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DE NOVO VENTURE STRATEGY: ARCH INCUMBENCY AT INAUGURAL ENTRY

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By definition, de novo *industry ventures do not share many market-contact points with incumbents—itself an important source of competitive 'stability' through mutual forbearance. As such, these ventures are often subject to aggressive retaliation at the outset, which could threaten their very survival. In this study, the notion of an arch incumbent is developed, hypothesizing that, in general, a large market overlap with an incumbent lowers the survival odds of a* de novo *entrant. However, a large market overlap with the arch incumbent combined with an aggressive inaugural market entry or a different market positioning reduces the probability of retaliation by the arch incumbent (and subsequently other incumbents as well), and hence increases the probability of survival for a* de novo *entrant. The empirical experience of* de novo *ventures in the intra-European passenger airline industry supports these hypotheses.* Copyright © 2009 John Wiley & Sons, Ltd.

INTRODUCTION

Every major company was at one point in its corporate lineage a *de novo* (new) venture, yet the various factors influencing its early survival are not well understood. Subject to a combination of financial constraints and market selection forces (Cabral and Mata, 2003), only a small fraction of the large number of new ventures survive and grow beyond anonymity. As described by Geroski (1991: 436), 'small-scale, *de novo* entry seems to be relatively common in most industries, but these small-scale, *de novo* ventures generally have a rather short life expectancy.' In other words, 'entry appears to be relatively easy, but survival is not' (Geroski, 1991: 436).

Keywords: new venture strategy; entry deterrent; arch incumbent; airline industry
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Estimates of new venture survival have not been encouraging: 40 percent are thought to fail within their first year (Timmons, 1990), 53 percent close within four years of operation (Phillips and Kirchhoff, 1989), and fewer than half survive their fifth anniversary (Dunne, Roberts, and Samuelson, 1989). This study seeks to extend extant theories on competitive strategy to understand how a *de novo* venture—one with no previous history in an industry—can enhance its survival odds in its critical early years by carefully positioning itself vis-à-vis its arch incumbent.

To understand the survival of new ventures, researchers are required to trade off between fine-grained, in-depth analyses on a small number of firms, and highly abstracted studies based on large, exhaustive surveys. Because of the small survival odds of new ventures in general, studies that are based on large, exhaustive censuses of all new ventures can dramatically reduce survivorship biases that may occur in data compiled from

voluntary company surveys (e.g., Profit Impact of Market Strategy, or PIMS database). The prognosis from several large-scale studies for new ventures is quite gloomy: new ventures face many hurdles to establish their legitimacy in the market, including entry retaliatory measures by incumbents. These obstacles have been crystallized in the concepts of liabilities of newness (e.g., Stinchcombe, 1965; Singh, Tucker, and House, 1986) and adolescence (Levinthal and Fichman, 1988; Brüderl and Schüssler, 1990).

Including an exhaustive list of new ventures within a region or country in a single study necessitates a high level of abstraction in terms of firm-level data. For instance, in large, exhaustive surveys from governmental censuses or registration-based sources, the firm-specific variables may be restricted to firm size (by employee counts or total sales), year in existence, and derivative measures of the two (e.g., Dunne *et al*., 1989; Audretsch, 1995; Mata, Portugal, and Guimarães, 1995). While one may still be able to obtain some firm-specific information such as broad strategic positioning (e.g., Durand and Coeurderoy, 2001), the views expressed are generally restricted from the focal firm itself, making it difficult to eliminate survivorship and/or recollection biases.

To maximize the fine-grained detail of each venture in the analysis, some scholars turn to in-depth surveys of a small number of ventures (e.g., Venkataraman *et al*., 1990). This type of study, popular in the entrepreneurship literature, has linked certain personality types or management team composition with venture strategy and eventual success (e.g., Begley and Boyd, 1987; Eisenhardt and Schoonhoven, 1990; Ciavarella *et al*., 2004). While these studies have been enormously instructive and insightful at the managerial level, they have revealed few insights linking new venture strategy (vis-à-vis direct competitors) with sustained survival.

Scholars have increasingly used industry-wide studies to provide more insights on both new venture survival and competition among established firms while minimizing survivorship biases. The industry-wide approach allows researchers to study the rise and fall of firms subject to longer-term industry cycles or technological revolutions (e.g., Agarwal and Audretsch, 2001). Among established incumbents in the same industry, the literature on competitive strategy has matured significantly over the past decade or so (e.g., Chen, 1996; Baum and Korn, 1996). In particular, multimarket contact was found to promote mutually tolerant behavior among potential rivals (Baum and Korn, 1999; Fuentelsaz and Gómez, 2006). The implication of this for new ventures is indeed grave: because of their lack of prior presence in multiple markets, *de novo* new ventures are more likely to be the targets of competitive actions taken by an incumbent than are other incumbents. This prediction is consistent with several empirical studies showing how entry barriers may be more severe for *de novo* ventures than for established firms (Gorecki, 1975; Hariharan and Brush, 1999).

In terms of industry-wide research on venture strategy, Eisenhardt and Schoonhoven's (1990) work on semiconductor firms and Wesson and de Figueiredo's (2001) report on microbreweries are closest with respect to the scope of this study. Eisenhardt and Schoonhoven's (1990) prime focus is the impact of the condition of the founding management team on the survival and growth of the new venture. Venture strategy is studied through the degree of technical innovation in a venture's product. While the firms surveyed in that study are all in the semiconductor industry, their exact products may differ—not every venture is competing with one another for the same customers. This contributes to the difficulty in translating firm-level visions to product-level strategies. Wesson and de Figueiredo's (2001) study of microbreweries ensures that the products of these mostly *de novo* ventures are, in theory, close substitutes to one another. However, as explained by the authors, the microbreweries are, in reality, not so much competing among themselves as they are competing against giant breweries. As such, their insights on venture strategy may be skewed.

When *de novo* ventures compete directly among themselves and with established incumbents, their competitive position vis-à-vis others becomes important in determining their overall survival. If a *de novo* venture chooses to enter markets in direct competition with a single incumbent, this 'arch incumbent' can launch coordinated retaliatory actions in all such markets with the goal of bankrupting the new venture and reducing the chance of other casual entries. Because of their far more limited financial resources, new ventures cannot afford sustained competitive actions from incumbents several times their size. Therefore, *de novo* ventures should pay attention to their respective incumbents and avoid eliciting competitive

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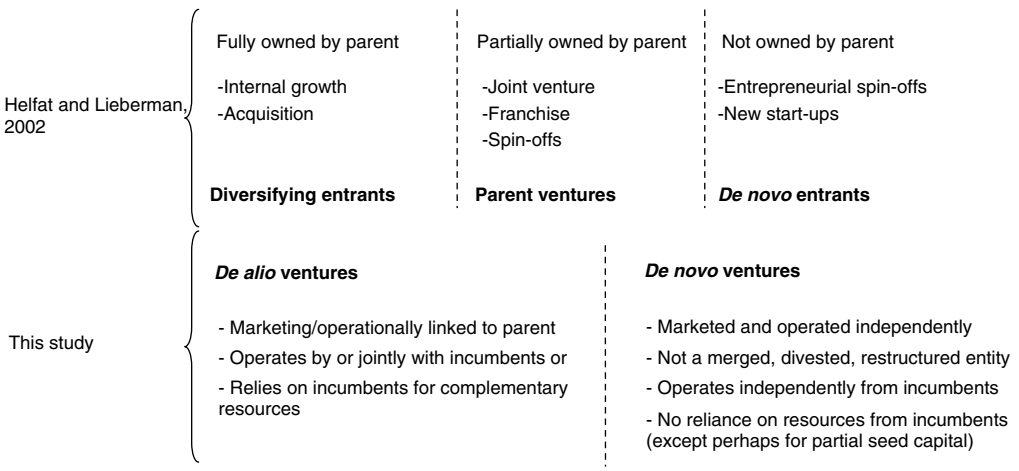

Figure 1. Comparison of definitions of *de novo* firms with Helfat and Lieberman (2002)

behavior from them, paying particular attention to the one incumbent with which it overlaps the most in terms of market coverage. If this 'arch incumbent' chooses to forbear the *de novo* venture, other incumbents with which the new venture also competes (but to lesser degrees) may also be inclined to follow suit, thereby improving the survival odds of the new venture. This concept of arch incumbency is developed in this research.

This study uses the intra-European scheduled passenger airline industry to empirically test the concept of 'arch incumbent.' This industry, unlike other technology-intensive industries, allows new entrants to have access to the aircraft and information technology which is comparable to that of established incumbents. Therefore, the influence of interfirm competition on venture survival should have greater influence here than in more technology-intensive industries. The significant deregulation of this industry in the 1990s stimulated the interest of many new ventures.

THEORY

In this study, a new or *de novo* venture is defined as a corporate entity that was formed to sell or trade products or services in a certain industry, that has no predecessor operating in this industry, and that markets and operates independently of other such corporate entities therein. Two companies are considered to be in the same industry if both have the regulatory approvals and technical expertise to produce substitutes to compete with each other at some point in time[1], even though they may not have done so historically and may have no intention to do so in the future. Note that this definition is stricter than simply applying industry classification codes.

Neither a subsidiary that is formed to serve a particular industry segment or is advertised as part of an incumbent through its distribution network, nor a divested, merged, or rebranded firm is considered a *de novo* venture. It is arguable whether a new subsidiary that is partly funded by an incumbent but operated and marketed independently should be considered a *de novo* venture if the products or services of the latter have not been offered before. The population surveyed for this study contains few such examples, and since the inclusion or exclusion of these few cases does not qualitatively change the results, they are considered to be *de novo*. This qualification is generally in line with what Helfat and Lieberman (2002) consider *de novo* entrants (see Figure 1 for comparison).

This study relies on three streams of research in the strategy literature to strengthen the theoretical understanding of how inaugural entry strategies impact the survivability of *de novo* ventures. The first stream is on interfirm competition, specifically about how the concept of mutual forbearance among established incumbents does not bode well for *de novo* ventures. By extending this research

[1] The phrase 'at some point in time' is included to allow for those companies with current patent protections for certain products or services to eventually face competition from their peers once the patent protection runs out.

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stream to *de novo* ventures, particularly to how these ventures can reduce the possibility of fierce competitive action unleashed by incumbents, the concept of arch incumbency is developed. The second stream of research concerns aggressive entry deterrence aimed at inaugural entries. While much of the literature on market entry is based on the experience of diversifying incumbents (e.g., PIMS database), there are important insights to be gained for new ventures. The third stream of research relates to market positioning. Combined with a large market overlap with an incumbent, a differential market positioning is hypothesized to deter entry retaliation and hence increase the survival odds of new ventures.

The concept of an arch incumbent

The focus of the first stream of literature, derived from research on interfirm competition, has evolved over the past decade or so from purely theoretical models (Simmel, 1950; Caves and Porter, 1977) to empirical studies (e.g. Evans and Kessides, 1994) that demonstrate how multimarket contact underpins mutually forbearing behavior among potential rivals (Baum and Korn, 1996; Fuentelsaz and Gómez, 2006). The appearance of competitive 'stability' rather than constant undercutting among competing rivals in the marketplace can be explained through the notions of competitive dyads (e.g., Baum and Korn, 1999) and a firm's spheres of influence (Gimeno, 1999). Essentially, the threat of retaliation deters competitors from casually initiating competitive actions against one another. These studies are consistent with observations made by applied economists that competitors do not pursue cutthroat price competition at all times (Brander and Zhang, 1990; Oum, Zhang, and Zhang, 1993).

The importance of mutual forbearance as a way to reduce the likelihood of cutthroat competition among firms does not bode well for new industry entrants. By definition, new industry entrants have no prior corporate history and operate independently of other such firms in the industry. As a consequence, the mutually forbearing behavior based on multimarket contacts does not work for these new ventures—at least not in the critical early years of post-entry operation. In fact, potential retaliatory actions by incumbents to *de novo* ventures is arguably more severe than for a new market entry by another incumbent, as the former represents both specific market entries by a new entrant *and* a new player at the industry level.

Previous studies have shown that incumbents reduce prices when other industry incumbents (Joskow, Werden, and Johnson, 1994; Windle and Dresner, 1995) or other diversifying incumbents in a related industry (Marion, 1998) enter their markets. *De novo* industry entrants may receive additional retaliatory actions from incumbents to ward off future entry into the industry (which likely translates into additional entries in specific markets). Ensuring the failure of one new industry entrant could potentially deter other future entries. Indeed, Lieberman (1987), Thomas (1999) and Simon (2005) find evidence that incumbents respond more aggressively to *de novo* industry entries than to incumbents expanding existing operations. Moreover, this is consistent with industry surveys that unfailingly show low rates of survival or short life expectancy among new industry entrants across different industries (Dunne *et al*, 1989; Geroski, 1995), although the low survival rates of *de novo* ventures may very well relate to the fact that they face more severe entry barriers in specific markets than do established incumbents (Hines, 1957; Gorecki, 1975; Yip, 1982).

As noted by Geroski (1995), while the case study literature is replete with examples of incumbents attacking market entrants, there is no conclusive evidence as to how incumbents actually try to deter entry. Not all incumbents have the same motivation to retaliate against a specific new industry or market entrant. Yamawaki (2002) confirmed that not all incumbents respond in the same way to market entries, and some of those incumbents that act similarly reflect an underlying cultural similarity. Simon (2005) found that newer incumbents cut prices more than older ones when reacting to a new market entry. In particular, Chen and Hambrick (1995) found that small incumbents respond differently from large ones, and Chen (1996) further conjectured that market commonality may be a strong predictor of likely competitive attack. Scholars from the economic literature have argued that incumbents' characteristics, such as dominance (Gaskin, 1971) and reputation (Kreps and Wilson, 1982), can influence their incentive for launching entry retaliatory actions. While these studies primarily focus on the competitive relations among established incumbents, the main arguments can be extended to *de novo* entrants.

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From the perspective of established incumbents, new industry entrants or existing incumbents attacking another incumbent's sphere of influence as defined by market share dominance, market dependence, or resource centrality would be expected to be subject to intense retaliation (MacMillan and Day, 1987; Gimeno, 1999). As such, few *de novo* industry entrants would dare base their inaugural strategy on targeting the core markets of a large, established incumbent and expect to survive.

However, since it is usually many times smaller than the industry incumbents (e.g., Geroski, 1995), the *de novo* venture would have a different perspective as to which incumbent firm it should fear most in terms of potential retaliatory actions. As far as a *de novo* venture is concerned, the particular incumbent with whom it shares the most market or product overlap (referred to herein as the arch incumbent) would potentially have the most to lose, and would therefore be the most motivated to launch an aggressive reaction. A coordinated attack on multiple markets by a single firm is more likely than a coordinated attack by a collection of noncooperative firms; therefore, if one incumbent is going to launch retaliatory actions to a *de novo* venture, the *de novo* venture would be most fearful of attacks initiated by the incumbent with whom it has the most overlap in its markets (entered at or shortly after inception), that is, its single most direct competitor. If a new venture only creates new markets not previously served by any incumbent players and does not enter into any markets with existing competitors, its overlap with its arch incumbent would be zero percent.

Note that the discussion so far adopts the perspective of a *de novo* venture, and *not* the perspective an incumbent. If a *de novo* venture decides to enter a small number of markets in direct competition with a single incumbent (in all these markets), it will still be relatively easy for the incumbent to launch coordinated attacks in all these markets *even though* these markets may be far away from its sphere of influence (Gimeno, 1999). In other words, *ceteris paribus*, a large degree of market overlap with any incumbent threatens new venture survival simply because of the risk of a coordinated attack from this particular incumbent, regardless of the centrality of the market entry from the resource perspective of the incumbent. This leads to Hypothesis 1:

Hypothesis 1: The larger the degree of market overlap between a de novo *venture and its arch incumbent, the less likely the new venture will survive.*

While a large degree of market overlap between a *de novo* venture and its arch incumbent translates into a more formidable menace *should* the latter decide to launch entry retaliatory actions, it can offer the new entrant an interesting survival-enhancing opportunity should the arch incumbent decide to forbear the entry. As long as the arch incumbent does not initiate retaliatory action, other incumbents may be tempted to 'follow the arch incumbent' while maintaining an option to act unilaterally later. This is possible since the impact of the market entry event by the new venture is inherently uncertain to incumbents in general, and to minimize search costs (Cyert and March, 1963), incumbents other than the arch incumbent may simply choose to follow it in its response. In other words, the other incumbents may reason that because the arch incumbent, who has the most to lose in this scenario, determines that it would be wiser to forbear than to retaliate, why should they differ in their logic? Other manners of mimetic isomorphism among established firms have been documented in such industries as banking and radio broadcasting (Haveman, 1993; Greve, 1998).

When the arch incumbent of a *de novo* venture chooses not to retaliate the latter's entry, there is another reason why other incumbents may also choose to forbear. All market retaliatory actions incur costs. An incumbent that is not the arch incumbent of a *de novo* venture may choose to unilaterally launch retaliatory action and successfully drive the venture out of business, but doing so may simply allow the arch incumbent to free ride on this potentially costly retaliation. This means that this retaliation-oriented incumbent could incur more of the cost but reap less of the benefit of the entry retaliation than the arch incumbent, which explains the potential hesitation of other incumbents to initiate retaliatory actions ahead of or independently of the arch incumbent.

This suggests that a *de novo* venture should first and foremost attempt to seek entry forbearance from its arch incumbent. The extant literature on market positioning and market entry in general provides at least two concrete suggestions on how a *de novo* venture may increase the chances of entry forbearance by its incumbents, including

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its arch incumbent. These two suggestions are discussed next.

Deterring entry retaliation through large-scale entry

In a second stream of studies, several scholars advocate aggressive entry by new ventures as a means to increase survival odds (Biggardike, 1979; MacMillan and Day, 1987; Miller and Camp, 1985; Cooper, Willard, and Woo, 1986). An aggressive entry by a *de novo* venture can aid its survival both internally and externally. Internally, Biggardike (1979) suggested that ambitious post-entry targets would galvanize managers to pursue aggressive investments and sales tactics, which in turn would increase the probability of a new venture achieving these targets. Meanwhile, the increased scale of entry allows the new venture to attain larger economies of scale earlier, closing the potential unit cost gap vis-à-vis established incumbents. This is consistent with the findings of Hariharan and Brush (1999) that new entrants tend to enter an industry with larger plant capacities than established incumbents, in part to compensate for the complementary resources of the latter that new entrants lack.

Externally, an aggressive entry can signal the availability of deep pools of resources for the new ventures, in turn suggesting that the cost of retaliatory actions aimed at driving the ventures out of business would be significant for the incumbents. The revelation of an exact amount in the 'war chest' of the *de novo* venture could, however, backfire because incumbents would then know exactly how much it costs for them to drive the new industry entrant out of business. If this one-time cost is small compared to the recurring stream of post-entry loss of business, the incumbents would have the incentive to launch an all-out attack on the new venture.

Some combination of these two reasons likely explains the empirical findings from large-scale studies confirming that those firms with larger inaugural production capacities tend to have better survival odds than others, given everything else constant (Audretsch and Mahmood, 1994; Agarwal and Audretsch, 2001). Since the main effect of an aggressive entry on venture survival has been the subject of previous investigation, it forms part of the control variables in this study. In the same vein, however, the interaction effect of an aggressive entry combined with a large overlap with the arch incumbent may increase the likelihood for the arch incumbent of a *de novo* venture to forbear, and hence increase the survival odds of the new entrant:

> *Hypothesis 2: When combined with a high degree of market overlap with an arch incumbent, the larger the inaugural production capacity of a* de novo *venture, the more likely the new venture will survive.*

It is worthwhile to note that the main effects of inaugural capacity for the *de novo* venture and market overlap with its arch incumbent are hypothesized to exert opposite effects on venture survival: a venture is more likely to survive by having either a larger inaugural production capacity or less market overlap with its arch incumbent. In Hypothesis 2, the combination of large inaugural production capacity and a high degree of market overlap with the arch incumbent is hypothesized to lead to enhanced survival odds for the new venture. As such, it is likely that at most only two out of these three effects (inaugural capacity, market overlap with one's arch incumbent, and the interaction of these two) would be confirmed. If the two main effects are confirmed to be significant, then a combination of large inaugural capacity and market overlap with the arch incumbent should have negligible influence on venture survival. If one main effect, say market overlap with the arch incumbent, plus the interaction effect is significant, then the other main effect must exert a weak influence, if any. This point should be noted when the analytical results are examined.

Deterring entry retaliation through market positioning

In a third stream of literature, researchers in the tradition of Hotelling (1929) have long argued that when firms sell the same product or adopt the same market positioning as an existing competitor intense price competition (and therefore zero profit) may be the result. A different product positioning by a firm signals that it is targeting a different set of customers; this should lessen the degree of competition with other firms, and hence increase its survival odds. Porter (1980) identified three generic strategic positions to enhance

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firms' long-term viability: a low-cost orientation, a differentiated positioning through higher quality, and a focus on specific niches, with the latter two echoing the recommendations of Cohn and Lindberg (1972) for higher levels of customer service and Hosmer (1957) on specialized products. Using a secondary, cross-sectional dataset of small to medium firms in France, Durand and Coeurderoy (2001) confirmed that a differentiated or cost leadership positioning indeed contributed to better firm performance.

The emphasis of this study is not on whether a low-cost, differentiated, or niche positioning would enhance the performance or survival of new ventures, as was the case for previous studies (e.g., Durand and Coeurderoy, 2001). However, adopting one of these market positions (low-cost, differentiated, or niche) may signal the intention of a new venture to avoid poaching the most valued customers of its incumbents, and hence increases the probability of its arch incumbent forbearing the new entry.

Indeed, prior to the actual service entry, a *de novo* venture most likely would have studied the potential markets for entry and its likely competitors. If such a new venture seriously considers competing directly with a single incumbent on multiple markets, it is likely that there is a convincing business case for doing so. This follows that the new venture must likely be aware of the market positioning, product, and distribution strategies of its arch incumbent. To minimize direct price competition, in the tradition of Hotelling (1929) and Lerner and Singer (1937), the *de novo* venture can try to position itself away from that of its arch incumbent to attract a slightly different clientele even if they are present in the same physical market space. It is easier for a new venture with one clear arch incumbent (with a distinctly large degree of market overlap) to position itself differently from this arch incumbent than for a venture with several ambiguous arch incumbents (each with small degrees of market overlaps) to position itself simultaneously away from all these incumbents. This different market positioning could spur the arch incumbent (and hence other incumbents as well) to forbear the new venture, or at least to wait for some time before retaliating. The forbearing behavior due to different market positioning may help explain why brand name prescription medicine producers chose to *raise* prices instead of reducing them upon the entry of their generic counterparts (Frank and Salkever, 1997). This stream of research leads to Hypothesis 3:

> *Hypothesis 3. For* de novo *ventures with large market overlaps with their arch incumbents, those adopting a low-cost, differentiated, or niche positioning will be more likely to survive than other new ventures.*

DATA AND METHODOLOGY

There are several reasons why the intra-European scheduled passenger airline industry has been chosen to provide empirical support in this study. First, in the study of new industry entrants, technological innovation often plays a significant role in firm success (Zahra, 1996). In the airline industry, the underlying aircraft technology and computerized reservation systems can be accessed by both incumbents and new ventures alike, which helps reduce the influence of technological innovation developed by one airline venture versus another. Second, in view of the low survival rates of new industry entrants in general, it is important to have a reliable record of when firms enter and exit, as well as specific information about the competitors and choices faced by each new venture. The airline industry does have reliable and reasonably detailed data along this line. Third, this industry characterizes geographical markets in the Hotelling (1929) tradition, facilitating the implementation of the 'arch incumbent' concept.

Relevant facts about the intra-European airline industry are described in this section, along with information on how the empirical data is obtained and the methodology of the analysis.

The intra-European passenger airline industry

This industry recently underwent significant economic liberalization with the maturing of the single market under the European Union (formerly the European Economic Union and Common Currency regimes) in the 1990s. Prior to this, the entry and exit, capacity, frequency and even pricing decisions on each route were highly regulated. On international routes within Europe, revenue pooling and sharing agreements between designated

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flag carriers were common, which effectively limited price competition while encouraging non-price competition in services prior to this liberalization.

As a comparison, the U.S. domestic airline industry has undergone similar deregulation since the late 1970s. However, the emergence and prevalence of the hub-and-spoke route networks in the U.S. domestic market complicates the link between the provision of non-stop air route capacities and the underlying passenger traffic, essentially rendering the definition of a 'market' (the traffic between two city pairs) very imprecise. In contrast, an increasing number of airlines in the intra-European industry, especially some new entrants, do not facilitate flight connections for passengers. This, combined with the relatively diffused route networks in Europe permits a reasonable link between the provision of non-stop services and the underlying market (Reynolds-Feighan, 2001; Fan, 2006).[2]

Since 1987, three packages of liberalization measures were introduced in Europe. In 1993, the third and final package was introduced, in which full pricing freedom within the European Union (EU) was granted. It permitted any airline of an EU member country to fly any intra-EU country route from 1997[3], without requiring the carrier to start or end the route in its home country. These liberalization measures apply to all the economic decisions (pricing, capacity, routing, service levels, marketing programs, etc.) of air carriers, but the air carriers are still subject to a harmonized accreditation of airworthiness, aircraft operations and maintenance standards, and other safety-related requirements. The economics of this industry is typical of capital-intensive, mature industries such as heavy manufacturing and banking, in that there is a natural incentive for firms to rapidly grow in size and operational intensity to achieve lower unit costs (Caves, Christensen, and Tretheway, 1984).

Data

The *Official Airline Guide* (*OAG*) is the authoritative compilation of airline schedules worldwide. Data from the *OAG*, confirmed by reports in industry publications including the *Air Transport World* and *Airline Business*, is used in the analysis; the information on operating flights[4] is collected from these sources. In particular, the published airline schedules within the EU are collated for every quarter (in the third week of February, May, August, and November of each year to avoid major holidays and hence bias in the data) from 1996 through May, 2004. The starting year of 1996 includes potential new ventures that were founded to take advantage of the pending liberalization in the following year, while the second quarter of 2004 preceded the subsequent run-up in oil prices. Initially, there were few entries in the intra-European airline industry, but entry activity accelerated from 1997, following full liberalization (Fan, 2009).

In total, 360 airline entities[5] were found to have operated within EU countries *and* marketed their own services during this period.[6] About half (146) of these were direct antecedents of scheduled carriers before 1996.[7] Twelve entities were helicopter operators and were not included for further analysis. Of the remaining carriers, 46 were found through trade journals and newsletters but either chose not to advertise on the *OAG* until later or had missed *OAG*'s filing deadlines to have substantial operations before 1996. A further 12 were found to be carriers that have merely undergone a corporate change (i.e., name change following an acquisition, subsidiaries operated in an integrated manner, and so forth[8]), and hence were not considered *de novo* carriers. Seven of the remaining airlines operated intra-European flights mostly as a continuation of intercontinental flights, and the low weekly frequencies indicated their focus was on intercontinental rather than intra-European traffic, and were thus dropped from the analysis. Two

[2] Some new airlines explicitly discouraged passengers from forming connecting itineraries using a series of flights by requiring these passengers to retrieve (and recheck) their baggage after every flight segment.

[3] At several primary airports, the extent of entry is constrained by the airport capacity. In this analysis, we consider all primary and secondary airports serving a major city as one geographical point.

[4] These exclude 'code-share' agreements under which one carrier buys and sells seats on flights operated by another carrier.

[5] Each airline entity refers to a distinct airline name being used, with duplicate names counted as two entities if different two-letter codes are used. The same two-letter airline code can be reused after a period of inactivity of two or more years.

[6] These exclude carriers that operate service on other carriers' behalf.

[7] These include several chartered carriers that have converted chartered flights into scheduled flights.

[8] For instance, Virgin Express established a separate unit operating out of Ireland in 2000 to take advantage of the lower labor costs there, but the orientation and schedules of both units were integrated as a single carrier. As such, this Irish operating unit is not considered a new entrant company.

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additional airlines were removed as they were set up as national or territorial (not necessarily profit-maximizing) carriers.

This process left a total of 135 *de novo* ventures and 1,235 venture-quarters for further analysis. Of these, 77 *de novo* ventures exited from the industry during the study period. Among those ventures that exited the industry through merger or acquisition by another carrier (e.g., the merger of Aegean Airways and Cronus Airlines of Greece), substantial route restructuring was observed. This supports the notion that the acquired carriers were not deemed sustainable prior to the acquisition, and hence their exits can be regarded as failures for the purpose of this study. In addition, five of the new ventures are offshoots of established carriers: bmibaby, Germanwings, Germania, Go, and Hapag-Lloyd Express (from established chartered carrier Hapag-Lloyd). Apart from the initial funding and help in accreditation, these offshoots are strategically and operationally independent from their parent companies. Excluding these five carriers from further analysis did not result in qualitatively different results. As such, they are included in the analyses reported.

Some of these *de novo* ventures have entered as low-cost, no frills airlines to rapidly gain market share, while others projected a professional image like other incumbent carriers. Overall, there has been a general convergence in product offerings over time: a number of established carriers began offering food and drinks for purchase onboard in line with low-cost upstarts, while others have cut back on food offerings to biscuits and 'finger' sandwiches.

Table 1 presents some descriptive statistics of the new ventures and their inaugural markets. The average *de novo* venture started with 2,004 one-way seats per week in capacity, equivalent to about 15 round trip flights using a 130-seat Boeing 737 aircraft, and a home airport with 36,000 seats scheduled to depart per week. This is equivalent to the average *de novo* venture operating out of a city comparable to Birmingham, Alabama, or about the size of Larnaca in Cyprus—avoiding the large, capital cities that are home to the incumbent carriers.

As explained earlier, a pair of cities served by scheduled non-stop flights is considered a 'market'; this is a reasonable estimation for intra-European passenger air travel. All carriers operating from different airports of the same city are considered to be serving that city. If a *de novo* venture enters into more than one market at inauguration, the statistics are weighted by the relative weekly seat capacity devoted to each of these markets in its route network. In general, the route networks of *de novo* carriers in successive quarters are reasonably persistent. For instance, among the 135 carriers, only 25 carriers (less than 20%) withdrew service in their second quarter of operation from any of the routes started in their first quarter, and the median number of routes withdrawn is exactly one. Similarly, only 21 carriers in their third quarter of operation withdrew service from any routes operated in the preceding quarter. In other words, the inaugural market entry pattern is representative of the overall market entry strategy of a *de novo* venture.

Table 1. Select descriptive statistics for the new intra-European carriers analyzed

Description	Number of new entrants
Total number of new entrants	135
Censored entrants (exited during study period)	60

Operating statistics for an average entrant	Capacity (passenger-seats)
Average flight operated	72 per week
Average capacity per week	2163 (one-way)
Home airport capacity (per week)	36,022 (one-way)

Methodology

Methodologically, the analysis links the survival odds of *de novo* ventures with their inaugural decisions. This approach follows what has been used in other studies such as Eisenhardt and Schoonhoven (1990), and Disney, Haskel, and Heden (2003).

While the preceding hypotheses are phrased in terms of the *survivability* of *de novo* ventures, the schedules of several defunct airline ventures showed no signs of intended route withdrawals right up to the last quarter of service (i.e., they maintained route capacity and frequency right up to the last day of operation). This implies that the continued operation of a scheduled service may

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bear little correlation to the underlying profitability of the market. Firm exits are therefore a more appropriate measure of firm performance (negative performance) for *de novo* ventures than, say, their withdrawals from specific markets. Hence, the probability of a *de novo* venture's post-entry exit, as witnessed by a lack of continued scheduled passenger air service, is used as the dependent variable in the econometric model.[9]

The econometric analysis is conducted in a semiparametric manner to estimate the hazard function for the *de novo* ventures as per Cox's (1972) proportional hazard procedure. This procedure does not require a hazard baseline for the ventures to be an *a priori* input (it estimates this baseline from the observed data). In this model, the hazard function, λ, of a venture i exiting an industry (or failure) at time t takes on this functional form:

$$\lambda(t_i) = e^{-\beta' \mathbf{x}_i} \ \lambda_0(t_i) \qquad (1)$$

where $\mathbf{x}_i$ represents a vector of independent variables and controls for entity i, $\boldsymbol{\beta}$ represents a vector of coefficients (to be estimated) corresponding to $\mathbf{x}_i$, and λ_0 represents a baseline hazard that describes the probability that a firm, having survived until period t_i, and not yet censored, would exit after period t_i.

Given a discrete time interval T_j and a corresponding set of firms that have not yet exited prior to this time (i.e., risk set j), the probability that a firm exists at T_j given that exactly one individual exits at this time is given by:

$$\text{Prob}\,[t = T_j | \text{ risk set}_j] = \frac{e^{\beta' X_i}}{\sum_{riskset_j} e^{\beta' X_i}} \qquad (2)$$

Note that in (2) the baseline hazard function (λ_0) drops out of the equation (i.e., it does not have to be prespecified in this model) and the regression reduces to a standard logistic form. In this way, new ventures that have been right censored, that is, still survive at the end of the data collection period, can still contribute information to the analysis up to the point they are censored (thus making full use of such information).

[9] Incidentally, wherever a merger of two *de novo* ventures or one *de novo* venture with an incumbent is observed, the 'exited' airline always witnessed drastic changes in its post-merger route structure, and hence these exits are interpreted as a sign of negative performance.

The regression coefficient of a particular variable can be used to compute a probability of failure (the exit hazard rate) at a point in time, holding all else constant. A negative coefficient is interpreted as being conducive to survival, while a positive coefficient indicates that the factor in question increases the probability of exit (i.e., not conducive to venture survival).

Variables

To estimate the impact of market overlap between a new venture and its arch incumbent in a test for Hypothesis 1, the percent of market overlap (ArcInc_i) from the perspective of the new venture is used. For instance, if a new venture i faces only three competitors, with 60 percent of its seat capacity overlapping (i.e., directly competing in the same city pair markets) with incumbent A, 40 percent with incumbent B, and 10 percent with incumbent C, A would be its arch incumbent with 60 percent market overlap ($\text{ArcInc}_i = 0.60$).

To test Hypothesis 3, information about the market positioning of the *de novo* ventures was collected from a combination of company Web sites and industry publications. The identity of the arch incumbents of *de novo* ventures revealed that they were overwhelmingly traditional, formerly national flag-carriers of E.U. countries. To adopt a different market position from the respective arch incumbent, the *de novo* ventures had to adopt a differentiated, low-cost, or niche position. Unfortunately, the 'niche' position cannot be readily identified in the intra-European airline industry, as no new venture started service between cities that previously had not had any scheduled air transport service (i.e., the networks of cities and city pairs served by the incumbents cannot be distinctly separated from that of any new venture). Possibly due to the relatively short flight durations in the intra-European markets, the low-cost orientation was the *de facto* choice of a different market position away from the arch incumbent for the new ventures if they chose to adopt a different positioning. Only one carrier, 'Fairlines,' advertised first-class only service between Paris, Milan, and Nice *(Economist,* 1998). However, it ceased operating a few months later, and since a dummy variable specifically identifying this venture is not statistically significant, only the low-cost market position is included in the discussion in the rest of this study. The variable LowCost_i takes on a

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value of one if venture i advertised itself as a low-cost or budget carrier, and zero otherwise. The main effect of this variable is tested as part of the control variables, but its interaction with the arch incumbency variable ($ArcInc_i$) is tested as potential support for Hypothesis 3. Among the carriers surveyed, 15 advertised themselves as low-cost or budget carriers.

To test Hypothesis 2, the inaugural capacity of a *de novo* venture is calculated, and then multiplied with the $ArcInc_i$ variable. In calculating the inaugural capacity of a *de novo* venture, the extant literature actually has two valid suggestions. First, the literature advocating an aggressive entry (Biggardike, 1979; MacMillan and Day, 1987; Miller and Camp, 1985; Cooper *et al*., 1986) includes instances of diversifying conglomerates entering new market segments but leveraging on the reputation and resources of the parents. Any forbearance to such entries can be interpreted as forbearance to the diversifying entries of the parent companies. This line of thinking suggests that the total inaugural capacity of each *de novo* venture be taken into account in the empirical analysis. The variable $SEATS_i$ is the natural logarithm of the total (one-way) capacity in terms of the number of seats per week of venture i (the logarithmic form is used such that the estimated coefficients would be equally sensitive to similar percent fluctuations around large or small capacities).

Secondly, studies on *de novo* versus diversifying entrants in the applied economics literature (Montgomery and Hariharan, 1991; Hariharan and Brush, 1999) employs the concept of minimum efficient scale (MES) in computing the production capacities of new entrants relative to those of the incumbents. Here, the reasoning is twofold: the scale disadvantage of the new entrant relative to the incumbents would disappear only if the production level of the former is increasingly close to the level of the latter, and the price impact of the new entry would be large if the entrant produces at a level close to that of its incumbents in the relevant market. In other words, this line of thinking suggests that the incumbents would perceive a *de novo* venture to pose significant risks to their own survival only if the latter produces at a level comparable to theirs in a specific market; the total production capacity of the new venture is of secondary concern. To test this effect, an MES of production is first computed for each city pair market entered by a *de novo* venture (adapted from Montgomery and Hariharan, 1991: 79, and Hariharan and Brush, 1996: 139, for the airline industry[10]). The MES is computed as the average seat capacity (one-way, per week) of the largest incumbents accounting in aggregate for at least half of the industry seat capacity for a particular non-stop city pair. The ratio of the capacity of a new venture (in terms of one-way seats per week) to that of the MES is the relative capacity, or $RMES_i$, of that venture i. The higher this ratio, the more 'threat' a new venture presents to the incumbents, and the more likely entry-retaliation is launched (and the less likely it is for the new venture to survive). If a *de novo* venture serves more than one non-stop city pair at inauguration, its RMES is a weighted value (by the seat capacity of the venture) of the RMES of each of these non-stop city pairs.

$SEATS_i$ and $RMES_i$ are two measures of capacity of *de novo* ventures. Since the main effects of the capacity of inaugural entry have been investigated in prior literature (e.g., Biggardike, 1979), these will form part of the control variables. However, each of these will interact (i.e., multiply) with the arch incumbency measure, $ArcInc_i$, in the regression analysis to test Hypothesis 2 (these interaction effects will be tested explicitly in the empirical analysis). Including both variables in the same regression model will result in too many variables simultaneously interacting with the arch incumbency measure (i.e., the effect of multicolinearity would become severe), and as a result, these are used in separate regression models.

In addition, several variables are used as controls in the empirical analysis. These are as follows:

Home city population. This is the natural logarithm of the population of the city ($Home_i$) of the operational home base of a *de novo* venture. The operational home base of the venture is the city where it has the most scheduled departure seat capacity per week.

Airport constraint. This dummy variable ($Multi_i$) takes on the value of one if the operational home base of the *de novo* venture is served by more than

[10] In Montgomery and Hariharan (1991), and Hariharan and Brush (1996), the calculation is based on the capacity of each manufacturing plants. In the airline industry, there is no such direct equivalent—instead, the production capacity in terms of the number of seats produced in a non-stop city pair market is used, since the production capacities in each city pair market competes directly with one another (i.e., akin to manufacturing plants producing goods that compete with one another).

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one airport (this is a sign of potential capacity constraint at the primary airport), and zero otherwise.

Market newness. Two additional variables are included to describe the proportion of the inaugural capacity of a *de novo* venture dedicated to city pair markets of different degrees of newness (that are previously not served). In some cases, a new venture starts service between two cities that previously did not receive any non-stop scheduled service (the city pair market is new according to the definition of market): City A and City B. If there exists a City C that is situated close to[11] City A, and there has been established non-stop service between City C and City B prior to the new entry, then city pair C-B is not a new market. In this case, the market newness variable NEARNEW_i (with respect to the link between Cities A and B) takes on the value of one (and zero otherwise). If the variable NEARNEW_i is zero (with respect to the link between Cities A and B), there exists a City D that is situated close to City B (and City C being close to A as before), and the city pair C-D is an established market, then NEARNEAR_i takes on the value of one (and zero otherwise). The variables NEARNEAR and NEARNEW for a venture with a multimarket presence are its proportions of capacity in 'NEARNEAR' and 'NEARNEW' markets respectively.

Year dummies. Dummy variables for different calendar years are used, but these do not turn out to be significant. To conserve valuable parameter space, only three dual-year dummies are used: YR9697_i (for the years 1996 and 1997), YR9899_i, and YR0001_i.

Age dummies. Based on the findings of earlier studies on the mortality of young firms (Phillips and Kirchhoff, 1989; Dunne *et al*., 1989), dummy variables for different ages of the venture are used, but these do not turn out to be significant. To conserve valuable parameter space, only one tri-year dummy is used: AGE123_i takes on the value of one for a venture in its first, second, or third year of operation, and zero otherwise.

Dual clock. As the intra-European airline industry underwent sweeping regulatory change in the 1990s, firms founded after the regulatory change, that is, 'new industry entrants,' were required to adjust to the new business environment right at the outset (Reger, Duhaime, and Stimpert, 1992), while incumbents could rely on the inertia among customers' behavior to justify a slower transition. However, incumbents that predate the regulatory or technological shifts, that is, 'preexisting incumbents,' usually have established reputations among potential customers, as well as a larger constellation of support services, suppliers, and distribution networks, which can help mitigate the advantages of *de novo* industry entrants. Note that the net survival enhancing benefits of being a 'new industry entrant' founded after significant industry liberalization may depend on the specific context of an industry. In any case, Mitchell (1991) theorized (and confirmed) the existence of dual clocks—whereas one clock counts all market entries, a second clock counts the entry by a subset of firms (e.g., incumbents or 'new industry entrants')—and being the first in its category to enter a market may confer unique survival advantages. If a *de novo* venture was the first among 'new industry entrants' to enter a non-stop city pair market populated by preexisting incumbents (founded before 1996), the variable NewCo_i takes on the value of one for venture i, and zero otherwise. If the new venture enters more than one non-stop city pair market at inception, its NewCo_i variable would be weighted by the weekly seat capacity of these markets.

Others. Other controls such as country and firm fixed effects were tested but not found to be significant. Also, dummy variables that indicate pre-entry competition (in terms of the Hirschman-Herfindahl Index) and pre-entry aggregate capacity (in terms of weekly seat capacities, or if a particular market is new for the *de novo* venture) were included but found to be insignificant. To conserve valuable parameter space, these are dropped in the analysis.

Table 2 shows the mean, standard deviation, and Pearson's correlation for these variables. The high number of dummy variables and interaction terms are potential causes of multicolinearity, which may affect the statistical significance of the regression estimates. According to Belsey, Ku, and Welch (1980), the largest condition index (the square root of the ratio of the largest eigenvalue to each individual eigenvalue of the covariance matrix) exceeding 100 is indicative of significant influence of multicolinearity, rendering the statistical estimations possibly biased. In the full models, the condition index hovers around half of this threshold

[11] A distance of 150 km is used as a definition for proximity, but changing it to 50 km or 200 km, equivalent to one or a few hours of driving, does not qualitatively change the results.

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Table 2. Statistics and Pearson's correlation of the variables across *de novo* ventures

Mean	Std dev.			1	2	3	4	5	6	7	8	9	10	11	12
13.767	14.181	1	Home	—											
0.119	0.324	2	Multi	0.385	—										
0.265	0.374	3	NearNew	−0.237	−0.177	—									
0.022	0.126	4	NearNear	0.028	−0.058	−0.070	—								
0.363	0.481	5	Yr9697	−0.109	0.046	0.120	−0.041	—							
0.529	0.499	6	Yr9899	−0.062	0.070	0.060	0.071	0.318	—						
0.517	0.500	7	Yr0001	−0.053	−0.016	−0.041	0.024	−0.217	0.181	—					
0.772	0.419	8	Age123*	0.054	−0.089	0.003	−0.019	−0.241	−0.416	−0.494	—				
0.235	0.359	9	NewCo	0.184	0.211	−0.337	−0.099	−0.264	−0.180	−0.001	0.129	—			
0.111	0.315	11	LowCost	0.220	0.235	−0.070	−0.029	−0.025	−0.106	−0.081	0.013	0.089	—		
0.532	0.412	10	ArcInc	0.242	0.221	−0.686	−0.205	−0.128	−0.027	0.035	0.015	0.330	0.026	—	
7.679	8.254	12	Capacity: SEATS	0.264	0.249	−0.290	−0.106	−0.153	−0.029	−0.027	0.001	0.128	0.403	0.256	—
0.757	0.501	13	Capacity: RMES	−0.188	−0.308	0.218	0.092	−0.115	−0.142	0.035	0.100	−0.097	0.095	−0.243	−0.025

* Venture age is determined on a quarterly basis.

of 100, including the interaction term, indicating some influence of multicolinearity, but the effect is not serious.

RESULTS

Table 3 shows the coefficient estimates in the various regression models. Note that positive signs indicate an enhanced likelihood for firm failure (negative signs mean that the corresponding coefficients are *conducive* to venture survival). Model 0 shows the regression estimates for the control variables without the market positioning variable LowCost_i and venture capacity variable (SEATS_i or RMES_i). While none of the estimated coefficients for the variables in Model 0, except the intercept, are statistically significant, some are of the expected signs. For instance, starting 'new' services between two cities close to existing ones with established competitors (positive for NEARNEW_i, NEARNEAR_i) is not conducive to venture survival. The size of the home city (HOME_i) does not appear to be conducive to new venture survival, but the early age (AGE123_i) of the industry entrant appears to be survival enhancing, indicative of a liability of 'adolescence' (Brüderl and Schüssler, 1990) instead of newness. Models 1 and 2 include LowCost_i and one measure of capacity (either SEATS_i or RMES_i). The estimated coefficient for LowCost_i is marginally significant in Model 2 ($p < 0.10$), and the difference between Models 1 or 2 and Model 0 is also (marginally) significant ($p < 0.10$) in terms of the log likelihood.

Models 3 through 5 use the SEATS_i measure of capacity and investigate the main effect of arch incumbency (ArcInc_i), its interaction effect with market positioning (LowCost_i), and its interaction effect with Capacity (SEATS_i), respectively. In Model 3, the estimated coefficients for both market positioning (LowCost_i) and the main effect of arch incumbency (ArcInc_i) are marginally significant ($p < 0.10$), and the log likelihood of the model is significantly different from Model 1 with only the control variables ($p < 0.05$). In particular, these two coefficients are of the expected signs: negative for LowCost_i (i.e., conducive to survival) and positive for ArcInc_i (i.e., detrimental to survival, as hypothesized).

Model 4 shows that upon including the interaction variable between arch incumbency and market

Table 3. Regression estimates

	Model 0 (M0)	Model 1 (M1)	Model 2 (M2)	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Intercept	−3.546**	−3.607**	−3.909***	−4.028***	−4.587***	−5.642***	−4.349***	−4.943**	−4.047**	−4.546***	−5.611***
	(1.420)	(1.510)	(1.449)	(1.521)	(1.564)	(1.784)	(1.474)	(1.522)	(1.625)	(1.572)	(1.796)
Controls											
Home	0.073	0.1184	0.112	0.110	0.137	0.122	0.100	0.125	0.092	0.122	0.107
	(0.101)	(0.103)	(0.104)	(0.104)	(0.106)	(0.104)	(0.104)	(0.106)	(0.105)	(0.106)	(0.104)
Multi	−0.025	0.239	0.183	0.283	0.468	0.326	0.216	0.390	0.227	0.419	0.278
	(0.390)	(0.396)	(0.409)	(0.402)	(0.399)	(0.397)	(0.415)	(0.410)	(0.415)	(0.405)	(0.405)
NearNew	0.178	0.102	0.167	0.721	0.890	0.856	0.788	0.963	0.860	0.931	0.894*
	(0.340)	(0.346)	(0.346)	(0.526)	(0.548)	(0.539)	(0.533)	(0.557)	(0.562)	(0.553)	(0.542)
NearNear	0.342	0.210	0.323	0.905	1.096	1.162	1.036	1.243	1.148	1.200	1.249
	(0.797)	(0.797)	(0.794)	(0.898)	(0.910)	(0.936)	(0.902)	(0.917)	(0.941)	(0.912)	(0.938)
Yr9697	0.028	−0.001	0.026	0.025	0.082	0.022	0.061	0.122	0.059	0.099	0.003
	(0.289)	(0.291)	(0.288)	(0.291)	(0.294)	(0.294)	(0.288)	(0.291)	(0.288)	(0.300)	(0.298)
Yr9899	−0.050	−0.088	−0.103	−0.115	−0.084	−0.017	−0.140	−0.114	−0.150	−0.104	−0.022
	(0.269)	(0.268)	(0.268)	(0.269)	(0.271)	(0.276)	(0.269)	(0.271)	(0.270)	(0.272)	(0.276)
Yr0001	−0.294	−0.342	−0.332	−0.335	−0.275	−0.332	−0.320	−0.260	−0.318	−0.295	−0.375
	(0.302)	(0.303)	(0.305)	(0.303)	(0.306)	(0.301)	(0.305)	(0.309)	(0.305)	(0.309)	(0.302)
Age123	−0.004	−0.053	−0.043	−0.067	−0.055	−0.066	−0.052	−0.037	−0.067	0.005	−0.017
	(0.389)	(0.389)	(0.391)	(0.388)	(0.389)	(0.384)	(0.390)	(0.392)	(0.392)	(0.397)	(0.395)
NewCo	0.012	−0.019	−0.031	−0.087	−0.187	−0.1081	−0.093	−0.188	−0.109	−0.125	−0.024
	(0.380)	(0.379)	(0.381)	(0.378)	(0.382)	(0.378)	(0.380)	(0.385)	(0.382)	(0.386)	(0.382)
LowCost	—	−0.829	−0.913*	−0.904*	−1.046	−0.797	−0.996*	0.890	−0.971*	1.296	−0.487
		(0.538)	(0.523)	(0.545)	(0.937)	(0.537)	(0.532)	(0.924)	(0.533)	(0.912)	(0.581)

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Capacity: SEATS	—	−0.059 (0.088)	—	−0.070 (0.087)	−0.080 (0.087)	0.159 (0.160)	—	—	—	−0.066 (0.089)	0.179 (0.165)
Capacity: RMES	—	—	−0.028 (0.274)	—	—	—	−0.034 (0.273)	−0.037 (0.276)	−0.305 (0.683)	—	—
Main effect											
ArcInc	—	—	—	0.823* (0.494)	1.079** (0.522)	3.035** (1.347)	0.807 (0.500)	1.057** (0.529)	0.585 (0.709)	1.099** (0.531)	3.143** (1.378)
Interaction											
ArcInc × LowCost	—	—	—	—	−2.847** (1.356)	—	—	−2.787** (1.365)	—	−3.043** (1.461)	—
ArcInc × Capacity: SEATS	—	—	—	—	—	−0.361* (0.203)	—	—	—	—	−0.377* (0.208)
ArcInc × Capacity: RMES	—	—	—			—	—	—	0.343 (0.793)	—	—
−2 Log likelihood	573.760	569.633	570.063	566.536	562.547	563.294	567.159	563.358	566.975	551.615	552.327
Change from M1	—	* (from M0)	—	**	**	**	—	—	—	n/a	n/a
Change from M2	—	—	* (from M0)	—	—	—	*	*	*	—	—

*** Statistically significant at $p < 0.01$; ** statistically significant at $p < 0.05$; * statistically significant at $p < 0.10$.

positioning ($\text{ArcInc}_i \times \text{LowCost}_i$), the coefficients for the main effect of arch incumbency and this interaction effect become statistically significant ($p < 0.05$). The respective coefficients are also of the expected signs: positive for ArcInc_i (survival threatening), but negative for $\text{ArcInc}_i \times \text{LowCost}_i$ (survival enhancing). Meanwhile, the estimated coefficient for the main effect of market positioning (LowCost_i) is no longer statistically significant. This means that any survival enhancing effect of a different market positioning, at least in the intra-European airline industry, can be explained by its adoption vis-à-vis an arch incumbent. In particular, the larger the market overlap between a *de novo* venture and its arch incumbent, the more the survival enhancing impact of a low-cost market positioning would be for the venture. The estimated coefficient for venture capacity (SEATS_i) is statistically insignificant. The log likelihood of Model 4 is significantly different from that of both Models 1 and 3 with only the control variables ($p < 0.05$),

Model 5 shows that upon including the interaction variable between arch incumbency and firm-wide capacity ($\text{ArcInc}_i \times \text{SEATS}_i$), the estimated coefficient for the main effect of arch incumbency (ArcInc_i) increases dramatically while remaining statistically significant ($p < 0.05$). This highlights the significant survival threats posed by a large market overlap with an arch incumbent for a *de novo* venture. The estimated coefficient for the interaction variable ($\text{ArcInc}_i \times \text{SEATS}_i$) is also significant ($p < 0.10$), albeit marginally, indicating that the threat of a large market overlap with an arch incumbent can be mitigated by an aggressive inaugural entry. Similar to Model 4, the estimated coefficient of the main effect of arch incumbency (ArcInc_i) is positive (survival threatening), but that of the interaction effect ($\text{ArcInc}_i \times \text{SEATS}_i$) is negative (survival enhancing). The estimated coefficient for venture capacity (SEATS_i) remains statistically insignificant. Model 5 is significantly different from Model 1 with only the control variables ($p < 0.05$), and marginally from Model 3 as well ($p < 0.10$).

Models 6 through 8 mirror Models 3 through 5, except that the measure of capacity is the ratio of the inaugural capacity of a venture to the industry MES (RMES_i). Here, the estimated coefficients for the main effect of RMES_i in Models 6 through 8 and its interaction with arch incumbent ($\text{ArcInc}_i \times \text{RMES}_i$) in Model 8 are not statistically significant. Also, the log likelihoods of Models 6 through 8 are not as significantly different from the controls-only model (Model 2, $p < 0.10$) as are those of Models 3 through 5 (from controls-only Model 1, $p < 0.05$). This suggests that for a *de novo* venture, its firm-wide capacity (SEAT_i) is likely a more appropriate measure of capacity than its relation to the industry MES as far as entry retaliation by incumbents is concerned.

In Models 6 and 8, the estimated coefficient for the main effect of market positioning (LowCost_i) is marginally significant ($p < 0.10$), but that of arch incumbency (ArcInc_i) is not. However, in Model 7, where the interaction effect of market positioning and arch incumbency ($\text{ArcInc}_i \times \text{LowCost}_i$) is included, the estimated coefficient for the interaction effect is statistically significant ($p < 0.05$), while the main effect of LowCost_i is not. This suggests that, consistent with Model 4, any survival enhancing effect of a different market positioning (LowCost_i) can be explained by its adoption vis-à-vis an arch incumbent.

As mentioned earlier, the population of *de novo* ventures includes five ventures that were founded with equity from established incumbents, but which operated and marketed themselves independently from their 'parents.' Models 9 and 10 show the regression results excluding these five entrants mirroring Models 4 and 5 respectively—the regression results are remarkably similar.

To double-check the sensitivity of the arch incumbent concept, additional statistical models have been tested where the continuous variable ArcInc_i is replaced with a discrete one denoting whether the market overlap between a *de novo* venture and its arch incumbent is relatively high (e.g., over 50%). This discrete variable, together with its interaction with SEATS_i, yields qualitatively similar results as Models 3 through 5. This lends further support to the concept of arch incumbency.

The combined effect of SEATS_i and ArcInc_i is rather complicated. In fact, even the size of the coefficient does not reveal the full complexity of this effect, which is illustrated in Figure 2 based on the statistically significant coefficients in Model 5 and using different levels of inaugural firm-wide capacities (SEATS_i). Figure 2 shows the probability of exit for a new industry entrant based on the average firm-wide capacity. A *de novo* venture with the average capacity (among all such entrants) experiences relatively constant exit probabilities

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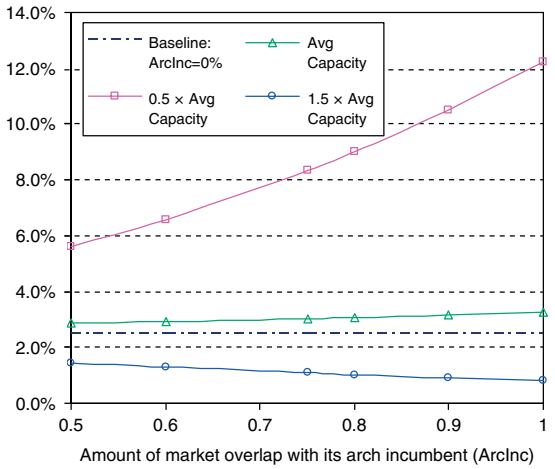

Figure 2. Probability of exit in a year for a *de novo* venture (Model 5). This figure is available in color online at www.interscience.wiley.com/journal/smj

as the amount of overlap with its arch incumbent increases ($ArcInc_i$). However, another venture with a smaller inaugural capacity (e.g., half of the average inaugural capacity among all entrants surveyed) would see its probability of exit multiply at an increasing rate as the amount of overlap with its arch incumbent increases (the hollow solid squares in Figure 2). Interestingly, another *de novo* venture with a larger inaugural capacity than the average would see its survival odds enhanced as the market overlap increases.

Figure 2 also shows specifically how much more likely a *de novo* venture is to exit at a fixed level of market overlap with its arch incumbent. For instance, at 75 percent market overlap with its arch incumbent, a *de novo* venture with half of the average venture's firm-wide inaugural capacity would be three times more likely to exit than another carrier with an average inaugural capacity, which in turn would itself be three times more likely to exit than another carrier with a 50 percent larger inaugural capacity. The fact that large inaugural firm-wide production capacity is associated with higher survival odds is consistent with prior surveys of *de novo* ventures and their survival (Dunne *et al*., 1989; Audretsch, 1995; Mata *et al*., 1995).

DISCUSSION

While previous studies in the strategy literature focus on competitive interaction among established incumbents—especially on how the centrality of a market entry to an incumbent affects its likelihood of competitive actions—this study shifts the focus to examine how the competition *as viewed by a new venture* ultimately affects its survival odds. By focusing on the entry of *de novo* ventures to the intra-European passenger airline industry, the preceding analysis is able to disentangle the effects of a broad marketing positioning (e.g., low-cost) from the competitive landscape encountered in specific markets. This analysis more fully examines the recommendation of Cooper *et al*. (1986: 258) that entrants 'must choose their battlefields carefully.'

In particular, the use of a continuous variable of arch incumbency (on market overlap between a focal *de novo* venture and its arch incumbent) adds a new dimension to the concept of competition. Instead of merely identifying a pair of independent corporate entities in an industry as competitors if they sell products in the same market space, the arch incumbency variable allows the degree of competition to be measured in a continuous manner (as opposed to a discrete, zero-one manner). By actively withdrawing selected service, a *de novo* venture can reduce the competitive threats posed by a particular incumbent.

By minimizing the maximum market overlap with any particular incumbent, the *de novo* venture can reduce the risk of a jointly coordinated entry retaliation by the incumbents. Note that this concept of arch incumbency is developed from the perspective of a *de novo* venture, and is different from the concept of resource centrality or sphere of influence from the perspective of the incumbents (e.g., Gimeno, 1999). Alternatively, if a *de novo* venture cannot avoid a high degree of market overlap with its arch incumbent, it must then either launch an aggressive entry or adopt a different market position to deter retaliation from this arch incumbent. As long as this arch incumbent holds off its retaliatory actions, other incumbents would be inclined to follow suit.

While a low-cost positioning is merely one way in which a firm can distinguish itself from another, the empirical analysis shows that simply adopting a low-cost market position in the absence of a large market overlap with its arch incumbent confers a *de novo* venture only ambiguous survival enhancing benefits. The same is true for an aggressive firm-wide scale of entry. This point is particularly instructive for entrepreneurs or managers of new ventures.

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Certainly, the deterring effect of a large inaugural capacity cannot be feigned. A new carrier pretending to have more financial resources than it actually does may run into cash flow problems if its net rate of resource consumption is significantly higher than anticipated for a prolonged period. Nevertheless, given an adequate level of inaugural resources, a new entrant in an industry with decreasing marginal costs of production should, according to the regression results, maximize its inaugural capacity both to decrease its unit cost of production and to deter entry retaliatory actions.

CONCLUSION

This study adds to the extant literature on interfirm competition and *de novo* venture strategy through the concept of an arch incumbent, and provides concrete recommendations for a *de novo* venture to enhance its survival odds. A large market overlap with a single established incumbent (the arch incumbent to a new venture) is found to be detrimental to venture survival in general. However, there are two special exceptions: an aggressive firm-wide scale of entry, or the adoption of a different market positioning from arch incumbents. Together with a sufficiently large inaugural capacity or a different market positioning, a large market overlap with an established incumbent can provide an opportunity for the *de novo* venture to position itself differently and thus reduce the possibility or severity of entry retaliatory actions. The experience of *de novo* ventures to the intra-European passenger air travel industry supports this notion. Moreover, the empirical analysis shows that a broad low-cost positioning (different from established incumbents) only enhances survival odds for a *de novo* venture if it has a large market overlap with its arch incumbent.

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