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How Long Should “Followers” Delay Market Entry?

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In this article, we theorize on the decision by followers to delay market entry in order to optimize performance. Using a decision-theoretic approach, we offer three entry timing prescriptions for followers' based upon the characteristics of their complementary assets (relative to pioneers) and the environment being entered. That is, we model how followers' optimal delay of market entry can be diminished or augmented based on the complementarity or substitutability of their relative amounts of complementary assets and the relatedness of those assets. Our findings can serve as guidelines for empirical research to probe whether followers' market entry should be delayed or expedited.

Keywords: Timing of Entry; Complementary Assets; Relatedness; Followers; Delay.

INTRODUCTION

Most research on market entry indicates that timing of entry is a key factor for success. Pioneers can often achieve an advantage over followers because early participation provides expertise ([12], [14]), they find it easier to gain customers ([21], [30]), and/or their market share gains are worth more ([10], [15]). Also, pioneers can erect entry and mobility barriers to increase their advantage over followers ([14], [19]). But pioneers do not always prosper over followers, e.g., Code-A-Phone pioneered the telephone answering machine industry but it could not match the low cost production abilities of Panasonic, which entered in the mid-1970s [35]. Diners Club pioneered the credit/charge card industry in 1950 but it could not match the large resource base of American Express, which entered in 1958 [35].

Schoenecker and Cooper [37] pointed out that "the question of why firms enter industries when they do has received little attention in the literature" (p. 19) and empirical results on the relationship between timing of entry and performance have been mixed ([27], [32]). Mitchell [27] proposed that conflicting results can be explained, in part, by the use of a "single clock" to capture entry time. A single clock approach does not consider different order incentives based on the characteristics of the entrants. He captured the different order incentives by distinguishing between those firms that possess specialized complementary assets (which are labeled "incumbents") from those that do not (which are labeled "newcomers") and this forms the basis of the dual clock concept, i.e., one clock to capture the entry time of all entrants and one clock to capture the entry time of those entrants that possess specialized complementary assets.

Mitchell's contribution to the entry strategy literature is substantial and worthy of further theoretical consideration. We extend his work by moving beyond a dichotomous categorization of specialized complementary assets (i.e., beyond "possession" or "not"), to capture heterogeneity in the relative amount, and level of relatedness of, followers' complementary assets. By doing this, we can conceptually move from an entry time model based on dual clocks to one where each follower possesses its own individualized clock to guide the time of entry decision. Furthermore, Mitchell proposed that in some environments a single clock is appropriate (e.g., pharmaceuticals [8] and chemical processes [13]), while in other environments a dual clock approach is necessary (e.g., analytic instruments [13] and semi-conductors [39]). We complement the above proposition by exploring different environments and the impact that these have on followers' timing decision.

We focus in this article on the factors that influence followers' timing of entry into new markets. Specifically, we theorize on the decision by a follower to delay market entry in order to optimize performance and on how the characteristics of its complementary assets (relative to pioneers) and the environment surrounding the market being entered impact that decision.[1] To do this we develop a decision-theoretic approach to derive a model of the optimal time for followers to delay market entry. We do not explicitly consider the strategic and tactical decisions of pioneers, rather we assume that they will act in their own best interests and exploit, as best they can, their specialized complementary assets. Thus we rely on a decision-theoretic approach that builds upon existing research highlighting performance tradeoffs involved in the timing of entry decision in order to explore followers' optimal period for delaying market entry.

ANALYTICAL FRAMEWORK

Our decision-theoretic approach considers heterogeneity in followers' complementary assets and in environmental conditions to offer prescriptions consistent with the notion of a follower with a specific clock that guides its time of entry decision. Numerous measures of performance have been used in entry timing research including profitability ([2], [33]), survival ([1], [3], [26], [32], [45]), market share ([30], [31], [43]), and multiple measures ([23], [27]). In this article, we conceptualize performance in terms of the combination of two dimensions: profitability and the probability of downside loss. Schoemaker and Amit [36] indicated that firms' strategic actions constitute a tradeoff between profitability and risk. Similarly, Radner and Shepp [29] proposed that corporate strategy aims at maximizing a linear combination of profit and risk. Since managerial surveys find that managers typically evaluate risk in terms of downside loss ([7], [22], [25], [34]), we define risk as the probability of downside loss rather than conceptualize it as the chance of not surviving [36] or bankruptcy [29].

[1] In this article we focus on a follower's lag time because information is available about the pioneer – a follower knows who the pioneer is and the characteristics of its complementary assets. Whereas information about who might enter later and when is far more speculative and the information might not be available for consideration in a follower's decision of when to enter.

Given the prescriptive purpose of this article, we deem important to use a definition of risk consistent with the way managers use risk in making their decisions.

Formulation of the entry decision

Each follower must select a period of delay after a pioneer's entry that maximizes its expected total performance. Let t be the industry age when a follower enters. Let a_t (>0) be the amount of complementary assets this follower possesses relative to that of the pioneer at t, which decreases over time at a non-decreasing rate reflecting the increasing ability of pioneers to build and/or otherwise acquire their stock of complementary assets (e.g. through persistence pioneers begin to build legitimacy which can help raise resources from stakeholders [4]). Complementary assets are the supporting capabilities used to commercialize a particular good [40]; e.g. a direct sales force [37]. A follower's ability to "free up" one hundred of its existing direct sales force to use in the newly entered market relative to the pioneer who only has access to a direct sales force of five reflects a high relative amount of complementary assets. A follower who can allocate eight direct sales force to the market compared to the pioneer's five possesses a lower relative amount of complementary assets. Formally, $da_t / dt < 0$, $d^2 a_t / dt^2 \leq 0$, and we let a_0 be the relative amount of complementary assets of a follower at the time of the pioneer's entry.

A follower's profit potential, if it enters the market at t, increases with the level of *relatedness* of its complementary assets, s. Relatedness of followers' complementary assets represents the extent to which the supporting capabilities are tailored to the successful commercialization of a good in the market being entered [40]. To illustrate the concept of relatedness we continue with the example of a direct sales force offered above. A pioneer's direct sales force was created specifically for the new market and/or has learned from being in the industry but a follower's direct sales force may not have that level of relatedness. Relatedness captures the extent to which a follower's direct sales force own the capability to meet the key success factors of the market. For example, the market being entered might be for an Advanced Manufacturing Technology that enables its customers to produce mass customized cardboard boxes. A highly related direct sales force has experiences in selling similar technologies to industrial buyers, whereas a poorly related direct sales force has experiences in selling health services to the elderly. A related sales force is more effective at its task and can enhance a firm's profitability.

Profit potential is the expected total return to stockholders during the life of the follower, discounted at some rate (not accounting for risk as we attempt to treat risk separately, but accounting for the time value of money, such as in the calculation of an expected present value of future cash flows – including both dividends and capital gain). A follower's profit potential, if it enters the market at t, decreases with t, the industry age. Profit potential diminishes as followers delay entry for a number of reasons. For example, pioneers have more time to erect mobility and entry barriers that are costly for followers to overcome (see [24] for a review). Last, profit potential increases with a follower's relative amount of complementary assets at a non-increasing rate. That is, the possession of a resource advantage over pioneers provides the basis for improving followers' profitability but we acknowledge that increases in the relative amount of complementary assets will likely produce diminished returns in profitability. Formally, $p(t, s, a_t)$ represents profit potential, where p is a non-negative function with $\partial p / \partial s > 0$, $\partial p / \partial a_t > 0$, $\partial^2 p / \partial a_t^2 \leq 0$ (second order derivative of profit potential with respect to relatedness does not affect our prescriptions and we therefore omit to specify this condition). Also, $\partial p / \partial t < 0$ and $\partial^2 p / \partial t^2 < 0$, as an industry matures profit potential reduces at a non-increasing rate (which reflects the greater influence pioneers have early in the life of an industry, such as direct the growth of an industry and set the "rules of the game").

It is not always possible for followers to enter later and use their large stock of assets to catch the pioneers. There are numerous examples of when followers' stocks of assets represent a liability rather than an asset in entering new markets. For example, Henderson and Clark [17] highlighted those innovations that change the architecture of a product and, as a result, can destroy the usefulness of the architectural knowledge accumulated by firms. Tushman and Anderson [42] also found that technological discontinuities can be competency destroying for a firm with accumulated assets based on other products. For example, assets that are totally unrelated to the market being entered may represent a liability, tempting followers to enter the market and try to solve new problems with inappropriate methods [28]. For these followers, the stocks of assets possess no (and possibly negative) value for the market being considered for entry and therefore the optimal entry decision would likely be not to enter at all.

Empirical evidence from the application of the learning curve to population level learning ([6], [20]) suggests that risk decreases with industry age (after an initial period of adolescence [9]), and at a rate h (> 0) well approximated by an exponential function. Risk also decreases with increases in the relatedness of a follower's complementary assets, e.g., as the knowledge, skills, and experience of a direct sales force more closely align with the requirements of the market being entered then the probability of downside loss is reduced. Moreover, risk decreases with a greater relative amount of complementary assets at a non-increasing rate. In this article, we define risk in terms of the probability of downside loss [34]. For example, resource slack can reduce the probability of downside loss [44] but there are likely diminishing returns to risk reduction from increasing levels of resource slack.

Formally, $r(t,s,a_t) = g\, e^{-h\,t} - g(s,a_t)$ represents risk, where g is a scaling parameter (large enough to keep risk positive) controlling for the direct effect of industry age and for an upper bound on risk, and g a non-negative function with $\partial g / \partial s > 0$, $\partial g / \partial a_t > 0$, $\partial^2 g / \partial a_t^2 \leq 0$ (second order derivative of risk with respect to relatedness does not affect our prescriptions and we therefore omit to specify this condition). The function $g(s,a_t)$ reflects the effect of the relatedness of a follower's complementary assets and an indirect effect of time due to changes in the relative amount of complementary assets. Note that we choose to express risk with an additive form, that separates the effect of the complementary assets' characteristics (relative amount and level of relatedness) and time, rather than its multiplicative counterpart (e.g., $r(t,s,a_t) = e^{-h\,t} / g(s,a_t)$). We argue for the appropriateness of an additive form because a low relative amount of complementary assets and a low level of relatedness of those assets lead to a high risk, even when time becomes infinitely large. Industry age, t, thus directly affects risk, allowing it to decrease over time, but also indirectly affects risk (due to a decrease in the relative amount of complementary assets), forcing it to increase over time.

Inspired by the economics literature, we conceptualize performance as a risk adjusted dollar value where expected profit potential is linearly adjusted based on the probability of downside loss and a conversion factor, e, that transfers each unit of risk into a dollar value (and thus considers the strength of the tradeoff between profitability and risk in the performance function). Formally, $\underset{t \geq 0}{\mathrm{Max}} \{ \, p(t,s,a_t) - e\; r(t,s,a_t) \, \}$ represents a follower's objective function.

Optimal market entry time

Based on the assumptions justified above, the first and second order derivatives of the objective function with respect to *t* provide the necessary and sufficient conditions for optimality. An appendix establishes these conditions, along with formal proof of our prescriptions. A follower's optimal time for entry occurs at t^* (an explicit form for t^* cannot be provided unless functional forms for *p* and *g* are specified). Figure 1 displays two performance curves labeled *A* and *B*. Curve *A* represents the *reduction* in performance over time (formally, $-ege^{-ht}$) that is due to the direct effect of time on risk (i.e., the benefits to performance from reduced risk decrease over time because of the decreasing slope of the risk curve). Hence, the slope of curve *A* captures the marginal gain in performance that is due to the direct effect of time on risk. Curve *B* (we offer two such curves for later usage) represents over time the sum of the performance due to the direct effect of time on profit potential, and the indirect effects of time (a decrease in the relative amount of complementary assets) on profit potential and risk (formally, $p + g$). The slope of curve *B* thus captures the sum of the marginal loss in performance due to the direct effect of time on profit potential, and the marginal loss in performance due to the indirect effects of time on profit potential and risk.

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Insert Figure 1 about here
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An optimal time for followers to enter a new market is when their slopes for *A* and *B* are equal. Implicit in the functional forms of profit potential, risk, and relative amount of complementary assets are competitive interactions between pioneers and followers. As followers delay market entry, pioneers gain stronger positions which results in less profit potential for these followers. However, in addition to this direct effect of time delay on followers' competitive positions, there is an indirect effect of time delay from a decrease in followers' relative amounts of complementary assets. This again results in lower profit potential and higher risk, and hence lower performance for followers that delay entry. Followers' optimal time for market entry corresponds to a form of equilibrium between these competitive interactions and the benefit of reduced risk; specifically, this equilibrium occurs when the slopes of curves *A* and *B* are equal. If the slope for *A* exceeds (in absolute value) that for *B*, then this follower should delay entry; if the slope for *B* exceeds that for *A* (in absolute value), then this follower should have entered earlier.[2] Note that entry time relates to industry age: "sooner" means earlier in the industry's life; "later" means when the industry is older. Changes in key model parameters move curves *A* and/or *B*, and as these curves change so does the optimal entry time.

PRESCRIPTIONS FOR A FOLLOWER ON ITS OPTIMAL PERIOD OF DELAY

Sensitivity of the optimal market entry time

We demonstrate the impact of the characteristics of followers' complementary assets on the optimal time they should delay market entry. Specifically, we study the impact of *complementarity* and *substitutability* between followers' relative amounts of complementary assets and the relatedness of those assets. To this end, we must specify a set of functional forms for the dynamics of a follower's relative amount of complementary assets. Suppose that an exponent function where $a_t = a_0 - \alpha t^n$, $n \geq 1$, formally represents the latter. a_0 (assumed large enough to keep a_t non-negative) is a follower's relative amount of complementary assets if it had entered the market at the same time as the pioneer (i.e. at $t = 0$) and α the rate at which the amount of a follower's complementary assets advantage decreases

[2] A follower is unable to catch up to the pioneers, i.e. its optimal market entry time equals zero when the initial marginal <u>gain</u> in performance due to the direct effect of time on risk (the slope of *A* at $t = 0$) is smaller than or equal to the sum of the initial marginal <u>loss</u> in performance due to the direct effect of time on profit potential and the initial marginal <u>loss</u> in performance due to the indirect effects of time on profit potential and risk (the slope of *B* at $t = 0$).

over time.[3] We select an exponent function because by varying the value of the exponent n one can "swipe" an infinite set of possible curves, making empirical validity of this functional form more likely.

To gain insight into followers' optimal periods of delay, we explore the effects that an increase in their level of initial relative amount of complementary assets a_0 and level of relatedness of these complementary assets s have on their timing of entry. These effects depend on second order cross-derivative conditions on profit potential and on the portion of risk that depends on these characteristics, as displayed in the following prescriptions.

PRESCRIPTION 1. A follower with greater initial relative amount of complementary assets (a_0) should *enter the marker later* than followers with less initial complementary assets when the environment is such that the effect of a higher relative amount of complementary assets is to decrease the rate at which this follower's profit potential declines with industry age.

Figure 2a schematically illustrates the necessary condition in Prescription 1. Under this condition, those followers with a larger relative amount of complementary assets will experience a smaller loss in profitability due to industry maturity, encouraging them to enter the market later. This greater advantage over pioneers in terms of the amount of complementary assets "buys" a follower more time before the optimal time to enter the market, which, referring back to Figure 1, is reflected in the decreasing steepness of the slope for curve *B* where its slope does not equal that of curve *A* until later. But when followers face different levels of relatedness of their complementary assets, a larger initial relative amount of complementary assets may not necessarily correspond to a market delay: a higher initial relative amount of complementary assets might not compensate for a lower level of

[3] The chosen functional form satisfies the behavior we described and justified in the previous section.

relatedness. The following proposition articulates this possibility.

PRESCRIPTION 2. A follower with a higher level of complementary assets relatedness (*s*) should *enter the marker sooner* than followers with less relatedness when the environment is such that the effect of increased relatedness is to:

(i) increase the rate at which profit potential declines with industry age, and
(ii) increase the rate at which both profit potential increases and risk decreases with increases in the amount of complementary assets.

Figure 2b schematically illustrates the necessary conditions in Prescription 2. Under these conditions, followers with higher relatedness will experience a larger loss in profitability due to industry maturity. In addition, at any time period, they will experience a larger gain in profitability and a larger reduction in risk from their relative amount of complementary assets due to the *complementarity* between the latter and the relatedness of those assets. Consequently, they will be encouraged to enter the market earlier. Referring back to Figure 1, increasing the level of relatedness of a follower's complementary assets increases the steepness of the slope for curve *B*. This effect on curve *B* means that its slope equals the slope of curve *A* earlier.

Of particular interest in Prescription 2 is a tendency for a shorter delay with a higher level of relatedness of the complementary assets. At first this implication was surprising. We intuitively expected that highly related complementary assets – corresponding to a more advantageous situation – would "buy" a follower more time than if its assets were less related. But reference back to the model provided insight into this initially non-intuitive proposition. On this point, Prescription 3 is more intuitive.

PRESCRIPTION 3. A follower with a higher level of complementary asset relatedness (*s*) should *enter the marker later* than followers with less relatedness when the environment is such that the effect of increased relatedness is to:

(i) decrease the rate at which profit potential declines with industry age, and

(ii) decrease the rate at which both profit potential increases and risk decreases with increases in the amount of complementary assets.

Figure 2c schematically illustrates the necessary conditions in Prescription 3. Under these conditions, followers with higher relatedness will experience a smaller loss in profitability due to industry maturity. In addition, at any time period, they will experience a smaller gain in profitability and a smaller reduction in risk from their relative amount of complementary assets due to the *substitutability* between a follower's relative amount of complementary assets and the relatedness of those assets. Consequently, they will be encouraged to enter the market later as increasing the level of relatedness of a follower's complementary assets has the effect of decreasing the steepness of the slope for curve *B* which will equal the slope of curve *A* later.

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Insert Figure 2 about here

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An illustration of the market entry prescriptions

We illustrate our prescriptions by offering five "pairings" of followers with a pioneer based on their levels of initial relative amount of complementary assets a_0 and the extent of relatedness of these assets *s*. For each pairing the pioneer (in the red corner) can be labeled as a "Related Lightweight". The pioneer's opponent (in the blue corner) is one of the following followers:

1. **"Unrelated Heavyweight"**. A very high initial amount of complementary assets (relative to the pioneer) with those assets having low relatedness (relative to those of the pioneer) characterizes this follower. For example, the follower possesses a direct sales force 5 times larger than that of the

pioneer but the knowledge, skills, and experience of its sales force only marginally relate to the task of selling products in the new market whereas the pioneer's sales force highly relates to this task.

2. **"Related Heavyweight"**. A high initial amount of complementary assets with those assets being moderately related characterizes this follower. For example, the follower possesses a direct sales force 5 times larger than that of the pioneer and the knowledge, skills, and experience of the sales force are almost as highly tailored to the task of selling products in the new market as that of the pioneer's sales force.
3. **"Unrelated Welterweight"**. A moderately high initial amount of complementary assets with those assets having low relatedness characterizes this follower. For example, the follower possesses a direct sales force 50% larger than that of the pioneer and the knowledge, skills, and experience of its sales force only marginally relate to the task of selling products in the new market whereas the pioneer's sales force highly relates to the task.
4. **"Related Welterweight"**. A moderately high initial amount of complementary assets with those assets being moderately related characterizes this follower. For example, the follower possesses a direct sales force 50% larger than that of the pioneer and the knowledge, skills, and experience of the sales force are as highly tailored to the task of selling products in the new market as that of the pioneer's sales force.
5. **"Unrelated Lightweight"**. An initial amount of complementary assets comparable to the pioneer with those assets having low relatedness characterizes this follower. For example, the follower's direct sales force is the same size as the pioneer and the knowledge, skills, and experience of its sales force only marginally relate to the task of selling products in the new market whereas the pioneer's sales force highly relates to the task.

Prescription 1 yields the following conclusion: *unrelated heavyweight*'s delay > *unrelated welterweight*'s delay > *unrelated lightweight*'s delay and *related heavyweight*'s delay > *related welterweight*'s delay. Since these followers all face the same low level of relatedness, an unrelated heavyweight's delay exceeds that of an unrelated welterweight, which exceeds that of an unrelated lightweight. Likewise for those that face the same moderate level of relatedness, a related heavyweight's delay exceeds that of a related welterweight.

Prescriptions 1 and 2 yield the following conclusion diagrammatically illustrated in Figure 3a: *unrelated heavyweight*'s delay > *related heavyweight*'s delay > *related welterweight*'s delay and *unrelated heavyweight*'s delay > *unrelated welterweight*'s delay > *related welterweight*'s delay (*related heavyweight*'s delay could be > or < *unrelated welterweight*'s delay whereas *unrelated lightweight*'s delay could be anywhere but > *unrelated heavyweight*'s delay). An unrelated heavyweight's delay exceeds that of a related heavyweight because, although both followers possess the same initial amount of complementary assets, the former possesses complementary assets that are less related (hence a smaller loss in profitability due to industry maturity, but also at any time period a smaller gain in profitability and reduction in risk from these assets). In turn a related heavyweight's delay exceeds that of a related welterweight because, although they face the same moderate level of relatedness for their complementary assets, the initial amount of complementary assets is higher for a related heavyweight, allowing it to further delay market entry (Prescription 1). Moreover, an unrelated heavyweight's delay exceeds that of an unrelated welterweight because, although they possess the same low level of relatedness, the former possesses a larger initial amount of complementary assets (hence, from Prescription 1, a smaller loss in profitability due to industry maturity). In turn an unrelated welterweight's delay exceeds that of a related welterweight because, although they face the same moderately high relative amount of complementary assets, the former has a lower level of relatedness of these assets (hence a smaller loss in profitability due to industry maturity, but also at any time period a smaller gain in profitability and reduction in risk from these assets) allowing it to delay entry.

Last, Prescriptions 1 and 3 yield the following conclusion diagrammatically illustrated in Figure

3b: *related heavyweight*'s delay > *related welterweight*'s delay > *unrelated welterweight*'s delay > *unrelated lightweight*'s delay (*unrelated heavyweight*'s delay is between that of *unrelated welterweight* and *related heavyweight* but could be > or < *related welterweight*'s delay). As in the previous conclusion, a related heavyweight's delay exceeds that of a related welterweight. But unlike the previous conclusion, a related welterweight's delay exceeds that of an unrelated welterweight because, although they face the same moderately high relative amount of complementary assets, the former possesses a higher level of relatedness of these assets (hence a smaller loss in profitability due to industry maturity, but also at any time period a smaller gain in profitability and a smaller reduction in risk from these assets) allowing it to delay entry. Also (from Prescription 1), an unrelated welterweight's delay exceeds that of an unrelated lightweight.

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Insert Figure 3 about here
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DISCUSSION

Contribution to the "timing of entry" literature

We explore how our prescriptions reflect, and complement, three highly relevant and impactful timing of entry studies: Mitchell [27], Thomas [41], and Schoenecker and Cooper [37]. Before initiating this discussion, we must point out differences in the conceptualization of performance. While Thomas [41] and Schoenecker and Cooper [37] did not have performance as a dependent variable, Mitchell [27] had two dependent variables for performance, i.e. market share and survival. We conceptualized performance as a combination of profitability and probability of downside loss. Although market share is sometimes used as a proxy for profitability [24] and survival has important implications for downside loss, the conceptualizations of performance are not the same and therefore results may be complementary but not directly comparable.

A number of findings in Mitchell [27] are particularly interesting and relevant to the current study. First, he finds that when considering the timing of all followers, later entry is associated with increased survival chances but among those entrants that possess specialized complementary assets, earlier entry is associated with increased survival. He suggests that this finding is consistent with the earlier entrants being able to "establish strong positions and knock out most laggards". Such a proposition assumes that all those firms that possess related complementary assets have the same amount of complementary assets and that these assets are at the same level of relatedness.

Although our model focuses on "catching" the pioneer rather than "knocking out" laggards, we propose that for those followers that possess a high initial relative amount of complementary assets, their timing of entry should depend on the relatedness of those assets. Interestingly, in environments where followers face *complementarity* between their relative amount of complementary assets and the relatedness of those assets, our model suggests that the more related their complementary assets, the earlier they should enter the market and begin chasing their pioneer (i.e. an unrelated heavyweight should delay market entry longer than a related heavyweight; Prescription 2). This reflects the fact that the moderating effect of higher relatedness of a follower's complementary assets on the relationship between the relative amount of complementary assets and performance is greater, earlier. It is in environments where followers face *substitutability* between their relative amount of complementary assets and the relatedness of those assets that the more related a follower's complementary assets, the later it should enter the market and begin chasing its pioneer (Prescription 3).

Second, Mitchell [27] discusses the appropriateness of his dual clock model under different environmental conditions. The first clock captures time of entry for all entrants regardless of whether they possess related complementary assets or not, and is proposed to be sufficient to assess the timing-performance relationship when pioneers' advantages are difficult to imitate, e.g., the pharmaceutical and chemical processes industry. He proposes that it is when imitation of pioneers is relatively easy that the possession of related complementary assets is relevant in the timing-performance relationship necessitating the use of a "second clock" for researchers to capture another aspect of entry time. Our model complements this notion that the role that followers' related complementary assets plays in the timing-performance relationship depends on the nature of the environment being entered. We acknowledge a number of environmental aspects and propose how they should impact entry time decision.

Third, Mitchell [27] found a positive relationship between later entry and lower market share for those with related assets, but by year nine, this relationship became negative. He uses this finding to highlight the problems of survivor bias in empirical investigations when failure is not accounted for. Empirical techniques, such as Heckman corrections ([16], [11]) can be used to correct for attrition, but conceptually one must consider possible tradeoffs between performance dimensions. In this article, we considered performance in terms of optimizing both profitability and probability of downside loss (risk) to provide a basis for decisions that were of particular relevance to strategists' in their decision making process [34].

Thomas [41] and Schoenecker and Cooper [37] empirically tested the impact of resources on entry time decisions. Thomas investigated order of entry in the ready-to-eat cereal industry and found that firms with a larger stock of brand capital were more likely to enter earlier a new market segment in that industry. The stock of brand capital was operationalized by the total number of cereal brands sold by the firm. Schoenecker and Cooper found that in the mini-computer segment, firms that possessed a direct sales force entered the new market earlier (nearly four years earlier than those that did not possess a direct sales force).

Our model also complements these findings. The brand capital of Thomas and the direct sales force of Schoenecker and Cooper can be considered related complementary assets, i.e., supporting capabilities that are tailored to the successful commercialization of a good in that market. Both these studies do not make a distinction between amounts of complementary assets and levels of relatedness of those assets (because it was not their purpose). We propose a possible tradeoff in entry incentives when a follower has both a large initial stock of complementary assets and those assets are highly related to the commercialization of products for the new market. We propose that for followers focusing on their position relative to pioneers, a larger initial stock of assets should encourage later entry whenever those followers with a larger relative amount of complementary assets will experience a smaller loss in profitability due to industry maturity (Prescription 1). Whereas the more related those assets the greater the pull should be to enter sooner in environments where followers face *complementarity* (as opposed to *substitutability*) between their relative amount of complementary assets and the relatedness of those assets (Prescriptions 2 and 3).

Future research

Empirical Testing

To empirically test our propositions, scholars must operationalize a follower's profit, risk, its relative amount of complementary assets, the extent of specialization of those assets, and the contribution of those complementary assets' characteristics to profit and risk. Profit is often operationalized by self-reported measures in survey research and from secondary sources of financial statements (such as annual reports of public companies and companies going public) in which net profit figures are stated. These are retrospective measures of profitability. Prospective measures can be achieved by expert assessments (e.g. [46]). Similarly, risk can be measured by an assessment of the chance of downside loss by an expert such as a venture capitalist (e.g. [38]).[4]

The strategic management literature offers a number of operationalizations for the characteristics of a firm's complementary assets, which are appropriate for testing our propositions. Relative amounts involve comparing a follower's stock of complementary assets with that of the pioneer. Examples of complementary assets include a direct sales force [37], skills and experience of individual employees, number and breadth of patents, cash and financial strength, and quality of the top management team as compared to those earlier entrants (adapted from [18]). In some cases objective measures can be obtained; in others subjective assessments are required. Extent of specialization of the complementary assets can be measured as the "fit" between a follower's assets and key success factors of an industry (although the *a priori* assessment of key success factors is typically difficult for a new industry). This concept of fit is similar to that discussed by Andrews [5] and researched by strategy scholars utilizing both an industrial organization and a resource-based perspective (e.g. [36]).

Model Extensions

In this article, we used an optimization model because such a model helps build theory and inform decision making. A decision-theoretic approach was used to prescribe among followers who

[4] Despite the importance of risk to strategy research, scholars are hampered by a lack of valid and reliable measures of

should enter earlier and who can afford to delay entry longer, emphasizing that every follower has its own individual clock to guide its entry decision. The entry of followers could also be investigated from the competitive dynamic between a pioneer and the entry of the second-mover. The strategic decision from the second-mover could stimulate a competitive reaction from the pioneer. A game-theoretic framework is well suited to capture the non-deterministic competitive behavior of these two firms. Such an equilibrium model would characterize how a pioneer's decision to delay entry be affected by its assessment of when other potential entrants might enter.

Conclusion

Based on our arguments and model implications, we offer three tentative conclusions. First, there may be a need to speed up a follower's market entry when environmental conditions change – e.g., in an environment where the effect of a higher relative amount of complementary assets is to decrease the rate at which followers' profit potential declines with industry age, followers who possess modest initial amounts of complementary assets would enter sooner than those who possess large amounts. Second, followers and the characteristics of their complementary assets differ such that their optimal time to delay market entry can be diminished or augmented, that is, the complementarity or substitutability of followers' relative amounts of complementary assets and the relatedness of those assets should influence the decision of when to enter a market. Third, there is much still to be learned about how long followers should delay market entry and this decision is critical to their performance.

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risk and suggest there is an opportunity for such measures to be developed ([34], [22]).

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APPENDIX: MATHEMATICAL DERIVATIONS

Optimal entry time. The 1st order derivative of the objective function $p(t,s,a_t) - e\, r(t,s,a_t)$ with respect to t is equal to zero (a necessary condition) when $e\,h\,g\,e^{-h\,t} = -\frac{\partial p}{\partial t} - \frac{da_t}{dt}\left(\frac{\partial p}{\partial a_t} + e\,\frac{\partial g}{\partial a_t}\right)$. The 2nd order derivative equals $\frac{\partial^2 p}{\partial t^2} + \left(\frac{da_t}{dt}\right)^2 \times \left(\frac{\partial^2 p}{\partial a_t^2} + e\,\frac{\partial^2 g}{\partial a_t^2}\right) + \left(\frac{d^2 a_t}{dt^2}\right) \times \left(\frac{\partial p}{\partial a_t} + e\,\frac{\partial g}{\partial a_t}\right) - e\,h^2 g\,e^{-h\,t}$, which is negative for any value of t, thus providing a sufficient condition for maximization. The optimal timing of entry occurs at t^* that solves the 1st order condition, as illustrated in Figure 1.

Proof of Proposition 1. We are interested in the effect on the optimal market entry time of a change in a follower's initial relative amount of complementary assets, a_0. Given that $a_t = a_0 - a t^n$ and the 1st order derivative is equivalent to $h_t = e\,h\,g\,e^{-h\,t} + \frac{\partial p}{\partial t} + \frac{da_t}{dt}\left(\frac{\partial p}{\partial a_t} + e\,\frac{\partial g}{\partial a_t}\right) = 0$, we obtain (comparative static analysis) $\frac{dt^*}{da_0} = -\frac{h_{ta_0}(t^*, a_0)}{h_{tt}(t^*, a_0)} = -\frac{1}{h_{tt}(t^*, a_0)} \cdot \left\{\frac{\partial^2 p}{\partial a_t \partial t} - a\; n t^{n-1}\left(\frac{\partial^2 p}{\partial a_t^2} + e\,\frac{\partial^2 g}{\partial a_t^2}\right)\right\}$, which is positive whenever $\frac{\partial^2 p}{\partial a_t \partial t} > 0$; $h_{tt}(t^*, a_0)$ is the 2nd order condition for optimality, which is negative at t^*. The cross-derivative necessary condition requires that the rate at which profit potential decreases as the industry ages be flatter when a follower possesses a larger relative amount of complementary assets.

Proof of Propositions 2 and 3. We are interested in the effect on the optimal market entry time of a change in the level of relatedness of a follower's complementary assets, s. As per the above proof, we obtain $\frac{dt^*}{ds} = -\frac{h_{ts}(t^*, s)}{h_{tt}(t^*, s)} = -\frac{1}{h_{tt}(t^*, s)} \cdot \left\{\frac{\partial^2 p}{\partial s \partial t} - a\; n t^{n-1}\left(\frac{\partial^2 p}{\partial s \partial a_t} + e\,\frac{\partial^2 g}{\partial s \partial a_t}\right)\right\}$, which is negative whenever $\frac{\partial^2 p}{\partial s \partial t} < 0$, $\frac{\partial^2 p}{\partial s \partial a_t} > 0$, and $\frac{\partial^2 g}{\partial s \partial a_t} > 0$ (Proposition 2). However, $\frac{dt^*}{ds}$ is positive whenever $\frac{\partial^2 p}{\partial s \partial t} > 0$, $\frac{\partial^2 p}{\partial s \partial a_t} < 0$, and $\frac{\partial^2 g}{\partial s \partial a_t} < 0$ (Proposition 3).

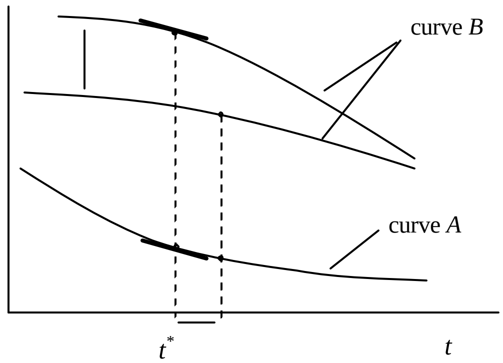
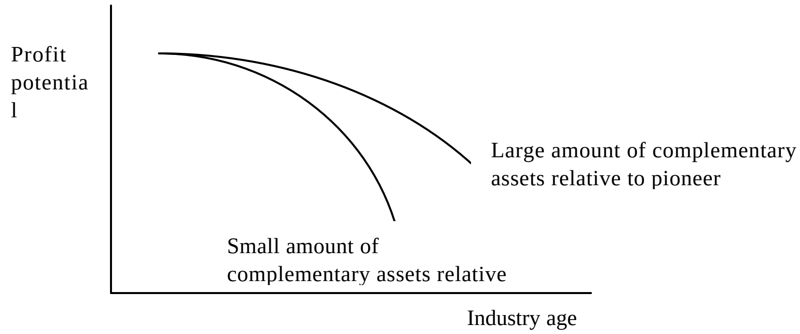
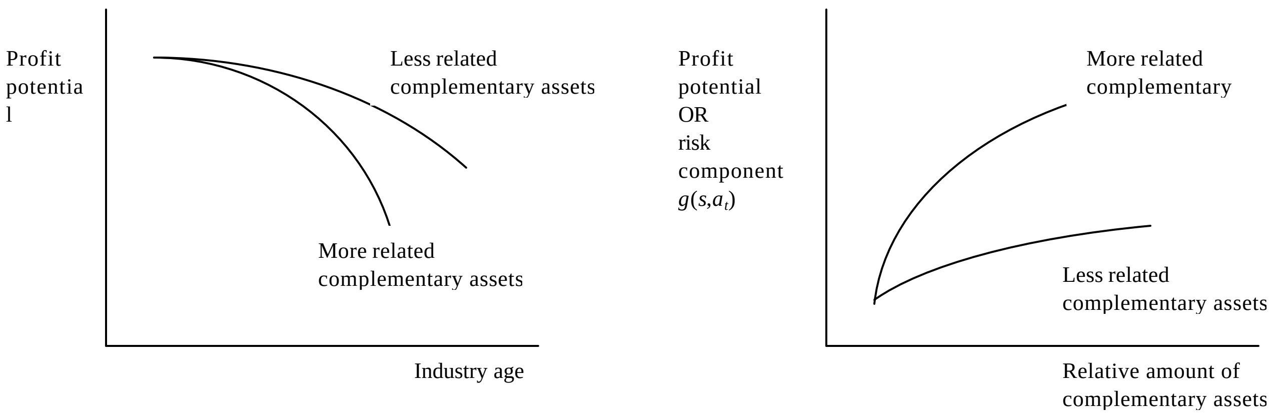


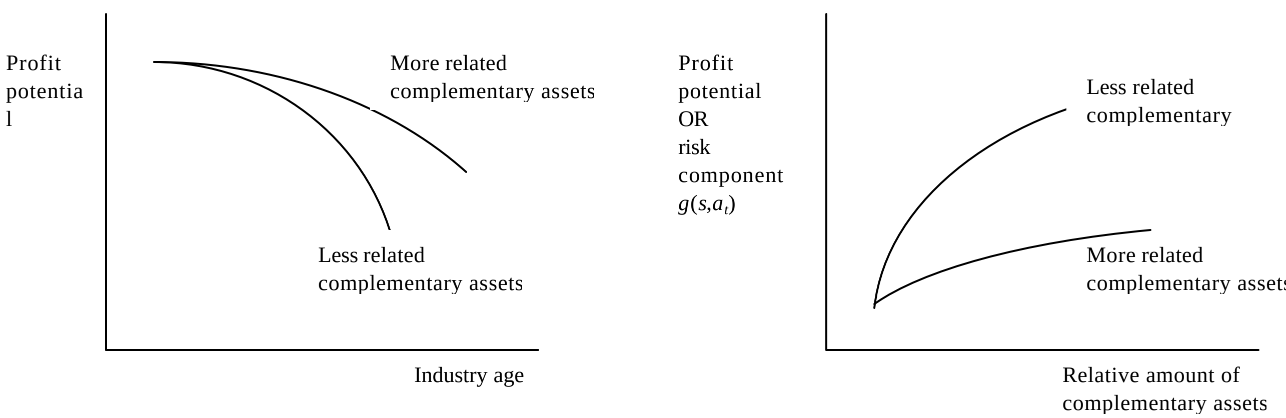
Figure 1. Performance curves A and B and some of their movements



(a) Prescription 1

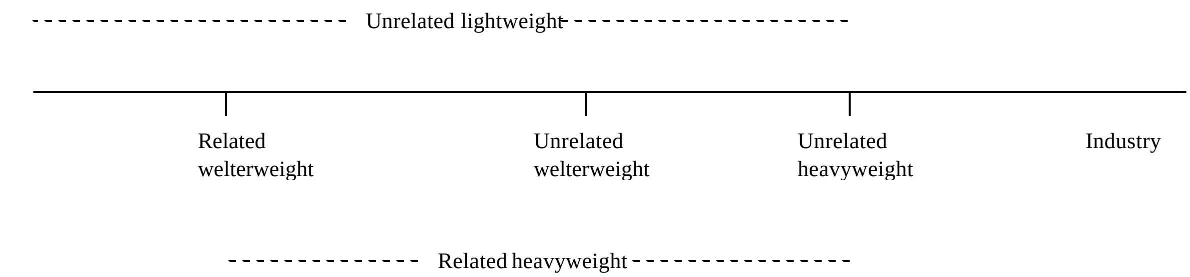


(b) Prescription 2

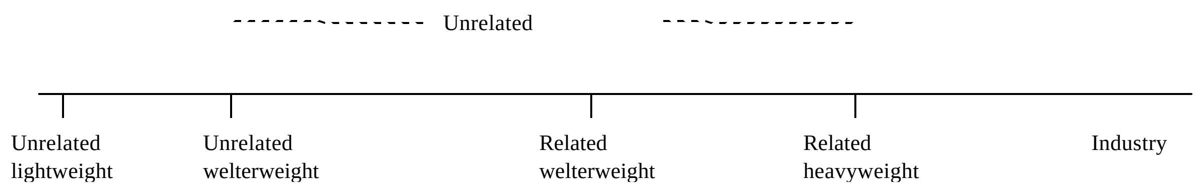


(c) Prescription 3

Figure 2. Sufficient environmental conditions for the market entry prescriptions



(a) with complementarity of the characteristics of a follower's complementary assets



(b) with substitutability of the characteristics of a follower's complementary assets

Figure 3. Ordering market entry times of the five pairings of followers with a Specialized Lightweight (the pioneer)