

Does the Order of Partner Selection Matter? Evidence from the Bio-Pharmaceutical Industry

Thesis Abstract

I investigate how entrepreneurs' choice of first partner influences the likelihood and type second partner and the effect of partner order on outcomes for new ventures in the bio-pharmaceutical industry. Ventures match up with generic resource firms as their first choice partners, while specialized resource partners prefer to wait till the underlying technology matures. Generic resource first partners enable selection of specialized second partners while specialized first partners inhibit the likelihood of a second partner. Identifying the right order in partner selection helps entrepreneurs access capabilities from multiple and diverse sets of partners improving their performance and financial growth.

Category: Entrepreneurship, Partnering, Transaction Costs

Keywords: Partner Order, Firm Formation, Bio-pharmaceutical

This research was funded in part by the Ewing Marion Kauffman Foundation. I would also like to acknowledge grants from the University of Minnesota Dissertation Fellowship Fund and the Holmes Center for Entrepreneurial studies. The contents of this publication and any errors are solely my own.

Does the Order of Partner Selection Matter? Evidence from the Bio-Pharmaceutical Industry

Executive Summary

Nachiket Bhawe*

Assistant Professor
North Carolina State University
Poole College of Management
NC 27695

April 2012

*Corresponding Author contact information: nmbhawe@ncsu.edu

This research was funded in part by the Ewing Marion Kauffman Foundation. I would also like to acknowledge grants from the University of Minnesota Dissertation Fellowship Fund and the Holmes Center for Entrepreneurial studies. The contents of this publication and any errors are solely my own.

Executive Summary

Background

The popular business literature on entrepreneurship has generally defined entrepreneurship as ‘creating and building something of value from practically nothing’. The Babson-Harvard definition of entrepreneurship also implies that:

“Entrepreneurship is building and creating value without regard to resources at hand. [...]Entrepreneurship involves building a team with complementary resources...of finding, marshalling and controlling those resources (often not owned by the entrepreneur) to create value.”

Given the focus in entrepreneurship on building capability, it is important that we understand and develop theory that addresses the question of ‘how’. For example, how do new ventures build, acquire, or bargain for resources as they go about exploiting value from their opportunities. My dissertation fills the gap in understanding the process through which new ventures may create and appropriate value. Understanding this question can drive insights from entrepreneurship research back to the theory of the firm and help us understand the genesis of firm heterogeneity.

Research Question(s)

In this essay, I address one aspect of this question—mainly how does the first partner affect the likelihood of attracting a second partner and when is this effect more salient? Resource accumulation in complex contexts is especially problematic for entrepreneurs. This is because these environments are characterized by multiple stakeholders each specializing in a particular aspect of the value chain. In this thesis, I explore ways by which entrepreneurs may be able to build their firms accessing resources from partners. Current studies investigate partnering choices through the lens of *ex post* efficiency. The strategic management literature has adopted

efficiency reasoning to argue that repeated efficient transactions should be associated with superior performance. However, just like ‘avoiding being cheated’ does not make one rich, similarly repeated processing of efficient transactions in isolation does not guarantee superior performance. In a similar vein, I argue that repeated partnering without necessarily considering partnering complementarities and interdependencies is not a sufficient condition to guarantee superior performance.

The central contribution of this essay lies in introducing the importance of sequencing of partnering transactions as a variable of choice in strategic interactions as a mechanism to reduce transactional inefficiencies and explain firm heterogeneity in resource bases. Different choices in the type of first partner affect the likelihood of attracting a second partner as well as influence the types of second partners for a focal venture. This initial choice leads to heterogeneity and path dependence in firm resource positions over time. While most partnering is interdependent, the effect of partner interdependence on value creation and appropriation is more acute in complex environments. I show how partner interdependence may vary based on which partner is selected first and its implications for the likelihood of entrepreneurs accessing resources from key partners. I focus on the order of partnering transactions to identify their differential impacts on new venture outcomes.

Sample and Context

I study the role of partner order in the bio-pharmaceutical industry. I studied how the type and attributes of the first partner influence the choice of second partnering in a multiple partnering context. I also investigated how access to both sets of complementary partners can influence different outcomes of interest in the bio-pharmaceutical industry. The bio-pharmaceutical industry consists of firms that are engaged in developing and manufacturing

biological, medicinal, and pharmaceutical products in various formats including ampoules, tablets, capsules, vials, ointments, powders, solutions, and suspensions (IBIS Industry Report, 2009). The bio-pharmaceutical industry is a dynamic, knowledge-based, and technologically intensive industry that relies on new drug innovations to sustain further research and development. It is an important part of the economy as innovative prescription drugs have cured diseases, saved lives and increased the life expectancy across the world. I use bio-pharmaceutical startups—small and new bio-pharmaceutical entrants to operationalize entrepreneurs in this industry. The bio-pharmaceutical industry provides a good research context to test the hypotheses made in the theoretical framework.

The bio-pharmaceutical context is complex characterized by significant information asymmetry with multiple players specializing in various parts of the value chain with bio-pharmaceutical startups accounting for a significant share of new drug innovations in the industry. This is because in recent years, the time taken for drugs to move from laboratory to market has increased by nearly seven years from 1960 to 2000. Most of this increase occurred in the clinical development phase. The average number of trials and the number of patients for each new drug application increased enormously, from 26 trials involving 1,500 patients in 1980, to more than 65 trials involving over 4,000 patients by 1995 with a success rate of 0.02 % according to CBO estimates (CBO, 2005). At the same time, new technologies for drug discovery such as biotechnology, genomics, combinatorial chemistry, and bioinformatics changed the drug development and discovery landscape. This forces incumbent partner firms to either cooperate or risk losing out on profits and emerging markets.

The increased cost of R&D and lengthening drug development periods have led to an increased specialization with new bio-pharmaceutical entrants accounting for a significant share

of drug innovations. Most drugs undergoing clinical trials today have originated in bio-pharmaceutical startups. Consequently, many established firms now rely on bio-pharmaceutical startups for new drug discovery while startups depend on private equity and bio-pharmaceutical startups for complementary resources. The rapid changes in knowledge which is dispersed, the importance of complementary capabilities vested in established partners, and the costs of drug development imply that new ventures in the bio-pharmaceutical industry need to develop multiple partnerships with both investors as well as established pharmaceutical companies in order to be successful.

The industry is fairly well established with two types of potential partners for a bio-pharmaceutical startup—the private equity firms and established pharmaceutical firms. Established pharmaceutical firms have well developed specialized expertise in the regulatory approval process as well as downstream activities such as manufacturing, marketing, and distribution. On the other hand, bio-pharmaceutical startups often gain financial resources, endorsements, and managerial resources from private equity firms. Drug development and clinical trials constitute a very important part of drug development. Bio-pharmaceutical firms with their expertise in managing clinical trials offer access to specialized resources as compared to private equity firms who offer access to generic resources such as financial and organizational capabilities.

The context is appropriate for studying questions related to inefficiencies borne from interdependence among partnering transactions. Scholars studying this industry have previously noted that long development times and shifts in bargaining power due to the FDA trials process often leads to interdependencies in the bio-pharmaceutical industry. Bio-pharmaceutical startups partnering with established pharmaceutical firms are likely to cede control rights to further

innovation often changing the incentives for future partners. Therefore in the bio-pharmaceutical industry, which type of organization, or which particular organization, will undertake a partnership agreement as well as the likelihood of a partnership agreement often requires understanding the set of prior and contemporaneous commitments made by the entrepreneur. Building on prior research in this industry, I focus on how transaction interdependence might be directional depending on the first partner and the implications of this choice of first partner on subsequent partnering choices.

The sample for testing the model is of 417 bio-pharmaceutical new ventures that developed drugs for the bio-pharmaceutical industry from 1995 to 2009. The sample comes from the entire population of 593 startups that were active in the industry from 1995 to 2009. During this period, equity alliances for developing drug candidates were on the rise. Similarly partnering firms also faced pressure to expand their drug portfolios, leading to a number of alliances between large pharmaceuticals and bio-pharmaceutical entrants in the early stages of drug development. The sample is developed primarily from Venture Economics database which is the most comprehensive database that collects firm founding, investment history data from both venture capital firms as well as strategic investors. This composite dataset allows me to identify the sequence of partnering transactions undertaken by a bio-pharmaceutical startup for a particular drug project in preclinical, phase I, and phase II of clinical trials. I restrict the sample to early stage drug development ventures as well as focus on partnering involving equity sharing agreements. Outright acquisitions or purely marketing and distribution agreements are not part of the sample. Thus for each bio-pharmaceutical startup, I have developed data on the order of partnering transactions. For the second partners, there were many ventures that did not have any partners and this was identified as well and these firms were kept in the sample.

The data is organized at the venture-partner level for analysis where I control for alternative specific variables and is at the venture level for multinomial analysis that does not control for firm level heterogeneity. The first stage of partnering offers a venture the choice of two types of partners—a generic resource partner and a specialized resource partner while at the second stage there are three choices for potential partners—a generic resource partner, a specialized resource partner and the option of not partnering. We have 344 ventures with generic resource partners while 73 choose specialized resource partners. Out of 344 ventures with generic first partners we find that 201 had a specialized resource second partner while out of 73 specialized resource partners only 20 had a generic resource second partner while 53 chose no other partners. The nested nature of the data shows that generic resource partners on average were higher in terms of their representation as first partners while specialized resource partners preferred to partner with ventures already having a generic resource partner.

Analysis and Results

To study how partnering takes place in this industry, I use a simple multinomial logit model to estimate the relative partnering patterns in the sample. Since a logit model may not control for venture or partner specific idiosyncratic variables that can skew the results due to unobserved variables not accounted for in my model. To account for these, I also test the effects of attributes of the partner choices using a discrete choice conditional logistic model that accounts for idiosyncratic focal venture attributes not accounted for in a standard logit model discrete choice conditional fixed effects model. While conditional logistic models may account for unobserved idiosyncratic venture specific variables, they may not fully account for the nested nature of partnering choices. Therefore I build a custom generalized extreme value model on estimating a sequential nested model that models both partnering choices jointly.

Overall, generic resource firms are preferred over specialized resource firms as first partners. This may be due to greater availability of generic resource firms for partnering or their propensity to partner with new ventures early. Notwithstanding claims of large pharmaceuticals entering the partnering game early, I find no evidence for early partnering by bio-pharmaceutical firms. This is reinforced by the finding that specialized firms enter as first partners only for advanced drug candidates who may not have found a suitable partner. This implies that entrepreneurs who want to work with specialized ventures may need to be further along before they can get access to specialized firm resources. I also find that generic resource firms prefer ventures that have robust technical capability and tend to partner with ventures in their area of expertise. Unsurprisingly consistent with literature in VC financing, I find that ventures closely located to venture capital companies tend to have them as their first partners.

While novelty of drug candidates does not affect first partner choice, I find that it enhances the likelihood of a complementary match when the first partner is a generic resource firm but not with a specialized first partner. This might indicate that novel drug candidates attract both types of partners and/or require both sets of resources for successful exploitation but these may only be available if generic partners are chosen first. I also found that advanced drug candidates tend to favor no second partners for both types of first partners. Surprisingly, I also found experienced first partners favor another generic firm as a second partner or no second partner. This might indicate a reluctance to subject a drug candidate to appropriation by large specialized firms if the first partner is sufficiently experienced. When generic firms partner with ventures in their technology domain they also tend to favor other generic firm as possible second partners. This might suggest that if first partners offer complementary capabilities to focal ventures the partnership may not favor adding specialized firms as second partners.

Having a generic resource firm as the first partner increases the chance of having a complementary set of partners that the venture can have to access resources. Similarly having a generic first partner is likely to reduce the likelihood of having no other partners. I also find that complementary partners increase the chances of an IPO while also increasing the number of new therapeutic indications for focal ventures' key drug candidate while the opposite is the case for ventures with no second partners. Partner choice and order does not matter for drug discontinuation, the likelihood of a founder retaining control and relative speed of trials. For ventures with a complementary partner, we find that the order of partners matters in terms of discovery of new drug candidates. In particular while having a generic first partner helps in having a complementary partner, it adversely affects the discovery of new uses for the focal drug, thus highlighting tradeoffs in the partnering process.

Discussion and Implications for Practice

My results can better inform the key players in the pharmaceutical industry so they can foster and support greater innovation especially at a time when most pharmaceutical pipelines are running dry. Specifically, pharmaceutical firms can realize the negative consequences for future innovation when they assume greater control rights as the first partners of a bio-pharmaceutical venture and create mechanisms that can increase trust and confidence of subsequent partners. In terms of specificities, I find that advanced drug candidates are more likely to find favor with specialized firms but such advancement also prevents ventures from accessing other complementary capabilities. Similarly, the choice of generic firms tends to enhance the likelihood of partnering with specialized resource firms. This effect is enhanced for a novel drug but tends to reduce for experienced generic partners. In general, I find that generic resource partners that offer some technical competence do not favor adding another technical

partner to the venture team. The results suggest tradeoffs in the partnering process that reduce inefficiencies for the firm.

Many entrepreneurs do not control resources necessary for opportunity exploitation having to rely on external partners for creating value. In many instances, entrepreneurs are often faced with interdependencies between partners, customers, or potential stakeholders forcing them to make a hard choice of serving one stakeholder at the expense of others. There are no prescriptive suggestions for such situations in the literature and this study is one attempt to address this gap. By strategically choosing the order of partnering, entrepreneurs can navigate these unwieldy interdependencies yet gain access to key resources needed to build their ventures. The results of this study go beyond the entrepreneurial context and also hold relevance for managers who are constrained by their prior transactions. For instance, long term contracts meant to motivate employees might end up constraining managerial flexibility in attracting future employees. If managers have flexibility in choosing the sequence of their decisions, they might be able to reduce inefficiencies and constraints on decision making.

The study shows the tradeoffs that entrepreneurs need to be mindful of when partnering with multiple players. Entrepreneurs may have different preferences—some entrepreneurs may be content to invent and then leave it in the hands of others to commercialize their invention, while others may be interested in actively working with their ventures and taking a greater portion of the pie. My study shows that different partner choices for the first and second partner may lead to predominance of different outcomes for the focal venture. If entrepreneurs care about having their drugs in the market, they are better off partnering late with venture capital firms, but this comes at the expense of the entrepreneur having to exit the venture. On the other hand, when the founder has a large number of PhDs on the board, it is less likely that the key

founder will leave the venture. Similarly, while generic partners help ventures secure access to specialized partners, having specialized partners second may reduce the likelihood of new drug discoveries. These tradeoffs suggest different paths based on different preferences that entrepreneurs could take to achieve their objectives.

My results besides highlighting the path dependent nature of growth also suggest that there is a particular order to capability development. When ventures attempt to partner with closely matched partners, they are likely to lack the ability to attract the other complementary partners to the venture there by limiting their options. Intrinsic capability of ventures to offer multiple sets of complementarities to different partners such as drug novelty or technological capability benefitting both generic ventures looking for returns as well as specialized firms looking for strategic goals afford ventures the ability to access complementary bundles and grow faster. The findings of my thesis offer promise for constructing a theory of partner sequence that suggests the correct staging of strategies for new ventures to evolve into established businesses.