

**Flexibility and Change: Growing Within and Across Technology Regimes in an
Evolving Industry**

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Version 1c, March 28, 2007

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ABSTRACT

This paper compares the adaptive capacity of entrepreneurial startups and diversifying entrants in an emerging market. While entrepreneurial firms are largely viewed as more flexible and adaptive than established firms, research has also found that established companies bring substantial advantages when they enter new markets. We propose that the advantages of entrepreneurial firms will be most evident when they are founded within the current technology regime, and we argue that established firms will exhibit greater adaptability when shifting to a new technology regime. We find evidence consistent with these propositions in the U.S. cellular industry, which has gone through several changes in technology standard over the history of the market. The results suggest that entrepreneurial firms are more flexible in matching the demands of the market when they are founded, but that established firms possess capabilities that enable them to change their operations more successfully when they face shifts in the competitive environment. Thus, these firms possess different capabilities for configuring and reconfiguring their activities, which give them different relative adaptive advantages.

I. INTRODUCTION

In an evolving industry, a firm's capability to adapt to changes in the environment is crucial to its survival and further growth. While the survival rates of entrepreneurial firms and diversifying entrants have been extensively compared in shakeout periods (review in Geroski 1995; review in Helfat and Lieberman 2002), the nature of the adaptive responses of these different types of firms have not been fully elaborated. In this study, we predict that entrepreneurial startups will grow faster than established firms when both enter a market during the current technology regime. In contrast, we predict that diversifying entrants will reconfigure more successfully after a shift in technology, and thus grow faster than startups after the shock.

We integrate insights from two literature streams—industry evolution (Agarwal and Bayus, 2002; Agarwal and Gort, 1996; Agarwal et al. 2002; Gort and Klepper, 1982; Klepper, 1996; Suarez and Utterback, 1995) and firm evolution (Christensen and Bower, 1996; Helfat and Lieberman, 2002; Klepper and Simons, 2000; Mitchell, 1989). Our central premise is that a central challenge for growing firms –reconfiguring the relationship between productive resources – will vary by the type of firm and the particular experience of the firm. We test our hypotheses in the context of the cellular telecommunications industry. This industry is an ideal setting; not only did the market experience significant technological disruptions and change, there is also significant entry by both diversifying entrants and entrepreneurial startups during the various technological regimes. By studying the growth of heterogeneous entrants over different technology conditions, we can examine the relative adaptive capabilities of startups and diversifying entrants under different conditions.

II. LITERATURE REVIEW

Firms vary widely in their pre-entry history. Some come with experience from operations in other industries, while others are newly founded by entrepreneurs within this industry, and each has its own advantages and constraints. Prior literature has examined the difference in post-entry performance in a new market either between diversifying entrants (*de alio*) and entrepreneurial entrants (*de novo*), based on their pre-entry backgrounds, or between incumbents and new entrants, based on their entry timing before or after a certain critical event such as market or technology change (see table1). In general, focusing on pre-entry background, prior empirical studies suggest that (1) entrepreneurial entrants generally have a rather short life expectancy (Geroski 1995), (2) entrepreneurial entrants with preproduction show the lowest initial death rate and then show the highest death rate at later ages (Carroll, Bigelow et al. 1996), (3) entrepreneurial entrants founded by individuals that worked for the leading automobile firms outperformed all firms and dominated the industry (Klepper 2002), (4) entrepreneurial entrants exert greater efforts and achieve greater technological outcomes in product innovation than diversifying entrants (Khessina 2004), (5) by about age eight, the mortality rate of entrepreneurial entrants with preproduction exceeds that of diversifying entrants; by about age twelve, it exceeds that of entrepreneurial entrants without preproduction (Carroll, Bigelow et al. 1996), and (6) diversifying entrants were common sources of substitute products, new-use products, and complementary innovations that require knowledge reconfiguration (Methe, Swaminathan et al. 1996). In addition, the greater the similarity between diversifying entrants' pre-entry resources and the required

resources in an industry, the greater the likelihood that the firm will survive and prosper (Helfat and Lieberman 2002).

On the other hand, focusing on the entry timing before or after a certain critical event, Methe et al.(1996) show (1) incumbents were especially likely to be the sources of innovations that substituted for existing uses and conversely, new companies were particularly unlikely to be the sources of substitutes in market change, (2) new companies were common sources of new-use products that required new knowledge bases, and the sources of many complementary products that involved knowledge reconfiguration. In addition, Christensen and Bower (1996) observe that market leading incumbents in the disk drive industry tend to fail in the face of disruptive technology change.

Overall, empirical evidence shows that (1) diversifying entrants (De Alio) have a longer life expectancy than entrepreneurial entrants (De Novo), but diversifying entrants' comparative advantage falls over time, and (2) diversifying entrants (De Alio) with greater pre-entry industry experience attain larger market shares and survive longer. Moreover, incumbents and new entrants both can be sources of innovations in an established industry and their comparative advantages over each other depends on what changes in the environments are.

Despite the variety of studies, the results leave a number of open questions. First, existing studies do not explain the mechanism and the conditions under which the initial advantages of diversifying entrants over entrepreneurial entrants might diminish. For example, empirical evidence suggests that the comparative advantage of diversifying entrants, as opposed to entrepreneurial start-ups, decreases over time (Agarwal et al.

2002). Although there is a strong presumption that entrepreneurial firms are more flexible, very little empirical evidence has been provided (Cooper, Willard et al. 1986; Agarwal, Sarkar et al. 2002).

In addition, pre-entry organizational capabilities alone can not explain the comparative advantages of diversifying entrants over entrepreneurial entrants. Many studies have found that pre-entry experiences contribute positively to performance and survival (Mitchell 1989; Christensen and Bower 1996; Karim and Mitchell 2000; Klepper and Simons 2000; Helfat and Lieberman 2002). However, at least one study suggest that firms might be trapped by their existing capabilities or relationships, which hinder firms from adapting to changes in the environments (Christensen and Bower 1996).

More important, the comparative **post-entry adaptive advantages** between diversifying and entrepreneurial entrants and the importance of post-entry adaptation on post-entry performance, survival or growth, have been overlooked. As suggested by the industry evolution literature, most industries evolve over time along two dimensions: (1) in technology, the pattern of innovations moves from product innovation to process innovation (Abernathy and Utterback 1978), the rate of innovation falls over time (Klepper and Simons 2000), and innovative information moves from distant to local places (Gort and Klepper 1982); and (2) on the demand side, the customer base changes from technology enthusiasts and early adopters-visionaries to mainstream markets(Moore 1999). In addition, research shows that these changes in the industry environment will affect firm capabilities and performance (Suarez and Utterback 1995; Agarwal and Gort 1996; Klepper 1996; Agarwal et al. 2002; Agarwal and Bayus 2005). Therefore, once a firm enters a new market, diversifying entrants and entrepreneurial entrants both face

three important challenges when growing their operations in new markets: the need to acquire new resources, the need to change the relationships between their existing resources, and the need to integrate new and existing resources. However, we are still not clear about the comparative advantages in adaptation between diversifying and entrepreneurial entrants and the mechanisms by which these different types of firms actually adapt. Our literature review shows that although studies that examine the performance difference between *incumbents and new entrants* have touched on the issues of adaptation, insights from these studies have never been integrated with studies that examine the performance difference between diversifying and entrepreneurial entrants.

Hence, it is the intent of this paper to examine what the relative adaptive capabilities of entrepreneurial start-ups and diversifying entrants are as they enter a new market and as the technology evolves in the market they enter, and to specify contingencies under which entrepreneurial and established firms will grow and thrive in new market segments.

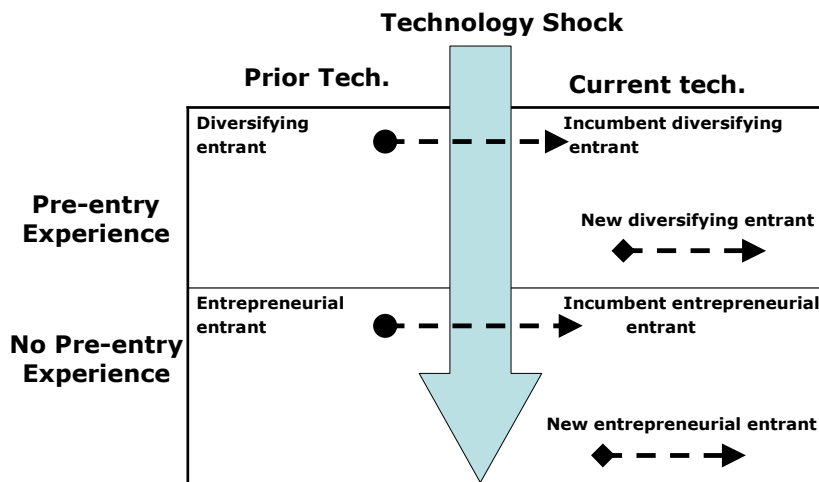
*****Insert Table 1 About Here*****

III. THEORY DEVELOPMENT

In this model, we focus on two types of entrants based on their pre-entry background: diversifying entrants – firms that enter the focal industry following experience in another industry – and entrepreneurial startups – firms that are founded within the focal industry. In addition, we assume that the focal industry evolves over time, and encounters at least one major technological shock. This technology shock causes the

emergence of a new technology regime, which will render the older one obsolete. Hence, while the industry retains the same underlying characteristic (e.g. wireless vs. wired communications), this disruption nonetheless may change industry standards and how a firm does business. By doing so, we capitalize on a technology shock in the focal industry to address the extent to which startups or diversifying entrants exhibit structural flexibility in adaptation. Moreover, we capture the distinction between incumbents, diversifying entrants and startups in a systematic manner: regardless of their pre-entry status at the time of entry, after the introduction of a major technology innovation, both types of entrants become *incumbents* in the industry since by definition, there are no incumbents in the focal industry when it is created (Figure 1).

Figure 1 Incumbents, diversifying and entrepreneurial entrants in technology changing environment



Lastly, we assume that at the time of entry, diversifying and entrepreneurial entrants carry different level of *organizational capabilities*, which are composed of two types of knowledge: core knowledge and integrative knowledge. “Core knowledge”, knowledge-often scientific or technological -that is at the heart of, and forms the foundation for, a

product or service (Helfat and Raubitschek 2000), permits a firm to make a living by producing and selling the same product, on the same scale and to the same customer population over time in the short term (Winter 2003). On the other hand, "integrative knowledge", knowledge of how to integrate, different activities, capabilities, and products in one or more vertical chains (Helfat and Raubitschek 2000). Integrative knowledge is similar to Winter's (2003) first-order capabilities or dynamic capabilities as integrative knowledge the firms' capacity to modify or reconfigure existing products, processes, or markets.

At the time of entry, diversifying entrants can transfer their core knowledge from their existing business to the focal industry (Helfat and Lieberman 2002). Hence, diversifying entrants are likely to have more developed organizational routines than entrepreneurial entrants, but these routines are likely to be inappropriate in some ways for the specific demands of the new environment (Khessina and Carroll 2001). Diversifying entrants need to modify their pre-entry knowledge to fit the environment of the focal industry and because of this the diversifying entrants develop "integrative knowledge" as they reconfigure the relationships between their activities and resources for the new industry.

On the other hand, entrepreneurial entrants develop their organizational capabilities in the process of learning in the focal industry (Khessina 2004). Entrepreneurial entrants, with no strings attached can focus their efforts on cumulating "core knowledge", instead of "integrative knowledge". This gives entrepreneurial entrants a greater growth potential over diversifying entrants, given that entrepreneurial entrants are able to learn and develop the closest match of firm level resources with environmental conditions.

Following a market discontinuity triggered by a radical technological innovation, both diversifying and entrepreneurial entrants entering the industry before the technology change become incumbents and reconfiguration of existing operations is required (Hill and Rothaermel 2003). We argue that their ability to adapt to the new technology regime depends on whether they have accumulated “integrative knowledge” in the focal industry as “integrative knowledge” enables firms to reconfigure their existing operations and relationships (Helfat and Raubitschek 2000; Winter 2003), and generating capability to integrate, reconfigure or develop and release new resources requires enough transformational experience such as M&As and new market entry that “tacit production and organizational knowledge” becomes stored in new patterns of activities, in routines (King and Tucci 2002). In contrast to prior literature on diversifying entrants and startups (Carroll et al. 1996; Khessina 2004), we argue that diversifying entrants will exhibit more structural flexibility in the face of discontinuous change relative to startups, given their prior experience in doing so and accumulating integrative knowledge at the time of entry.

IV. HYPOTHESES

Entry before the technology shock

Traditionally, scholars focus on the initial stock of resources and capabilities that entrants carry to the industry they enter and its impact on post-entry performance (Helfat and Lieberman 2002). Diversifying entrants, which are established firms in another market, have a significant advantage over entrepreneurial firms in acquiring resources. Within their existing operations, these firms have surplus resources, such as

organizational knowledge, human resources, brand, and capital, which they can commit to the new venture (Penrose 1959). In addition, these firms have valuable external relationships with stakeholders, such as capital providers, regulators, the news media, and customer groups, which will significantly reduce the cost of acquiring other new resources. In total, these many assets and relationships endow diversifying entrants with an external legitimacy that other studies have found gives them a significant survival advantage over new firms. In contrast, entrepreneurial firms, new firms with no legal association with any established firms, have limited resources and operational capabilities.

However, even high in terms of stock, the initial endowments of established entrants might not perfectly match the core knowledge of the focal industry, knowledge (often scientific or technological) that forms the foundation for a product or service (Helfat and Raubitschek 2000) as these initial endowments are previously committed and designed for other industries. In addition, it takes time for established firms to adapt their old resources, capabilities, or routines to the new industry due to the internal and external inertia. On the other hand, entrepreneurial firms lack the many pre-existing and long-standing commitments that an established firm must deal with. Moreover, in the technological regime of entry, relevant (and deployable) core knowledge of entrepreneurial startups are created for the focal industry, hence the initial match to environment is higher.

On top of that, incremental learning within the technological regime of entry is easier given greater structural and strategic flexibility of the startups vis-à-vis diversifying entrants. When entrepreneurial firms are established within the current technology regime of the market, this flexibility advantage is considerable. New markets

require both the perception and solution of a variety of new problems to provide a product or service to potential customers. The structure and practices of established firms act as a filter, which makes it more difficult for them to perceive the specific problems in this market segment. This leads to our first hypothesis.

H1: Entrepreneurial firms founded within the current technology regime will grow more rapidly than diversifying firms entering during the current technology regime.

Facing a technology shock

While the challenge of changing the relationship between existing resources is a considerable constraint that established firms must overcome, experience with the process of re-ordering internal and external relationships can create capability to change (Helfat and Raubitschek 2000). Faced with a technological shock, integrative knowledge and prior experience with change may provide diversifying firms an advantage over entrepreneurial startups.

Diversifying entrants have developed integrative knowledge through their earlier experience reconfiguring activities and resources from another industry to apply them in the focal industry. For instance, PacTel moved its cellular headquarters to Dallas – far from its telephone business – and put managers from an acquired cellular operator in charge to adapt its practices to the new demands of the cellular market. In particular, they gain experience in integrating demand and technology signals and restructuring within the organization to enter the new market, which can be leveraged to address technological/demand shocks within the focal market once these occur. In applying

combinations of resources at hand to new problems and opportunities in the focal market, diversifying entrants have already engaged in reconfiguration, or what Baker and Nelson call “bricolage,” wherein a firm goes through a process of testing and counteracting limitations that requires creativity and improvisation (Baker and Nelson 2005). Thus, diversifying entrants possess “transformational experience” through their reorganization/redirection of effort to new markets (King and Tucci 2002). Diversifying entrants have prior experience in responding to change and undertaking necessary structural transformations, so they are able to respond more effectively than entrepreneurial startups to the shock.

In contrast, startups may have a tougher time negotiating change. Examining dominant firms in the semi-conductor industry, Holbrook et al.(2003) document how startup Shockley Semi-conductors was able to leverage founder information for competitive advantage initially, but was less successful in navigating change vis-à-vis diversifying entrants from other electronics industries, particularly when the changes rendered their earlier information advantage to obsolescence.

Hence, when an entrepreneurial firm faces a new technological regime after being founded in a prior technological regime, it now has existing commitments related to the last technological standard, yet no experience with changing prior commitments. Thus, we posit an advantage for diversifying entrants as they transition to new technology standards.

H2: Diversifying entrants which entered during a prior technology regime will grow more rapidly than entrepreneurial firms which entered during a prior technology regime.

The concepts of core and integrative knowledge also relate to the concepts of structural and strategic flexibility (Volberda 1996). Volberda (1996) defines structural flexibility to consist of managerial capabilities for adapting the organization structure and its decision and communication processes to suit evolutionary changes, and strategic flexibility to consist of managerial capabilities that allow modification of goals in light of disruptive changes.

Alternative mechanism: Diversifying entrants have a resource advantage under uncertainty.

Prior hypotheses dealt with responses to changes from one technological regime to another (sequential evolution). During the periods of competing technological standards (simultaneous availability of multiple technologies), the risks for firms is high as network investments may rapidly lose value if another standard comes to dominate (e.g.: TDMA). In such circumstances, access to resources and ability to span multiple product lines by diversifying entrants will provide an advantage either due to (1) better ability to push own standard towards widespread adoption, or (2) hedging of risk by incorporating multiple standards.

H2alt: During periods of competing technology standards, diversifying entrants will grow more rapidly than entrepreneurial firms.

Note that above arguments do not relate to “deep pockets” or the size of firm (these are controlled for), or superior access to a larger set of resources. Instead, they are based

on the type of knowledge needed for success, which is a function of whether the industry environment has experienced a technological shock.

Also, they are in direct contrast to Carroll et al.(1996) and Khessina(2004). While Carroll et al.(1996) acknowledge that diversifying entrants have to overcome inertial tendencies prior to entering the focal industry, they nonetheless assume that startups have greater structural flexibility than diversifying entrants. Also, they posit that deep pockets and relevant resources will provide diversifying entrants more organizational competence than startups. Building on this framework, Khessina (2004) argues that diversifying entrants have more organizational competence than structural flexibility, and thus will do better initially (early age in focal industry) in terms of new innovations, but then lag behind startups since their inertial catches up.

While this hypothesis is stated for all entrepreneurial firms, we will compare those established within current tech regime to those from earlier regimes to see if transition experiences will increase these firms ability to acquire resources during periods of instability.

V. EMPIRICAL APPROACH

The proposed hypotheses are tested on firms who provided service in the wireless communication industry between 1985 and 2004. The cellular communications service was initiated in 1983 as the Federal Communications Commission issued its first license for cellular communications service, and Ameritech Mobile Communications launched the first commercial cellular service in Chicago in 1985.

This industry is an appropriate setting to test the proposed hypotheses for the following reasons. First, the industry environment of wireless communications service

has rapidly evolved in technology. For example, the first technology innovation in this industry is the shift from analog to digital signal in transmitting the message. In January 14th 1991, PacTel Cellular placed the first commercial digital cellular phone call in Los Angeles using the new cellular industry equipment standard. In addition, several standards are competing for the dominant digital standard: NAMPS, IS-45 TDMA, IS-136 TDMA, GSM, to IS-95 CDMA (Wickham 1993).

Second, firms entering the industry included both independent and corporate entrepreneurs, and represented diversity in both product and geographic scope. For instance, some entrants operated local phone services or microwave stations prior to entry while some had no organizational history at all. One of the start-ups was actually founded by former FCC staff members. Third, firms operating in the industry exhibit an evolution of their capabilities through adapting their technology, entering new geographic markets, and changing their organizational capabilities through hiring, internal restructuring, mergers, acquisitions, and alliances. Thus, testing our hypotheses within the wireless communications service industry enables us to observe both the disparity in entrants' growth due to their heterogeneity in initial endowment, subsequent learning in reconfiguring their business within the focal industry in the face of disruptive technology change.

The data for our empirical test are collected from several sources, including Phillips telephone and wireless industry directory, LexisNexis, company annual reports and 10Ks, industry reports, the FCC's Universal Licensing System (ULS), and industrial magazines such as Cellular Business and Mobile Phone

IDENTIFYING ENTRANTS AND BACKGROUND

Due to a high number of partnership formations and transfers of ownership within the partnership and cross licensees within one single year in the earlier stage of the industry, a large number of firms or individuals entering the industry solely to realize short-term gains from arbitrage. An entrant has to own the *majority ownership* in a cellular communications license and have built a network and provided commercial service over their own network.

To serve the purpose of finding all the active companies in the industry, the following two steps are subsequently pursued (1) obtaining the complete list of licensees in each year and (2) for the partnership type of licensees, identifying the ownership within each partnership. To obtain the complete list of cellular licensees in the United States in each year from 1983 to 1999, we mainly refer to a series of Phillips Publishing's publications, which include the cellular marketplace in 1984, telephone industry directory from 1987 to 1992, mobile communications directory from 1990 to 1992, cellular/mobile communications directory from 1993 to 1994, and wireless industry directory from 1995 to 1999. In addition, we use the licensee information published in the "Cellular Business" magazine from 1984 to 1985 to supplement the years that Phillips Publishing has no publications on cellular licensees. We check the overlapping years, and the information about licensees in each market from the two sources appears to be consistent.

After obtaining the complete list of licenses, the second step is to identify who is behind the partnership type of licensees and the ownership structure within each partnership. *Cellular Radio: Birth of an Industry (1983)*, *Cellular Marketplace (1984)* and *Donaldson, Lufkin & Jenrette's Cellular Communications Industry (1985)* provide a

list of parties who have formed a partnership in order to apply for the cellular licenses before 1985, and their ownerships in partnerships. From these three books, we know the partnerships they formed before 1985. For the partnerships formed on and after 1985, we check the annual reports and 10Ks of existing cellular operators since a large number of entrants to the industry went public in two or three years after they enter. If the ownership structure or identity in partnership type of licensees can not be identified by the previous three sources, I perform a general search in the LexisNexis.

After obtaining the complete list of licensees in each year and identifying the ownership structure within each partnership type of licensees, we compiled a list of entrants to the industry of cellular communications services from 1983 to 2000. Entry year is set as the year that the entrant has the majority ownership of at least one license and has shown activities in conducting the core business. In addition, entrants are identified as diversifying entrants if they are formed by established firms in other industry, and entrants are identified as entrepreneurial entrants if founders' information is available.

MEASUREMENT & METHODOLOGY

The dependent variable, growth, is measured each year as the percentage growth in subscribers over the previous year. The explanatory variables include entrant type (diversifying entrant or entrepreneurial entrant), and technology regime of Entry/Existence. Control variables include (1) firm sales,(2) age,(3) year of entry,(4) industry sales and growth, and (5) number of firms, number of firms².

We estimate the effects of these variables on growth using four different regression specifications: Ordinary Least Squares (OLS), Generalized Least Squares (GLS) with

heteroskedasticity, OLS with random effects for unobserved firm differences, and OLS with random effects and error clustering by firm.

VI. RESULTS

Table 1 shows the results of our empirical test and the results show support for H1 and H2.

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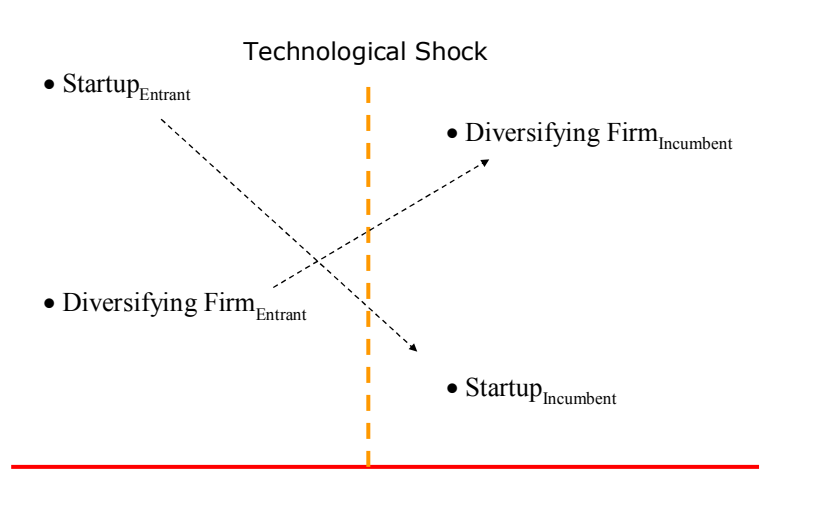
VII. CONCLUSION

Entrepreneurial and established firms face different barriers to change, and bring different advantages in adapting to change during technology shifts. In this paper we explore the differences in their success before and after shifts in technology standards. We argue that diversifying entrants will possess capabilities for reconfiguring existing resources and adding new resources required by changes in technology standard. On the other hand, entrepreneurial firms will have a flexibility advantage to configure relationships and resources matching the focal industry because they are not restrained by existing knowledge and commitments when they enter the industry. Thus, entrepreneurial firms will grow more quickly when founded under the current technology standard, but will grow more slowly when faced with the task of re-ordering their resource commitments to compete under a new standard or under competing standards.

The pattern of growth in the U.S. cellular industry is broadly consistent with these propositions. Startups have higher growth rates in the technological regime of entry relative to diversifying entrants, but are not able to manage transitions as successfully as diversifying entrants. In addition, for diversifying entrants, managing the transition within the focal industry is easier than the transition from outside industries to the focal industry.

On the other hand, for startups, the lack of “integrative knowledge” represents a roadblock when confronted with a technological regime change. The results are represented in Figure 2.

Figure 2: Growth rates of startups and diversifying firms as “entrants” and “incumbents”



Our results have several implications. First, for entrepreneurship, start-up firms have a growth advantage before an industry transition, which contrasts with much of the received literature on industry evolution, where diversifying entrants are found to survive longer than startups. This highlights an important aspect of diversification that is often overlooked – while diversifying entrants can draw on valuable existing resources and capabilities, their existing commitments and ingrained patterns impose limits on the extent to which they can adapt to the demands of a new setting. This inertial constraint is rarely considered in the literature on diversification and resources. Second, for the dynamic capabilities literature, we show evidence that prior ability to deal with reconfiguration is advantageous in future transitions. Third, for industry evolution, our evidence that technological change affects firm performance not just directly, but also affects the types of firms that will thrive after the disruption. Finally, while

entrepreneurial entrants exhibit flexibility and rapid incremental progress within the same technological regime, they are disadvantaged vis-à-vis diversifying firms when confronted with disruptive change.

We did not find support for H2alt. Diversifying entrants do not have a significant growth advantage over startups during periods of competing standards. This, together with the fact that diversifying entrants did not demonstrate uniform advantages over startups, suggests that advantages in resource acquisition cannot explain the differences between the firms. Since the performance of the two types of firms varies in periods where the adaptive challenges will differ, it strongly suggests that the differences arise because of the relative adaptive advantages of the two types.

The strength of the inferences we can draw from the study are limited by the fact that it is a single industry context, and the generalization of the propositions to other industries – especially industries where technology shifts emerge more endogenously as a result of product introductions – has not been established. In addition, the study does not directly measure the reconfiguration and adaptation of the firms, instead it relies on inference based on growth outcomes and types of firm. In our next study, we plan to study the actual mechanisms of adaptation in the firm by comparing the patterns of changes to top management teams and the subsequent impact of these changes on the two types of firms.

Table 1 Entrant Type and Post-Entry Performance

Article	environmental setting	entrant type	Key arguments about comparative advantages of two entrants	Performance measurement	Performance outcome
Geroski 1995 IJIO	Not specify	Diversifying entrants vs. start-ups	Not applicable(review piece)	Duration of Survival	Small-scale, de novo entrants generally have a rather short life expectancy
Carroll et al. SMJ	Not specify	Diversifying entrants vs. start-ups (De Alio Vs. De Novo)	(1). De Alio entrants usually arrive with an ample stock of resources and overcome initially the most severe inertial constraints. De Alio firms have more stakes in the status quo. (2). De Novo firms have poor planning and resource shortages, and the substance of what they learn can be incorporated into their structures due to structural flexibility. As De Novo firms age, their structurally flexible becomes less and less, and organizational competence is likely to improve (3). Preproduction stages give chance of trial-and error, lowering risk of failure	Mortality rate	(1) De Alio and De Novo entrants with pre-production period will have lower initial mortality rates but that mortality of these firms relative to others will increase with age. (2) De Novo producers with preproduction show the lowest initial death rate and then show the highest death rate at later ages. By about age eight, the mortality rate of De Novo firms with preproduction exceeds that of De Alio producers; by about age twelve, it exceeds that of de novo firms without preproduction. (3) De novo entrants whose founders have relevant pre-entry experience survive longer than De Novo entrants whose founders have no such relevant experience.
Klepper 2002 ICC	Not specify	Diversifying entrants vs. start-ups (De Alio Vs. De Novo)	(1). Earlier entrants enter when firm price-cost margins are higher, so they will expand faster and have a lower hazard at older ages but possibly not at younger ages. (2). Among contemporaneous entrants, those with a greater R&D productivity will conduct more R&D and grow by a greater rate at every age (3). if firm backgrounds condition their R&D productivity, inexperienced firms would have lower average R&D productivities and even as firms age, this disparity will continue	Hazard Rate	While diversifying firms on average outperformed De Novo entrants, De novo entrants founded by individuals that worked for the leading automobile firms outperformed all firms and dominated the industry.
Helfat and Liberman 2002 ICC	Not specify	Diversifying entrants vs. start-ups	Not applicable(review piece)	Survival rate, duration of survival & market shares	(1) The match between the market entered and the firm's pre-entry resources and capabilities affect the likelihood and success of entry even for de novo firms (2) The greater the similarity between pre-entry firm resources and the required resources in an industry, the greater the likelihood that a firm will enter that particular industry, and the greater the likelihood that the firm will survive and prosper.
Khessina 2004 working paper	Incremental vs. major innovation	Diversifying entrants vs. start-ups (De Alio Vs. De Novo)	(1). Well-developed organizational routines are important for incremental innovations, and flexibility in internal structures and relations with external actors is crucial for a firm's ability to undertake and succeed for major innovation. (2). De Alio firms are likely to have a fairly well developed organizational competence at the time of entry, and routines are not perfectly transferable. (3). De Novo firms should have an advantage over De Alio firms in terms of structural flexibility since imprinting and inertia processes shape organizational abilities to undertake structural changes and the inertia pressure is likely to be weaker for De Novo firms than for De Alio firms.	Product innovation	De Novo firms exert greater efforts and achieve greater technological outcomes in product innovation than De Alio firms
Methe, Swaminathan, and Mitchell 1996 ICC	Incremental innovations, major innovation, and new market creation	Established (including industry incumbents and diversifying entrants) vs. new firms	(1) The market change classification denotes whether the innovation substituted for existing goods, complemented existing goods or created a new use. The technical change classification denotes whether the innovation required substantial new knowledge. (2) This study argues that variation along the technical and market dimensions will affect which types of firms are the sources of major innovations.	source of innovations	(1) In terms of Major Innovation within Established Product Markets, established firms account for more than two-thirds (68%) of the first entrants and almost three-quarters (73%) of the first five entrants. Industry incumbents account for almost half of the early entrants, including 47% of the first entrants and 44% of the first five entrants. (2) The market change results show that incumbents were especially likely to be the sources of innovations that substituted for existing uses. Conversely, new companies were particularly unlikely to be the sources of substitutes. (3) Diversifying entrants were common sources of substitute products, new-use products, and complementary innovations that require knowledge reconfiguration. New companies were common sources of new-use products that required new knowledge bases, and new firms were the sources of many complementary products that involved knowledge reconfiguration. (4) Incumbents were the sources of many innovations that substituted for existing goods.

Table 2, Growth among U.S. Cellular Operators, 1985-2004
(H1 predicts negative coefficient for Diversifying Firms from Current Regime)

	Regression	GLS	Random Effects	RE robust
Age	-0.23* (.14)	-0.15*** (.05)	-0.28** (.14)	-0.28*** (.10)
Firms	-0.26** (.13)	-0.20*** (.04)	-0.29** (.12)	-0.29*** (.10)
Firms squared	0.003** (.001)	0.0023*** (.0005)	0.003*** (.001)	0.003*** (.001)
Industry size (ln subs)	0.54 (.53)	0.37** (.18)	0.70 (.53)	0.70* (.36)
Firm size (ln subs)	-.06 (.05)	-.04*** (.01)	-0.05 (.07)	-0.05 (.09)
Entry Year	-0.14 (.13)	-0.11** (.05)	-0.18 (.13)	-0.18** (.08)
Startups from Current Regime	--	--	--	--
Startups from Prior Regime	-0.94*** (.36)	-0.64*** (.13)	-0.97*** (.40)	-0.97*** (.38)
Diversifying Firms from Current Regime	-0.45** (.24)	-0.50*** (.12)	-0.53** (.32)	-0.53* (.39)
Diversifying Firms from Prior Regime	-0.73** (.32)	-0.55*** (.14)	-0.61* (.41)	-0.61** (.36)
Baseline Group	Startups entered in current tech regime	Startups entered in current tech regime	Startups entered in current tech regime	Startups entered in current tech regime
Number of Observations	503	503	503	503

* significant at .10 ** significant at .05 *** significant at .01, single-tailed tests

Table 3, Growth among U.S. Cellular Operators, 1985-2004
(H2 predicts positive effect for Diversifying Firms from Prior Regime)

	Regression	GLS	Random Effects	RE robust
Age	-0.23* (.14)	-0.15*** (.05)	-0.28** (.14)	-0.28*** (.10)
Firms	-0.26** (.13)	-0.20*** (.04)	-0.29** (.12)	-0.29*** (.10)
Firms squared	0.003** (.001)	0.0023*** (.0005)	0.003*** (.001)	0.003*** (.001)
Industry size (ln subs)	0.54 (.53)	0.37** (.18)	0.70 (.53)	0.70* (.36)
Firm size (ln subs)	-0.06 (.05)	-.04*** (.01)	-0.05 (.07)	-0.05 (.09)
Entry Year	-0.14 (.13)	-0.11** (.05)	-0.18 (.13)	-0.18** (.08)
Startups from Current Regime	0.94*** (.36)	0.64*** (.13)	0.97*** (.40)	0.97*** (.38)
Startups from Prior Regime	--	--	--	--
Diversifying Firms from Current Regime	0.49* (.32)	0.14* (.09)	0.44 (.42)	0.44* (.33)
Diversifying Firms from Prior Regime	0.20 (.27)	0.09 (.08)	0.35 (.39)	0.35** (.20)
Baseline Group	Startups entered in prior tech regime	Startups entered in prior tech regime	Startups entered in prior tech regime	Startups entered in prior tech regime
Number of Observations	503	503	503	503

* significant at .10 ** significant at .05 *** significant at .01, single-tailed tests

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