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Which subfield to enter first? The role of a firm's pre-entry experiences

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ABSTRACT

In this study, we draw from the organizational experience and market entry literature and investigate if a firm's pre-entry experiences predict which subfield to enter first. We employ a unique data set from the biotechnology industry where two distinct subfields emerged around the same time due to a revolutionary discovery. Among the firms that entered one of the two emerging subfields, we examine the relationship between pre-entry experiences and which subfield a firm enters. Our key finding is that general experience rather than specialized experience increases the likelihood of a firm entering first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

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1. Introduction

Firms frequently face market entry decisions of whether and when to enter a subfield, which is a new product-market that emerges from technological changes (Tushman and Anderson, 1986). Firms also face market entry decisions of which subfield to enter first when more than one subfield in an industry emerges around the same time. A few prior studies have examined the first set of issues of whether and when to enter a single subfield (Mitchell, 1989, 1991; Sinha and Noble, 1997). However, we know very little about the second issue of which subfield a firm chooses to enter *first* when it encounters *more than one* subfield entry opportunity around the same time. We presume a key reason for the absence of prior empirical research on this issue may be data limitations. In this study, we employ a unique data set where two distinct subfields emerged around the same time as a result of a revolutionary discovery. Hence, most firms in this industry faced an explicit decision of which subfield to enter first before another.

While the market entry decision of which subfield to enter is not as common as whether and when to enter a subfield, given the rising influence of technological advances across many industries, it will increasingly become more common to firms. Furthermore, the decision of which subfield to enter first is important since many firms face resource constraints and may not have the luxury of pursuing more than one entry opportunity at a time. Thus, we attempt to fill a void in the extant literature with this study and suggest that a firm's decision on which subfield to enter first between two distinct market entry opportunities will depend on its prior market entry experiences.

We draw from the organizational experience and market entry literatures that emphasize the importance of a firm's prior experience in learning and developing competencies (King and Tucci, 2002) and achieving the best fit between internal competencies and external opportunities on market entry decisions (Helfat and Lieberman, 2002). We argue that the development of a firm's internal competencies (or assets and resources) occurs considerably through its experience in entering prior subfields (or product markets). These experiences, in turn, determine the best fit between a firm's internal competency and the subfield opportunity, which influences the decision of which subfield to enter. Certainly, firms have different experience profiles (Garrett et al., 2009; Helfat and Lieberman, 2002), but subfields also have different opportunity profiles. For example, Beckman et al. (2004: 262) state that "markets vary in their level of uncertainty and unpredictability, and firm fortunes may vary considerably within those markets." Given these variations in experience and opportunity profiles, how a firm's pre-entry experience might influence which subfield to enter first presents an important theoretical and empirical interest for researchers. Therefore, we explore the following research question: do a firm's pre-entry experiences affect which subfield to enter first? More specifically, do type (i.e., specialized versus general) and age (i.e., recency and dispersion) of a firm's pre-entry experiences affect which subfield to enter first given two distinct market entry opportunities—one subfield with higher level of uncertainty and versus another subfield with lower level of uncertainty?

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While prior research has enhanced our understanding of how type and age of organizational experiences influence new product introductions (Nerkar and Roberts, 2004), knowledge creation (Nerkar, 2003) and alliance performance (Sampson, 2005) of firms, we add to the literature by examining how type and age of organizational experiences affect market entry—a research area that is "imperfectly understood" (King and Tucci, 2002: 171). We also contribute by employing a fine-grained measure of organizational experience by identifying each segment a firm previously entered instead of the broader measures used in prior studies (Kim, 2004), for example, industry operating experience (Mitchell, 1989), general prior new market entry (King and Tucci, 2002), or industry specific assets (Mitchell, 1989). We test these effects by examining the entry of biotechnology firms into the therapeutic monoclonal antibodies subfield with higher level of uncertainty and the diagnostic monoclonal antibodies subfield with lower level of uncertainty. The following section reviews the theoretical background and hypotheses. The next section discusses the data and method. The subsequent sections discuss the results and conclude.

2. Theoretical background and hypotheses

2.1. The effect of pre-entry experience

The organizational experience literature suggests that a firm's experience in entering product markets affects new market entry decisions (Ingram and Baum, 1997; Mol and Birkinshaw, 2009; Nerkar and Roberts, 2004). In addition, the market entry literature argues that the type of experiences a firm possesses affects market entry decisions (Finney et al., 2008; Schoenecker and Cooper, 1998) and that the fit between internal competencies and external opportunities may have a greater influence on market entry than the simple possession of internal competencies (Helfat and Lieberman, 2002). Clearly, both literatures correspond with the long standing view in strategy that accumulated product-market experience helps develop a firm's internal competencies and influences how it positions itself within the external environment (Porter, 1980, 1985). Similarly, Anand and Khanna (2000) and Sampson (2005) argue that the benefits of prior alliance experience are greater under conditions of greater uncertainty and complexity. In these types of environments, experience tends to hold more value because it can provide firms with a greater range of tools to deal with the uncertainty and complexity (Becker and Knudsen, 2005; Klein, 1998; Sampson, 2005).

In general, firms with prior market entry experiences can benefit from accrued knowledge (Nelson and Winter, 1982), learning (Argyris and Schon, 1978), legitimacy (Carroll et al., 1996), and confidence (Martins and Kambil, 1999). These benefits can help firms facilitate their entry into a subfield with greater uncertainty. We define uncertainty as the inability to predict the success of a new product introduction (Miller and Bromiley, 1990) due to both external and internal constraints. Thus, we offer the following hypothesis.

H1. Firms with prior market entry experiences will more likely enter first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

A firm's pre-entry experience is multidimensional, but more recent research has focused on two particular dimensions: type and age. We next explain and offer our hypotheses on how type and age of experiences affect market entry into a new subfield.

2.2. Type of pre-entry experience: specialized versus general

We distinguish type of experience according to how closely associated the new experience is to the domains (e.g., technological and/or product-market) that the firm has already experienced (Katila and Ahuja, 2002; Nerkar and Roberts, 2004). Our language and categorization is similar to what prior researchers have used—proximal versus distal product market experiences (Nerkar and Roberts, 2004), core versus complementary competencies, and specialized versus generalized competencies (Helfat and Lieberman, 2002). We define specialized experiences as prior entries in a narrow range of product domains. Hence, specialized experiences develop functional activities (e.g., research and development, marketing and distribution), organizational knowledge, patents and relationships with buyers and sellers that are tailored to a specific setting (Helfat and Lieberman, 2002; Nerkar and Roberts, 2004). On the other hand, we define general experiences as prior entries in a broad range of product domains. Hence, general experiences develop functional activities and organizational competencies that are applicable to a broad range of settings (Helfat and Lieberman, 2002; Nerkar and Roberts, 2004).

Firms accumulate different types of entry experiences, which can lead to the development of different types of competencies (Ingram and Baum, 1997; Nerkar and Roberts, 2004). What competencies firms possess prior to subfield entry may affect which subfield to enter (Helfat and Lieberman, 2002). Since market entry requires firms not only to develop new competencies but also alter and apply existing competencies that best fits the external opportunity, we focus on how specialized and general experiences of firms affect market entry.

There exist competing arguments for the benefits of specialized and general experiences since a firm can exploit area-specific or generic competencies (Freeman and Hannan, 1983; Ingram and Baum, 1997; Min and Wolfinbarger, 2005; Sinha and Noble, 1997). Some scholars argue for the benefits of specialized experiences. For example, Galunic and Rodan (1998) argue that firms gain more from specialized knowledge than dispersed knowledge because the latter increases the cost of knowledge recombination. Conversely, other scholars argue for the benefits of general experiences. For example, Helfat and Lieberman (2002) suggest that more general competencies can be applied to many markets and support successful market entry. Interestingly, Nerkar and Roberts (2004) argue that both types of experiences can assist product-market entry. Specialized experience assists product-market entry because it gives a firm access to specific customers, established distribution channels, and area-specific reputation, while general experience assists product-market entry because it helps firms develop more general competencies.

In summary, the prior research provides arguments that both specialized and general experiences can help firms better manage uncertainty and facilitate entry into a subfield with greater uncertainty. Since we know empirically very little about the effect of specialized or general experiences on market entry, with the exception of Nerkar and Roberts' (2004) study, we draw on these arguments and offer and test two competing hypotheses.

H2a. Firms with greater specialized experiences will more likely enter first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

H2b. Firms with greater general experiences will more likely enter first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

2.3. Age of pre-entry experience: recency and dispersion

Age of experience may impact a firm's entry into a new subfield since a firm's experience can devalue with time (King and Tucci, 2002; Nerkar, 2003; Nerkar and Roberts, 2004; Sampson, 2005). We focus on two aspects—recency and dispersion—examined by prior researchers (Katila, 2002; Katila and Ahuja, 2002; Nerkar, 2003). We define recency of experience as prior market entries that occurred very recent in time. Hence, a firm with a high proportion of recent prior

market entries (e.g., in the past year or two) would have greater recency of experience compared to a firm with a high proportion of older prior market entries (e.g., in the past three years or later). We define dispersion of experiences as prior market entries that occurred evenly over time. Hence, a firm with a balanced mix of recent and older prior market entries would have greater dispersion of experience compared to a firm with an unbalanced mix, either a predominance of recent or older prior market entries.

2.3.1. Recency of experience

Nerkar (2003) and Sampson (2005) suggest several benefits from recency of experience in creating new knowledge and alliance performance respectively. Drawing directly from their reasoning, we argue that recency of prior market entries can reduce uncertainty and support entry into a new subfield with higher level of uncertainty. First, a firm's recent experiences most likely represent the best knowledge, technology and practices, especially in industries with rapid technological change. Second, a firm stores its experiences in memory through routines. Embedded routines seizing on the most recent practices most likely incur fewer errors and produce greater value than a trial and error method. Third, a firm's prior experience with successful entry into other subfields promotes confidence in entering new subfields (Martins and Kambil, 1999) and using new knowledge and technology arising from recent experiences promotes legitimacy among stakeholders (Abrahamson, 1996). Based on these arguments, we suggest that more recent experiences facilitate entry into a subfield with higher uncertainty because they help firms better manage uncertainty by providing the best fit between internal competency and external opportunity. Thus, we hypothesize the following:

H3. Firm's with more recent experiences will more likely enter first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

2.3.2. Dispersion of experience

Some scholars also suggest that a mix of recent and old experiences enhance new product introductions (Katila, 2002; Katila and Ahuja, 2002) and knowledge creation (Nerkar, 2003). Drawing on their reasoning, we argue that age dispersion of pre-entry experience in entering prior subfields can support entry into a new subfield with higher level of uncertainty. First, old experiences in entering prior subfields are thoroughly understood and learned. Old experiences are more reliable, less costly, more legitimate, and more developed into routines than new experiences (Katila, 2002; Katila and Ahuja, 2002). Second, firms can make better decisions regarding a new subfield entry by learning from and drawing on older experiences of oneself and others (Nerkar, 2003). Third, firms can also leverage older technologies or knowledge, which are more conducive to present than past market conditions (Nerkar, 2003). Based on these arguments, we suggest that a mix of recent and old experiences facilitates entry into a subfield with higher uncertainty because they help firms better manage uncertainty by providing the best fit between internal competency and external opportunity. Thus, we hypothesize the following:

H4. Firms with greater age dispersion of experiences will more likely enter first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

3. Data and method

In this study, we employ a unique data set from the biotechnology industry where two distinct subfields emerged around the same time due to a revolutionary discovery. This required most firms to make an explicit decision of which subfield to enter first before another. In the following sections, we discuss how the two subfields emerged and differ in terms of level of uncertainty, the data source, and the measures used in the analyses.

3.1. The biotechnology industry context

The discovery of monoclonal antibodies (mAbs) in 1975 by Kohler and Milstein created two subfields for biotechnology firms to enter. The first involved producing "diagnostic kits" that respond to diseases using the diagnostic mAbs. The second involved developing "therapeutic drugs" that strike only diseased cells in organs using the therapeutic mAbs. The techniques using these antibodies to detect—diagnostic mAbs—or treat—therapeutic mAbs—harmful molecules entering human bodies revolutionized the study and practice of biology and medicine (Sikora and Smedley, 1984). In the area of detection, mAbs could accurately identify antigens that are associated with particular diseases, such as cancer and Alzheimer. In the area of treatment, mAbs could be used to attack only those particular cells without interfering in the normal function of the human body such as the liver and kidneys (McCullough and Spier, 1990). As a result, this revolutionary discovery of mAbs created two subfields, requiring most firms to make an explicit decision of which subfield to enter first before another.

3.1.1. Distinguishing subfield uncertainty

We conceptualize subfield uncertainty very narrowly and define it as the "inability to foresee the connections between R&D expenditures and the actual introduction of a new product" (Miller and Bromiley, 1990: 759), i.e., the inability to predict the success of a new product introduction. While prior researchers have identified uncertainty in terms of technological, demand, and competitive conditions (Aaker and Day, 1986; Beckman et al., 2004; Nelson and Winter, 1982), given our focus on a specific industry and data limitations, we focus on technological uncertainty both from an external (i.e., the Federal Drug Administration (FDA) approval process) and internal (i.e., extent of absolute R&D investments) perspectives.

Even though companies can apply similar technologies, especially genetic technologies, to develop new products for the diagnostic or therapeutic mAbs subfields, there are clear distinctions in the technological uncertainty between the diagnostic mAbs and therapeutic mAbs subfields, which makes entry into the latter more uncertain. First, in general, therapeutic products face a more rigorous process for obtaining FDA approval than diagnostic products. Because diagnostic mAbs are used outside the human body, scientists do not have to worry about any side effects. Conversely, because therapeutic mAbs are applied inside the human body, scientists have to seriously consider any immunological or toxicological effects. Second, firms engaging in therapeutic products usually have to spend significantly more on research and development (R&D) than firms engaging in diagnostic products. For example, average R&D expenditures and total sales vary significantly between the two product markets. *Biotechnology Guide U.S.A* (5th Edition 2000) reported that biotechnology firms focusing on therapeutic products averaged $15.8 million and $49.7 million in R&D expenditures and total sales, respectively, while biotechnology firms focusing on diagnostic products averaged $4.3 million and $14.4 million in R&D expenditures and total sales, respectively. While the percentage of R&D over sales is only slightly higher for the therapeutic products than the diagnostic products, introducing therapeutic products poses greater risks as the therapeutic products require much higher absolute R&D investments. Since R&D expenditures are typically unrecoverable markets with higher R&D expenditures generally pose greater risks in entering (Porter, 1980; Stonebreaker, 1976).

In summary, the higher R&D investments coupled with a more rigorous FDA process that increases the risk of not receiving approval, the therapeutic mAbs subfield is generally considered to have a higher

level of uncertainty than the diagnostic mAbs subfield and is a classic example of a market with higher growth potential but higher levels of challenges (Aaker and Day, 1986). On the other hand, firms may still choose to enter the therapeutic mAbs, even with the higher level of uncertainty, because of the potential for higher sales and returns.

3.1.2. Date source

The unit of analysis for our study is the entry of biotechnology firms into the therapeutic and diagnostic mAbs subfields. A sample of biotechnology firms that entered either of these two subfields are collected from the *CorpTech Directory of Technology Companies* listings from 1986 to 2000 period. This directory includes companies that manufacture or develop products in high-technology industries such as advanced materials, biotechnology, chemicals, medicals, telecommunications, etc. *CorpTech* uses its own technology classification system with over 3,000 separate segments and identifies entries of firms into each of these segments for each year. While *CorpTech*'s classification system is hierarchical and very similar to the Standard Industry Classification (SIC) codes or North America Industry Classification System (NAICS) codes, it is much more fine-grained in identifying segments. Consequently, we employ a more fine-grained measure of organizational experience instead of the broader measure of industry and general market entry experience used in prior studies (Kim, 2004).

Fig. 1 illustrates graphically the classification system. From this classification system, we are able to identify every firm that entered the human therapeutic mAbs (BIO-GE-HMH) and human diagnostic mAbs (BIO-GE-HMD) segments. We are also able to identify all prior subfield entries for our sample firms by segment back to 1986. Hence, in our study, we define market entry as firms that manufactured or developed a product for a particular market, and the operational definition of market entry means only 'successful entry' into a market (i.e., receiving FDA approval and product sales).

We identified a total of 155 firms that produced either the diagnostic or the therapeutic mAbs from 1986 to 2000 period. We checked for mergers and acquisitions, spin-outs, joint ventures, or name changes using the *CorpTech* and *Who Owns Whom* directories to ensure we captured all prior subfield entries. We used only 87 of these firms in running the regression to test Hypothesis 1 because *CorpTech* lacked data for some of the control variables. In some instances, we collected the missing data for the control variables of public firms from the company's Web site or an online database such as *Lexis-Nexis* or *Factiva*. We next identified firms that had one or more prior market entries in any segment before they started to produce either the diagnostic or therapeutic mAbs. This reduced our sample to 45 firms in running the regression to test Hypotheses 2a and 2b. In other words, the remaining 42 firms did not have any prior market entry experience and their first market entry was either in the diagnostic or therapeutic mAbs subfields. Among the 45 firms, 28 firms entered the diagnostic mAbs subfield first and 17 firms entered the therapeutic mAbs subfield first. Of the 45 firms, four firms were dropped in running the regressions to test Hypotheses 3 and 4 because of only one year of prior experience.

3.2. Measures

3.2.1. Dependent variable

We use binary logistic regression to test the effects of a firm's pre-entry experience on the likelihood of entering first either the therapeutic or diagnostic mAbs subfield. Firms that entered first the therapeutic mAbs subfield are coded as 1; those that entered first the diagnostic mAbs subfield are coded as 0.

3.2.2. Independent variables

We first examine the effect of prior market entry experience (H1) on which subfield to enter first. We used a dummy variable by coding firms with prior experience as 1 and firms with no prior experience

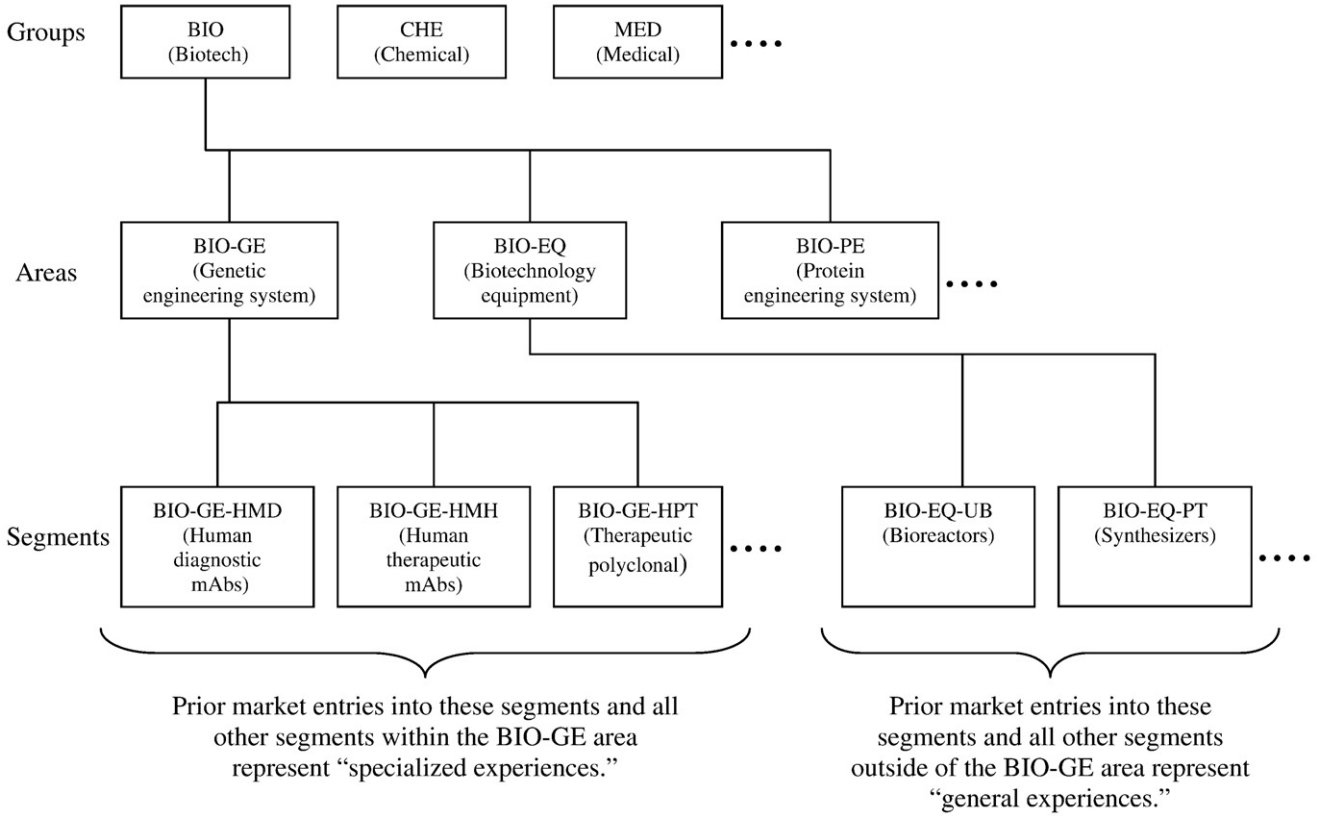

Fig. 1. Classification system for identifying a firm's pre-entry experience.

as 0. We next analyze the effect of both type and age of pre-entry experience on new subfield entry. To measure type of pre-entry experience (H2a and H2b), we count all the segments a firm entered each year before first entry into either the diagnostic or therapeutic mAbs. We then compute a ratio of total segments within the genetic engineering systems area to total segments for all areas for each firm. This ratio takes a value from 0 to 1. A value closer to 0 equates to firms with more general experience (i.e., wider range of segments across many areas), while a value closer to 1 equates to firms with more specialized experience (i.e., narrower range of segments within the genetic engineering systems area). As shown in Fig. 1, we consider all prior market entries within the genetic engineering system (BIO-GE) area as specialized experience because the two subfields—diagnostic mAbs (BIO-GE-HMD) and therapeutic mAbs (BIO-GE-HMH)—of interest in our study are classified within the BIO-GE area. We use the log of the type of pre-entry experience ratio in our analysis.

To measure recency of experience (H3), we count all the segments a firm entered each year before first entry into either the diagnostic or therapeutic mAbs. We limited the recency measure to cover a five year period since most firms had five years of pre-entry experience or less. We assign numeric weight values to each year (i.e., 5 for the most recent year and 1 for the 5th year before first entry). We next multiply the numeric weight value by the number of segments entered for each year. Thus, higher values equate to firms with more recent experiences.

We use the Gini coefficient to measure age dispersion of experience (H 4). The Gini coefficient has been used mainly in economics to measure distribution of income and wealth, but it can be used to measure any form of dispersion, for example, pay dispersion on a team (Bloom, 1999) and performance dispersion in an industry (Powell, 2003). The Gini coefficient takes a value from 0 to 1. The closer the Gini coefficient is to 0, the greater a firm's dispersion of recent and old experiences in entering prior subfields. The Gini coefficient is calculated as follows:

$$G = \left| 1 - \sum_{i=0}^{N} (\sigma Y_{i-1} + \sigma Y_i)(\sigma X_{i-1} - \sigma X_i) \right|$$

3.2.3. Control variables

We employ several control variables. First, we control for private versus public ownership with a dummy variable. Some scholars argue that public firms with hired managers take on less risk (or tend to avoid uncertainty) because hired managers tend to be conservative with other people's resources (Amihud and Lev, 1981). Similarly, others argue the opposite that private firms with owner managers take on less risk because the firm's resources are their own resources (Fama and Jensen, 1983). Second, we control for firm age, which is measured by the year established, as older firms tend to have more experiences and different risk preferences relative to younger firms. Third, we control for entry year as changes in the industry environment—for example, development of complementary technologies and regulatory changes—may influence which market to enter first. Fourth, we control for firm size with total sales as larger firms tend to have more experiences and different risk preferences relative to smaller firms. Fifth, we control for both prior diagnostic and therapeutic experiences by calculating the ratios of each type of experience to total experience. Presumably, firms that have greater experience in entering diagnostic product markets may choose to enter first the diagnostic mAbs subfield, while firms that have greater experience in entering therapeutic product markets may choose to enter first the therapeutic mAbs subfield. Lastly, we control for total experience with the log of total subfield entries. Since we measure type of experience as a ratio of genetic engineering system (BIO-GE) experience to total experience, two firms can have the same ratio, but the actual number of total experience may differ substantially.

4. Results

Table 1 presents the descriptive statistics and correlation matrix for the variables, and Table 2 reports the binary logistic regression results that test the hypotheses. We performed four models. Model 1 contained the control variables as well as total experience to test Hypothesis 1. We included the type of experience in model 2 to test the competing Hypotheses 2a and 2b. Model 3 included the recency of experience to test Hypothesis 3, while model 4 included age dispersion of experience to test Hypothesis 4.

The results of model 1 do not support Hypothesis 1 and suggest that a firm's prior experiences do not influence the market entry decision of entering a subfield with higher level versus lower level of uncertainty. Since it was unclear a priori whether specialized or general experience has more influence in reducing uncertainty and promoting entry into a subfield, we offered two competing hypotheses. Based on our sample, we found support for Hypothesis 2b. The significant, negative relationship (model 2: $B = -3.784$, $p < .05$) suggests as the ratio gets closer to 0—more general experiences—the greater the likelihood of entering first the therapeutic mAbs subfield with higher level of uncertainty—coded as 1 in the binary logistic regression model. Moreover, adding the type of experience ratio increased the fit of the models. In short, more general experience rather than specialized experience of a firm increases the likelihood of entering first the subfield with higher level of uncertainty as opposed to the subfield with lower level of uncertainty.

Hypothesis 3 predicted that the greater a firm's recency of experience, the greater the likelihood of entering first the subfield with higher level of uncertainty. We found no support for Hypothesis 3. Hypothesis 4 predicted that the greater a firm's age dispersion of experience, the greater the likelihood of entering first the subfield

Table 1
Descriptive statistics and correlations.

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9
1. Private firm[a]	0.54	0.50									
2. Year established	1982	12.8	0.198*								
3. Entry year	1993	6.43	0.168	0.359**							
4. Sales	32.3	127.76	−0.134	−0.065	0.057						
5. Ratio of diagnostic to total experience[b]	−0.20	0.37	−0.095	0.095	−0.056	−0.151					
6. Ratio of therapeutic to total experience[b]	−0.27	0.45	0.043	0.096	−0.077	−0.070	0.836**				
7. Total experience[b]	0.90	0.37	0.054	0.074	0.322*	0.204	−0.495**	−0.915**			
8. Recency of experience	4.07	0.62	−0.122	−0.214	−0.379*	−0.125	0.313*	0.688**	−0.694**		
9. Dispersion of experience	0.40	0.25	−0.157	−0.196	−0.054	−0.057	0.173	0.571**	−0.502**	0.755**	
10. Ratio of genetic engineering to total experience[b]	−0.59	0.31	0.109	0.039	−0.156	−0.020	0.073	0.406**	−0.359*	0.121	0214

[a] Dummy variable.
[b] Logarithm.
* $p < .05$.
** $p < .01$.

Table 2
Results of binary logistic regression predicting which subfield to enter first.

Variable	Model 1	Model 2	Model 3	Model 4
Private firm [a]	−0.797	−0.615	−0.897	−1.048
	(0.501)	(0.826)	(0.863)	(0.815)
Year established	0.001	−0.006	−0.009	−0.010
	(0.022)	(0.039)	(0.036)	(0.036)
Entry year	0.130*	0.232+	0.176	0.189
	(0.065)	(0.121)	(0.127)	(0.119)
Sales	0.003	0.036	0.004	0.004
	(0.002)	(0.026)	(0.011)	(0.009)
Ratio of diagnostic to total experience [b]	−1.275	−1.762	−1.050	−1.057
	(1.037)	(2.207)	(1.074)	(1.080)
Ratio of therapeutic to total experience [b]	1.919+	6.078	4.112	5.172
	(1.142)	(5.87)	(4.460)	(4.954)
Total experience [a]	1.002			
	(0.993)			
Total experience [b]		2.485	2.138	2.579
		(5.703)	(4.571)	(4.886)
Ratio of genetic engineering to total experience [b]		−3.784*		
		(1.745)		
Recency of experience			0.003	
			(1.193)	
Dispersion of experience				−1.197
				(2.038)
N	87	45	41	41
Cox and Snell R^2	0.135	0.342	0.237	0.243
Nagelkerke R^2	0.184	0.465	0.321	0.330
−2 Log-likelihood	102.841	40.855	43.752	43.409
X^2	12.647+	18.812*	11.095	11.438

[a] Dummy variable.
[b] Logarithm.
+ $p < .10$.
* $p < .05$.

with higher level of uncertainty. We also found no support for Hypothesis 4 based on our sample.

5. Conclusion

The purpose of this study is to advance our understanding of how type and age of pre-entry experiences influence a firm's entry into a new subfield. Specifically, we examined whether specialized or general experience, and recency and age dispersion of experience influence a firm's decision to enter first one subfield before another—subfield with higher level of uncertainty versus subfield with lower level of uncertainty. We employed a fine-grained approach to measure organizational experience by identifying each segment a firm entered previously instead of the broader measures used in prior studies. We also examined their effects on which market to enter first instead of whether and when they entered a single market. We tested the effects of these pre-entry experiences on the first entry of biotechnology firms into the therapeutic mAbs subfield with higher level of uncertainty versus diagnostic mAbs subfield with lower level of uncertainty.

First, we found that a firm's pre-entry experiences in general do not influence the likelihood of first entry into the therapeutic mAbs subfield with higher level of uncertainty. However, we found that more general experience rather than specialized experience increases the likelihood of first entry into the therapeutic mAbs subfield with higher level of uncertainty. While a few recent research emphasizes the value of general competencies in market entry (Helfat and Lieberman, 2002; Nerkar and Roberts, 2004), researchers have argued that performance from entering a new business depends on how much 'core skill' is shared and leveraged among the existing and the new businesses (Chatterjee and Wernerfelt, 1991; Rumelt, 1974; Bettis, 1981) and that a firm can reduce uncertainty and causal ambiguity by drawing on its specialized competencies from similar prior experiences (Markides and Williamson, 1994). In addition, Galunic and Rodan (1998) argue that moving and transplanting dispersed knowledge is more difficult than handling concentrated knowledge, because of high costs of resource recombinations. These arguments suggest that a firm should be discouraged to enter a new market where it does not have specialized experiences (or concentrated knowledge) because of the inefficiency in combining general experiences as well as the inability to share and leverage specialized competencies among the existing and new markets.

But contrary to these arguments, our study finds that firms are more likely to enter more uncertain markets when they possess general experiences rather than specialized experiences. Our finding suggests that firms should not only consider the efficiency gains from combining specialized knowledge emphasized by prior researchers (e.g., Chatterjee and Wernerfelt, 1991; Galunic and Rodan, 1998) but also the benefits of general experiences emphasized in more recent research in entering new markets. For example, drawing on the absorptive capacity view (Cohen and Levinthal, 1990), Kim (2004) argues that different types of experiences help firms better evaluate, apply and accumulate knowledge to enter other markets. Similarly, we posit that more general experience tends to hold more value because it can provide firms with a greater range of tools to deal with the uncertainty and complexity (Klein, 1998; Sampson, 2005). Our result on the value of general experience is consistent with Nerkar and Roberts (2004). They focused on novel and generic new product introductions of pharmaceutical firms and found empirical support for the effect of general (or distal) product-market experience on the success of novel but not generic new product introductions. Novel products introductions are very similar to entering the therapeutic mAbs subfield, while generic new product introductions are very similar to entering the diagnostic mAbs subfield. Introducing novel products are more risky—rigorous FDA approval process and significant R & D investments—than introducing generic products—relatively easy FDA approval process and significantly lower R & D investments—since generic products are introduced after patents expire for novel drugs. Given the similarities in uncertainty between the novel/generic pharmaceutical products and the therapeutic/diagnostic mAbs subfields, these findings corroborate that more general experiences can help firms better manage uncertainty and support entry into a market with higher level of uncertainty. Thus, our finding provides further empirical support for the significant influence of general experience in dealing with the uncertainty and complexity associated with entering a risky market.

Second, we found that recency and age dispersion of experiences do not influence the likelihood of first entry into the therapeutic mAbs subfield with higher level of uncertainty. Our findings are inconsistent with Nerkar's (2003) study that showed an impact of both recency and age dispersion on knowledge creation. However, our study was different in several ways. For example, we measured recency and age dispersion of experience in terms of prior subfield entries, while Nerkar's study measured recency and age dispersion in terms of prior patent citations. Furthermore, we examined their effects on first entry between two subfields, while his study examined their effects on future patent citations or knowledge creation. Thus, our inconsistent findings may be attributed to different measures being applied to different contexts—market entry versus knowledge creation.

While our study adds to the literature on organizational experience and market entry, we acknowledge some limitations and offer some suggestions for future research. First, future studies can explore our arguments in other industries such as semiconductor and electronics. Second, future studies can attempt to measure pre-entry experiences more precisely by asking managers actually involved around the time of entry since a lag effect exits between the decision to start the R & D process and actual entry into a new market. Third, our sample would have missed any market entries into the therapeutic and diagnostic mAbs product markets from 1975 to 1985 since *CorpTech Directory* initiated coverage in 1986. However, we seem to have an inclusive sample because the time between discovery, application and

commercialization of a new technology tends to be significant in the biotechnology industry. In fact, while mAbs was discovered in 1975, the application was not developed until the early 1980 s (Reichert, 2001). Fourth, future studies can examine how pre-entry experience not only affects sequencing and timing but also the decision of potential entrants to not enter. Lastly, future studies should consider performance before and after the market entry decisions. Performance before the market entry decision may be important because prospect theory suggests that poor performance can enhance risk taking behavior (Kahneman and Tversky, 1979). Performance after the market entry decision may be important because we only presume in our study that general experience enhances a firm's ability to deal with the uncertainty and complexity of a risky market, which, in turn, leads to enhanced performance for the firms.

In summary, this study sheds further light on the effects of type and age of a firm's experience on market entry. We find additional empirical evidence that firms can benefit from general experience as it supports entry into a market with higher level of uncertainty. Thus, firms with broad range of experiences can deal better with uncertainty and complexity associated with market entry. However, our insignificant findings for recency and age dispersion of experience on market entry imply that the influence of these effects may depend on different contexts, which future research should examine further.

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