose to terminate its involvement. Knowing this, each firm wishes to avoid being in the situation of being the laggard in the learning process; in effect, a situation of pure private benefits causes firms to race against each other.

We turn to the theory of technology races to shed some light on resource allocation in such situations of pure private benefits.\(^\text{13}\) The general idea in this theory is that the first firm to finish the one or more stages that constitute the race gets a prize. This is a modeling abstraction for saying that the benefits of being ahead when the process ends are significantly greater than the benefits of being a laggard. Since this prize could be the award of a patent, this literature is often called the patent race literature. Each racing firm allocates resources to maximize its own expected profit at every stage. Typically, the firm’s allocation affects the probability that it will move

ahead in the race. The race ends when either participant finishes the several stages. Although the number of stages in the race is fixed, the length of time for which the race is in progress is endogenously determined by the realized patterns of resource allocation. In the context of alliances, the stages are abstractions for the learning steps that each partner must undergo in order to learn the skills of its alliance partner. The alliance ends when either partner has learned enough from the alliance and has begun earning private benefits. Since there are no forthcoming common benefits, it does not find it worthwhile to continue in the alliance.

To facilitate discussion, let us now focus on a two-stage race (a special case of the multistage situation above) with two firms. We will use a particular specification of such a race model to illustrate some general conclusions. It is certainly true that individual models of technology races rely on very specific assumptions. However, we want to emphasize that, although the particulars of the dynamics of a race remain closely tied to the specific assumptions in the model, none of our conclusions depend on these specific assumptions. Our conclusions are valid for any comparison between resource allocation under pure common benefits on the one hand and that under pure private benefits on the other.

**Result 3.** For the case where there is no overall budget for the project, the time profile for resource allocation is as shown in Figure 2 (Grossman and Shapiro, 1987).

The firm that completes the first stage first increases its allocation (while its rival immediately lowers its allocation). If the lagging firm then finishes the first stage before the leading firm finishes the second stage (so that the firms are even again), then both firms alter their resource allocations as shown. To understand the intuition for this result, one has simply to realize that each firm’s resource allocation is driven by its expected profit at each stage. Thus, the act of getting ahead causes a firm to raise its expectation of winning, and thus its expected profit, and lowers its resource allocation.14

The dynamics of multistage races can be quite subtle (see, for example, Harris and Vickers, 1987), but the key point to note is that relative position in the race always plays a role in determining resource allocation.15 Further, there

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14 There are actually two conflicting forces acting on each of the leader and follower, described in Grossman and Shapiro (1987). Briefly, the authors show that a ‘pure progress effect’ causes the leader to increase its resource allocation. However, a ‘diminished rivalry effect’ (due to the follower reducing its allocation) causes the leader to lower its resource allocation. Simulations indicate that the former effect typically dominates. For the follower, the fact that its rival is more likely to finish and win the prize first means that its expected prize has fallen, and this causes it to lower its resource allocation. On the other hand, the fact that its rival has increased its resource allocation causes it to want to step up its own. For most parameter values for which the simulation is conducted, the first effect again dominates.

15 This is not to say that ‘absolute’ position does not matter. For example, in the two-stage race described above, the resource expenditure levels when both firms are still finishing the first stage are quite different from those when both firms are finishing their second stage. Thus, in this comparison, though their relative position is the same, their absolute position is different and their resource expenditure patterns vary.
is an element of chance in who gets ahead; in this example, both firms start out with equal resource allocations, and each of them has a 0.5 probability of being the first to finish the first stage. Thus, it is impossible for each to predict whether it will be the leader at the end of the first stage, and therefore impossible to know whether the optimal resource allocation would be higher or lower. This kind of uncertainty, created in alliances with pure private benefits, is not present in alliances with pure common benefits or when firms conduct their projects unilaterally (as exemplified by Results 1 and 2 above).

Results 1 and 2 (unilateral learning or pure common benefits) are examples of resource allocation processes that are qualitatively different in at least three ways from those exemplified by Result 3 (pure private benefits):

1. The first difference has to do with an incentive to race. The former class of situations does not create an incentive to race because, with pure common benefits, there is no reason to try and get ahead. In contrast, racing is the norm in a situation of pure private benefits, where only the first firm that finishes earns any benefits at all.

2. The second qualitative difference between the two classes of situations has to do with the inevitable appearance of asymmetries in incentives to invest as learning progresses in situations with pure private benefits. These asymmetries arise because a firm’s position (relative to that of its alliance partner), through its influence on expected profit, bears on how much it is optimal for the firm to invest. In contrast, there are no such unfolding incentives to invest in learning in situations of pure common benefits because there is no economically meaningful sense in which a firm can be said to be ahead of its partner. It is important to note that these asymmetries arise even though the firms are entirely symmetric at the outset (i.e., at the beginning of the learning process). Naturally, any models with ex ante asymmetries will retain the feature of ex post asymmetries in learning emerging with the evolution of the alliance.

3. The final difference has to do with an additional source of uncertainty in the case of pure private benefits. Neither firm can know in advance how its position will evolve and whether it will have to raise or lower its expectation of profits and thus its investments in learning. For an example, one has only to contrast the resource allocation predicted by Result 1 with that predicted by Result 3. In the first situation, a firm can predict that its resource allocation will rise systematically as the number of stages completed increases. However, in the latter context of a project with pure private benefits, there is no systematic ex ante method for a firm to predict the pattern of resource allocation. A reduction in resources allocated to an alliance may be a natural part of the learning dynamics in some situations with a high degree of private benefits. Again, note that this importance of relative position emerges even with no ex ante asymmetries between the partners.

Given these stark differences, we can conclude that pure private benefits create very different incentives to invest resources in learning than do pure common benefits.

Alliances with private and common benefits

Most alliances clearly will not fall at the extremes of pure private benefits or pure common benefits. We have shown that racing behavior arises in the case of pure private benefits. Starting from a situation of pure private benefits, as the ratio of common to private benefit rises, the incentive to race is attenuated. To see this, recall that a firm raced out of fear of being locked out of receiving any benefits. This outcome could occur because the first firm to finish learning may find that it is earning enough from its private benefits to no longer justify expending resources to stay in the alliance for the prospective common benefits. To the extent that there is no incentive for the firm that is ahead to quit once it achieves its private benefits (because of the expectation of sufficient future common benefits), no such locking out of the laggard will occur, and there will be less incentive to race by any firm. Indeed, for any level of private benefits, there is a threshold level of common benefits above which it is optimal for the leading firm to choose not to terminate its involvement in the alliance once it begins to receive its private benefits, thus reducing the need to race in the first instance (Khanna, 1996a). Further, as the level of common benefits rises
above this threshold and the situation of pure common benefits approaches, incentives to race are reduced, and the purely cooperative behavior of the pure common benefits situation is approached.

To summarize, the behavior patterns sketched out for pure common benefits on the one hand, and for pure private benefits on the other, represent extremes. Most alliances lie between these extremes; firms expect both private and common benefits, and exhibit behavior patterns that are an amalgam of those associated with the extremes. The lower the ratio of private to common benefits, the closer an alliance approximates pure cooperation and jointly profit-maximizing resource allocation, and the less the resource allocation differs from the optimal pattern under unilateral learning.

It is important to note that it is the ratio of a particular firm’s private to common benefits that affects its decision to stay in or quit the alliance, as the firm in question compares its already existing private benefits to its potentially attainable common benefits in trying to decide whether to continue its involvement in the alliance. In contrast, the ratio of one firm’s private benefits to the private benefits of its partner, or of one firm’s common benefits to the common benefits of its partner, are not relevant to the individual firm’s decision to continue in the alliance. Recall that this ratio of a firm’s private to common benefits is determined by its relative scope. We have thus established that a firm’s propensity to engage in competitive racing behavior in the context of a particular alliance may be related to activities of the firms that are not within the scope of the alliance. Further, since the firm’s resource allocation at a point in time is determined by its expectations of forthcoming private and common benefits (conditional on its own estimation of its learning and that of its partner), we have effectively proposed a way of endogenizing the evolution of pay-off structures and of their effect on alliance dynamics.

Some notes on the applicability of this analysis

On the applicability of the analysis to learning alliances

For a firm in a learning alliance to absorb skills from its partner requires it to continually allocate resources to the learning process. Implicitly, what we have in mind are skills that cannot be easily codified and transferred between partners through other means such as a licensing agreement. We also do not have much to say about alliances whose primary purpose is not learning (e.g., alliances formed to augment the partners’ market power). In fact, it is important that each firm invests to learn from the other. To see this, consider a two-firm alliance in which only one firm, A, is learning from the other, B (and B is in the alliance for some other reason, such as financing a venture, or gaining market power). Now A does not have to fear that B will terminate the alliance after learning enough to earn private benefits. Consequently, A’s learning, unaffected as it is by B’s (nonexistent) resource allocations for learning, will effectively follow a pattern described by Results 1 and 2 (unilateral learning or learning with pure common benefits), rather than one closer to that described by Result 3 (learning with pure private benefits).

Although it is important that both firms invest in learning, it is not important that both earn private benefits. To see this, consider the following. If a firm has relative scope lower than ‘1’ ($RS_{ij} < 1$), indicating that it can earn private benefits, it may not have an incentive to continue in the alliance once it has learned these private benefits (if the forthcoming common benefits are not sufficiently higher than the already earned private benefits to justify the additional costs of continuing in the alliance). Knowing this, any partner (of such a firm with $RS_{ij} < 1$) will race to avoid being in the situation where the alliance could terminate without its earning any benefits. This is true even if the partner’s own relative scope measure is 1, that is, it has no possibility of earning private benefits. If both partners have relative scope values lower than ‘1’, each has an incentive to race. Combining this analysis with the observation that racing behavior tends to be mutually reinforcing, we conjecture that racing is more likely to occur the greater the deviation of the number and extent of relative scope measures from 1.

Note that the learning being gained can be of a variety of sorts. It need not be restricted to R&D-related issues. For example, the type of knowledge being transferred could relate to understanding a particular customer base, understanding marketing in a new country, or learning the use of new production techniques.
Further, the precision with which the learning goals are known at the outset does not affect the tenor of the results. What is important is that there be an expectation of earning some kind of benefits, even if the source of these benefits is unclear. This condition is not overly restrictive because it is difficult to imagine firms entering into alliances with no expectations of benefits. Consider the case of pure private benefits where neither party knows exactly what it has set out to learn, but each has some expectation of earning private benefits (indeed, these form the reason for entering the alliance in the first instance). It is still true that if a firm’s partner figures out ways of earning private benefits first, it might terminate the alliance. Thus, the earlier intuition that each firm would race in an effort to avoid being locked out of any benefits at all still applies.

On the informational assumptions underlying the analysis

The dynamics outlined above are interesting only if (a) there are stages of learning and (b) each firm is able to infer, at least to some extent, how far along its partner is in its own learning process. The stages are abstractions for milestone-like demarcation of the progress that firms go through in the learning process. Certainly, if the learning is truly a one-shot process (no stages), there is no opportunity to study the variations in the resources partners allocate to learning, and the dynamics are uninteresting. To see why situations where condition (b) is not satisfied are also uninteresting from the standpoint of understanding alliance dynamics, imagine that each firm had no idea how far along its rivals were. The dynamics that manifest themselves as changing resource allocation patterns arise from responses to new information regarding one’s own progress or that of one’s partner. If no new information is forthcoming about partner progress, then, at least for the purposes of resource allocation decisions, each firm might as well behave as though it were engaged in the project unilaterally. As we have seen above (Results 1 and 2), the resource allocation patterns in such circumstances are much more predictable.

Although we believe that the nature of the knowledge and skills (Nelson and Winter, 1982) being transferred is an important determinant of a firm’s ability to infer how far along its partner is in its learning, clearly other factors are also at work. For example, Hamel (1991) suggested that additional factors determining ‘transparency’ include the social context surrounding the partners. Others discussed the importance of the emergence of trust as an alliance progresses (Ring and Van de Ven, 1992; Zajac and Olsen, 1993; Gulati, 1995a). Another influencing factor might be the degree to which a firm is attuned to happenings in the marketplace, as this might allow it to pick up signals about its partner’s progress from the latter’s attempts to realize private benefits.16

On the existence of asymmetries between firms

Our framework can accommodate a range of asymmetries between firms as long as these asymmetries can be understood in terms of the primitives of private and common benefits. Another way to express this is to say that various dimensions along which firms differ can be seen as parameters that affect the particular realization of each firm’s private and common benefits (appropriately modified by the transferability factor and relative bargaining power discussed in a previous section). We focus on the analysis of symmetric firms above because it appears to be a sensible benchmark case.

Consider, for example, asymmetries in sizes between the alliance partners. Ceteris paribus, a larger firm might be expected to earn more private benefits as it has more markets to which it can apply its learning. A larger firm might also have greater bargaining power than its smaller partner (for reasons such as financial constraints which might limit the outside options of the smaller firm to a greater extent), thus enlarging its common benefits. Thus, large firms may stand to receive more private as well as common benefits. The ratio of private to common benefits might thus be larger or smaller for a larger firm than for its smaller partner.

16 A theoretical issue that we do not address here is whether a firm has an incentive to reveal to its partner(s), in situations where the progression through the stages is not transparent enough, the extent to which it has progressed in an attempt to influence their resource allocations. It is easy to come up with some examples where a firm would have an incentive to reveal its position to its partners as well as examples where it would not.
In an alliance with pure private benefits, it is still the case that each firm has an incentive to race to ensure that the alliance is not terminated before it begins to earn private benefits. The observation that the two firms might earn different amounts of private benefits does not alter this conclusion, except in as much as one firm might have a greater incentive to race than the other. Similarly, for alliances that yield a mixture of private and common benefits, there would be a difference in the extent to which each firm had an incentive to race that would depend on the extent and nature of the asymmetry. As suggested earlier, what matters is not the relative amounts of private or common benefits that each firm earns, but the ratio of private to common benefits for each firm.

A particular class of asymmetries deserves special attention: that arising from different kinds of contractual agreements between firms. Although different contractual agreements may imply different optimal resource allocation patterns, these patterns (a) can be understood in terms of the effects of combinations of private and common benefits, and (b) will differ from those in a unilateral or purely cooperative learning mode. In particular, although the optimal resource allocation patterns will be different for an alliance between ‘vertically’ related firms than for those between ‘horizontally’ related firms (because the ratio of private to common benefits is likely to be different, ceteris paribus), both these optima will differ from the unilateral or purely cooperative learning optimum allocation. Similarly, the presence or absence of equity stakes between partners in alliances can alter private and common benefits in a variety of ways. Again, from the perspective of understanding the dynamics of resource allocations in learning alliances, what is important is that the apparatus of private and common benefits provides an appropriate analytical framework.\(^{17}\)

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\(^{17}\) Studies of the determinants of the contractual form of an alliance are usually rooted in transaction cost analysis (see, for example, Pisano, Russo, and Teece, 1988). As others have noted (Zajac and Olsen, 1993), such studies are static in nature and are less appropriate for understanding the dynamics within alliances.
tion that the realization of private benefits by a firm precedes both firms' realization of common benefits. However, the nature of the incentives to invest in learning created by private and common benefits remains unchanged regardless of the particular sequencing of the streams of private and common benefits. The prospect of future common benefits always creates an incentive for firms to continue in the alliance, while the prospect of private benefits, particularly without the lure of future common benefits, will always create the incentive to race. What is crucial to the model's logic is the idea that, as asymmetries in the learning process evolve, each firm continually evaluates whether staying in the alliance is worthwhile, and that the results of such an evaluation are contingent on the expectation of earning future private and common benefits.

**Links to the resource-based view**

Our framework provides a way to think about optimal resource allocation patterns in learning alliances and about how the incentives to invest in learning evolve, in a way that is robust enough to accommodate the particulars of a variety of situations. An important outcome of this analysis is that the optimal resource allocation profiles differ depending on the pattern of private and common benefits associated with a particular alliance.

It is reasonable to expect that firms develop organizational routines (Nelson and Winter, 1982) that are optimal for the pursuit of learning in the mode to which they are most accustomed. The same set of organizational routines might be optimal in situations of unilateral learning and of learning in alliances with pure common benefits. In contrast, since optimal resource allocation patterns are qualitatively different in alliances with pure private benefits, one might expect the optimal organizational routines to differ as well. One important dimension along which these routines might differ is their ability to deal with the greater uncertainty that accompanies learning in alliances with pure private benefits, and the associated greater need for flexibility of resource allocation in such alliances.  

A body of work on the resource-based view of the firm suggests that such organizational routines are 'sticky' and inimitable. This inimitability may have several underlying causes: for example, it might be difficult for outsiders to infer what makes a particular routine work (Lippman and Rumelt, 1982), or the routine may simply require a long period of time to get established (Dierickx and Cool, 1989). Inability to rapidly adjust organizational routines provides a theoretical reason for believing that firms that have routines suited to unilateral learning will have trouble transitioning to learning in alliances with pure private benefits, as the latter require rather different types of routines. Thus firms that have not historically relied much on alliances might be expected to have trouble managing this mode of learning.

This provides a candidate explanation for suboptimal behavior in alliances if one assumes that firms making the transition from unilateral learning to learning alliances with private benefits do not sufficiently recognize the need to adapt to the new learning environment. This might happen if firms tend to think of the learning in an alliance as a stand-alone activity, as opposed to thinking of alliances as part of a portfolio of the firm's activities. The former framing does not direct attention to the private benefits that can arise from adapting the learning to markets outside the scope of the alliance, thus resulting in suboptimal behavior.

This motivates an empirically testable proposition regarding perceived departures from the purely cooperative behavior 'expected' in an alliance and the relative scope measures of the partners in the alliance. Our analysis suggests that more such departures (and, hence, more alliance failures) will occur the greater is the extent of the various partner firms' business in (product or geographic) markets not covered by the alliance.

The importance of this empirically testable proposition lies in realizing that the extent to which a

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18 Indeed, Bleeke and Ernst (1991), in their study of 59 alliances, found that one of the critical success factors for alliances was the ability of the partners to be flexible. The idea that routines might evolve to support the management of particular types of alliances also seems to find some support in the fieldwork reported in Lyles (1987). In this work, the notion of experience at running joint ventures shows up quite clearly, as does the idea that firms commonly make mistakes in understanding the nature of technology transfer, learning, and the development of partner skills.

19 Examples of work on this theory include, but are not limited to, Wernerfelt (1984), Barney (1991), Conner (1991), and Peteraf (1993).
firm has an incentive to depart from cooperative behavior (and engage in the racing behavior described above) depends on characteristics of the firm that have little to do with the alliance in question. The opportunity set of each firm outside the particular alliance crucially affects its behavior within the alliance.

While most academic work has studied the individual alliance, recent studies have focused on the effect on an individual alliance of the past history of involvement between partners (Kogut, 1989; Ring and Van de Ven, 1992; Parkhe, 1993; Gulati, 1995a, 1995b). Instead of focusing on such intertemporal effects on the likelihood that a particular alliance will be formed, we seek to expand the scope of inquiry along a different dimension by focusing attention on the overall patterns of partner firms’ business interests on firms’ behavior within a particular alliance at any given point in time.

**SUBOPTIMAL BEHAVIOR IN LEARNING ALLIANCES**

Recognizing the nature of the economic incentives created by multistage learning races of the sort discussed here can help the partners in an alliance potentially avoid misunderstanding each other’s intentions. The optimal strategic behavior suggested by the racing models described above requires managers to appreciate the simultaneously cooperative and competitive nature of alliances. Our models suggest that if firms view their relationship with others in the alliance as either strictly competitive or strictly cooperative, this may give rise to suboptimal outcomes for one or more firms in the alliance. We can anticipate three types of pathologies that might easily arise if firms deviate from the kind of strategic behavior proposed by our model. In the remainder of this section, we outline these three potential pathologies and draw upon research in behavioral decision theory to suggest why such suboptimal behavior might occur. \(^{20}\)

We call the first pathology that might arise the ‘three-legged fallacy’. In this situation, the partners fail to recognize that they are in a racing situation at all, and act as if their fates are inextricably tied. Thus, as opposed to the optimal scenario, both partners maintain their original resource commitments in each stage, neither stepping up nor reducing their resource allocations in response to their evolving learning asymmetries. This situation is graphically depicted in Figure 3A. Notice that both firms A and B match each other’s resource commitments in lock-step at every stage of the race, even though it would be to A’s benefit to increase its allocation at the

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\(^{20}\) While we do not have much to say about the persistence of suboptimal behavior, we note that while there is some evidence, in different contexts, of firms learning from feedback (Kagel and Levin, 1986), others have suggested that learning is difficult in the common situation of insufficient timely feedback (Tversky and Kahneman, 1986).
end of the first stage and it would be to B’s benefit to reduce its allocation at the same time. By not following their optimal individual allocation strategies and remaining stuck in a pure cooperative frame, both firms end up not performing as well as they could.

The second pathology we might anticipate is called the ‘reluctant loser’. In this scenario, the lagging partner fails to reduce its allocation, even though the leading partner has increased its allocation and seems likely to secure its private benefits. This situation can be graphically depicted as shown in Figure 3B. As one can see, firm A, which has the learning advantage at the end of the first stage, has acted strategically and increased its resource allocation, but firm B, despite being behind, does not decrease its resource allocation as our model would suggest but instead maintains its original resource commitments. In these situations, the leading partner laughs all the way to the bank while the lagging partner is left shouting ‘foul!’

The final pathology is called the ‘hesitant winner’. In this situation, the leading partner fails to capitalize on its learning advantage, even though the lagging partner has reduced its resource commitments to the alliance. The leading partner’s hesitation may arise for a variety of reasons. It may simply not recognize that it has a learning advantage, it may recognize its lead but fail to allocate the necessary additional resources, it may hesitate for fear of appearing to be opportunistic, or it may be hampered by the strong personal ties which may exist across firms (Tenbrunsel et al., 1997). This situation is depicted in Figure 3C. Notice that, in direct contrast to the situation above, it is the lagging firm (Firm B) that acts strategically. In response to its lagging position, it decreases its allocation. The strategic mistake here is made by firm A that does not step up its resource allocation to capitalize on its learning advantage.

To make a case for these scenarios actually occurring in practice, we must answer the question: Why might firms in an alliance deviate from our normative benchmark and adopt such suboptimal strategies?

One answer is simply that some managers are smarter than others and can think more strategically. We think that such individual differences in the capacity to reason strategically offer at best partial, and in some cases spurious, explanations for the likelihood of observing suboptimal strategies in managing strategic alliances. Instead, in keeping with some of the recent research in the behavioral and cognitive sciences on how people deal with uncertainty, complexity, and ambiguity, we suggest that there are some predictable biases or heuristics that managers might employ in managing strategic alliances (Kahneman, Slovic, and Tversky, 1982). These biases and heuristics help explain why even smart managers might end up adopting suboptimal alliance strategies.

The literature on behavioral decision theory has identified several types of biases in managerial decision-making. Drawing on this literature, we discuss below three types of decision-making biases that might be especially likely to arise in the context of learning alliances and lead to the pathologies identified above.

The first bias arises from the observation in behavioral decision theory that firms insufficiently consider dynamic uncertainty and are unable to see how their decisions should be contingent on those of others with whom they interact (Zajac and Bazerman, 1991; Bazerman and Carroll, 1987; see Bazerman, 1993, for a review). For instance, managers usually forecast the investments and the pay-offs associated with entering into an alliance. These expectations then become the basis for a whole host of commitments inside the firm such as short- and long-term budgeted revenues and expenditures. Although such forecasts are useful, the problem is that managers often fail to realize that their pay-offs and hence proper resource allocation levels must be contingent on information that cannot be known in advance. Such information includes the relative speed at which the partners will learn each others’ skills, the new opportunities for private benefits that present themselves as each side learns, and the changing opportunity cost of the resources allocated to the alliance. These costs are based on factors endogenous to (e.g., differential learning by the partners) and exogenous to (e.g., the success of other interdependent projects) the alliance. Even when there are no ex ante asymmetries between the partners, our models establish the role of uncertainty in ensuring that ex post asymmetries will naturally emerge. For optimal decision-making, the parties in a learning alliance must incorporate new information as it becomes available and revise their expectations and
behaviors accordingly. However, behavioral decision theorists have observed that individuals are often incapable of incorporating evolving information in their decisions over time. They remain stuck in their original estimates and are thus incapable of displaying the flexibility suggested by the normative models we have discussed. Further, this may be exacerbated by the fact that some executives may seek only confirmatory evidence for what they think is initially true and neglect disconfirmatory evidence (Einhorn and Hogarth, 1978).

A second type of bias that can lead to the suboptimal scenarios we have outlined is the well-known ‘anchoring’ problem (Kahneman and Tversky, 1979). It has been widely documented that people often form judgments by adjusting from a well-known base case or ‘anchor’ without critically assessing whether the anchor is truly appropriate for the situation at hand. For instance, if a new product line typically earns $500,000 in the year of introduction for XYZ company, decision makers will bias the earnings estimates of any new product toward the anchor of $500,000. Moreover, it has been found that decision-makers do not easily adjust these anchors, even when confronted with information that suggests that the anchor is biased. Similarly, in alliance situations, we might expect managers to anchor their resource allocation estimates based on their experience with similar projects where they had previously worked alone. Alternatively, the anchor might be based on an alliance with a different ratio of private to common benefits. One can readily see the dangers of extrapolating from such anchors. As we have shown in the models above, the optimal resource allocation strategy when a firm is investing alone is very different from the optimal strategy when it is investing in an alliance. Indeed the optimal strategy even varies across alliances and depends on the ratio of private to common benefits in any alliance. In sum, we expect that managers will be susceptible to adopting suboptimal strategies in managing alliances if they remain anchored to models derived from their past experience. This bias is likely to be especially acute if the firm has had little experience with alliances in the past.

The third type of bias that can readily apply to the alliance situation is what is known as the ‘framing’ bias (Kahneman and Tversky, 1979). The best-known framing bias is the propensity for individuals to be risk-averse when choices are framed as gains but to be risk-seeking when choices are framed as losses. Experiments have shown that individuals will routinely choose a sure gain of $10 over a 50 percent chance to win $20, but will choose a 50 percent chance to lose $20 over a sure loss of $10. Similar framing effects have been shown to systematically influence choices in a variety of situations. Applying this observation to the context of alliances, we might expect biases from managers who frame the alliance in pure ‘cooperative’ or ‘competitive’ terms rather than in mixed motive terms. The importance of such relationship frames have also been documented by Sondak and Moore (1993), who found that it was hard for managers to recognize that situations could simultaneously be competitive and cooperative. They typically frame relationships as being either cooperative or competitive and are unwilling to consider that a firm may be both a competitor and a partner.

Given that alliances are typically framed as cooperative, their competitive aspects can often be neglected or even suppressed. Viewed from such a cooperative frame the kinds of strategic behavior suggested by our racing models can appear quite ‘opportunistic’ to those expecting loyalty and unwavering commitment from alliance partners. Indeed, the behavior recommended by the models may be seen as predatory acts of bad faith. One can easily see how such framing biases may lead to the kinds of pathologies we have described above.

A final behavioral bias may arise out of fairness considerations, which have been shown to be important in situations where there is a conflict between individual and collective interests (for reviews of research on social dilemmas see Messick and Brewer, 1983; Messick, 1991). For example, a faster-learning firm may believe that it is fair for it to behave in its own self-interest because it believes that it was implicitly understood by both firms that such a situation might occur, while the slower-learning firm expects equal commitments as fair and appropriate behavior. Firms who do not recognize the inevitable asymmetries that arise as learning alliances evolve tend to use their own behavior as information about how others will behave (Wade-Benzoni, Tenbrunsel, and Bazerman, 1996).

In addition to the above behavioral biases, it is important to point out one other factor that
might further explain suboptimal behavior in the management of alliances. Alliances can also present thorny agency problems (Jensen and Meckling, 1976). Perhaps the most obvious agency problem is that managers assigned to an alliance can feel that their success hinges on the ongoing success of the alliance. Thus they might be reluctant to engage in actions that could lead to the termination of the alliance or even the reduction of resources available to the alliance. Indeed, instead of disinvesting when they are behind in the learning race, managers might display the behavior of the reluctant loser and get caught up in a syndrome of escalating commitment as they try and catch up and make the alliance succeed (Staw, 1981).

CONCLUSION

Our objective was to develop a general theoretical framework to advance our understanding of the dynamics of learning alliances. Toward this end, we introduced notions of private and common benefits and of relative scope. Alliances with different ratios of private and common benefits are likely to exhibit different optimal resource allocation patterns. In particular, we demonstrated that optimal behavior patterns differ between unilateral learning and learning in alliances, and that this divergence grows more pronounced the greater is the ratio of private to common benefits. This argument has implications for the kinds of alliances that particular firms enter, and for our understanding of how suboptimal behavior patterns might arise in practice. An important conclusion of our work is that the overall pattern of partner firms’ activities plays an important role in understanding a firm’s behavior within a particular alliance.

We took as given the private and common benefits associated with a particular alliance. In fact, since the scope of an alliance influences private and common benefits, and since the scope of the alliance is at least partially a choice of variables that the partner firms must agree on, these benefits are at least partly endogenous (Khanna, 1996b). Therefore, a question of great interest is understanding how firms can structure alliances to optimally configure the combinations of private and common benefits and thereby affect alliance evolution. More generally, the overall question of structuring alliances (Ring and Van den Ven, 1992) deserves greater attention. Empirical work that operationalizes the notion of relative scope, and, more generally, takes into account that alliances are but one organizational means for shaping the boundaries of the firm, also appears to us to be important. Some recent evidence seems to suggest that such an empirical inquiry might indeed be fruitful.

The methodological contribution that this paper makes is to think about alliances in terms of their pay-off structures (Gulati et al., 1994; Parkhe, 1993). At each point, the optimal decision by each partner is a function of its expected pay-off given not only its own accomplishments up to that point, but also those of its partners in the alliance. Since these expected pay-offs change as the alliance unfolds, the incentives to continue to invest in the alliance change as well. It follows that there is an element of uncertainty in the optimal resource allocation pattern, and it behooves participants to recognize this uncertainty up-front and to organize for it to the extent possible. Such issues of understanding the process by which an alliance evolves merit further theoretical and empirical attention (Zajac and Olsen, 1993; Mody, 1993; Nakamura, Shaver and Yeung, 1996).

21 It is worth reiterating that this paper has not arrived at any conclusions regarding the particular combinations of private and common benefits that would be optimal for a particular alliance. In the simple model outlined in a previous section, waiting to attain common benefits is certainly a plus, but the firm that is further along toward accomplishing its own learning goals must trade these potentially increased benefits off against the cost of continuing to participate in the alliance. In equilibrium, firms will take this into account before the alliance entry decision. The point is that it is not a priori clear that alliances in which common benefits are attained in equilibrium are necessarily better than those in which they are not.

22 Bleeke and Ernst (1991) discuss the overlap of partner activities in the context of acquisitions and joint ventures. Park and Russo (1996) recently documented that a joint venture between direct competitors is more likely to fail than one in which the partners do not compete, suggesting at a minimum, in the language of our paper, that joint ventures with different levels of private benefits might behave quite differently.
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