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The Structure of Competition: How Competition Between One's Rivals Influences Imitative Market Entry

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This paper investigates how the pattern of encounters between a firm's competitors affects the firm's inclination to follow its competitors into a new market. We theorize that direct encounters between a firm's rivals lead to a herding effect, making imitative market entry more likely. Past mutual forbearance between a firm's competitors (resulting from asymmetric multimarket competition) further strengthens this herding effect, by enhancing the firm's expectations of market attractiveness. In contrast, aggressive past rivalry between the competitors (resulting from symmetric multimarket contact) dampens these expectations, producing a competition effect that makes herding less probable. We test our idea in two distinct contexts—the Chinese pharmaceutical industry and the Taiwanese computer hardware industry—and find consistent support in both settings. We discuss how our analysis of what we call the "structure of competition" can be extended to research on other forms of firm behavior.

Key words: structure of competition; imitation; market entry; multimarket competition; herding theory
History: Published online in *Articles in Advance*.

1. Introduction

Under uncertainty, firms often seem to be inclined to imitate each other's actions (Lieberman and Asaba 2006). Empirical studies have documented the influence of imitation on a wide variety of strategic decisions, including diversification (Fligstein 1991, Haveman 1993), organizational structure (Fligstein 1985), adoption of management practices (Abrahamson 1997, Burns and Wholey 1993), innovations (Greve and Taylor 2000, Rogers 1995), and choice of location (Henisz and Delios 2001), among others. Imitation is alleged to play a role in influential societal phenomena such as acquisition waves, the Internet bubble, and the surge in usage of credit default swaps in the banking sector that led up to the 2008 financial crisis (e.g., McNamara et al. 2008, Pernell 2010).

Among the many reference organizations that firms can potentially imitate, those who compete closely with a focal firm in the same industry segment have received particular scholarly attention. Although organizational scholars generally expected a firm to imitate its direct competitors, empirical findings have been inconclusive or even conflicting. Although in several studies firms were found to imitate their close competitors (e.g., Garcia-Pont and Nohria 2002, Guillen 2002, Yang and Hyland 2006), other studies showed that competing organizations' actions had insignificant or mixed influence (e.g., Greve 1996, Guillen 2003, Semadeni 2006), and still others found that firms tended to steer away from—rather than imitate—their direct competitors (e.g., Baum et al. 2000, Delios et al. 2008, Han 1994). In an attempt to shed light on these conflicting findings, we argue and show that a firm's propensity to imitate or instead steer away from its direct competitors is determined by the extent and nature of rivalry between its competitors.

We focus on a specific form of firm behavior—market entry—and analyze how a firm's decision to follow suit is moderated by the rivalry between its competitors. Using insights from herding theory (Banerjee 1992, Bikhchandani et al. 1992), which analyzes perceived market attractiveness, we theorize that competitive interactions between a firm's rivals create a herding effect, which makes mimetic entry more likely. On the other hand, rivalry between a firm's competitors may also make entry into the same market segment seem less attractive because of intensified competition. We assess the latter effect by examining the nature of the competition between the firm's rivals—specifically, whether there is multimarket competition (Bernheim and Whinston 1990, Jayachandran et al. 1999) and whether it is the type that reduces or intensifies rivalry (Gimeno 1999). Thus, we theorize that the contagious effect of competitors' prior entry is determined by a set of moderators that delineate the structural pattern of

competition around a focal firm—whether a firm's direct competitors also directly compete with each other and, if so, what the nature of their rivalry is.

We tested our ideas in two distinct contexts. The first study concerned the Chinese pharmaceutical industry and domestic drug producers' entry into new product markets. The second study concerned the Taiwanese personal computer (PC) industry and hardware producers' entry into new geographical markets in China. Of course, product-market entry and geographic-market entry are two different strategic actions, and they are associated with different underlying motives and partially different streams of literature. However, by examining these different contexts, we intend to show evidence of the applicability of our ideas across different settings and forms of market entry. Our findings reveal that a firm's tendency to imitate its direct competitors is strongly influenced by the wider pattern of market encounters between these rivals.

Our paper makes two main contributions. First, by examining a set of moderators, we advance the literature on imitation by revealing circumstances under which firms have a propensity to imitate their direct rivals and those under which they are distinctly disinclined to follow suit. Our second contribution is a more general one. Our independent variables concern characteristics of what we call the *structure of competition*: the pattern of who competes with whom in an industry, particularly as regards characteristics of competitive encounters between a firm's rivals. Our results indicate that firms' behavior—in our study, imitative market entry—is strongly influenced by such competitive structures because they can bring about herding effects. This opens up the intriguing possibility that other types of firm behavior might also depend on and be moderated by such structural features of the wider pattern of competitive interactions in an industry.

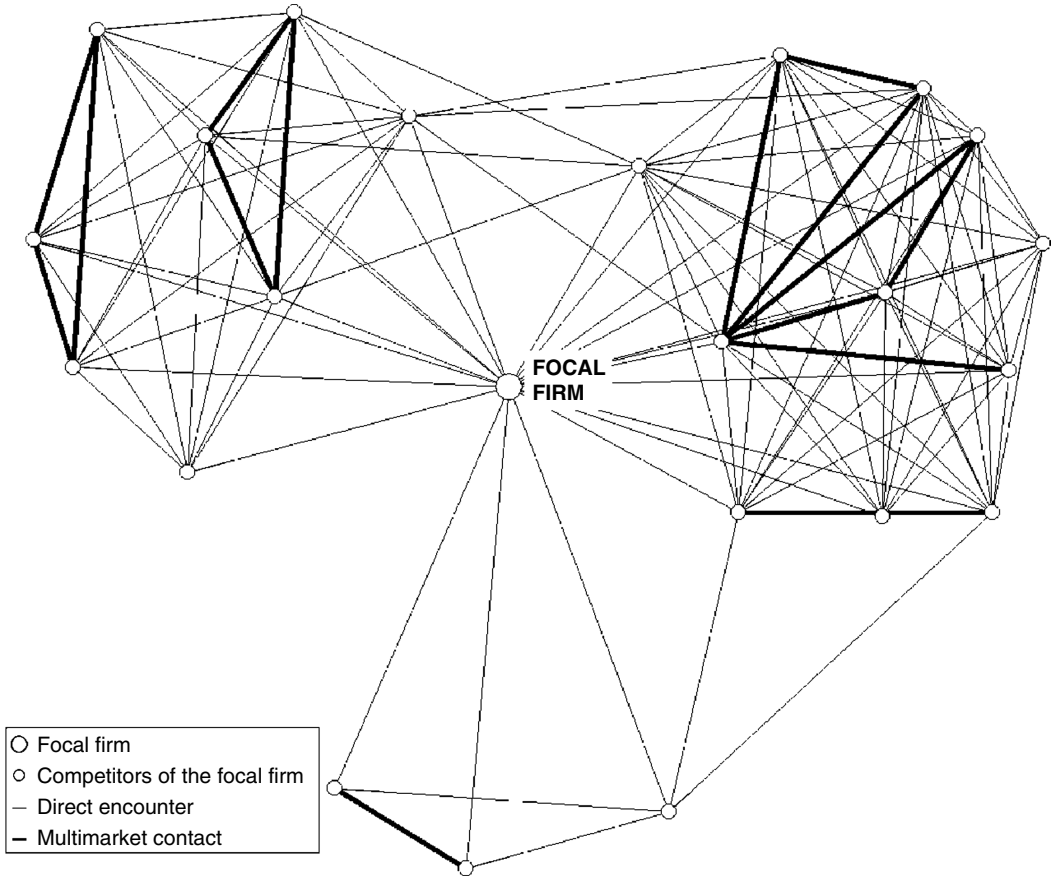
2. The Structure of Competition

Each firm within a particular industry faces a different competitive context. This is because an industry typically consists of multiple product segments operated by different but overlapping sets of industry members. Two industry members can be regarded as direct competitors to each other when they operate in at least one common product segment (Chen 1996, Peteraf and Bergen 2003). Commonality in market segments is consequential because it is often used by firm managers as a basis of competitor identification and business strategy formulation (Porac et al. 1995). Each firm in an industry might directly compete with some industry members for certain product segments but not with others. Similarly, among the direct competitors of a focal firm, some might directly compete with each other, whereas others do not. For example, a pharmaceutical company operating in the cardiovascular and the dermatological segments might have one direct competitor in the former segment and another in the latter, but these two direct competitors may or may not directly encounter each other in any common segment. Mapping all the competitive encounters between a firm and its rivals can reveal remarkably different structures.

Consider the sample firm depicted in Figure 1. It has 22 direct competitors. The lines between them indicate whether these competitors also compete directly with each other. The 22 rivals could potentially form 231 competitor pairs in the market. However, because not all firms encounter each other, there are only 94 connections between them. Moreover, 15 of these connections (as indicated by the bold lines) concern firms that meet each other in multiple segments of the industry, a situation of multimarket contact (Bernheim and Whinston 1990, Jayachandran et al. 1999). We theorize that the properties of such a competitive structure influence how likely it is that the focal firm follows entrants from this set of competitors into a new market. This is so, we argue, because these properties determine expectations of market attractiveness, possibly triggering herding effects.

In particular, in this paper, we compare four basic situations: a firm whose direct competitors do not compete with each other; a firm whose competitors also encounter each other; and a firm whose competitors are engaged in multimarket competition, wherein this latter case we will distinguish between two different forms of multimarket rivalry. We argue that in an uncertain situation such as new market entry, the presence of direct encounters between a firm's current rivals creates a group effect—the proverbial herd (Banerjee 1992, Bikhchandani et al. 1992)—making imitative entry more likely. This results in our first hypothesis. Yet it is the nature of this competition—whether it is multimarket competition and, if so, of what form (following Gimeno 1999)—that may counter this effect. Some forms of multimarket competition may lead the firm to expect aggressive rivalry in the new market resulting from entry by its direct competitors (i.e., so-called symmetric multimarket contact), making the market seem less attractive and thus suppressing herding effects. In other cases, the rivalry may be more subdued (i.e., so-called asymmetric multimarket competition), augmenting the herding effect and, with it, a firm's propensity to enter. This results in our second and third predictions. Hence, shaped by the extent and nature of the rivalry between its present competitors, a firm might be inclined to mimetically enter a new market or stay out of it altogether.

Figure 1 Example of a Firm and the Market Encounters Between Its Direct Competitors



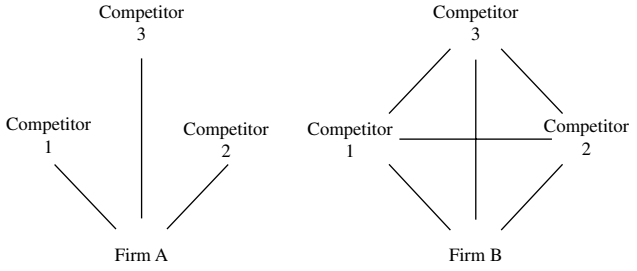
3. Theory Development and Hypotheses

3.1. Competition Between a Firm's Competitors

Prior market entry by a firm's competitors may make a firm more inclined to enter that market too because of an inclination to follow "the herd." Herding theory suggests that, under uncertainty (Avery and Zemsky 1998), firms interpret prior entry as a signal of market attractiveness in terms of the market's potential size, consumers' willingness to pay, and so on. These earlier entrants are thought to act based on information unavailable to the firm (Bikhchandani et al. 1992).[1] Especially when an increasing number of its direct competitors appears to conclude that entry is favorable, the firm is likely to act based on this information and enter too (Banerjee 1992, Bikhchandani et al. 1998). However, prior entry by a firm's competitors can also reduce the firm's expectations of market attractiveness (and with it, its inclination to enter) because of a competitive crowding effect. This effect could be especially pertinent when it concerns the firm's direct competitors.

We expect that the positive herding effect will be particularly strong when many of a firm's direct rivals also encounter each other, because in this situation, its competitors start to act as a reference group (Greve 1998). Encounters between rivals prompt the firm to view them as forming a group of closely related organizations, of which the focal firm is a part (Fiegenbaum and Thomas 1995). Organizations usually closely monitor their reference groups, which increases the probability that they will act in similar ways because, as Greve (1998) put it, "What you see is what you do." When the group of rivals starts acting as a herd and the firm monitors them, it is likely to be drawn into following their actions. According to herding theory, this effect is further strengthened by outsiders' assessments of their movements. That is because firms that are a part of this group of competitors but that do not follow suit—that is, they do not enter the new market when others do—will expose themselves to reputational risk (Zwiebel 1995). In their seminal paper on herding theory, Scharfstein and Stein (1990) explained how rational managers, eager to protect their reputation as sound decision makers, follow the herd in the form of mimicking the decisions of others even in light of private information that suggests that a market is unattractive. Although the firm might believe that the market is unlikely to be profitable, managers cannot take the risk of not entering because they are "afraid of being perceived as lone fools for missing out on the ride" (Scharfstein and Stein 1990, p. 465); in contrast, the personal risk of entering a market that is

Figure 2 Direct Encounters Between a Firm's Competitors



likely to be unprofitable while others also enter is comparatively low "because an unprofitable decision is not as bad for reputation when others make the same mistake" (p. 466). Hence, building on these insights from herding theory, we predict that encounters between a firm's direct competitors are likely to create a herding effect, thus drawing the firm into entering into the new market, too.

Consider firms A and B in Figure 2. In this stylized example, both firms have three direct competitors. However, firm A's competitors do not compete directly with one another. This is because firm A encounters competitor 1 in one segment of the industry (e.g., cardiovascular drugs), competitor 2 in another segment (e.g., dermatological drugs), and competitor 3 in yet another one; these firms have no other segment in common. In contrast, the four firms on the right-hand side all meet each other in some segment of the industry. The latter firms (firm B and its competitors) are more likely to operate as a herd because they all monitor each other. Therefore, we expect that firm B is more likely than firm A to follow its competitors into a new market. That is, we predict that direct encounters between an organization's existing competitors will positively moderate the relationship between prior entry by competitors and a firm's propensity to follow suit. Hence, a firm will be even more inclined to match rivals' market entry moves if many of its current competitors also compete directly with each other. Formally stated,

HYPOTHESIS 1. *The extent to which a firm's direct competitors also compete directly with each other will increase the relationship between the number of direct competitors that have entered a particular market and the firm's likelihood of entering the same market.*

3.2. Asymmetric Multimarket Contact Between a Firm's Competitors

Prior entry may create a herding effect because it increases a firm's expectations of market attractiveness (Banerjee 1992, Bikhchandani et al. 1992). However, as stated previously, there could also potentially be increased competition resulting from prior entry by the firm's direct competitors, which could lower the firm's market expectations. To what extent this competition effect occurs will depend on the nature of the rivalry between the firm's competitors. If the entrants stem from a group of direct competitors among which rivalry is fierce, the firm might expect this rivalry to spill over into the new market, lowering market expectations. On the other hand, if existing competition is subdued, the firm might expect entering firms to behave similarly toward each other in the new context as well. One thing influencing the nature of the rivalry is whether there exists multimarket contact between the competitors and what form it takes.

Multimarket or multipoint competition (Bernheim and Whinston 1990, Jayachandran et al. 1999, Karnani and Wernerfelt 1985) occurs when a firm's competitors encounter each other in *multiple* segments of the industry. Traditionally, scholars of multimarket contact have argued that when two competitors have small footholds in each other's key market, an implicit threat of reciprocal retaliation results. Competition thus becomes more subdued, appearing in the form of nonaggressive behavior toward each other, a situation that has been referred to as mutual forbearance. For example, Gimeno (1999) showed that airlines use a relatively small presence in their competitors' main hubs to reduce rivalry in their own hub. Thus, this form of multimarket contact serves as a deterrent, which limits the intensity of rivalry. It has been associated with higher profits (Feinberg 1985, Scott 1982), more favorable price setting (Evans and Kessides 1994, Gimeno 1999), and lower rates of market exit (Barnett 1993, Baum and Korn 1996, Boeker et al. 1997). Following Gimeno (1999), we refer to this situation in which competitors have a small foothold in each other's key market as "asymmetric multimarket competition," in contrast to symmetric multimarket competition, according to which both players are largely dependent on the same segment. It is in the situation of asymmetric multimarket contact that mutual forbearance is likely.

Hence, we predict that the market expectations of prior entry are positively enhanced by asymmetric multimarket competition between a firm's competitors because it makes the firm optimistic about the fierceness of rivalry in the new market. Hence, it strengthens the herding effect. Owing to mutual forbearance, the rivalry between the firm's competitors will have been characterized by nonaggressive behavior, which is likely to spill over into the new market (Baum and Korn 1999). Competitors that behaved in a nonaggressive way toward each other in the past, as a result of asymmetric multimarket competition, are expected to also behave in a nonaggressive way in the new market. This applies to prior entrants as well as potential future entrants from this group. Thus, because of the asymmetric multimarket contact between its current rivals, the firm's expectations of rivalry in the new market will be relatively optimistic.

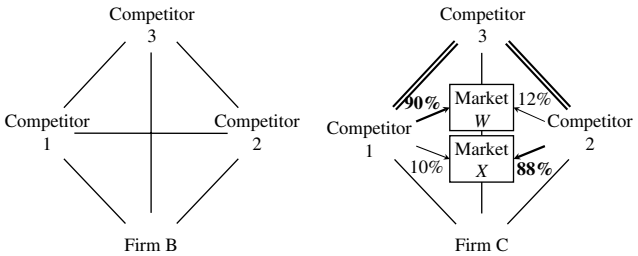
The firm will benefit from the mutual forbearance between its competitors, for example, because their nonaggressive price setting will also be advantageous to

the firm. The rivals will abstain from initiating fierce price competition so as to avoid retaliation, a state of affairs from which the focal firm will also profit (Barnett 1993). Indeed, Haveman and Nonnemaker (2000), examining the California savings and loan industry, found that single-market competitors benefited from the mutual forbearance created by multimarket competition between their rivals. Therefore, a firm's expectations of market attractiveness will be more positive when the entrants come from a group of rivals who are engaged in the type of multimarket competition that implies a small foothold in each other's key market. Having observed a history of forbearing behavior between them, the firm can expect that rivalry in the new market will also be restrained, which strengthens the herding effect by making entry more attractive.

Consider firms B and C in Figure 3, in which firm B's competitors directly encounter one another, as do firm C's competitors. Yet whereas firm C's competitors are engaged in multimarket competition, firm B's competitors are not. Two of firm C's competitors encounter one another in segments W and X. Competitor 1 depends 90% on segment W (e.g., because it generates 90% of its revenues there) and 10% on market X. The interests of competitor 2 in the two markets are almost the reverse: it depends 12% on segment W and 88% on segment X. Mutual forbearance is likely to occur in such a situation because competitor 1 will likely respect competitor 2's interest in X in exchange for competitor 2's restraint in W (Gimeno 1999). We expect firm C to be more prone to follow the herd and imitate its competitors because these firms' forbearing behavior toward each other can be expected to spill over into the new market. Therefore, we predict that this type of multimarket competition between a firm's present competitors will positively moderate the relationship between prior entry by competitors and the firm's propensity to follow suit such that the firm will be even more inclined to match its rivals' entry moves if these rivals encounter each other in multiple segments.

Hypothesis 2. *Asymmetric multimarket competition among a firm's direct competitors will further increase the relationship between the number of direct competitors that have entered a particular market and the firm's likelihood of entering the same market.*

Figure 3 Asymmetric Multimarket Contacts Between a Firm's Competitors



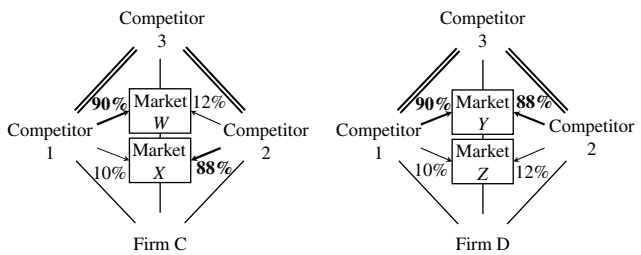
Note. Bold figures highlight the market of major interest to each competitor.

3.3. Symmetric Multimarket Contact Between a Firm's Competitors

As discussed previously, multimarket contact between competitors can potentially lead to mutual forbearance. However, this does not always happen (for an overview of empirical findings, see Baum and Korn 1999). Mutual forbearance is unlikely to occur when two multimarket competitors depend heavily on the same segment. For example, if two airlines share the same main hub, and all other routes are of marginal importance to both of them, competition is likely to be fierce (see Gimeno 1999). Take Figure 4 as an example. Consider the case of firm D. As in the case of firm C, competitor 1 depends 90% on market Y and 10% on market Z. Here, however, competitor 2's relative interests in the two markets are very similar: it depends 88% on market Y and 12% on market Z, a situation of highly symmetric market dependence. In this situation, aggressive competition—not mutual forbearance—is more likely to occur. Because both markets are of equal strategic importance to both firms, they will often compete intensely against one another. Each firm seeks to prevent the other from gaining the upper hand in either of the two markets (Knickerbocker 1973) to avoid cross-market subsidization (Chen and MacMillan 1992, Gimeno 1999, McGrath et al. 1998).

We contend that the herding effect of prior entry by competitors is negatively affected by such symmetric multimarket contact between a firm's competitors. Having observed the aggressive behavior of its competitors toward each other in the past, a firm might expect that entrants from such a group will compete fiercely with each other in the new market too, as will possible future entrants from that group. Their aggressive behavior toward each other will likely incur negative spillovers because, for example, intense price competition between them will put pressure on the profit margins of every firm in the market. Rather than being inclined to mimic these rivals' entry moves, the firm might choose not to join its competitors in the new market, in an attempt

Figure 4 Asymmetric vs. Symmetric Multimarket Contacts Between a Firm's Competitors



Note. Bold figures highlight the market of major interest to each competitor.

to steer clear of the rivalry. Therefore, we expect that firm D will be less likely to follow its competitors into a new market. Put differently, we predict that symmetric multimarket contact will negatively moderate the relationship between prior entry by competitors and a firm's propensity to follow suit, so a firm will *not* be inclined to imitate its competitors' entry decisions.

HYPOTHESIS 3. *Symmetric multimarket competition among a firm's direct competitors will decrease the relationship between the number of direct competitors that have entered a particular market and the firm's likelihood of entering the same market.*

4. Methods

4.1. Study 1: The Chinese Pharmaceutical Industry

Research Setting. Our first database consisted of all domestic producers of active pharmaceutical ingredients in China, observed during the period 1992–2001. Before the start of economic reform in China in the 1980s, drug producers operated solely in accordance with the production plans set by the government's public health agency, whose primary concern was ensuring the supply of basic pharmaceuticals rather than efficiency, profit, or innovation. Consequently, the industry became characterized by bulk capacity of generic drugs and a focus on output volume (White and Liu 1998). Firms were primarily engaged with meeting the output targets that had been set centrally for them.

In the late 1980s and early 1990s, a series of economic reforms moved China toward a market economy. Following these developments, China's national healthcare system underwent various significant changes. Among these, the old cooperative medical system was dissolved; price regulations were abolished and replaced by a system distinguishing between "ethical" and "over-the-counter" drugs; medical consultation and drug dispensing were separated; and a partial national insurance scheme, including an expanding list of approved drugs and mandatory price caps, was introduced. Furthermore, various policy measures and certification programs aimed at improving the efficiency and quality of drug production and distribution, similar to those in developed countries, were introduced by the Ministry of Health. These developments presented managers in the pharmaceutical industry with various challenges and uncertainties. Managers had to move beyond their traditional role of overseeing production and assume responsibility for strategic decision making, which previously had been handled by governmental agencies (Guthrie 1997, White 2000). It is for this latter period that we tested our predictions regarding imitative market entry.

Data. We compiled our longitudinal data for the period 1992–2001 using the *Pharmaceutical Industry Yearbook*, an industry directory published annually by the Chinese National Bureau of Statistics. We chose 1992 as a starting date because the types of data reported in the yearbooks before 1992 were inconsistent with those for the years thereafter. Moreover, before this date, because of the central planning economy, individual firms had relatively little control over which products they produced. The *Pharmaceutical Industry Yearbook* combines records of various public healthcare agencies and covers every drug manufacturer in China, providing detailed production data on all drugs produced by each manufacturer in a given year. Because the pharmaceutical industry is highly regulated and monitored, these official records are comprehensive. Using this information source, we were able to identify the whole population of drug manufacturers in China as well as every product line expansion event during the observation period.

Our database consisted of the entire population of domestic drug manufacturers in China, as listed in the yearbooks. During the observation period, 1,634 firms had their own facilities for manufacturing active pharmaceutical ingredients. Industry experts we consulted for this project suggested that a relatively large number of these firms were likely to be short-lived, highly specialized companies that focused on producing one specific ingredient. Since we feared this might distort our statistical results, in the analysis presented below we included only the 742 firms that had ever produced at least two distinct active ingredients during the observation period. However, we repeated the analyses on the data covering all the firms and found consistent results.

In total, these drug manufacturers produced more than a thousand active ingredients. The Chinese State Food and Drug Administration classified all active ingredients into 22 therapeutic categories (see Table A.1 in the appendix for details) similar to those used in other countries. Ingredients that act on the same organ or system and that have similar therapeutic characteristics are grouped into the same category. Producing ingredients with different therapeutic effects requires drug producers to acquire and exercise different technical know-how and to deal with different sets of distributors and physicians. Therefore, each therapeutic category delineates a distinct product market within the pharmaceutical industry. We used these categories to identify direct competitive relationships between firms and market entry events. Two drug producers were regarded as directly competing with each other if they manufactured active ingredients in at least one common category. A market entry event was defined as a firm starting to produce an ingredient in a therapeutic category that it had not served before. During the period 1992–2001, 331 of the 742 companies made 542 entries into 22 different product markets.

4.2. Study 2: The Taiwanese Computer Hardware Industry

Research Setting. Our second database consisted of manufacturers of PCs and ancillary hardware in Taiwan

and their direct investments into China during the period 1999–2005. During this period, Taiwan had—and still has—a very substantial computer industry. For example, in 1998, Taiwanese producers registered a production value of US$34 billion (Institute for Information Industry 2000). This made Taiwan the third-largest hardware supplier in the world (after the United States and Japan). Unlike Japan and Korea—whose computer industries were dominated by large, diversified conglomerates—Taiwan's computer industry consisted of many medium-sized producers, located along a 50-mile stretch south of the capital, Taipei. These medium-sized companies specialized in rapidly adapting their production to technological innovations by quickly moving into emerging product technologies and jumping onto the next technology available as soon as margins eroded (Dedrick and Kraemer 1998).

Yet the business environment became increasingly challenging in the late 1990s. First, the global PC market experienced dramatic price erosion. In the United States between 1997 and 1998, for example, the average retail price of a PC dropped from $1,800 to about $1,000 (Curry and Kenny 1999). In addition, soon after, most PCs became so powerful that few applications required a faster machine, and corporations and consumers slowed their replacement cycles, which led to a drop in demand. As a consequence, for the first time since 1981, in 2000–2001 the market demand for PCs declined. During the same period, while Taiwanese PC hardware producers were struggling to adapt to the drop in demand, the Chinese economy, which had been relatively sheltered from the 1997 Asian financial crisis, was experiencing substantial development as a result of its shift toward a market economy. For Taiwanese companies, China not only represented an ideal site for setting up low-cost production facilities but also became an important end market in itself. Economic wealth increased rapidly in various regions, and local demand for PCs surged. Consequently, although relatively few companies had a major presence in China until the mid-1990s, by the end of 2005, investments by our sample companies in China accounted for more than 60% of their total investments overseas.

Data. The data used in this study concerned all companies listed in Taiwan that had ever produced PCs or ancillary hardware using in-house manufacturing facilities during the period 1999–2005. Companies were identified from two bourses in Taiwan: the Taiwan Stock Exchange (where larger and more-established companies are listed) and the Gre Tai Securities Market (which lists smaller, more-entrepreneurial companies). Regulations in Taiwan require listed companies to disclose in annual reports their sales of products accounting for 10% or more of their total revenue. Using Standard Industry Classification (SIC) categories to define product markets, we identified all firms that were reported to be active in the following five product markets: computers, monitors and terminals, computer peripherals, audio and video equipment, and communication equipment. This yielded 205 companies, for which we proceeded to identify all direct competitors. We regarded two companies to be directly competing with each other if they operated in at least one common product market. Since many of the 205 companies had diversified into other related markets (e.g., optoelectronics components), we also collected information about their direct competitors in these segments. This in turn yielded another 344 companies in an additional 15 product markets (see Table A.1 in the appendix for details).

For these 549 companies, we traced all investments into China back to 1982—before which Taiwanese investments into China were virtually nonexistent—using two complementary sources. First, the Investment Commission (the regulatory agency of foreign investment in Taiwan) reviewed and kept records of every investment project greater than US$200,000. In addition, Taiwan's listed companies self-reported their activities in China to the Market Observation Post System, an open information platform managed by the Taiwan Stock Exchange. Together, these two sources provided comprehensive coverage of all investments into China by Taiwanese companies. These data were updated quarterly. During the period 1999–2005, 389 of the 549 companies made 650 entries into 22 different geographic markets in China. A geographic market was defined as a province, a municipality, or an autonomous region in China. This is the standard way of distinguishing between various regions within China (Chan et al. 2010) because each is overseen by a separate local government. A market entry move was defined as the first direct investment made by a Taiwanese company in a particular geographic market.

4.3. Dependent Variables and Method of Analysis

Our hypotheses pertained to the likelihood that a firm will enter a specific new market, as influenced by its direct competitors' prior entries. We estimated this entry likelihood using Cox's (1975) semiparametric proportional hazard model. The dependent variable in Cox models is the hazard rate, or the instantaneous probability of a firm entering a particular market by a specific point in time. A firm was at risk of entering any market it had not operated in before. Letting $h[t \mid \mathbf{Z}(t)]$ be the hazard rate of entering a market at time t for a firm with covariate vector $\mathbf{Z}(t)$, our Cox models are as follows:

$$h[t \mid \mathbf{Z}(t)] = h_{0i}(t) \exp[\boldsymbol{\beta}' \mathbf{Z}(t)].$$

In this equation, the hazard rate is represented as covariates modifying multiplicatively an unspecified baseline hazard function. Because both of our samples contained multiple observations of each firm with regard to its

entry decisions in different markets at a given point in time, we were able to stratify our models by fitting an individualistic baseline hazard function $h_{0i}(t)$ for each firm (denoted by i).

Accordingly, estimates of the parameter vector $\boldsymbol{\beta}$ were obtained by maximizing the log-likelihood function:

$$\log L(\boldsymbol{\beta}) = \sum_i \log L_i(\boldsymbol{\beta}),$$

where $L_i(\boldsymbol{\beta})$ is the partial likelihood function using only the data for those observations associated with firm i. In a few instances, a firm might have entered more than one market at the same time, resulting in ties between event times. We implemented Breslow's estimator (1974) to account for ties. Specifically, we let $d_i(t)$ equal the number of entry moves that firm i undertook at time t, let $D_i(t)$ be the set of markets that firm i entered at time t (each market is denoted by m), and let $R_i(t)$ be the set of markets that firm i was at risk of entering at a time just prior to t (i.e., risk set). The partial likelihood function corresponding to each firm can be expressed as follows:

$$L_i(\boldsymbol{\beta}) = \prod_t \frac{\exp[\boldsymbol{\beta}'\mathbf{s}_i(t)]}{[\sum_{m\in R_i(t)} \exp[\boldsymbol{\beta}'\mathbf{Z}_i(t)]]^{d_i(t)}},$$

$$\text{where} \quad \mathbf{s}_i(t) = \sum_{m\in D_i(t)} Z_i(t).$$

Since the likelihood function is not dependent on the baseline hazard function, we could make inferences on the effects of covariates without specifying $h_{0i}(t)$. As such, stratifying the baseline hazard function constitutes a convenient and highly effective way to control for unobserved firm-level effects. Indeed, since $L_i(\boldsymbol{\beta})$ is based on contrasting observations in $D_t(t)$ (the set of markets that firm i entered at time t) with observations in $R_i(t)$ (the set of markets that firm i was at risk of entering at a time just prior to t), the effects of any variables that vary only at the firm level—including both fixed and time-variant ones (e.g., firm size)—would be canceled out. Another important advantage of these Cox models is that left-truncated data can be easily accounted for. When left-truncated data are present, the risk set $R_i(t)$ is defined as observations of firm i that were under study at a time just prior to t. With this simple modification, the usual techniques for estimating regression coefficients in Cox models can be applied (see Klein and Moeschberger 2003).[2]

In Study 1 (the Chinese pharmaceutical industry), observations were determined by firms, years, and therapeutic categories. A spell, or time-to-event, started either at the beginning of the period of observation (1992)—in which case the observation was left-truncated—or at the point of founding of a specific firm (if after 1992). A spell ended in an event when the firm entered a particular market or was right-censored either at the end of the observation period (2001) or because the firm went out of business before that date. In Study 2 (the Taiwanese PC industry), observations were determined by firms, quarters, and geographic regions in China. A spell ended in an event if the firm entered the particular market; otherwise, the observation was right-censored, either in the quarter in which the firm was dissolved or because it had not entered a market by the end of 2001. Our data contained 66,540 firm-year-market observations associated with 12,988 spells in Study 1 and 88,678 firm-quarter-market observations associated with 3,703 spells in Study 2.

4.4. Explanatory Variables

Competitors' prior entry was measured as the number of a firm's competitors that had previously entered a particular market. As a robustness check, we also computed an alternative measure weighed by the size of each competitor (using the logarithm of annual sales) because prior research has indicated that firms might be more inclined to imitate large organizations (Greve 2000, Haunschild and Miner 1997, Haveman 1993). This weighted measure yielded highly consistent results. In the tables, we report the results based on the count measure because its estimated coefficients are relatively easy to interpret in terms of their implied effects.

Direct encounters between a firm's competitors indicated how often a firm's direct competitors also previously encountered one another in at least one common market segment. In Study 1, a market segment was defined as one of the 22 therapeutic categories; in Study 2, a market segment was identified as one of the 20 SIC categories (as listed in Table A.1 in the appendix). Thus, we counted the number of occasions that competitors of the focal firm also encountered each other and divided that by the maximum number of times they could have encountered each other. For example, in Figure 2, this measure takes on the value of 0 (no encounters between competitors) divided by 3 (number of times they could have encountered each other) for firm A and would be 3 divided by 3 for firm B. Thus, this variable indicates the extent to which a firm's direct competitors also compete with each other.[3] Its value ranges from 0 to 1, where a higher number indicates more direct market encounters between a firm's competitors.

We captured asymmetric (versus symmetric) multimarket competition through a combination of two variables. The first variable indicates the extent to which there is *multimarket contact between a firm's competitors*, regardless of whether it is symmetric or asymmetric, which is the traditional way to measure multimarket competition. Specifically, we measured how many of the direct encounters between a firm's competitors consisted of multimarket contacts. Thus, again, this variable represents a proportion whose value ranges from 0 (no multimarket encounters between competitors) to 1 (all the competitors that directly encounter

each other are engaged in multimarket competition). For example, in Figure 3, it takes on the value 0 (no competitors meet in multiple markets) divided by 3 (the number of times multimarket competition could have happened) for firm B, whereas it takes on the value 3 divided by 3 for firm C.

The second variable (defined below) captured the extent of symmetry in these multimarket contacts. Hence, in our analysis, when we include (and control for) both measures, the variable defined above will model the effect of asymmetric multimarket contact, whereas the symmetry variable will capture the influence of symmetric multimarket competition. Alternatively, we also developed a set of dichotomous variables that directly distinguished between asymmetric and symmetric multimarket contact. These variables and models, which we will discuss in the Results section, produced results virtually identical to the ones above.

Market dependence is most often measured as the proportion of a firm's sales generated in a particular market (Bothner 2003, Burt 1992, Chen and MacMillan 1992), which is what we used in Study 2. In Study 1, however, data on firms' sales per segment were not always available. Therefore, we assessed the level of market dependence as the proportion of a firm's total drug portfolio that it offered in the particular market. Subsequently, using these numbers for both studies, we computed the Euclidean distance between each pair of competitors to indicate the extent of symmetric market dependence between them. A high distance score indicates two firms that have very dissimilar market dependence, whereas a low distance score between two companies implies that they have highly symmetric market dependence. For example, in Figure 4, firm C's competitors are located at the coordinates 0.90, 0.10 (firm 1) and 0.12, 0.88 (firm 2), which leads to a Euclidean distance of 1.103, indicating asymmetric market dependence. Firm D's competitors are located at the coordinates 0.90, 0.10 (firm 1) and 0.88, 0.12 (firm 2), which leads to a Euclidean distance of 0.028, indicating highly symmetric market dependence. Formally stated,

$$d_{k,l}(t) = \sqrt{\sum_m \left[\frac{s_{k,m}(t)}{s_k(t)} - \frac{s_{l,m}(t)}{s_l(t)} \right]^2}.$$

In the above equation, $s_{k,m}$ denotes the number of active pharmaceutical ingredients (Study 1) or total sales (Study 2) that competitor k generated in market m, and s_k denotes the total number of ingredients or sales of competitor k. We reverse-coded $d_{k,l}$ (by subtracting $d_{k,l}$ from a constant equal to the maximum distance score in the sample) to indicate the symmetry score between k and l, denoted by $q_{k,l}$. The firm-level variable *symmetric contact between a firm's competitors* was then computed as the average of $q_{k,l}$ across competitors' multimarket contacts, so a high score indicates a set of multimarket competitors that are highly symmetric in terms of their market dependence.

4.5. Control Variables

Study 1. Although we focused on the market relationships between a firm's direct competitors, we also controlled for the market relationships between the firm itself and its competitors through the inclusion of two interaction terms, *a firm's multimarket contact with its competitors* × *competitors' prior entry* and *a firm's symmetric contact with its competitors* × *competitors' prior entry.* Including these variables should enable a direct comparison between the effect sizes of a firm's encounters with its direct competitors and the effect sizes of encounters between its competitors.

Moreover, companies might sometimes enter the same market not because they imitate one another but because the target market has certain characteristics that make it highly attractive. We accounted for market attractiveness using a number of control variables. For one, we accounted for density-dependent legitimation and competition dynamics (Hannan and Freeman 1989) by controlling for *market density,* measured as the total number of firms that were active in a market at a time, and *market density*^{2} (divided by 100 for rescaling). Prior literature suggests that the market entry rate would increase with density but decrease with density squared (Carroll and Hannan 1989, Greve 2000, Haveman 1993).

In all our models, we included the natural logarithm of total market output to account for *market size*. We also controlled for *market exits*, measured as the number of companies that left a particular product market, and *incumbents operating at a loss*, measured proportionally as the number of incumbents operating at a loss divided by the total number of incumbents in a product market. We expected the market entry rate to decrease with these two variables because they might signal a decline in market attractiveness (Chan et al. 2006). Furthermore, literature in industrial economics has suggested that excess capacity and high market concentration can deter entry (Scherer and Ross 1990). To construct a measure for *excess capacity* in a market, we cumulated the firms' production capacity, subtracted the market's total production volume, and then divided this number by the total production volume to arrive at a measure of relative excess capacity. We expect access capacity to deter entry because it makes the market more competitive and less attractive. We measured the *market concentration ratio* as the proportion of market output by the four largest manufacturers in a market (the CR4 index). Whereas in some settings, market concentration can stimulate entry—especially by small specialists who offer differentiated products that satisfy the needs of particular niche customers better than large generalists can (Carroll 1985)—in our setting we expected the entry rate to decrease with market concentration. This is because the possibility for product differentiation is very limited (the vast majority of Chinese producers focused on

generic drugs), and the economies of scale enjoyed by large incumbents created entry barriers.

Study 2. As in Study 1, in Study 2 we controlled for *competitors' prior entry* and included the interaction terms *a firm's multimarket contact with its competitors* × *competitors' prior entry* and *a firm's symmetric contact with its competitors* × *competitors' prior entry* to isolate the effects of the market relationships between a firm and its competitors. *Market density* and *market density*^{2} were controlled for using the total number of foreign and domestic firms involved in the computer hardware industry in each of the geographic markets in China. The information on market density was obtained from the Bureau of Statistics of China. As before, we also included *market exits* as a control.

To reflect other factors that might affect the attractiveness of a geographic market, we constructed four additional control variables: the level of *internationalization* of the particular geographic market (captured by imports, exports, and total foreign capital), *wealth per capita* (captured by the average gross domestic product, disposable income, and household expenditure per capita), the availability of *skilled labor* (captured by the proportion of the population with college degrees, the number of recent college graduates, and the number of professionals in the region), and the market's *transportation infrastructure* (captured by highway density and railway density). These data were obtained from the various yearly issues of the *China Statistical Yearbook*. Table A.2 in the appendix shows all these indicators and their discriminant validity using exploratory factor analysis. These measures, representing favorable local conditions, were expected to be positively associated with the market entry rate. Table 1 reports descriptive statistics of the variables used in the two studies.

5. Results

The Cox models testing our hypotheses are presented in Tables 2 and 3. In both tables, Model 1 includes

Table 1 Summary Statistics and Correlations

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
Study 1: Chinese pharmaceutical industry													
1. *Direct encounters between a firm's competitors*	0.85	0.15											
2. *Multimarket contact between a firm's competitors*	0.31	0.15	0.09										
3. *Symmetric contact between a firm's competitors*	0.54	0.02	0.19	0.19									
4. *A firm's multimarket contact with its competitors*	0.14	0.15	−0.76	−0.10	−0.06								
5. *A firm's symmetric contact with its competitors*	0.72	0.27	0.82	0.00	0.16	−0.65							
6. *Competitors' prior entry*	18.76	18.62	−0.19	−0.16	−0.03	0.18	−0.20						
7. *Market density*	0.56	0.52	0.06	0.10	0.07	−0.05	0.04	0.63					
8. *Market exits*	2.71	2.55	0.06	0.05	0.05	−0.05	0.04	0.51	0.67				
9. *Incumbents operating at a loss*	0.23	0.13	0.01	−0.02	−0.05	−0.03	0.02	0.05	0.20	0.18			
10. *Excess capacity*	0.02	0.06	−0.02	−0.01	−0.03	0.00	−0.01	−0.16	−0.19	−0.13	−0.23		
11. *Market concentration ratio* (CR4)	0.64	0.23	−0.06	−0.05	−0.06	0.05	−0.04	−0.59	−0.76	−0.62	−0.17	0.28	
12. *Market size*	7.76	2.76	0.03	0.01	−0.02	−0.04	0.02	0.36	0.57	0.43	0.31	−0.46	−0.70
Study 2: Taiwanese PC industry													
1. *Direct encounters between a firm's competitors*	0.86	0.19											
2. *Multimarket contact between a firm's competitors*	0.04	0.03	0.16										
3. *Symmetric contact between a firm's competitors*	0.43	0.09	−0.01	−0.16									
4. *A firm's multimarket contact with its competitors*	0.01	0.02	−0.76	−0.18	−0.07								
5. *A firm's symmetric contact with its competitors*	0.73	0.23	0.78	0.17	0.08	−0.78							
6. *Competitors' prior entry*	2.28	6.94	−0.11	−0.10	−0.05	0.13	−0.14						
7. *Market density*	5.27	5.23	0.02	−0.02	0.03	−0.02	0.03	0.55					
8. *Market exits*	0.50	0.53	−0.02	0.01	0.00	0.02	−0.02	−0.07	−0.24				
9. *Internationalization*	−0.09	0.94	−0.01	0.04	−0.04	0.01	−0.01	0.44	0.85	−0.26			
10. *Wealth per capita*	0.09	0.95	0.06	−0.11	0.11	−0.08	0.08	0.20	0.18	−0.20	0.00		
11. *Skilled labor*	0.08	1.00	0.05	−0.10	0.10	−0.07	0.06	0.11	0.27	−0.07	−0.04	−0.09	
12. *Transportation infrastructure*	0.00	0.99	−0.01	0.02	−0.02	0.01	−0.01	0.06	−0.10	−0.17	0.03	−0.03	0.01

only the control variables. Table 2 shows the results for the Chinese pharmaceutical industry. In line with prior research (Hannan and Freeman 1989, Nickel and Fuentes 2004), the market entry rate increases with density but decreases with density squared, indicating a competitive crowding effect when many firms come to be active in the market. Table 3 displays the results for the Taiwanese PC hardware industry. Here, too, the market entry rate initially increases with density but decreases at higher levels of density. In both sets of models, the effect of prior entry by the firm's direct competitors is positive and significant, which suggests that, on average, firms are inclined to imitate the market entry moves by their direct competitors. Our hypotheses tests below concern moderators of this relationship.

5.1. Hypotheses Tests

Hypothesis 1 predicted that the propensity of a firm to imitate its direct competitors will be greater if its direct competitors also directly compete with one another. This hypothesis is tested through the interaction of competitors' direct encounters and competitors' prior entry because the former is expected to positively moderate the influence of the latter on the market entry rate. Corroborating Hypothesis 1, the effect of the interaction term is positive and significant in both studies. Following Cleves et al. (2010), we assessed the magnitude of the interaction effects by taking the partial derivatives of the relative hazard with respect to the variable *competitors' prior entry* under different levels of *direct encounters between a firm's competitors*. In Study 1, when direct encounters between a firm's competitors are prevalent (one standard deviation above the sample mean), an additional competitor's entry will increase the relative hazard of entry by a factor of 1.04. Yet when direct encounters between a firm's competitors are rare (one standard deviation below the sample mean), an additional entry by a competitor has only a marginal impact on the relative entry hazard (multiplier ≈ 1.00). In Study 2, these multipliers are 1.08 and 1.02, respectively. These results are in line with the idea that the mimetic effect of prior entry is stronger in cases where a firm's rivals also encounter each other.

Hypothesis 2 predicted that a firm's propensity to imitate its direct competitors' market entry moves will be even stronger if these firms have small footholds in each other's markets: the classic case of multimarket competition. This prediction rests on the idea that over and beyond the positive herding effect due to encounters between a firm's rivals (tested in Hypothesis 1), such asymmetric multimarket contact between a firm's competitors can lead to even more positive market expectations. In line with these ideas, in both studies, the coefficient of the interaction term of (*asymmetric*) *multimarket contact between a firm's competitors* and *competitors' prior entry* is positive and significant, which corroborates this hypothesis.

In terms of the size of this effect, in Study 1, when multimarket contact between a firm's competitors is prevalent (one standard deviation above the sample mean), an additional competitor entering the market will increase the relative hazard of entry by the firm by a factor of 1.03. Yet when multimarket contact between a firm's competitors is rare (one standard deviation below the sample mean), an additional competitor entering has a negligible impact on the firm's entry rate (multiplier ≈ 1.00). In Study 2, these multipliers are 1.09 and 1.01, respectively. Thus, when a firm's competitors have footholds in each other's main markets—referred to as asymmetric multimarket contact—the firm's inclination to mimic its direct competitors' market entry moves is significantly higher.

Hypothesis 3 predicted that a firm's propensity to mimic its rivals' market entry moves will be lower if its direct competitors do not have small footholds in each other's markets but instead have highly similar stakes in the same markets. Corroborating this hypothesis, in both studies the interaction term of *symmetric contact between a firm's competitors* and *competitors' prior entry* is negative and significant, which supports the idea that the former negatively moderates the influence of the latter. In both studies, the influence of prior entry by a firm's direct competitors would even turn negative at very high levels of symmetric multimarket contact (two standard deviations above the mean): in Study 1, each additional competitor's entry would decrease the relative entry hazard by a factor of 0.92, and in Study 2, the corresponding multiplier was 0.95. This finding implies that in such a situation, firms actually avoid the markets entered by their direct competitors. It indicates that a firm might also become less attracted to a certain market as a result of competitors' prior entry—namely, if its rivals have highly symmetric market dependence.

5.2. Robustness Tests and Additional Analysis

Dichotomous Multimarket Contact Variables. Our empirical approach to testing Hypotheses 2 and 3 was to use one variable to measure the extent of multimarket contact and a second variable to measure the extent to which it was symmetric. Using this approach, in our full model, the former variable represents the case of asymmetric multimarket competition and the latter variable picks up the influence of symmetric multimarket contact. The advantage of this approach is that these measures acknowledge that the extent of symmetry is a continuous variable. However, as a robustness check, we also created two dichotomous variables that directly separated asymmetric and symmetric multimarket contacts. This involved identifying a cutoff point of the distance score ($d_{k,l}$) to distinguish between the two. Using a grid search algorithm (see Bazaraa et al. 2006), the optimal threshold that maximized model fit was 0.488

Table 2 Cox Models for Study 1 (Chinese Pharmaceutical Industry)

	Models				
Variables	1	2	3	4	5
Competition between a firm's competitors					
Direct encounters between a firm's competitors × *Competitors' prior entry* (H1)		0.131*** (0.038)	0.183*** (0.043)	0.140*** (0.038)	0.233*** (0.047)
(*Asymmetric*) *multimarket contact between a firm's competitors* × *Competitors' prior entry* (H2)			0.147*** (0.032)	0.313* (0.130)	0.164*** (0.033)
Symmetric contact between a firm's competitors × *Competitors' prior entry* (H3)			−2.182*** (0.316)	−0.343† (0.183)	−2.727*** (0.396)
Symmetric and equal dependence × *Competitors' prior entry*					0.604* (0.298)
Symmetric and high share dependence × *Competitors' prior entry*					0.182* (0.092)
Other controls					
Competitors' prior entry	0.017** (0.006)	0.016** (0.006)	0.009 (0.007)	0.020** (0.006)	0.018* (0.007)
A firm's multimarket contact with its competitors × *Competitors' prior entry*	−0.035 (0.021)	0.043 (0.031)	0.056 (0.035)	0.041 (0.032)	0.074* (0.037)
A firm's symmetric contact with its competitors × *Competitors' prior entry*	0.005 (0.014)	−0.023 (0.017)	0.001 (0.018)	−0.016 (0.017)	−0.006 (0.019)
Market density	1.354* (0.530)	1.303* (0.535)	1.157* (0.557)	1.270* (0.539)	0.991† (0.558)
Market density^2	−0.334** (0.115)	−0.318** (0.117)	−0.393** (0.127)	−0.355** (0.121)	−0.375** (0.128)
Market exits	−0.003 (0.028)	−0.001 (0.028)	−0.001 (0.029)	−0.004 (0.028)	−0.003 (0.029)
Incumbents operating at a loss	−2.845*** (0.860)	−2.731** (0.855)	−2.636** (0.875)	−2.681** (0.857)	−2.534** (0.874)
Excess capacity	−3.377 (2.760)	−3.550 (2.783)	−2.868 (2.766)	−3.368 (2.779)	−2.959 (2.766)
Market concentration ratio (CR4)	−1.397** (0.537)	−1.493** (0.538)	−1.573** (0.544)	−1.508** (0.538)	−1.565** (0.548)
Market size	−0.041 (0.041)	−0.037 (0.041)	−0.014 (0.043)	−0.031 (0.042)	−0.013 (0.043)
Stratified baseline rate (by individual firms)	Specified	Specified	Specified	Specified	Specified
Log likelihood	−897.6	−891.0	−857.7	−887.2	−851.7
LR χ^2 against null model	200.1***	213.2***	279.9***	220.8***	291.9***
Akaike information criterion	1,815.1	1,804.0	1,741.3	1,800.4	1,733.3

Notes. $N = 12{,}988$ (spells). Standard errors are in parentheses. Model 4 is based on alternative dichotomized variables. LR, likelihood ratio.
†$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (all two-tailed tests).

in Study 1 and 0.236 in Study 2. These two alternative variables, as reported in Model 4 in Tables 2 and 3, also led to significant support for our predictions in both studies: asymmetric multimarket contact between a firm's direct competitors positively moderated the relation between prior entrants and the firm's entry rate, whereas symmetric competition negatively moderated the same relationship.

Multimarket Contact Accounting for Market Share. In our analysis above, we followed Gimeno (1999) using the proportion of the firm's sales or portfolio in its various markets to distinguish between symmetric and asymmetric multimarket contact. However, although theory pertaining to multimarket contact predominantly revolves around relative market dependence (e.g., Bothner 2003, Burt 1992, Chen and MacMillan 1992), one could also argue that proportion of market share, in addition to proportion of the firm's total revenue, could play a role, too. For example, two rivals engaged in symmetric multimarket competition could each have a low market share in their main market (e.g., just 5% each) but could also each have a high market share in the same segment (e.g., 40% each). Our measure does not distinguish between the two situations. Therefore, in addition, we developed a variable taking into account the size of each multimarket competitor's market share. Formally stated, for competitors k and l in common market m, let $w_{k,m}$ denote the product of k's dependence on and market share in m, and let $w_{l,m}$ denote the product of

Table 3 Cox Models for Study 2 (Taiwanese PC Industry)

	Models				
Variables	1	2	3	4	5
Competition between a firm's competitors					
Direct encounters between a firm's competitors × *Competitors' prior entry* (H1)		0.160*** (0.047)	0.143* (0.059)	0.169** (0.053)	0.091 (0.064)
(*Asymmetric*) *multimarket contact between a firm's competitors* × *Competitors' prior entry* (H2)			1.430*** (0.387)	3.402** (1.041)	1.545*** (0.443)
Symmetric contact between a firm's competitors × *Competitors' prior entry* (H3)			−0.522** (0.159)	−6.445† (3.441)	−1.366*** (0.329)
Symmetric and equal dependence × *Competitors' prior entry*					1.429*** (0.377)
Symmetric and high share dependence × *Competitors' prior entry*					0.109* (0.049)
Other controls					
Competitors' prior entry	0.053*** (0.011)	0.041*** (0.012)	0.044** (0.016)	0.069*** (0.015)	0.011 (0.020)
A firm's multimarket contact with its competitors × *Competitors' prior entry*	−0.031 (0.287)	0.409 (0.335)	0.240 (0.359)	0.365 (0.348)	−0.190 (0.397)
A firm's symmetric contact with its competitors × *Competitors' prior entry*	−0.067† (0.036)	−0.062 (0.038)	−0.069† (0.037)	−0.053 (0.037)	−0.096* (0.042)
Market density	0.347*** (0.095)	0.351*** (0.096)	0.305** (0.097)	0.309** (0.097)	0.339*** (0.098)
Market density^2	−0.009*** (0.002)	−0.010*** (0.002)	−0.009*** (0.002)	−0.009*** (0.002)	−0.010*** (0.002)
Market exits	0.034 (0.137)	0.057 (0.139)	0.079 (0.142)	0.107 (0.142)	0.150 (0.147)
Internationalization	0.383 (0.321)	0.393 (0.320)	0.444 (0.325)	0.430 (0.325)	0.397 (0.326)
Wealth per capita	0.357* (0.150)	0.383* (0.151)	0.428** (0.156)	0.426** (0.155)	0.480** (0.156)
Skilled labor	0.259 (0.179)	0.280 (0.180)	0.341† (0.187)	0.342† (0.186)	0.335† (0.186)
Transportation infrastructure	0.309*** (0.079)	0.320*** (0.079)	0.268** (0.082)	0.273*** (0.082)	0.312*** (0.084)
Stratified baseline rate (by individual firms)	Specified	Specified	Specified	Specified	Specified
Log likelihood	−560.6	−553.9	−542.0	−546.7	−533.2
LR χ^2 against null model	647.3***	660.8***	684.5***	675.1***	702.0***
Akaike information criterion	1,141.2	1,129.7	1,110.1	1,119.5	1,096.5

Notes. $N = 3{,}703$ (spells). Standard errors are in parentheses. Model 4 is based on alternative dichotomized variables. LR, likelihood ratio.
†$p < 0.1$; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$ (all two-tailed tests).

l's dependence on and market share in m; the extent to which both parties are highly dependent on and have a large share in market m is measured as the square root of $w_{k,m} \times w_{l,m}$. This score is then summed across all common markets shared by each pair of a firm's direct competitors. Finally, the measure *symmetric and high share dependence* is computed as the average across all pairs of competitors facing a focal firm. See panel B of Table A.3 in the appendix for some illustrative examples.

Model 5 in Tables 2 and 3 displays the estimates with the inclusion of the interaction between this variable and prior entry by a firm's direct competitors. As shown, in both our samples the estimate is positive and significant, whereas the estimate of the interaction between symmetric multimarket competition and prior entry remains negative and significant. This implies that whereas symmetric multimarket competition between one's rivals usually deters imitative entry (as per Hypothesis 3), this appears not to be the case when it is accompanied by high market shares. In this case, firms do follow their rivals into the new market. It is somewhat speculative what is driving this result, but two potential explanations come to mind: First, this finding is consistent with the industrial organization economics literature on market concentration, which argues that high market concentration renders rivalry between market leaders more benign (Scherer and Ross 1990). Our theory would indeed predict that such more subdued rivalry between a firm's competitors makes mimetic entry more likely, as we observe here. Furthermore, it may also be that

the signaling value of prior entry is not the same for firms with low and high market shares. It seems possible that entry by a large and dominant competitor might be interpreted by the firm as a stronger signal of market attractiveness than when a relatively minor player enters (Haunschild and Miner 1997). Hence, in spite of possible past rivalry between the firm's direct competitors, the firm may decide to enter anyway because of the strong signal of market attractiveness. Future research on multimarket competition might want to examine these different effects in more depth.

Multimarket Contact Accounting for Equal Dependence. Another shortcoming of our market dependence-based measure of symmetric multimarket competition is that it does not take into account the absolute levels of market dependence, just the extent to which the level of dependence on a particular segment is equal to that of its competitors. For instance, in the stylized example as displayed in Figure 4, our measure would not distinguish between the situation in which two competitors each have a 10% and 90% dependence on their two segments and the situation in which two competitors each have a 50% and 50% dependence on the same segments; the variable just indicates that their dependence is the same—that is, symmetric. However, perhaps one might expect that the 50:50 situation is less clear-cut in terms of how likely it is to foster aggressive competition versus mutual forbearance.[4] Therefore, we constructed an additional variable dedicated to capturing how similar the firms' dependence is on the various markets. Formally stated, for competitors k and l who have $N_{k,l}$ markets in common ($N_{k,l} \geq 2$), the situation of perfectly equal dependence would be when both parties' dependence on each common market is equal to $1/N_{k,l}$ (i.e., 50:50 with two common markets, or 25:25:25:25 with four common markets). We first capture the extent to which k and l's relationship deviates from the situation of perfectly equal dependence using a Euclidean distance score and then reverse-code the distance score to obtain the equal dependence score. Finally, the measure *symmetric and equal dependence* is computed as the average across all pairs of competitors facing a focal firm. See panel A of Table A.3 in the appendix for some illustrative examples.

Model 5 in Tables 2 and 3 includes the estimates with the addition of the interaction between this variable and prior entry. As shown, in both samples, the estimate is positive and significant while leaving the original estimates testing our hypotheses intact. This result indicates that a firm is indeed less likely to enter mimetically into a new market if its rivals are engaged in symmetric multimarket competition with unequal market dependence—in other words, the situation as depicted in Figure 4. This confirms our hypothesis. However, this is not the case when the firm's competitors depend equally on the different segments in which they operate. Hence, our hypothesis is especially relevant and supported in cases where both competitors depend to a large extent on the same segment (e.g., the 90:10 situation), not when dependence is much more equal (e.g., 50:50). Indeed, it seems plausible that competition is more fierce when the multimarket competitors depend heavily on the same segment (e.g., both have a 90:10 dependence) rather than when their interests are spread out over different segments (e.g., both have a 50:50 spread over their two segments). This is an important nuance to our theory and perhaps for the study of multimarket competition in general.

Main Effects. As discussed in the Methods section, in each of our models we controlled for all unobserved firm-level variables using a separate baseline hazard function for each firm. The advantage of this approach is that it provided a superb control for all firm-level effects, both time-variant and time-invariant. The disadvantage, however, is that the main effects of our predictors (*direct encounters between a firm's competitors, multimarket contact between a firm's competitors*, and *symmetric contact between a firm's competitors*) cannot be separately included and estimated in these stratified Cox models. To check for robustness, we also estimated alternative models without the firm-level stratification, with the main terms included separately. In these alternative models, all the interaction terms still came out statistically significant with the same sign.

Proportional Hazard Assumption. An assumption of Cox models is that the hazard rate can be specified as covariates multiplicatively modifying the baseline hazard function. Given two observations with particular values of covariates, the ratio of the estimated hazards over time will be constant within each stratum. Yet this proportional hazard assumption might not be valid for certain covariates. Because our covariates are all time varying, we tested the proportional hazard assumption for each of them using Schoenfeld residuals (Schoenfeld 1982). The results indicated that the assumption is rejected for only two of our control variables (*market density*^{2} in Study 2 and *market exits* in both studies). Hence, the proportional hazard assumption is not a problem for any of our hypotheses tests. The models' global chi-square statistics are 15.76 ($p = 0.328$) in Study 1 and 23.57 ($p = 0.052$) in Study 2. Although the proportional hazard assumption appears to be borderline violated in the latter case, this situation is driven entirely by the control variable *market exits*. Removing this one variable—which is insignificant in itself—reduces the global chi-square to 11.54 ($p = 0.566$). Moreover, neither including nor excluding it leads to any noticeable difference in the estimated interaction effects between our predictors; the same goes for excluding *market density*^{2}.

Level of Analysis. We have argued that the market relationships between a firm's direct competitors will influence the firm's inclination to imitate the market entrants among them. However, one question that might arise is whether it is the encounters between all of a firm's competitors that matter or only the encounters between those prior entrants. Our theory pertained to all of a firm's direct competitors, mainly because nonentrants may enter at some future point in time. To assess this question empirically, we constructed alternative variables that captured the direct encounters and the asymmetric and symmetric multimarket contacts between only those competitors that have already entered the specific target market. If a firm focuses mostly on prior entrants but largely ignores the nonentrants, these alternative variables should perform better than the variables reported in our tables. However, our empirical estimates suggested otherwise: in both studies, these alternative variables remained largely insignificant in terms of their effect on the entry rate. Apparently, our results are not driven by the competitive encounters between entrants only. We will return to this issue in the next section.

6. Discussion

In this study, we examined the structure of competition surrounding a firm, specifically in terms of the encounters between its competitors. Our main thesis is that the extent and nature of rivalry between a firm's direct competitors determines to what extent a herding effect occurs. Accordingly, our empirical analysis indicated how the structure of competition influences a firm's inclination to imitate its rivals—in particular, their market entry moves—with very consistent results across our two settings. Dependent on its structural properties, competition may increase or decrease the firm's likelihood of mimetically entering a particular market. Although previous studies usually expected a firm to imitate its competitors, empirical findings had been mixed or even conflicting. We contribute to the imitation literature by identifying this set of underresearched factors that appear to be crucial moderators of a firm's imitative tendencies.

The general picture that emerges from our findings is that a firm is especially inclined to imitate—in terms of new market entry—when its competitors form a dense cluster of rivals, especially if these rivals hold footholds in each other's key segments. In such a situation, when a firm observes entry from this group into a new market, it is inclined to follow suit. Past mutual forbearance further raises expectations about the relative ease of competition in the new market, increasing that market's attractiveness even more. In contrast, imitative entry is less likely when the firm's rivals do not encounter each other and are scattered across different segments, or when they do encounter each other but engage in fierce head-to-head competition because they depend heavily on the same segment. In that case, herding is far less likely because entry by competitors reduces a firm's appetite for the new market.

Thus, another important contribution of our paper lies in the exploration of various characteristics of the competitive structure that different firms in an industry face. The types of structures we examined in this paper could potentially influence a range of other aspects of firm behavior. We applied our ideas to explain imitative market entry; however, such competitive structures could potentially influence other aspects of firm behavior such as price setting, the propensity to acquire and ally, and the diffusion of practices and innovations (see Semadeni and Anderson 2010). Ultimately, the varying structures of competition could affect organizations' performance and chances of survival. Few studies have explored how competitive linkages between particular competitors can influence other firms. Haveman and Nonnemaker (2000) indicated that mutual forbearance as a result of multimarket contact can spill over to other firms. Baum and Korn (1999) showed that multimarket competition between two firms can stimulate other firms to also seek multimarket contact—something they attributed to vicarious learning. Yet our study is the first to systematically analyze and show how the particular pattern of competitive encounters between a firm's rivals influences the choices the firm makes.[5] Our findings indicate that in its actions, a firm is guided not only by its interactions *with* its competitors but also by the wider pattern of interactions *among* its competitors.[6]

6.1. Level of Analysis

Interestingly, our analysis showed that a firm's decision whether to enter a particular new market or not is moderated by the competitive encounters between all of its direct competitors, not just the subset of the prior entrants among them. Our theoretical arguments included the suggestion that this is the case because the nonentrants will be considered potential entrants, which influences the market expectations effect. Furthermore, to explore whether there are additional reasons why a firm's entire structure of competition matters for imitative entry, and not just the encounters between the subset of prior entrants, we conducted a series of 19 face-to-face interviews with executives from six different companies in the Taiwanese PC hardware industry (our second sample). The interviewees confirmed the first part of the mechanism: they pay attention to nonentrants because they realize several of them may soon enter too. For example, one executive commented, "For those hotspots in China, our working assumption is that everyone is either already a player or will soon become one." Another said, "They [firms that have not yet entered] are relevant because they may enter any time."

Yet the interviewees suggested an additional mechanism. Their insights suggested that—at least in their perception—firms become inherently more or less

aggressive because of the competitive interactions that they have experienced in the past. This inclination toward aggressiveness may persist even if a firm enters a new market and encounters a different competitive situation. This implies that, for example, a firm that operated in a situation with ample symmetric multimarket contact, which triggered fierce rivalry, may also be aggressive in a new market it enters, regardless of whether its multimarket contacts enter that market, too. One executive commented, "Although their old rivals are not there in the new territory, their experience [surviving a price war] has taught them to stay tough no matter what." This seems to constitute a form of competitive imprinting: the structure of competition determines whether firms become aggressive players or not, and they take this aggressiveness with them into a new market, even though the situation there may be different. When facing a new environment, adjusting their style may take time. One executive, when confronted with the question of whether a rival's style may change in a different environment, commented, "They are what they are. True, a different market environment may eventually change their style, but it will be a slow process." Thus, the structure of competition may lead a firm to develop a certain style, through a process of imprinting, that it will take with it into a new environment. This would also explain how, in our setting and analysis, firms' behavior is determined by the full set of competitors around them, and not just the subset of prior entrants, because the direct rivals that did not enter also shaped the entrants' current competitive style. Using our notion of the structure of competition, future research may focus more specifically on the topic and process of competitive imprinting, thus enhancing our understanding of its impact.

6.2. Limitations and Future Research

In a general sense, prior research in management theory has emphasized how organizations are embedded in wider institutional and social contexts that influence their behavior and performance (Aldrich 1999, Burt 1992, Scott and Davis 2006, White 2002). In this paper, we endeavored to emphasize that firms are also embedded in wider structures of competitive interactions and to show how these influence their behavior. We limited our analysis to examining the structure of competitive interactions between a firm's rivals. However, when mapping all the competitive encounters between firms within an industry, one could identify even wider structures. These patterns through which all firms connect to each other—what we call the structure of competition—can differ significantly across industries and periods in time. In this paper, we limited our analysis to what could be considered the first ring of a firm's structure of competition: the competitive relations between its rivals. In principle, analogous to social network theory, the concept could be extended to examine much wider structures. For example, one could imagine examining the influence of indirect ties and structural holes in an organization's competitive network (Burt 1992) or addressing the competitive linkages between firms in a particular industry as forming a small world (Uzzi and Spiro 2005). Thus, the notion of the structure of competition could be extended up to the industry level, perhaps to compare the structures of an industry at different points in time or to compare different industries altogether.

Studying the Chinese pharmaceutical industry, we examined how the structure of competition influences a firm's entry into new product markets. In the second study, the Taiwanese computer hardware industry, the dependent variable was geographic market entry. In both studies, we mapped the independent variables—the structure of competition—using firms' overlap in terms of the product markets they serve. Research on multimarket contact has used both product markets (Boeker et al. 1997, Stephan et al. 2003) and geographic markets (Barnett 1993, Baum and Korn 1999, Greve 2000, Haveman and Nonnemaker 2000) to determine market overlap. Similarly, one could imagine mapping the structure of competition based on geography. Given the characteristics of our research settings, mapping geographic structures might not be a fruitful course of action.[7] Nevertheless, future studies could potentially explore geographic market structures, in addition to or perhaps in interaction with product market structures.

Our study showed that the structure of competition will influence firms' decisions to enter mimetically into new markets. However, this means that, in turn, firms' market entry might alter the competitive structure they face. In other words, competitive market structures can drive firm behavior, but they also can result from firm behavior. In this paper, we did not examine this reciprocal loop. Similarly, market exit decisions might be subject to similar variables and processes (Boeker et al. 1997, Bothner 2003, Greve 1995) that in turn influence the structure of competition. Future research on the dynamic nature of the structure of competition might provide a more complete understanding of how market structures are shaped and evolve over time.

Following prior research on competitor analysis (Chen 1996, Peteraf and Bergen 2003, Porac et al. 1995), we identified direct competitors as firms competing in the same product segments within a given industry. We used this to map the wider structure of competitive relationships between firms and analyzed how that influenced a firm's propensity to imitate. Yet prior research has shown that other forms of interfirm relationships, such as board interlock ties, might also influence imitation behavior (Haunschild 1993, Westphal et al. 2001) because market actors are embedded in both social and competitive contexts. Additionally, organizational decision makers might sometimes identify firms operating in other industries as their peers. For instance, Porac et al. (1999) showed that corporate boards might expand peer definitions beyond

industry boundaries when firms perform poorly, industries perform well, CEOs are paid highly, and shareholders are powerful and active. Future research might want to consider multiple forms of interfirm relationships and categories jointly since it seems possible that, for instance, social structures and competitive structures interact.

Our analysis also uncovered some intriguing variants of multimarket competition. Not only did we show—in conformity with Gimeno (1999)—that symmetric and asymmetric multimarket competition can have very different, even opposing effects, our additional analyses taking into account separate measures of relative market share and measures of the absolute level of market dependence showed that these matter, too. Future research on multimarket contact might further disentangle the effects of similarity in market dependence, absolute levels of dependence, and market share and develop further theory in terms of what matters when. A limitation of our study is that we were not able to do all this within the scope of this one paper.

Another limitation of our study is that we cannot entirely disentangle the various possible effects that lead to imitative behavior (see Lieberman and Asaba 2006) nor the different effects that could lead to competitive crowding at higher levels of entry. The firm-specific baseline hazard functions that we formulate in our models may control for firm-specific tendencies, but there could still be other influences when firms observe their rivals enter. We observe the imitative tendency itself—or the absence thereof—but not exactly what is driving it. Therefore, another limitation of our study is that we must be careful in generalizing our results. We found confirmation for our predictions in two very different contexts but also realize that both contexts have their idiosyncrasies. For example, in the Taiwanese sample, all the firms were listed. It is unclear to what extent these results would hold for unlisted firms, which might be subject to smaller or different types of legitimacy pressures. Furthermore, all of the Chinese pharmaceutical sample concerned domestic firms. Although foreign firms in China invariably operate in patented drugs, the vast majority of domestic firms operate solely in generic drugs, which are the markets we were analyzing here. Future research comparing listed and nonlisted firms or the influence of foreign on domestic firms, for example, might provide a fruitful avenue to further build our understanding of the competitive interactions between firms and imitative behavior in particular.

In summary, our study shows that firms might either follow or steer away from their direct competitors in the course of market expansion depending on the pattern of competitive relationships between their peers. In so doing, it opens up a new avenue of research into how the wider structures of competitive interactions that surround organizations affect organizations' behavior.

Appendix

Table A.1 Product Markets Used in Our Studies

Panel A: Categories of active pharmaceutical ingredients (Study 1)	
1. Anti-infectives for systemic use	12. Blood and blood-forming organs
2. Musculoskeletal system	13. Solutions affecting the electrolyte balance
3. Vitamins	14. Anesthetics
4. Antiparasitic products, insecticides, and repellents	15. Antihistamines; antidotes
5. Sex hormones; hormonal preparations	16. Biochemicals
6. Antineoplastic and immunomodulating agents	17. Antiseptics and disinfectants
7. Cardiovascular system	18. Sensory organs
8. Respiratory system	19. Dermatologicals
9. Nervous system	20. Diagnostic agents
10. Metabolism	21. Alimentary tract
11. Genitourinary system	22. Solution additives
Panel B: Related product segments in the IT industry (Study 2)	
1. *Computers*	11. Electro-medical equipment
2. *Monitors and terminals*	12. Integrated circuits
3. *Computer peripherals*	13. Discrete devices
4. *Audio and video equipment*	14. Semiconductor packaging and testing
5. *Communication equipment*	15. Electronic passive devices
6. Telephones and cellular phones	16. Bare printed circuit boards
7. Storage media	17. Printed circuit board assembly
8. Cameras	18. Electronic parts and components
9. Optical instruments	19. Liquid crystal panel
10. Measuring and control equipment	20. Optoelectronic materials and components

Note. The focal firms in our sample stem from segments 1 to 5, which appear in italics above.

Table A.2 Factor Analysis of Local Conditions in China (Study 2)

Measures	*Internationalization*	*Wealth per capita*	*Skilled labor*	*Transportation infrastructure*
1. Total foreign capital	*0.898*	0.250	0.250	0.155
2. Exports	*0.871*	0.327	0.289	0.145
3. Imports	*0.829*	0.360	0.270	0.288
4. Gross domestic product per capita	0.490	*0.625*	0.108	0.551
5. Disposable income per capita	0.450	*0.806*	0.209	0.272
6. Household expenditure per capita	0.437	*0.810*	0.176	0.272
7. No. of professional personnel	0.402	−0.427	*0.745*	−0.067
8. Population with a college degree	0.284	0.202	*0.910*	0.081
9. No. of recent college graduates	0.117	0.306	*0.903*	0.020
10. Highway density	0.437	0.492	0.061	*0.656*
11. Railway density	0.123	0.178	−0.009	*0.959*
Cumulative variance explained	0.304	0.539	0.768	0.944

Notes. Rotation: orthogonal varimax. Factor loadings displayed in italics indicate the measures used to construct the variables.

Table A.3 Illustrative Examples of the Symmetric and Equal Dependence (A) and the Symmetric and High Share Dependence (B) Measures

	Scenario I		Scenario II		Scenario III	
	Competitor 1	Competitor 2	Competitor 1	Competitor 2	Competitor 1	Competitor 2
			Panel A			
Dependence on market *Y*	0.90	0.88	0.45	0.52	0.90	0.12
Dependence on market *Z*	0.10	0.12	0.55	0.48	0.10	0.88
Perfectly equal dependence (no. of markets = 2)	$1/2 = 0.50$		$1/2 = 0.50$		$1/2 = 0.50$	
Distance score	0.780[a]		0.076[b]		0.780[c]	
Equal dependence score	$0.780 - 0.780 = 0$		$0.780 - 0.076 = 0.704$		$0.780 - 0.780 = 0$	
			Panel B			
Dependence on market *Y*	0.90	0.88	0.90	0.88	0.90	0.88
Share in market *Y*	0.40	0.40	0.40	0.04	0.04	0.04
Dependence on market *Z*	0.10	0.12	0.10	0.12	0.10	0.12
Share in market *Z*	0.15	0.15	0.15	0.15	0.15	0.15
Symmetric and high share	0.382[d]		0.129[e]		0.052[f]	

[a] $\sqrt{(0.90-0.50)^2+(0.10-0.50)^2+(0.88-0.50)^2+(0.12-0.50)^2} = 0.780$.
[b] $\sqrt{(0.45-0.55)^2+(0.55-0.50)^2+(0.52-0.50)^2+(0.48-0.50)^2} = 0.076$.
[c] $\sqrt{(0.90-0.50)^2+(0.10-0.50)^2+(0.12-0.50)^2+(0.88-0.50)^2} = 0.780$.
[d] $\sqrt{(0.90\times0.40)\times(0.88\times0.40)}+\sqrt{(0.10\times0.15)\times(0.12\times0.15)} = 0.356+0.016 = 0.382$.
[e] $\sqrt{(0.90\times0.04)\times(0.88\times0.40)}+\sqrt{(0.10\times0.15)\times(0.12\times0.15)} = 0.113+0.016 = 0.129$.
[f] $\sqrt{(0.90\times0.04)\times(0.88\times0.04)}+\sqrt{(0.10\times0.15)\times(0.12\times0.15)} = 0.036+0.016 = 0.052$.

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Endnotes

[1]Observing the entry moves does not reveal the actual information, but it does suggest to the firm that its competitors' assessment of the market is positive. This does not mean that "the herd" is always correct in the sense that the market entered by the competitors always turns out to be profitable, because the assessment of the early entrants could be flawed. It does imply that a firm's estimation of the likelihood of market attractiveness becomes more positive because of prior entry.

[2]Left truncation is not an issue in our Taiwanese sample because if a spell started before 1999, we traced historical data back to 1991 (before which no firms in our sample were operating in China) so that we could determine the exact time

that had elapsed. And although there is left truncation in our Chinese sample, this should not introduce a bias because all product markets opened up gradually but at the same time. Furthermore, following Klein and Moeschberger (2003) and Cleves et al. (2010), we deal with left truncation in our Cox models by adjusting the risk set at each point in time $R(t)$.

[3]One could argue that highly diversified firms are less likely to have many competitors that also encounter each other. To account for this possible effect, we also created a variant of the variable in which we divided the proportion of a firm's direct competitors that also compete with each other by the number of markets in which the firm operates, thus controlling directly for the influence of diversification. In both samples, the estimates using this alternative measure were virtually identical to the ones reported below, significant at $p < 0.001$.

[4]We thank an anonymous reviewer for suggesting both of these important additions and lines of thought.

[5]Our results, displayed in Tables 2 and 3, show that the variables indicating the nature of the competitive encounters between a firm's rivals had stronger moderating effects than did the control variables indicating the nature of the competitive encounters between these rivals and the firm itself. Put differently, in our settings, how a firm's competitors competed with each other proved to be more influential than how the firm itself competed with these rivals.

[6]Note that according to our theory, firms do not need to be aware of the exact shape of the structure of competitive encounters around them but only need to observe the nature of the rivalry that results from it. This view was confirmed by an executive of one of our sample firms who said, "Except for a few big players, we rarely consider exactly who is competing with whom and how. That would be way too complicated. But we do have an overall impression about how our competitors typically behave toward one another."

[7]The Chinese pharmaceutical firms usually produce their drugs in only one location, and the headquarters of most Taiwanese PC hardware firms are clustered within one specific region—the Hsinchu Science Park.

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