The Strategic Determinants of Tardy Entry: Is Timeliness Next to Godliness?

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THE STRATEGIC DETERMINANTS OF TARDY ENTRY

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Abstract. Previous research has considered extensively the causes and effects of market entry order and timing. It has neglected, however, the timeliness of such entry — the degree to which a firm delivered a new product on the date it had set for its release. In this article, we begin to fill the need for such research by evaluating some strategic explanations for why a firm might miss a scheduled entry date. We then test whether such "tardy entry" influences sales performance in the new market.

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INTRODUCTION

Timeliness can mean everything. Arrive 15 minutes late for a job interview and you are likely to walk away still unemployed. Complete a task after the deadline and you may be looking for a new job. Yet, despite its importance, timeliness in a business context — whether, for example, a firm delivers a new product in a timely or tardy manner — has been little studied by management scholars. In this article, we begin to address the need for such research by developing and testing a model of how strategic considerations might influence a firm's propensity to miss market entry schedules. We then explore the degree to which such tardy entry influences future sales performance.

The actual timing of entry into new markets has been the subject of extensive research. Many scholars have sought to explore when and where earlier or later entrants are more likely to gain a competitive advantage (Kerin et al. 1992). They have begun to reveal when entry timing or order influences future success. What they have not done is consider whether the actual time of entry was different from that originally scheduled or announced;[1] that is, whether the firm's observed entry was *tardy* or *timely*. Yet, there is reason to believe that timeliness as well as the actual timing of entry influences a firm's prospects (Hendricks and Singhal 1997). Timeliness or tardiness may reflect on a firm's propensity for honesty. It may also reveal information about a firm's operational abilities.

[1] For the sake of consistency, we refer to the first *announcement* date of the product as the "scheduled" entry date. If the firm actually *ships* the product on that date, the firm's entry is "timely." If the firm is delayed shipping the product relative to the announcement date (see below in the Methods section), we denote that "tardy entry."

Research on the timeliness of market entry could have considerable practical importance. Delivery of products significantly after originally scheduled release dates, what we will call *tardy entry*, has been observed in several industries. For example, in a study of software projects, Bayus, Jain, and Rao (1997), found that fully 47% of the projects were delayed by at least 3 months (Bayus et al. 1997). In the software industry, such delays have even gained a derogatory moniker: "vaporware." What may cause such tardiness? Is it that firms act strategically in setting schedules? Or, is it that they simply run into unexpected technological problems that require extensions in production times? In this article, we will emphasize analysis of some possible strategic explanations for why firms might be more or less likely to miss market entry schedules.

We will also consider some potential operational causes of tardy entry. We will consider how the propensity to be tardy in releasing products to new markets is influenced by a firm's technological experience, product attributes, and existing technological position. Each of these elements deserves dedicated theoretical and empirical analysis, and could themselves be the subject of focused research. In this article, however, we include these factors only as "controls." We hope to return to the operational determinants of tardy entry in later investigations.

One explanation for why tardy entry has been neglected in past research is that analysis of tardy entry entails significant data and methodological challenges (Wu et al. 2004). Most prosaically, such research requires scholars to measure both scheduled and actual entry, and this can be a considerable challenge when using archival data. More importantly, it requires the creation of econometric models for both entry schedules and tardiness. Finally, it requires consideration of endogenous choice among the models.

In this article, we use detailed information about scheduled and actual entry into the hard disk industry. Over 20 years, the *Disk / Trend Report* gathered information on every firm that planned or actually produced new disk drives. When these new disk drives were targeted toward a new "format size", they represent entry into a new product market (Christensen 1997). We develop a model of how firm and market attributes influenced a firm's scheduled time for releasing a product with these new format sizes. We then also develop a model for when firms tended to be tardy in meeting these schedules. Finally, we analyze whether tardy entry influences a firm's chances of success in the new market.

LITERATURE REVIEW

The nascent literature on tardy entry draws on both the entry timing and the "preannouncement" literatures. Entry timing, whether tardy or timely, has been the subject of considerable scholarly research. In general, results seem to suggest that early entry provides advantages, but that numerous tradeoffs, contingencies, and exceptions exist (Kerin et al. 1992; Lieberman and Montgomery 1998). Early entry is most valuable when markets exhibit increasing returns to scale (e.g., network externalities or economies of scale:Katz and Shapiro 1985; Klepper 1996). Moreover, the effect of early entry may differ across firm types. Incumbent firms with considerable complementary assets may be able to enter later in the development of a new market, and so avoid the inevitable mistakes that harm market pioneers (Christensen et al. 1998). Later entry may allow firms to avoid mistakes made by earlier entrants, and it may allow more efficient use of development resources (Lieberman and Montgomery 1998). Early entry may truncate the development of product features and force the firm to encapsulate less complete or polished technology in their product.

The "preannouncement" literature considers the benefits and costs of advanced announcement of a scheduled entry time (Robertson et al. 1995). In a fundamental paper, Farrell and Saloner (1986) argue that managers may use early scheduled entry to forestall competition or discourage customers from buying rival products (Farrell and Saloner 1986). Preannouncements, they argue, may signal an intention to aggressively compete with rivals and so prevent their entry. It may also create uncertainty about eventual winners of network externalities, and thereby cause customers to wait for a clearer indication about the emerging winner (Carpenter and Nakamoto 1989).

Of course, scheduling an entry date is also fraught with considerable risk. Eliashberg and Robertson (1988) argue that large firms may not (pre-)announce entry schedules or may provide more accurate announcements because of anti-trust concerns or because they fear cannibalization of existing products (Eliashberg and Robertson 1988). The threat of lost reputation may also prevent firms from announcing product delivery schedules. For example, delays in Microsoft's new operating system have harmed their reputation for reliability and technological excellence (Cooper 2006). Finally, uncertainty about technical aspects of new product development may make managers wary of announcing entry schedules.

A theory of tardy entry

Developing a strategic theory for tardiness requires considering both the benefits and costs of missing a scheduled entry. This in turn could be a function of the incentives to post a more aggressive entry schedule, the cost of meeting this schedule, and the penalty for being late. The emerging literature on tardy entry emphasizes first order effects (cf. Wu et al. 2004). For example, the propensity to schedule an earlier entry is thought to also increase the propensity to miss that schedule, and likewise, an increase in the cost of tardiness is thought to reduce its likelihood. A more accurate, but also much more complicated analysis would include the multiple reaction functions of managers, customers, competitors, and complementors in calculating a new equilibrium outcome. We wish eventually to perform such an analysis, but first we must begin to develop a basic understanding of tardiness. To do this, we will follow the existing literature in forming hypotheses based on a first-order analysis (fig. 1). We will, however, consider more complex reactions in our empirical analysis, and we will discuss the implication of our findings for future research.

******insert figure 1 about here*****

Tardiness as a function of entry schedule

Forestalling of Competitors. One of the principal articles of the initial literature on the predictors of tardy entry suggests that the incentive to forestall competition can explain tardy entry. Strategic models of forestalling entry generally argue that firms can prevent the entry of competitors by demonstrating that such entry will not be profitable (Milgrom and Roberts 1982). Firms can do this by demonstrating that should another firm attempt to enter the market, they will aggressively compete with them (Dixit 1980). For this reason, firms may invest in large production facilities that demonstrate that they plan to have the capacity to serve the majority of the market. They may also announce their plans to deliver a product at an early date. In so doing, they attempt to demonstrate the degree to which they are investing in long term returns from the market and so dissuade competitors from entering.

Firms may also wish to signal their strategic intent to customers and complementors by scheduling an early entry date (Robertson et al. 1995). When markets exhibit increasing returns, early entrants can gain an insurmountable competitive advantage. Once they recognize an emerging winner, customers and complementors often pile on and reinforce the increasing returns. If competitors can slow the development of these returns, they may be able to slow this process and gain a foothold. As demonstrated by Farrell and Saloner (1986), one way to do this is for the firm to schedule an early entry. By announcing an early date, firms may be trying to signal competitors that they will fight aggressively for market control. They may also be trying to sow confusion among customers about which firm will eventually dominate the market, and thereby dissuade customers and complementors from purchasing or specifying competing products.

H1: Firms with a larger share of existing markets will be more likely to set early entry schedules, and thus be more likely to be tardy in meeting these schedules.

Tardiness and cannibalization. Managers in technical industries often fear that new products will cannibalize existing ones. In a survey of managers from a wide range of industries, Eliashberg & Robertson (1988) report that the fear of cannibalization was an important factor of managerial decisions in deciding whether and when to schedule a product release. The main effect of this fear should be to reduce the tendency to schedule early release dates for new products, because this may cause customers to stop buying older models and instead wait for newer ones. Firms that risk cannibalization of existing products should wish to keep as short a window between the announcement of a new product and its delivery. This means that announced schedules will be more certain (because they will be more imminent in time), and that firms will be more exacting in delivering on schedule.

The risk of cannibalization increases for firms with greater sales in existing markets, because these firms stand to lose a greater number of current customers. Thus, we hypothesize that these firms will be less likely to miss product release schedules.

H2: Firms with a larger share of existing markets will be likely to set later entry schedules, and thus be less likely to be tardy in meeting these schedules.

It is important to note, that both elements of H2 directly contradict H1. Yet, the theoretical logic of the two hypotheses is not exclusive. Thus, confirmation of one hypothesis will not necessarily refute the logic of the other. Such a result could just reflect the size of influence of the two effects relative to each other.

Tardiness as a function of sanction costs

***Reputation costs from tardy entry*.** Tardy entry is likely to be more damaging for some firms than for others. Clearly, part of this financial penalty is caused simply by lost sales of the delayed product. In other cases, it represents harm to a firm's reputation for honesty and accuracy.

Firms often depend on their reputation to serve as evidence of the credibility of otherwise untestable performance claims (Kirmani and Rao 2000). For many technical products, performance cannot be verified through observation or specified in contracts (Kirmani and Rao 2000). Instead, exchange partners must rely on reputation or "relational assets" to act as guarantors of such unobservable claims (Baker et al. 2002). If after purchase, buyers determine that performance or quality claims have been false, they can refuse to purchase other products produced by the firm. Such sanctions can occur for future products or for other related products whose purchase the customer may forgo. The threat of these lost sales, evocatively called "the shadow of the future", prevents firms from making false claims now. This shadow is more threatening when the firm would lose more future sales.

H3a: Firms will be less likely to miss entry schedules if they produce other products in the same technical market.

Sanctions also exist across product types. Firms invest in a reputation for honesty and truthfulness (Kirmani and Rao 2000). This investment serves as a forfeitable bond that provides evidence of the truthfulness of unobserveable claims (Kirmani and Rao 2000). Should the firm renege on some promise, it reflects on all of the firms promises. Empirical evidence demonstrates that lost reputation in one domain often spills over to other markets (Mitchell 1989). Thus, we reason that firms will be less likely to miss product schedules if they also produce products in other markets.

H3b: Firms will be less likely to miss entry schedules if they produce products in other markets.

Prevailing norms

Theory suggests that the degree to which a firm is sanctioned for tardy entry will also depend on prevailing norms of behavior. In many cases, norms do not arise from an outside authority, but are instead the outcome of tradition and custom (Ingram and Silverman 2002). If the large majority of firms enter promptly at their scheduled time, then tardiness will be more severely sanctioned. Norms and sanctions can change dramatically over time (Ostrom 2000). For example, norms in advertising kept certain types of commercials off the air. These norms have gradually broken down as more aggregators and cable operators have begun to air ads once thought to be too risquée. We surmise that a similar process could also occur in truth telling about product schedules.

> *H4: The more common the occurrence of tardy entry in past market entry, the more likely firms will be tardy when entering future markets.*

RESEARCH METHOD

The disk drive industry provides an excellent opportunity to explore the determinants and consequences of tardiness in releasing products for new markets. From the late 70s to the late 90s, the industry underwent several major technological and market transitions. More than six new format sizes (the diameter of the spinning disk) were introduced — each considerably smaller than the previous one, and each serving a different type of customer at the beginning. For example, the 14-inch disk drive could initially be found in mainframe computers, the 8-inch in mini-computers, the 5.25-inch in workstations, the 3.5-inch in personal computers, the 2.5-inch drives in laptops, and smaller drives in MP3 players, watches, cell phones, and so on.

Data and Sample

Data on the disk drive industry were obtained from the *Disk/Trend Report* (*D/TR*), a reliable source of information for the industry. The report was compiled annually under the supervision of one person — James Porter — from 1976 to 1999. We used information on years from 1976 to 1995. To compile information on shipment schedules, we augmented and verified information from the *D/TR* with information from Lexis-Nexis.

The *D/TR* contains information on 208 firms that ever produced a disk drive. We constructed a cross-section data of firms announcing their market entry in a new format size (14, 8, 5.25, 3.5, 2.5 and 1.8-inch) between 1976 and 1995. We collected 235 observations. To calculate the independent variables used in our analysis, we needed to analyze the entry schedule and tardiness of firms that already produced a disk drive. Therefore, we excluded those firms that announced and shipped in one format size only, focusing our attention on firms that entered more than one market niche (n=117). Moreover, we also excluded firms that announced a new format size but never shipped one. We performed robustness checks by including them as illustrated in Appendix 1, but we did not find statistical differences that changed our ability to confirm (or fail to confirm) our hypotheses. The total sample consists of 109 observed market entries across 64 firms in 6 format sizes. The descriptive statistics and correlation matrix can be found in Tables 1 and 2.

***** Insert Tables 1 and 2 about here *****

Dependent Variables

To conduct our analysis, we must analyze models of the scheduled entry date and the propensity of the firm to be tardy in meeting this date. To understand the import of both scheduled and actual entry times, we analyze their effect on the firm's performance. Thus, we use three dependent variables in our study.

Scheduled Release Date captures the focal firm's announced entry schedule in comparison with other firm's scheduled entry for that particular format size (i.e. a new market). The variable is calculated as the scheduled date minus the average scheduled release date for that format size divided by the standard deviation. Thus, it represents the deviation of the firm's scheduled release date from other firms. Information on scheduled release came from the *D/T Report*[2] and Lexis/Nexis searches.

Tardy Entry captures whether there is at least a 1-month time lag between the announced release date and the actual ship date for a firm entering a new format size. The variable tardy entry takes the value of one when there is a delay between the scheduled and the actual shipment date and takes value of zero otherwise[3]. The length of delay is obtained by the *Disk/Trend Report* and by Lexis/Nexis articles on new format categories.[4]

For example, Syquest Technology was started in 1982 to manufacture disk drives for the personal computer market. The first shipment of fixed and removable disk drives was scheduled for mid-1982, with very large quantities planned for 1983 (Computerworld 1982; Porter 1982-1985). Technical problems with the drive compromised the plan and forced the firm to postpone the shipment until the end of 1983. During 1984, however, the firm was able to reach high volume production and a reliable drive. In this case, we code the scheduled entry date as July, 1982 and the actual release date as November, 1983.

We cross-checked information from the Disk Trend Report with Lexis/Nexis articles to obtain clear and reliable information. The average entry delay in whole sample (including the firms that were on time) is 3.5 months. The average entry delay increases to 10 months for only those firms that were tardy.

[2] Some of the product shipment dates are prior to the publication of *D/T Report*, others later. Therefore, one could consider the ones after the publication date as pre-announcements and the ones before the publication date as an indication of an effective shipment. However, the picture is more complicated than it seems. We checked each of the shipment dates in the following reports and in some cases in Lexis Nexis files, and we could not find such a systematic pattern. Many shipment dates reported before the report publication date were actually pre-announcements, because the actual shipment date was postponed. We could not find a trend of being late for the product being announced before the report was published in comparison with the ones announced later.

[3] To test the robustness of our analysis to other parameterizations of entry, we also estimate a model of the duration of entry delay. Results for this specification are found in Appendix 1.

[4] The *Disk/Trend Report* specifies the shipment date down to the month or occasionally quarter. When specified quarterly, we express the date as the second month of the quarter. For example, a scheduled entry date in the 2Q of 1985 is coded as April, 1985.

The *Average future sales* variable captures the firm's eventual success in the market category (disk diameter or format size). It is calculated as the log of the average future sales of each firm in each market divided by the number of years in which the firm produced a drive in that market.

Independent Variables

Market share. Our hypotheses 1 and 2 propose that firms with a larger share of existing markets will be more likely to try to forestall competition (1) or fear cannibalization (2). We operationalize "share of existing markets" as a continuous variable that captures the market share of the focal firm of all sales of the prior disk drive format size. This measure is heavily skewed to the left (most firms have only a small share). To test the robustness of our findings to other operationalizations of the variable, we also measured it as binary variable that capture the market share of the focal firm in the prior market or format size. This binary specification takes a value of 1 when market share is higher than 5% (*share_binary*).

*Product market exposure***.** Our second set of independent variables measure the potential disadvantages of tardy entry. We hypothesize that the more the firm sells products in numerous product markets, the more it will fear the reputational cost of tardy entry. We measure product market exposure with two binary variables: *de alio* and *entry niches*.

De alio identifies the nature of firm entrants. *De alio* producers are firms that diversify from other related markets. Those firms must maintain their reputation among customers in different markets, and the managers of these firms may fear that customers may interpret tardy entry as evidence of poor quality or technological expertise.

To measure the second aspect of product market exposure, *entry niches,* we simply count the number of format and size categories for which a firm produces a given disk drive in a given year. Inspection of the variable reveals that it is dramatically skewed to the left – most firms produce only a few drives, and a few produce a great number. To mitigate the potential for outliers to bias our results, we decided to use a binary measure in our analysis. This measure takes on a value of 0 if the firm produces fewer than the median value (6 drives) and 1 if the firm produces 6 or more drives. This variable captures the diversification of firms within the same industry.

*Prior lateness***.** Hypothesis 4 is based on theories that predict that norms concerning entry tardiness will influence future propensities to enter in a timely manner. We hypothesize that such norms will be influenced by observed behavior in previous market entry. We measure *prior lateness* as the percentage of firms that postponed their scheduled shipment in the previous market. For example, we use the percentage of firms that were tardy in entering the 8 inch format size to predict the propensity to be tardy in entering the 5.25 inch format size.

Control Variables

We also include in our econometric models variables that capture various facets of firm experience in product design, production, and sales. We also measure the firm's position relative to the existing technological frontier, and its reported technological ambition. We use these and other measures as control variables.

Design experience. Firm may miss entry schedules because they lack the experience to foresee the operational difficulties that may arise in new development efforts. We capture the degree to which a firm has had experience developing new products by counting the number of new designs that they have previously produced. We follow (Baum and Ingram 1998) in discounting these design occurrences by dividing by the time that has elapsed since the design. We then sum these discounted values. Finally, we create a deviation score for each firm in each year. The result is a measure of the degree to which the firm has recent design experience (as compared to other firms in that year).

Production and sales experience. We follow King and Tucci (2002) in creating our measure of the firm's production and sales experience. This measure represents the deviation in the sum of discounted sales for each firm in each year. It represents the degree to which any firm in a given year has recently produced a greater or smaller number of disk drives.

Technological Position. Firms attempting to create new products at the technological frontier are more likely to incur development problems and consequently they might need to reschedule the new product introduction time (Schoonhoven et al. 1990). We calculated the technological position of the focal firm related to other firms in the previous market following the Agarwal et al. (2004) method (*technological position*).

Technological Ambition. We also add a variable that captures the difference between the current and the previous technological position (*jump*). The bigger the difference in technological position, the greater the technological "jump" from the previous to the current format size.

We also measure managerial experience in the industry as a binary variable (*experienced founders*) as found by doing a content analysis of the initial report on the firm in the *D/TR*; and how long the firm has been in the industry as normalized deviation of time length (*age*). Finally, we control for firm nationality (*US*) and market (dummy variable for each format size).

Statistical method and models

We use three different statistical methods to test our hypotheses. We use a GLS regression to model the determinants of the scheduled entry date. Then we use a probit regression to examine tardy entry. Finally, to evaluate how early entry schedule and tardy entry affect performance, we use a 3-stage least squares model. The models and their dependent variables are illustrated below.

Scheduled Entry model. We use a generalized least square regression model to predict early entry schedule and test the first part of H1 and H2:

$$y_{ij} = \alpha + \boldsymbol{\beta} \mathbf{X}_{ij} + \varepsilon_{ij}$$

where y is a measure of the scheduled release date of the firm *i* in a new format category *j*. The vector $\mathbf{X}_{ij}$ represents the characteristics of the firm *i* or of its industry in the year before its entry into format j. Firm characteristics from the previous format size and in the previous year are likely to influence the scheduled release date in the new market. For example, the characteristics of a firm or its industry producing 8-in drives last year will influence the scheduled entry announcement in the 5.25-in market this year.

Since firms may enter more than one market or format category, our observations are not independent within groups (firms). We use White's robust specification to account for the correlation of the error terms within groups. This method calculates the standard errors for coefficient estimations by considering errors to be grouped by firm, and then calculates the group's contribution to variance estimates. Unlike other methods of grouping observations (e.g. fixed and random effects), this method does not allow each group to have a constrained or unconstrained intercept.

Tardy Entry model. To test the second part of H1 and H2 and the other hypotheses, we also model a firm's propensity to be tardy. Following previous research, we use a limited dependent variable to measure whether a firm has been tardy, and thus we employ a probit model to measure the determinants of tardiness.

$$P_{ij} (\lambda=1|z) = \Phi (\mathbf{Z}_{ij} \boldsymbol{\delta})$$

Where P_i is the probability of the firm *i* to postpone the scheduled release date λ, in which δ is the coefficient estimate for the probit model. The vector **Z** contains characteristics of the firm *i* before its entry into format *j* (such as *technological position, market share, design experience, entry niches and de alio*), characteristics of the firm *i* in the current format *j* (like *scheduled entry* and *jump,*) and industry characteristics in the year before its entry (*prior lateness*).

One of the elements of vector **Z** is the scheduled entry date, and this variable is itself the outcome of an endogenous choice process. To understand the role of such endogeneity, we use two different models. In one, we use an instrumental variable approach to attempt to eliminate the effect of factors that might simultaneously influence the choice of entry schedule and the propensity to be tardy. In the other, we test for the robustness of our findings by using the actual measurement of announcement schedule. The reason to have two models is given by the recent discussion among scholars on whether early or late market timing is an endogenous variable like other examples of strategic managerial choice (Boulding and Christen 2003). Managers make strategic decisions based on expectations of how their choices (whether to make or buy, to enter later or earlier) influence future performance. Therefore, some scholars argue, managers' decisions are endogenous to their expected outcomes[5] (Hamilton and Nickerson 2003). Until recently, the endogeneity problem was overlooked and, when addressed, its significance was often minimized (Shaver 1998). To guard against mistaken inference caused by such endogeneity, we first identified some instrumental variables that predicted market entry schedule, but did not predict tardiness. We then specified models using the predicted schedule. We present and discuss the results of models using both the actual scheduled and IV predicted schedule..

Performance model. Finally, we wish to understand whether tardiness influences the future success of the firm. Once again, we have endogenous variables. Both the firm's entry schedule and its tardiness may be a function of factors that also (and directly) influence performance. To help reduce problems associated with such endogeneity, we use a 3SLS as:

[5] If not, we may conclude that managerial decisions are randomly made.

$$\gamma_{ij} = \alpha + \theta y_{ij} + \theta\lambda_{ij} + \mu_i$$

where γ_{ij} is a measure of the future sales of the firm *i* in that market sector *j*, y_{ij} is the scheduled release date for firm *i* in sector *j*. We use an OLS model to predict this scheduled entry (as above)

$$y_{ij} = \alpha + \boldsymbol{\beta}'\mathbf{X}_{ij-1} + \varepsilon_{ij-1}$$

and we use a probit mode (as above) to predict the propensity to be tardy where λ_{ij} is the tardy entry function

$$P_{ij}(\lambda=1|z) = \Phi(\mathbf{Z}_{ij}\boldsymbol{\delta})$$

The 3SLS estimates systems of structural equations, where some of these equations include endogenous variables among exogenous ones. These endogenous variables (in our case, θy_{ij} and $\theta\lambda_{ij}$) are the dependent variables of other equations. The 3SLS involves three steps. First, it uses all the exogenous variables to generate the predicted or instrumented values of endogenous variables. Second, it estimates a cross-equation covariance matrix of disturbances. Third, it re-estimates again the model with the covariance matrix used as a weighting matrix to obtain new values of the parameters. If the covariance matrix of disturbances is consistent, there is an advantage in using 3SLS instead of a 2SLS because it obtains more efficient estimators (Wooldridge 2002). As robustness check, we have tested the system of equations with various 2SLS models and we did not find differences in sign and significance for the variables of interest.[6]

[6] To run the 2SLS method, first we calculated the predicted value of the Probit function as suggested by Wooldridge (2002: 623).

RESULTS

We report the results of our analyses in Table 3. First, we explore the effect of market share on entry schedule in each new format size. Beginning first with the control variables, we find evidence that the *age* of the firm has a significant influence on the entry schedule of the focal firm. Following King and Tucci (2002), we also include a measure of the firm's experience (*Production and sales experience)*, and consistent with their results, we find evidence that firms with more experience in previous format sizes were more likely to enter emerging disk drive markets.

***** Please insert Table 3 about here *****

To test the first part of Hypotheses 1 and 2, we test whether a measure of the firm's market share in existing disk drive formats influences their entry schedule. Model 1 in Table 3 shows that, ceteris paribus, firms with greater *Market share* in the previous format size are more likely to schedule a later date for entry into a new disk drive market. In support of Hypothesis 2 and in opposition to Hypothesis 1, we find statistical evidence that firms with greater market share are likely to schedule later entry dates. We believe, however, that this finding should be interpreted cautiously because it may depend on the specified functional form of *market share* and *production and sales experience*. To capture the effect of sales on experience, King & Tucci (2002) draw on the learning curve literature to propose that a firm's experience should follow a log discounted functional form of firm's sales, and we followed this convention in creating *production and sales experience*. *Market share* also derives from sales, and represents the firm's sales compared to that of others in the previous year. Because they are both transformations of previous sales, the two variables are correlated, and if one variable is removed from the model, the coefficient of the other is always negative. Thus, the strongest tendency appears to be that firms with greater sales are more likely to schedule earlier entry. We thereby interpret Model 1 to suggest that *given a particular parameter form for previous experience*, a firm with a larger market share will be more likely to schedule a later date. This result is consistent with Hypothesis 2, but also suggests the need for further robustness testing. As a first step, we dichotomized *Market share*, and we found consistent results (though the model fit was reduced).

To test the rest of Hypothesis 2 and our other hypotheses, we estimated two models of tardy entry. Model 2 represents an instrumental variable approach to solving the potential endogeneity of entry schedule. *Predicted scheduled entry* is an estimation using the coefficients from Model 1. Model 3 ignores the endogeneity issue and uses *scheduled entry.* As shown in both models, we find evidence that firms scheduling a late entry in the new format size are less likely to postpone their product introduction date. In other words, firms that announce earlier than their competitors are more likely to be tardy, rescheduling their first shipment in the new market. This provides some comfort that our "first order" development of our hypotheses may not be misplaced.

We find support for the second part of Hypothesis 2. Firms with larger *market share* are more likely to deliver their products on time. This effect is above and beyond that provided by the later schedule that firms with high market share tend to choose. In other words, as suggested by H2, larger firms both tend to schedule a late entry, *and* they tend to be less likely to miss this scheduled date.

Models 2 and 3 provide evidence to support Hypotheses 3a and 3b. Consistent with our expectation that firms with positions in other markets or larger positions in disk drives would fear the loss of reputation entailed by late entry, we find strong evidence that firms operating in more sectors of existing technical markets (*entry niches)* and producing products in other markets (*de alio*) are less likely to postpone their release date. We find no support for Hypothesis 4. We find no evidence that norms of behavior (*prior lateness*) in the previous market entry influences future "tardy behavior" in the industry.

With respect to operational control variables, we find that uncertainty in technological development may push managers to miss scheduled entry dates. Both *technological position* and *jump* have positive and significant influence on tardy entry. Thus, firms are more likely to be tardy in entering new markets if they currently employ more sophisticated technology or seek to do so in new markets.

Turning finally to our performance model, we find strong evidence that firms with later scheduled entry *and* those firms that were tardy in entry can expect fewer sales in these markets. Model 4 shows the result of a 3-stage least squares regression analysis. The 3SLS calculates what we are interested in: how two endogenous variables (*tardy entry, scheduled entry*) influence another endogenous variable (*average future sales*), in a system of three structural equations. The system includes three equations: the scheduled entry, the tardy entry and the performance equation. The model is calculated with the covariance matrix and with all the instrumented values in place of the endogenous variables. The results in Model 4 depict only one of the three equations: the performance equation (the one of interest). This equation shows, as regressors, the two instrumented values of the endogenous variables (*tardy entry, scheduled entry*) and a control variable (*experienced founders*).

DISCUSSION & CONCLUSIONS

Summary of Findings

In summary, we do not find support for the hypothesis that firms with a larger share of existing markets are more likely to schedule early entry into new markets to forestall competitors. Nor do we find that they are more likely to be tardy. On the contrary, we find support for our hypothesis (H2) that firms with a greater share of existing markets will tend to announce later entry and also to be on time. We find evidence for Hypotheses 3a and 3b that the fear of lost reputation or other sanctions may deter tardy entry among incumbents with greater exposure in similar or diversified markets. Yet, we find no evidence that the fear of such losses changed with the history of tardiness in the industry. We also form additional inferences from analysis of our control variables. Firms that are closer to the technological frontier, or seek to make a bigger technological leap, are more likely to be tardy. Finally, we find that tardiness has a performance effect: firms that are tardy relative to their own announcement date tend to perform poorly in the market.

Implications and Extensions

Existing research has considered extensively the determinants and effects of entry timing. Our research suggests that researchers should also consider the degree to which observed entry is tardy or timely relative to a firm's planned schedule. Indeed, highlighting distinctions between scheduled and observed entry represents one of the contributions of this article. Previous research has emphasized the degree to which firms *actually* ship products early or late relative to competitors. We believe research should also consider the degree to which firms *schedule* early or late relative to competitors, and the degree to which they are *timely* or *tardy* manner relative to their own schedule. In this paper, we are focusing on the early vs. late scheduled entry and timely vs. tardy entry relative to the scheduled entry.

There are both empirical and theoretical reasons why greater precision with respect to planned and observed entry may be important. Empirically, understanding this distinction may help resolve puzzles in the entry timing literature about whether early entry or late entry is beneficial. Several theories predict that there are benefits to entering early (Klepper 1996; Lieberman and Montgomery 1988). Yet, empirical research provides inconsistent results on the effect of early vs. late entry, despite many controls for network externalities, industry, competition, etc. We believe that some of these inconsistencies may be caused by measures that confound scheduled and actual shipment dates. In addition, our research suggests that models that only consider the scheduled entry date (which is the easiest measure to find and capture) may overlook a major moderator of the effect, which is timeliness relative to the firm's own schedule.

Our research also highlights the importance of reputational / relational assets in determining the actual entry schedule of the firm. In many economic models of entry preemption or credible commitment to future competition, the underlying assumption is that the scheduled entry announcement deters other entry without any reputational feedback for either future credibility or technological competence. In some sense, it is a two-period game in which by announcing an early schedule, the firm gains reputation as a "tough" player that scares off other firms in the next period. However, we see from our results that reputation as a tough player cuts both ways. If tardy entry is actually as bad for the firm as it appears, and customers take into consideration firm behavior in both related and upstream / downstream markets, then a rational decision might be to avoid the risk of possible penalties from tardy entry by foregoing the use of an entry announcement to forestall competitors.

Avenues for additional research may also be suggested by conflicts between our results and the nascent literature on tardy entry. For example, our results differ from those of Wu et al. (2004) with respect to potential fears of cannibalization. Although they form a similar hypothesis to our own (H2) concerning the effect of the fear of cannibalization on tardy entry, they report evidence that the fear of cannibalization in the computer hardware, software, and telecommunications sector triggers entry *tardiness*. In contrast to their empirical results, but consistent with the hypotheses of both articles, we find a strong effect in the opposite direction. The difference in the two findings may be due to our use of a model that also incorporates scheduled entry, while Wu et al. (2004) specify a simpler model that does not account for this complication.

Our research supports the conclusion of Wu et al. (2004) that operational factors are important in determining entry timeliness or tardiness, and buttresses their call for greater research to clarify the precise mechanisms of this effect. Results for our control variables are consistent with Wu et al. (2004), who proposed that uncertainty in product development can delay firms. We find that the closer the firm is to the technological frontier, the more likely it is to be tardy. But, this result raises additional questions. Why for example, doesn't the firm's experience with such innovative technology have a corresponding benefit of speeding future entry timeliness? One explanation may be that more sophisticated technological knowledge is harder to transfer to new development products. We hope to explore this conjecture in future research.

Finally, future research should go beyond an analysis of first-order effects and include more consideration of second-order or indirect effects. As mentioned in the literature review, a full analysis would consider the complicated reaction functions among managers, customers, and competitors. Although our research provides some evidence that first-order models can explain some observed behavior, we believe that a more formal equilibrium model should be the ultimate reference against which empirical analyses are compared.

Limitations

Our research has several limitations. Two relate to the measurement of important variables used in our analysis. First, as we discuss above, our results may depend on the particular parametric form chosen to measure experience and market share. We use accepted and established parametric forms in creating our measures, but we believe that additional robustness tests are in order. Second, our measure of tardy entry may be confounded with a firm's preannouncement decision. When a firm schedules an entry date, this is, by definition, an example of "pre-announcing" (i.e., the product was not ready at the time the announcement was made). Theory suggests that the date of the pre-announcement as well as the date scheduled for shipment may both effect future performance. In future work, we plan to capture both dates in our analysis.

As mentioned in the literature review, our analysis makes it impossible to support both H1 and H2. Yet, both effects could be in force at the same time. To allow for both effects, we could perform an analysis that includes temporal information about the entry announcements of other firms. By evaluating the effect of such announcements, it should be possible to determine how a focal firm changes its strategy, and thereby tease out forestalling incentives from fears of cannibalization.

The construction of our sample also limits our ability to draw general conclusions from our results. Because we need to include measures of existing characteristics, we must exclude from our analysis data on the first market entry of firms diversifying into the industry and the first product of startup firms. We hope to be able to include these data in future analysis, though the measurement and econometric problems are daunting.

Finally, we plan to test the robustness of our findings to different parametric forms for our measure of tardiness. In the current analysis, tardiness of entry is a dichotomous variable. While this approach for entry timing is common in the literature, the actual continuous time calculation of tardiness might be preferable. There are several econometric issues involved in using such a specification (e.g. right-censoring of the data). In appendix 1, we start to address these issues.

In conclusion, we begin to fill the need for empirical and theoretical research on market entry *timeliness*. While a large and flourishing literature considers entry timing and entry order, little attention has been given to whether this entry matches the firm's planned schedule. To begin to fill the need for theory, we draw on the strategic literature concerning entry forestalling, cannibalization, and the credible communication of unobservable characteristics. We find evidence that some of these strategic considerations influence the propensity for firms to be timely or tardy. We also find evidence that a firm's technological position and aspirations influence entry tardiness. Finally, we find evidence that both entry timing and the timeliness of this entry affect future sales performance. In total our research begins to address a gap in the literature, suggests how it might be filled, and clarifies how such research might extend understanding of how firms use both scheduled and actual entry timing to gain competitive advantage.

Appendix 1

The right censoring of data

In the discussion section, we consider a number of limitations of the current study. One potential issue is that we parameterize tardiness as a dichotomous variable. Clearly, a complete analysis of the robustness of our findings should include an analysis of the duration of the delay, not simply its existence. Evaluating the duration of delay raises a statistical difficulty, because it forces us to consider the issue of right censoring and the meaning of "failed" entry. First, we will discuss the right censoring issue.

Right censoring occurs when a firm schedules an entry in a new format size, but never ships a product during the period of the study. Such failed entry may occur because the firm fails or is acquired before it can actually enter, or because time runs out on our panel. In the above analysis, the cases were not included because their actual entry is never observed. These cases also prevent us from using a regression analysis to estimate the duration of delay, because the delay is unobserved for these firms. To allow the use of this censored data, we transform our cross-section dataset into a panel data-set and employ an accelerated failure-time analysis.

The "failure" variable is *market entry* that takes value 0 on the first month the firm scheduled an entry in a new market sector. The variable is equal to 0 for every month of delay. It turns 1 when the drive is actually shipped. If the firm is timely in shipping the drive, the variable takes value 1 on the month the firm scheduled (and consequently shipped) the product, since the scheduled entry date and the shipment date coincide. When firm scheduled their market entry, but never shipped the drive, the variable takes value 0 till the firm exits the industry or the end of the period study is reached.

Accelerated failure-time regression Model

To test H1 and H2 and address the right censoring issue, we use the accelerated failure-time regression (AFT) model. The AFT model is suitable for right censoring data, because it allows estimation of the effect of censored observations. The model is specified as:

$$\text{Log } t_{ij} = \beta \mathbf{X}_{ij} + z_{ij}$$

Where the log t_{ij} is the natural logarithm of the scheduled-tardy entry time, $\mathbf{X}_{ij}$ is a vector of covariates of the firm i in the market j, β is a vector of regression coefficients, and z_{ij} is the error term, whose distribution form determines the regression model. The AFT assumes that the timing of the event is distributed according to a parametric baseline distribution (in this case the time length between the scheduled entry and the shipment date), which could have different shapes (Cleves et al. 2004). A positive β accelerates the baseline distribution of the event time implying an increase in the expected waiting time for failure – the time length between the scheduled entry and the shipment entry increases. A negative β means that the same time length tends to decrease, since the scheduled entry date and the shipment entry date tend to converge.

Accelerated failure time requires the specification of a distribution, but how to select it? The log likelihood-ratio, the Wald tests and the Akaike information criterion can be used to discriminate the appropriate parametric model (Cleves et al. 2004). In our case, the exponential distribution provides a better fitting model, and the Wald test suggests that it is the better distribution to use.

Unfortunately, our failure time analysis raises another problem, because 8 firms fail to ever enter a new market – even after a delay of more than 10 years. Surely, at some point during this time period, the firm stops being at risk to deliver the originally scheduled product. Nor do the competitive forces and observer expectations that we evaluate in our analysis continue to be in effect. That is, we don't expect stakeholders to think: "Firm X's drive is 6 years late, maybe it will be released tomorrow."

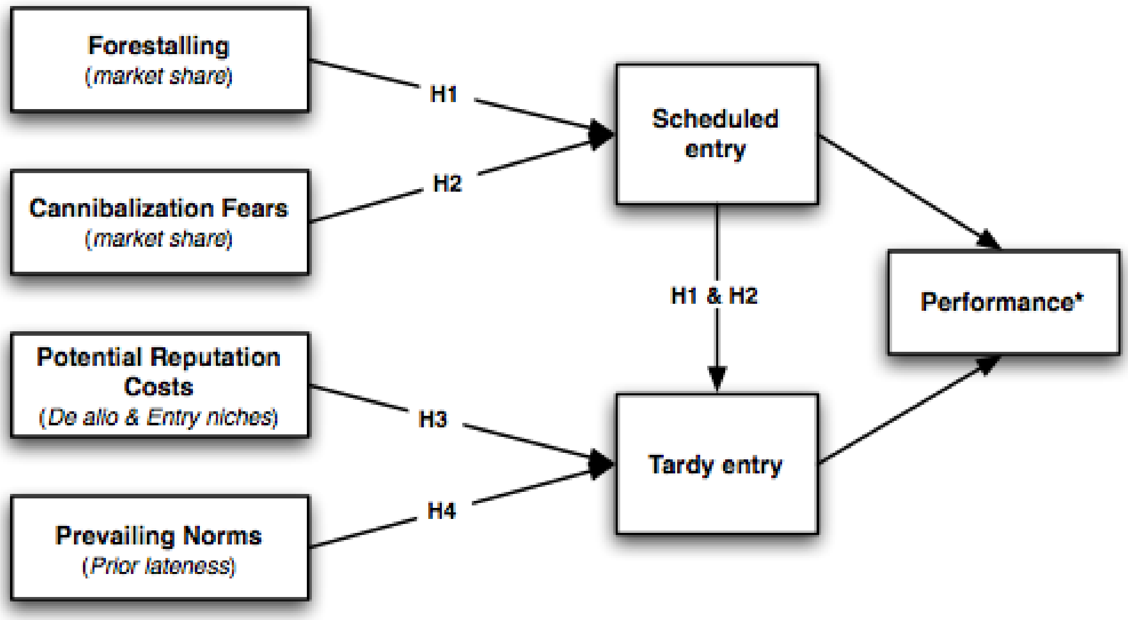
In the models presented below, we do not limit the effect of these extended delays, but we tested to see if these firms might influence our results. To do this, we created a maximum time window per format size for those firms that eventually shipped. This value as set at 125%, 150%, 175% and 200% of the longest observed delay. Results from these specifications, do not differ in sign and significance from the results reported in model 2 and 3.

***** Insert table 4 about here *****

In Table 4, we display the new duration models (Model 1 to Model 3). Model 1 uses the same sample as that used in Table 3 (i.e. it continues to use the censored sample) and confirms that our results from the cross section are not sensitive to the use of the binary variable for tardiness. Model 2 and 3 (correcting for and ignoring the endogeneity of the scheduled entry variable) illustrate the full sample, where observations of firms that never shipped in specific format are included. We find consistent inference for variables of interest like *market share*, *de alio* and *entry niches*, which remain negative and significant as in the previous models. Unlike the results reported earlier, however, coefficients for the predicted and the actual value of scheduled entry variable are no longer statistically significant, though they maintain their negative sign.

Interestingly, across all of the duration models, we do not find significant effects of the operational variables on the time window. The firm's technological position or technical ambitions for the new product do not significantly predict the length of delay (though as reported earlier they do predict the existence of some delay). In future research, we plan to investigate the source of these differences.

Figure 1: the theoretical framework



*Performance may also be directly effected by independent variables (e.g. existing market share)

Table 1: Statistics

Variable	Description	Obs	Mean	S.D.	Min	Max
Tardy entry	Dummy=1 if firm is tardy in entering new market	109	0.33	0.47	0	1
Scheduled entry	Deviation of scheduled release date	109	-0.13	0.84	-1.44	2.29
future sales	log average of future sales in the format size	109	2.23	2.52	0.05	8.60
Market share	Market share in the previous format size (%)	109	0.05	0.10	0.00	0.50
De alio	Dummy=1 if produces in related markets	109	0.69	0.47	0	1
Niches	Dummy=1 if the number of format and size categories in a given year >6	109	0.38	0.49	0	1
prior lateness	Firms that postponed their scheduled shipment in the previous market (%)	109	0.53	0.32	0	1
Design experience	Deviation of discounted number of prior capacity categories across all drive sizes	109	1.53	1.36	-0.83	5.18
Sales experience	Deviation of discounted sales experience for each firm in the previous year	109	0.34	1.15	-0.98	3.59
Technological position	technological position in the previous format size	109	0.59	0.39	0.02	1
Jump	Difference between the current technological position and the one in the previous format size	109	-0.17	0.44	-0.98	0.87
Managerial experience	Dummy =1 if management is industry expert	109	0.23	0.42	0	1
Age	Deviation of time period in the industry in any format size	109	4.69	4.06	-1.30	16
us	Dummy=1 if US	109	0.54	0.50	0	1

Table 2: Correlation matrix

	variable	1	2	3	4	5	6	7	8	9	10	11
1	Market share	1										
2	De alio	-0.17	1									
3	Niches	0.10	0.15	1								
4	prior lateness	0.03	0.00	-0.03	1							
5	Design experience	0.13	0.27	0.65	0.13	1						
6	Sales experience	0.52	-0.19	0.38	0.08	0.48	1					
7	Technological position	0.10	0.08	0.14	0.38	0.32	0.10	1				
8	Jump	-0.06	-0.16	-0.07	-0.09	-0.05	-0.05	-0.63	1			
9	Managerial experience	0.23	-0.76	-0.02	-0.05	-0.26	0.21	-0.12	0.19	1		
10	Age	0.02	0.00	0.52	0.02	0.50	0.29	0.09	0.09	0.01	1	
11	us	0.27	-0.38	0.03	-0.04	-0.11	0.32	0.13	-0.13	0.41	0.01	1

Table 3: the models (N=109 with 64 clusters)

	Entry schedule model	Tardy Entry Model (correcting for endogeneity)	Tardy Entry Model (ignoring endogeneity)	Performance Model† (3SLS)
Dependent variable	Scheduled entry date	Tardy entry	Tardy entry	Average future sales
Independent variable (read down)	1	2	3	4
Scheduled entry			-0.48**	
			(-2.39)	
Predicted scheduled entry		-0.92**		-1.81***
		(-2.18)		(-3.64)
Predicted Tardy entry				-5.07***
				(-4.63)
Market share	2.91***	-9.98**	-8.10***	
	(5.35)	(-2.54)	(-2.89)	
de alio		-1.0***	-0.98***	
		(-3.17)	(-3.09)	
Niches		-0.85**	-0.87**	
		(-1.99)	(-2.13)	
Prior lateness		0.31	0.27	
		(0.68)	(0.58)	
Design experience		-0.01	-0.03	
		(-0.07)	(-0.16)	
Production and sales experience	-0.41***			
	(-5.59)			
Technological position	0.36*	1.45**	1.22**	
	(1.78)	(2.38)	(2.15)	
Jump		0.73**	0.66**	
		(2.22)	(2.18)	
Experienced founders				2.39***
				(4.26)
Age	0.08***			
	(3.34)			
US		-0.50	-0.27	
		(-1.55)	(-0.82)	
Constant	-0.72***	-0.02	0.07	4.02***
	(-4.33)	(-0.04)	(0.15)	(8.04)
Market dummies	No	No	No	Yes
F/ c^2	10.53***	33.35***	37.57***	59.65***
Likelihood-ratio		-50.28	-49.60	

†Only the performance equation is displayed here.

p* < 0.10, p** < 0.05, p*** < 0.01, two-tailed tests, the t-statistics are in parentheses

Table 4. Duration models

	duration models♣ correcting endogeneity	duration models♣ correcting endogeneity	duration models♣ ignoring endogeneity
Dependent variable	Market entry	Market entry	Market entry
Independent variable	Restricted sample actual shipment only	Full sample	Full sample
(read down)	1	2	3
Scheduled entry			-0.17
			(-0.91)
Predicted scheduled entry	-0.54**	0.20	
	(-2.28)	(0.62)	
Predicted Tardy entry			
de alio	-0.54**	-0.67***	-0.67***
	(-2.38)	(-2.71)	(-2.60)
Niches	-1.11***	-1.21***	-1.21***
	(-3.68)	(-4.19)	(-4.03)
Prior lateness	0.33	-0.11	-0.72
	(0.81)	(-0.02)	(-0.14)
Market share	-2.78***	-3.38***	-3.36***
	(-4.87)	(-3.72)	(-4.02)
Design experience	0.09	0.56	0.05
	(0.82)	(0.46)	(0.39)
Production and sales experience			
Technological position	0.55	0.78	0.08
	(1.08)	(0.15)	(0.18)
Jump	0.43	0.22	0.18
	(1.25)	(0.68)	(0.57)
Experienced founders			
Age			
US	0.08	0.27	0.32
	(0.35)	(1.08)	(1.36)
Constant	1.16***	1.75***	1.76***
	(3.16)	(4.57)	(4.56)
Market dummies	Yes	Yes	Yes
F/ c^2	177.39***	216.49***	217.62***
Llikelihood-Ratio	284.52	253.81	254.21
Observations	463	620	620
Clusters	64	66	66
No of subjects	109	117	117
No. Of failures	109	109	109
Time at risk	463	620	620

†Only the performance equation is displayed here.

♣Negative accelerated event-time coefficients in column 1, 2 and 3 indicates a shorter time lag between scheduled and shipment date

p* < 0.10, p** < 0.05, p*** < 0.01, two-tailed tests, the t-statistics are in parentheses

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