Essays on international market entry

Eapen, A.

Publication date:
2007

ESSAYS ON INTERNATIONAL MARKET ENTRY: STRATEGIC ALLIANCE GOVERNANCE AND PRODUCT SEGMENT ENTRY

ESSAYS ON INTERNATIONAL MARKET ENTRY: STRATEGIC ALLIANCE GOVERNANCE AND PRODUCT SEGMENT ENTRY

Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit van Tilburg, op gezag van de rector magnificus, prof.dr. F.A. van der Duyn Schouten, in het openbaar te verdedigen ten overstaan van een door het college voor promoties aangewezen commissie in de aula van de Universiteit op woensdag 6 juni 2007 om 10.15 uur door

Alexander Eapen

geboren op 1 januari 1977 te Kerala, India

Promotor: Prof. dr. Jean-François Hennart

To my parents

PREFACE

In your hands is the result of toil, sweat and tears of more years than I would like to count. The journey towards the PhD was intellectually enriching, but certainly not an easy one.

I would like to express my deepest appreciation for Jean-François who has helped me in more ways than he could now possibly remember. He took a leap of faith in my abilities and agreed to supervise my research when I started off at IVO. And since then, he has advised and supported me in immeasurable ways.

Jean-Francois is the most curious person I have ever met. He is curious, whether it's about transaction cost theory, or about the finer workings of my parents' vegetable garden. I have learnt a lot from him over the years and his style heavily influences the way I teach and do research today. Every class I have taught since I started at Sydney, for example, knows why red cars get into accidents. The only thing I might have been able to give back to Jean-Francois was accompany him on the most interesting ride of his life - on a local train in Delhi. There again, he couldn't stop asking questions about the sacred cows that called the railway station home.

I am very fortunate to have Beth Rose, Filippo Wezel, Xavier Martin and Niels Norrderhaven on my thesis committee. Beth Rose has been a constant source of encouragement, advice and support ever since we first met at the Monterey AIB conference in 2003. I am happy to be now sharing the same part of the world with her; as she once put it, Wellington is just across the ditch from Sydney.

Filippo Wezel has never ceased to amaze and inspire me. His PhD class on 'population ecology' is what sparked off chapters three and four in this thesis. He has also been extremely generous in helping me find my way around the new terrain that was population ecology. I am very grateful.

I am also deeply indebted to Niels Noorderhaven who helped make it possible for me to come to Tilburg for the PhD in the first place. He has been extremely supportive at every stage of the PhD and especially during the data collection phase in India.

Xavier Martin has been an inspiration since the day he joined Tilburg. His 'Advanced Strategy' course in the PhD program was an eye-opener in many ways. I still consider getting a 9 on that course one of my sweetest achievements. Xavier has spent his precious time discussing ideas and commenting on my work; I am very grateful and do not take any of that for granted.

Rejie and Rekha were my constant companions throughout my time at Tilburg. Without those refreshing get-togethers on weekends and otherwise, life would have been extremely painful. Though I got to know him only later, Srini was fun to hang out with. I haven't yet met Ambily, but from what Rejie says, she is a great person.

Paulo, Arjen and I are, in the language of econometrics, observations with correlated error terms. We share the same supervisor. There was never a dull moment with Arjen, despite that we never shared the same interests in Seinfeld, soccer, or beer. Since Athens in 2001, Arjen has been my 'preferred conference travel mate'. Paulo is a great friend and a really smart person. I do miss the exciting conversations we had in Tilburg; they ranged from ambitiously planning research for our next ASQ pieces (!) to how to bake pizzas and bread at home.

I have had enjoyable times with Eric Dooms, Oleg, Sjoerd, Martyna, Dorota, Anna, Amar, Jeff, Ilya and Mario. Jan de Dreu was my benevolent, friendly landlord. I still remember the memorable visit to your parents'. And I still have the cutlery your mom donated to me when I moved out of your place. Ilya was kind enough to write up the Dutch summary of the thesis on very short notice. Rian Drogendijk may not remember, but she helped me write my first ever PhD proposal while I was an exchange

student at Tilburg. Aswin, from the department of Organization and Strategy at Tilburg, and Gerard de Groot from IVO were instrumental in getting me funding for my research.

I cannot express in words how indebted I am to Irene and Roy. They were loving, caring and helpful throughout my stay in Tilburg. My first few weeks in the Netherlands with them, and the match between Willem II and PSV – the only live soccer match I've seen in my life – will remain permanently etched in my memory.

My family has been patiently waiting for the PhD to get over. I am glad I can finally tell my parents "it's done". It's to them I dedicate this work. I also acknowledge the support and prayers of John and Subin. I thankfully remember the many trips John made to the San Francisco public library to scout for data on the US auto industry. I didn't make it to 'doctor' before Saju did but the race was fun. Thanks to Lini too, for her moral support.

The gang here at Sydney deserves special mention – Anil & Neelu, Bright & Shirin, Dannie & Jeannie, Denny & Blessy and Rony & Chinu. Thanks mates!

Words cannot express how I feel about Prea. She is the joy of my life, and the best thing that will ever happen to me. She makes every day worth living, and the average person I am feel special. Without her, I am not much.

Sydney, *Alex Eapen*
May 2007

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

The wave of globalization in past decades has dramatically changed the way firms do business. With the opening up of new markets, tariff reductions, and the dismantling of protectionist regimes across the globe, firms have increasingly expanded their businesses beyond home markets. Scholarly interest in the various decisions that cause and accompany such foreign expansion has not trailed behind either.

This dissertation consists of three studies on the entry and evolution of foreign firms in a new market. The common thread through these three essays is a focus on the scope of the foreign firm in a host country, and on how this scope is shaped by local firms and environments. I examine the scope of the foreign entrant both in terms of its economic boundaries – what it 'makes' and what it 'buys'-, as well as in terms of its product-market footprint – the product segments it occupies in the host country market.

In particular, I examine two different strategic decisions firms make when entering a new country. The first is the choice between contractual and equity governance modes in strategic alliances with domestic firms, and the second, the decision of which market segments to enter in the host country. Both these strategic choices influence the scope of the firm. By choosing an equity alliance over a licensing contract, a firm essentially expands its boundaries; it increases the range of activities organized in-house as opposed to externally. And by deciding to enter yet another market segment, a firm expands its product-market scope. Across the three essays in this dissertation, I examine how local firms or local environments in the host country influence these decisions.

The first essay looks at the choice between contractual and equity forms of governance in technology transfer alliances between foreign and local firms in India, and

at how the technology capability of the local Indian partner influences this choice. The second examines whether and why a foreign firm will enter a particular market segment of the US automobile industry. Here I explore the role of the local environment – e.g., the presence of other firms, the barriers to entry into the segment, the extent of multi-market competition the firm faces in the segment, etc. In the third essay I look at aggregate entry rates of foreign firms into various market segments of the US auto industry, again emphasizing the influence of the number of various types of incumbents in the segment.

The thesis is comprised of five chapters. Chapters 2, 3, and 4 report the research that constitutes this dissertation, while chapter 5 draws together key findings and implications and suggests avenues for future research.

1.1 RESEARCH QUESTIONS, SEQUENCE, AND KEY FINDINGS

Firms sometimes need to ally with local firms when entering new markets. While that is clear, we know relatively little about what form of governance this alliance should adopt. The literature on alliance governance (e.g., Oxley 1997; 1999; Pisano 1989), mostly from a transaction cost theory standpoint, focuses on alliance-level determinants such as its functional and geographic scope and tells us little about how firm capabilities influence the governance decision. The first essay seeks to rectify this, and examines the effect of technology capabilities of the local firm on the choice between contractual and equity forms of governance, that is between licensing and equity joint ventures, controlling for characteristics of the technology being shared. Essentially, we argue that the information and appropriation costs associated with technology transactions vary with both knowledge characteristics and the technology assimilation capabilities of recipient firms. We test our hypotheses using survey data from 126 alliances between foreign and domestic Indian firms and find that when the ability of the recipient Indian

firms to assimilate the technology being transferred is poor the alliance takes the form of an equity joint venture as opposed to a licensing contract. This, we argue, is because poor capabilities call for the foreign partner to transfer supporting skills to help the recipient absorb the core technology. Because most of these skills are tacit, their transfer through contractual means is fraught with information problems and the hazard-mitigating properties of equity governance become necessary.

The second essay moves on to study the product-market scope of foreign firms in a host country. Product markets are rarely homogeneous, but typically characterized by market segments across which buyers have different tastes and preferences. The product market scope of a firm at any given time is made up of successive decisions it has taken in the past on whether or not to enter (or exit) a given segment. Ceteris paribus, the more segments a firm chooses to enter, the larger its product scope. This paper examines the determinants of these entry decisions. Drawing from the strategic management, strategic momentum, population ecology and industrial organization perspectives, I predict that a foreign firm's propensity to enter a given segment in the host country in a particular year depends on the extent of its multi-market contact with rivals and its prior experience in that segment, and on the number of other participants in that segment – i.e. the segment density. I test these hypotheses using data on segment entries by foreign manufacturers in the US automobile industry over nearly two decades (1986 - 2003). The analyses suggest that all the above determinants are relevant. Multi-market competition and the firm's prior entries into a segment have non-monotonic effects; prior entry has a positive but diminishing effect on segment entry while that of multi-market competition follows an inverted U shaped pattern, increasing initially and then decreasing after a point. The number of other participants in the segment has a deterring effect on a firm's propensity to enter. These findings corroborate multi-market competition, strategic momentum and

spatial competition predictions. I find only limited support for the population ecology perspective, which predicts an inverted U-shaped effect for segment density.

The limited support for the population ecology perspective is intriguing. Hence, I explore this further in the third essay. I use another econometric specification which is commonly used in population ecology research on organizational founding and, more importantly, explore the boundaries to the density effect. Traditionally, density dependence theorists have assumed that the processes of legitimation and competition, which are the key drivers of the density dependence effect, operate at the level of the overall population. Recent studies, however, have started to emphasize spatial heterogeneity in populations and have suggested that the density effect operates at the level of national subunits, such as regions and cities (Cattani et.al, 2003; Lomi, 1995; Carroll & Wade, 1991). I take this advance forward and emphasize two alternative levels of aggregation that serve as boundaries to legitimation and competition forces and hence to the density effect. First, industries can be disaggregated into segments, which correspond to homogeneous types of demand. I argue that the density effect is stronger at the segment level than at the industry level, i.e., among firms that depend on similar kinds of buyers. Second, I propose that density effects do not affect all firms equally strongly but will be strongest among firms that share similar identities. And since foreign firms share similar identities vis-a-vis domestic firms, density effects will be stronger within the sub-population of foreign firms, rather than across foreign and domestic firms. My results from analysing data on entry rates of foreign firms into segments of the US automobile industry support these notions.

First, I find support for my density dependence predictions. This appears to contradict the finding in chapter three and needs to be discussed further. I do this in chapter 5, after reporting details of both analyses in chapters 3, and 4. Second, I find that

density dependence effects are stronger at the segment level compared to the population or industry level which prior research has traditionally used. And third, I find that entry rates of foreign firms are more sensitive to the number of foreign participants in the segment than to the whole population of the segment. Taken together, the last two findings suggest that lower levels of aggregation such as the segment and the sub-population of foreign firms are better levels of analysis to study density-dependent processes.

1.2 THE BIG PICTURE: A NOTE ON COHERENCE BETWEEN CHAPTERS

The essays in this dissertation are heterogeneous to some extent. All three papers do not share the same research question, theoretical core, research design, or empirical setting. In writing the dissertation, I focussed more on the individual contributions of the essays than on their collective common identity; each essay was meant to 'stand-alone'. Nevertheless, there are clear commonalities between the papers. At first glance, chapters three and four are similar – they both explore the decisions of foreign firms to enter market segments, albeit at different levels of analysis.

At a more fundamental level, all three papers address the issue of the scope of the foreign firm in the host country market. While the first essay addresses economic scope, the second and third explore product market scope. And while determinants of scope vary across all three papers, at a fundamental level they emphasize the local firm. In the first paper I study the effect of the local firm's capabilities. In the second and third, I am still interested in the effect of firms in the local environment, but in a more aggregated, than individual effect.

The other way the three essays hold together is in their positioning within international business research, and in particular, in the stream on foreign market entry.

The central phenomenon foreign market entry research seeks to address is the location and distribution of foreign entries. Some scholars are interested in the distribution of foreign entries across geographic space and study questions pertaining to the location of FDI, either within a host country or globally. The three essays in this dissertation also address the location and distribution of foreign entries, first in governance space, and then in product space. In this sense, they complement each other as well as add to extant research on firms' entry into foreign markets.

TABLE 1.1
THESIS OVERVIEW

	Chapter 2	Chapter 3	Chapter 4
Research question(s)	How does technology capability of the local firm influence the choice between licensing and joint venture forms of alliance governance?	What factors drive foreign firms' decisions of which market segments in the host country market to enter?	How does density affect entry rates of foreign firms into segments? Is the density-effect stronger at the level of the national industry or the market segment? Within market segments, is the density effect stronger among sub-populations of foreign firms?
Dependent variable	Binary: whether the alliance was governed by licensing contract or through an equity joint venture.	Binary: whether or not foreign firm *i* entered segment *j* in year *t*	Count of entries of foreign firms into a given segment in a given year
Unit of analysis	An alliance	Firm – segment – year	Segment – year

Theoretical lens	Transaction cost theory	Multi-market competition, Momentum, Density dependence, and spatial competition	Density dependence theory
Broader theoretical issue addressed	How do firm capabilities influence the boundaries of the firm?	Do these theoretical mechanisms operate at the level of market segment? Which theories best explain the distribution of foreign entries across market segments in a host country?	Boundaries of the density-dependence effect. Levels of aggregation, and boundaries within which legitimation and competition processes operate.
Research design & empirical setting	Survey of technology alliances between foreign and domestic firms in India	Secondary data on entries of foreign firms into market segments of the US automobile industry, 1986 - 2003	Secondary data on entries of foreign firms into market segments of the US automobile industry, 1986 – 2003
Key findings	Recipient firm's technology capability significantly influences governance form of the alliance. We find a higher likelihood of equity joint venture over licensing when the recipient has poor technological capabilities. In this empirical context, the relevant transaction costs come from information costs rather than appropriation concerns.	A foreign firm's decision to enter a market segment is significantly influenced by the extent of multi-market contact it has with incumbents in the segment, as well as by its prior entry experience and the number of other participants in the segment.	Segment density has a significant effect on entry rates of foreign firms into those segments. This shows that the segment is a relevant level of aggregation at which density-dependent processes operate. Also, for foreign entry into segments, it is the foreign component of segment density which is significant.

CHAPTER 2

RECIPIENT TECHNOLOGY CAPABILITY, KNOWLEDGE HETEROGENEITY AND GOVERNANCE CHOICE IN TECHNOLOGY ALLIANCES: EVIDENCE FROM AN EMERGING MARKET[1]

Abstract

This essay examines the choice between joint ventures and licensing contracts to govern strategic technology alliances between foreign and domestic firms. Extant research has predicated this choice on alliance-level characteristics, such as their functional or geographic scope, giving relatively short shrift to technology characteristics and recipient firm capabilities. In this paper we argue that the information and appropriation costs associated with technology transactions vary with both technology characteristics and the technology assimilation capabilities of recipient firms. We test our hypotheses using survey data on technology transfer alliances between foreign and local firms in India, an empirical setting which provides variation in our core constructs. We find that recipient technology assimilation capabilities significantly influence the choice of governance form. We also find that, in our sample, contractual hazards rooted in information asymmetries are much more significant determinants of governance choice than those based on potential knowledge misappropriation.

[1] This chapter is the result of joint work with Jean-François Hennart.

We thank Xavier Martin, Paulo Cunha and Arjen Slangen, and seminar participants at HEC Paris, the University of New South Wales, and at the 2003 Academy of Management and Academy of International Business Meetings, for their comments on an earlier version of this chapter.

2.1 INTRODUCTION

To exploit their firm specific advantages in foreign countries, Multinational Enterprises (MNEs) need to combine those advantages with local assets, such as distribution networks, market knowledge, locally-known brand names, and factors of production such as land, labor, and utilities, among others. In some cases such complementary assets can be obtained on the local market. In others they are held by local firms. One important way MNEs can then access them is by allying with the local firms that own them. Such alliances can take two main forms: an arm's length contract (e.g. the MNE licensing the local firm), or an equity joint venture, where the MNE and the local firm are jointly responsible for the management of the operation and are paid for their contribution through a share in the results (Hennart, 1988). While the need to enter into alliances with local firms in distant markets seems well accepted, we know a lot less about the form that these alliances should take. Specifically, under what circumstances should the strategic alliance between MNEs and incumbent firms be contractual rather than equity-based?

The mainstream literature on the governance form of alliances (Pisano, 1989; Osborn & Baughn, 1990; Oxley, 1997; Gulati & Singh, 1998; Pangarkar & Klein, 2001) predicts governance form from alliance-level features such as its technological, geographic, and functional scope. Oxley (1997), for example, argues that alliances that transfer multiple technologies or span multiple geographies – and thus have broad technological or geographic scope – are more likely to take the form of equity joint ventures than that of contractual agreements. Pisano (1989) argues that the functional content of the alliance matters; for example, R&D alliances are more likely to be governed through equity than through contract. While this focus on variations in alliance-scope is indeed useful, prior research on alliance governance has underemphasized two

additional types of variation across technology alliances: variation in *characteristics of the technology* being transferred, and in the *recipient's technology assimilation capability*. These two constructs are not entirely new. When examining the boundaries of the firm, scholars have emphasized the effect of technology characteristics such as its age and tacitness (Davidson & McFetridge, 1985; Kogut & Zander, 1993; Arora & Fosfuri, 2000), as well as the capabilities of technology recipients (Martin & Salomon, 2003; Szulanski, 1996; Madhok, 1996). Studies that specifically study the role of these constructs on the governance form of alliances, however, are rare (but see Colombo, 2003; Sampson, 2004).

In this paper, we examine how the characteristics of technology transferred and the technology assimilation capabilities of the recipient affect the governance form chosen for an alliance. Our argument rests on the transaction cost notion that when the contractual hazards associated with technology exchange are high, contractual forms are less efficient, and need to be replaced by equity forms of governance (Hennart, 1988; Oxley, 1997). We argue that the extent of contractual hazards in technology transfer alliances varies with the characteristics of the transferred technology as well as with the assimilation capabilities of technology recipients. We test our hypotheses using survey data on technology transfer alliances between foreign multinational and Indian manufacturing firms.

Our results show that, controlling for the characteristics of the technology transferred, the technology assimilation capabilities of Indian recipients significantly influence the choice of governance form. Weak recipient capabilities correlate significantly with a higher incidence of equity as opposed to contractual governance. Equally importantly, our results suggest that it is contractual hazards rooted in

information asymmetries rather than those based on potential knowledge misappropriation that are determinant in our sample.

In summary, this research contributes to the alliance governance literature by carefully examining the effects on the choice between contractual and equity transfer of technology characteristics and recipient capability, two types of cross-sectional variation that prior research has largely overlooked. We also contribute to transaction cost theory by showing that the relevant sources of contractual hazards in technology transactions are context dependent. In samples from lesser-developed countries such as ours, information costs rather than appropriation concerns underlie contractual hazards. Finally, this is to the best of our knowledge the first transaction-level study to examine the choice between contractual and equity alliances in India. We thus add to our currently quite limited knowledge on knowledge transfer between foreign and local firms in emerging economies (Tse, et. al 1997; Hagedoorn and Sedaitis, 1998; Meyer, 2001).

2.2 THEORETICAL BACKGROUND

2.2.1 Transaction Cost Economics, Information and Appropriation concerns

Transaction cost theory has been a dominant perspective in the literature on strategic alliances (Hennart, 1988; 1991; Pisano, 1989; Oxley, 1997; Pangarkar & Klein, 2001; Colombo, 2003; Sampson, 2004). The basic tenet of the theory is that due to limitedly rational and opportunistic dispositions of economic agents (Williamson, 1985), not every transaction can be efficiently organized on the market. Transactions sometimes involve high contractual hazards and are therefore more efficiently organized within firms than through the market. Since transactions differ in severity of contractual hazards and governance structures vary in hazard-mitigating properties, the core proposition of

the theory is that transactions should be aligned with the most appropriate governance structure (Williamson, 1991).

In this paper, we examine two types of contractual hazards in strategic technology alliances: information costs, which arise from information asymmetries between partners (Arrow, 1974; Hennart, 1989), and appropriation concerns, which are due to less than perfect definition and enforcement of property rights (Levin et.al., 1987; Oxley, 1997; Hennart, 2000; Sampson, 2004).

Information and appropriation costs arise when it is difficult to define the good being transacted and monitor the activities of the parties. Under neo-classical perfect market conditions, actors are perfectly rational and have perfect information about the attributes of the good being transacted. Under such conditions, prices act as an organizing principle, and market transactions are frictionless. However, in real life, the above conditions do not always hold. In technology alliances, recipients often have less than perfect information about the characteristics of the technology being transacted and its potential performance and, consequently, tend to under-price it. The seller, on the other hand, cannot reveal all his knowledge before the contract is signed, for fear that by so doing the recipient gets the know-how essentially free of cost. Together with the fact that buyers are limited in their abilities to identify ex-ante if the seller might act opportunistically, by, for example, not supplying the know-how in its fullest form or concealing potentially dangerous or problematic characteristics of the technology, information asymmetries of this kind cause the market for knowledge to fail, and call for further contractual safeguards. Arrow (1962; 1974; 1984) called this 'buyer's uncertainty', and these kinds of contractual difficulties are particularly pertinent when it is difficult to properly define the knowledge, such as when a large portion of it is tacit (Hennart, 1982; 1989).

The seller, on the other hand, worries about potential misappropriation of the know-how transferred, i.e., its use in ways not mentioned in the contract and hence essentially unpaid for. While specific stipulations in the contract and patenting should mitigate these concerns, it is often costly, difficult, or time consuming to detect and prove contract violations in a court of law. This gives rise to positive appropriability concerns (Teece, 1986; Levin et.al, 1988; Oxley, 1997), which constitutes a contractual hazard.

2.2.2. Contractual hazard mitigation in equity alliances

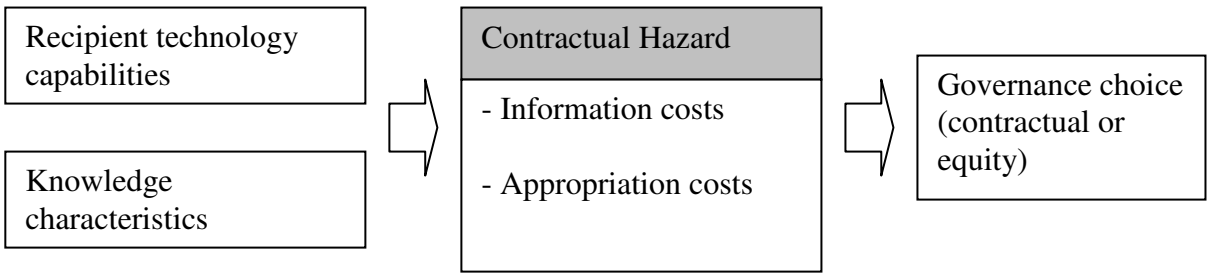
One way to mitigate contractual hazard is to reduce the incentives of agents to cheat by organizing the transaction within the firm, thus replacing the market mechanism with hierarchy (Hennart 1982; 2000). Considering different organizational forms on a continuum between markets and hierarchies, joint ventures are closer to the hierarchical solution while licensing contracts retain properties more characteristic of the market mode of organization (Hennart, 1993). Joint ventures have superior hazard-mitigating properties because, in a joint venture, the seller is not paid upfront for the technology. Rather, both parties are paid out of the residual profits of the venture and hence have less incentive to cheat. In a licensing agreement, on the other hand, licensors have only limited financial interest in the profitability of licensees, as licensors are paid for their technology through a lump sum and through a percentage of sales, not of profits (Hennart, 1988; 1989). Furthermore, joint ventures provide better avenues for closely monitoring partner behaviour through participation in the board of directors of the JV (Oxley, 1997; Sampson, 2004).

Figure 2.1 summarizes the argument we develop in the next section that information and appropriation costs faced by parties negotiating a technology transfer – and hence, their proclivity towards joint ventures – depend on the technology

assimilation capability of the recipient firm (c.f., Martin and Salomon, 2003) and the characteristics of the technology transferred (Davidson and McFetridge, 1985; Arora and Fosfuri, 2000).

FIGURE 2.1

Schematic representation of the underlying theoretical mechanism



2.3 HYPOTHESES

2.3.1 Recipient technology capability, effective technology package and information and appropriation costs

Prior research on governance choice in strategic alliances has given short shrift to differences in recipient capabilities, assuming partner firm capabilities to be largely homogenous across alliances. Yet, the technology assimilation capacity of recipient firms varies from alliance to alliance.

The few studies that have looked at capabilities tend to examine divergence in technological capabilities between partners (Colombo, 2003; Sampson, 2004). Following Jaffe (1989) and Mowery et.al (1998), this has been measured by the extent to which the patent portfolios of both partners overlap, with a greater overlap in patent portfolios indicating similar partner capabilities and vice-versa. This measure has two crucial

limitations. First, while it tells us the extent to which the overall technology capabilities of firms overlap, it gives us little insight into how they overlap for the specific technology being transferred in the alliance. Second, the measure only maps overlap in patentable skills. Yet, as we will argue below, gaps in tacit skills may be much more crucial in determining the choice of alliance form.

We therefore think that a more promising way to model differences in firm capabilities is to look at the *'effective technology package'* being transferred. Successful transfer of commercial technology requires that the technology recipient be able to incorporate the technology in a product and service which can be profitably sold. This requires that the recipient possess not only an understanding of the technology itself, but also a mastery of the many other 'supporting skills' (e.g., planning, logistics, marketing, and management skills) which are necessary for successfully implementing the technology (Baranson, 1969). Recipients differ in the extent to which they possess these supporting skills. Whenever transfer takes place between firms that have the same supporting skills, the only knowledge that needs to be transferred is 'technology *stricto sensu*'. When recipients do not possess these supporting skills, then successful technology transfer requires the transfer of both 'technology *stricto sensu*' and the associated 'supporting skills' that are necessary to profitably sell the product in the local market (we will call this overall package the *'effective technology package'*). The effective technology package transferred is thus not generally equivalent to 'technology *stricto sensu*', but may include a variable amount of supporting skills depending on the recipient's capabilities.

Many of these supporting skills are tacit and their transfer can entail severe information problems since it is difficult to completely define and specify them *a priori* (Arrow, 1962; Hill, Hwang & Kim, 1990; Hennart, 2000). Hence the greater the range of

supporting skills needed by the technology recipient, the higher information costs, and the more likely that the transaction will be more efficiently organized in an equity joint venture (Davies, 1977; Killing, 1980; Caves, Crookel & Killing, 1983; Pisano, 1989). Reduction in information cost for a given change in recipient technology capability is significant at lower than at higher levels of recipient capability. For technologically capable recipients that already have many of the basic skills, subsequent improvement in capabilities contributes relatively less in terms of reducing information problems.

However, while the recipient's lack of supporting skills increases the overall tacitness of the 'effective technology package', the information asymmetries between sender and recipient, and correspondingly, the information costs associated with the exchange, there might be an offsetting effect. The more similar the knowledge base of the partners, the more beneficial it is for them to appropriate knowledge from their partners in ways which are not covered by the contract. In other words, the more recipients have the needed supporting skills, the more likely they are to compete with the transferor in unauthorized ways, and hence the greater the threat of knowledge misappropriation (Colombo, 2003). However, the same magnitude of increase in recipient capability is likely to result in greater misappropriation concerns at higher levels of recipient capability than at lower levels. In other words, concerns about misappropriation are likely to increase exponentially rather than linearly with recipient technology capability.

Given that information costs and appropriation costs move in opposite directions as the recipient's technological assimilation capabilities range from weak to strong, and hence as the recipient's needs for supporting skills decreases, we predict a U-shaped effect of recipient's technology assimilation capabilities on the probability to joint venture. When the recipient firm has technology capabilities that approach those of the

sender, the appropriation hazards are high, necessitating the incentive alignment and safeguards inherent in joint ventures. As recipient capabilities become weaker, the risk of misappropriation diminishes, making the probability of joint venture less likely. However, as recipient capabilities become weaker, it becomes more and more necessary for the sender to enhance the 'effective technology package' to include tacit supporting skills. The tacit component in the technology package increases the information costs surrounding exchange, and at a certain level of recipient firm capabilities, increasing information costs override decreasing appropriation costs and cause the transaction cost curve to inflect and slope upwards.

FIGURE 2.2

Recipient's need for supporting skills, information and appropriation costs, and the proclivity to Joint Venture

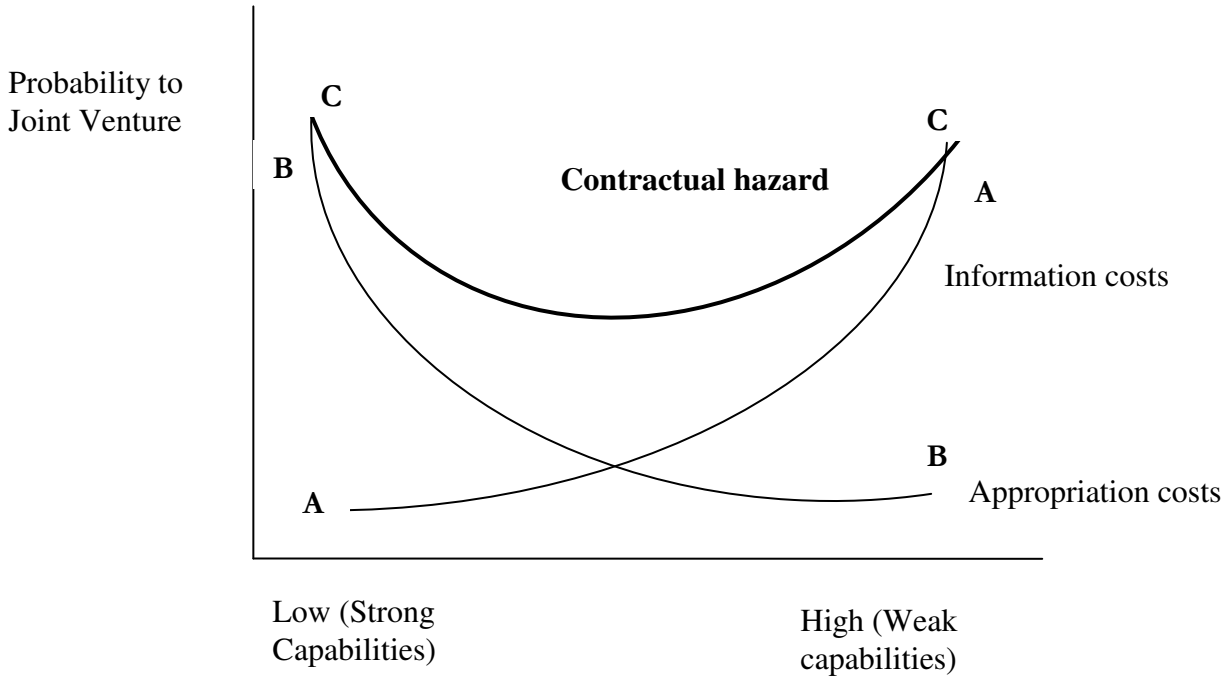


Figure 2.2 illustrates this relationship. Line AA represents the information costs curve while BB is the appropriation cost curve. CC, the sum of the two, represents the total contractual hazard curve which is U-shaped and varies with the technology capability of the technology recipient.

There is an inverse relationship between a recipient's technology assimilation capability and the range of supporting skills it needs: the lower the recipient's capabilities, the wider the range of the effective technology package and supporting skills it needs (and vice-versa). Hence, from a transaction cost standpoint, we predict that:

H1: The technology recipient's need for supporting skills has a U shaped effect on the probability that the alliance will take the form of a joint venture rather than that of licensing contract.

2.3.2 Technology heterogeneity and transaction costs

A second source of variation across technology transfer alliances is in the characteristics of the technology being transferred. A number of authors have explored how some dimensions of knowledge, such as its codifiability and age, affect the probability that it will be transferred internally rather than through licensing contracts (Davidson & McFetridge, 1985; Kogut & Zander, 1993; Arora & Fosfuri, 2000). However, these studies have typically not controlled for the technology assimilation capacities of technology recipients. There could potentially be correlations between these assimilation capabilities and the type of knowledge transferred. For example, it is plausible that highly complex and tacit knowledge is transferred to recipients with superior technology assimilation capabilities while fairly less complex codified technologies are transferred to recipients with lesser technological capabilities. In earlier

models where recipient's technology capabilities are not explicitly controlled for, it then becomes difficult to separate the independent effects of technology characteristics from that of recipient's technology assimilation capability. To take care of this potential conflation, we simultaneously include both these variables in our model.

As argued earlier, Arrow (1974) has pointed out that the basic problem in selling or renting knowledge is that the buyer does not know what he is buying. As Hennart (1982) has shown, patents are an imperfect solution to this information asymmetry problem, because they allow the owner of know-how to make it public—thus reducing information asymmetry over its value—while, in theory, retaining full property rights over it. Because patents reduce the information asymmetry that accompanies the sale of knowledge, while providing monopoly rights in its use, they make it possible to lend knowledge to unaffiliated parties, i.e. to license it. But patenting (and hence licensing) has limitations whose severity tends to vary across knowledge types. First, the efficacy of patenting depends on the codifiability of the know-how. Patenting means putting knowledge on paper and tacit knowledge is therefore not patentable. Hence the patent system works well for highly codifiable knowledge, such as chemical formulae, but less well for tacit knowledge, such as marketing know-how (Levin et al., 1987; Cohen et. al., 1997; Arora et al., 2001 a,b).

H2: The less codifiable the technology transferred, the higher the probability of its transfer through joint ventures rather than through licensing.

H3: Non-Patented technologies are more likely to be exploited through joint venture than by licensing

Whether the technology was initially tacit or explicit, the amount of information available on it should increase with the passage of time. Older technologies are likely to have been implemented into products that have been put up for sale. They have a track

record. Hence, a buyer's ignorance of a technology, and the relative advantage of joint ventures over licensing, should decrease with the age of a technology (Teece, 1977; Davidson & McFetridge, 1984). Furthermore, older technologies are less crucial to transferors (Telesio, 1979), and their misappropriation by the recipient less of a problem. Hence,

H4: Older technologies are more likely to be transferred through licensing than through joint ventures

The process of technology transfer requires complex skills from both senders and receivers. Senders must learn how to transfer technology, a complex and costly task (Teece, 1977). One of the reasons is that successful technology transfer requires subtle adaptations to a host of local factors and conditions: the chemical composition of raw materials may differ, climatic conditions may require changes, the relative prices of factors of production may require technological modifications. Hence the first transfer can involve significant costs, but once these teething problems have been solved, their solution is likely to be codified, thus reducing the cost of subsequent transfers (Teece, 1977) and facilitating transfer through licensing. Prior transfer of knowledge also implies greater public knowledge of its characteristics (Davidson & McFetridge, 1985), thus reducing information asymmetries between transferor and transferee, and encouraging licensing. Hence,

H5: Prior transfers of technology by the source firm increase the probability that subsequent transfers will take place through licensing rather than through joint ventures

Licensing can be described as renting the right to access technology. But while a rented car that a renter fails to return can be repossessed, the same cannot be said of rented knowledge. Hence a major problem faced by knowledge transferors is that the

knowledge can be used by the recipient to compete with the transferor. Both licensing and joint venture contracts cannot fully safeguard against this problem: licensees can compete with licensors at the expiration of the licensing contracts, while joint venture partners can dissolve the joint venture at any time and start competing with it (Reich and Mankin, 1986). There is however two crucial differences between the two. First, joint venture partners are represented in the Board of Directors of the joint venture and they have the right to post their employees in the joint venture. They have therefore more opportunities to control the transfer of technology to their partners than in a case of a licensing agreement. Second, joint ventures provide better incentive alignment than licensing contracts since partner rewards consist in a share of the profits of the joint venture. They will therefore pay a penalty in the form of lower returns if by their actions they undermine the profitability of the joint venture. We would expect this advantage of joint ventures to be particularly important whenever the knowledge transferred is core to the transferor. Transferors are more likely to generate future products and processes in core than in non-core lines, and hence the risk of misappropriation of knowledge by the partner is greater in the former than in the latter (Telesio, 1979).

Consequently, the closer the know-how to be transferred is to the technology transferor's *core business*, the more likely its transfer will be through equity modes rather than through licensing (Davidson & McFetridge, 1985). Telesio's (1979) and Blomstrom & Zejan's (1989) findings that technology transferors with a wider product line tend to be more active licensers are also broadly supportive. Hence:

H6: Technology core to the transferor is more likely to be exploited through joint ventures than through licensing

While transferors may be more wary about misappropriation when core technologies are transferred, they are less likely to have such concerns when the

technology is core to the recipient. Misappropriating technology may bring short term gains to the recipient, but it also creates distrust and rules out the possibility of any future transfers of technology from the sender. When the technology transfer is for key operations, the recipient would want to have access to future flows of newer versions of the technology as well as to continuing technical and management support from the sender. In such situations, given the risk of losing future support from the sender, the recipient is less likely to behave opportunistically and misappropriate the technology being transferred (Madhok, 1996). Consequently, appropriation concerns for the sender are low and there is less need for the contractual safeguards inherent in a JV:

H7a: Technology core to the recipient firm is more likely to be transferred through licensing than through joint ventures

The prediction is the opposite, however, when we think in terms of information costs instead of appropriation concerns. Information costs arise when the buyer has imperfect knowledge of the technology being transferred and is wary about the seller misrepresenting its value and performance potential. The recipient has more to lose from the poor performance of technologies related to its core operations and consequently will be particularly cautious about misrepresentation by the seller. When information concerns are high in such situations – i.e., where the technology being transferred is core to the recipient – contracts cease to be efficient ways to organize the transaction. A joint venture, where both the sender's and recipient's returns depend on the successful transfer of the technology, aligns incentives of both buyer and seller and alleviates some of these contractual problems. Hence:

H7b: Technology core to the recipient firm is more likely to be exploited through joint ventures than through licensing

2.4 METHODS

2.4.1 Research design

We test the preceding hypotheses on a sample of technology alliances between foreign and Indian firms. Since the opening up of the economy to foreign investment in 1991, Indian firms have increasingly entered into technology transfer alliances with foreign firms, making India an interesting context to explore our ideas. Besides, there is ample variation in the technology capabilities of Indian firms. While some firms such as Ranbaxy in pharmaceuticals and Infosys and Wipro in information technology have achieved world class levels of technology proficiency, others are technologically weak. Hence our setting offers sufficient variation in the technology assimilation capabilities of incumbent firms. To get adequate variation on the technology variables and to maximize potential response rate we sampled across industries.

2.4.2 Sample

Prior studies on the governance of strategic alliance have largely relied on secondary data (e.g. the MERIT-CATI database) (Gulati, 1995; Oxley, 1997). However, tapping into more micro level technology attributes such as the characteristics of the technology and differences in the capabilities and skills held by technology recipients requires survey methods of data collection. We sampled from the list of over 7000 Indian firms put up by Capitaline, one of the two leading Indian corporate databases. The Capitaline database lists the specific joint ventures and licensing agreements each Indian firm has with foreign firms. Nevertheless, since we observed that the database tended to focus on listed firms, we also sampled from business directories of various foreign chambers of commerce in India (German, French, American and British) to avoid any potential sample selection bias. However, we had to limit ourselves to those alliances for

which a proper address and name of the Managing Director (who was to be our respondent) was available. We identified 1258 such alliances.

We then sent an announcement card introducing the survey and its objectives, and the actual survey a week later. Close to 450 announcement cards were returned indicating that they had failed to reach their targets because the targeted firm had closed down or moved to another location. So the first mailing of the survey was directed to the remaining 800 firms. After a second wave of mailing, we received 94 filled surveys. One of the authors paid personal visits to firms located in Delhi, Bombay and Madras and these yielded 32 more responses. Our final sample consists of 126 Indian firms – a 16% response rate – of which 75 are local partners in joint ventures with foreign firms and 51 are licensees of foreign firms. Missing information on some variables led to a further reduction in the number of usable observations, which varies from 118 in the baseline to 107 in the full model.

To check for non-response bias we performed a t-test for difference in means between a subset of 40 respondents and 355 non-respondents for whom data was available from secondary sources. The two groups did not significantly differ in annual sales and firm age (t value was insignificant at $p > 0.10$ on both variables). Our respondents were knowledgeable about the alliance: 63% were chairpersons and managing directors of the alliance, and the rest were vice-presidents, general managers or full-time directors.

The final sample is distributed over 20 manufacturing industries. Twenty percent of the respondents are in the industrial and commercial machinery industry, 18% in chemicals and allied products and 12% each in the electronics and electrical equipment and transportation equipment industries. Alliances are with foreign firms from 19 countries with German and U.S firms accounting for the largest share (22% and 21%

respectively). Whenever an Indian firm had multiple alliances with foreign firm, we asked the respondent to choose one alliance that was most important to the firm.

2.4.3 Measures

Dependent variable

In line with prior studies (Osborn & Baughn, 1990; Gulati, 1995) we coded our dependent variable JV equal to one if the alliance is a joint venture and zero when it is an arm's length licensing agreement. Any type of alliance that involves foreign equity stakes is officially categorized in India as "financial collaboration", while all those without equity stakes are called "technical collaborations". Hence we are sure that all our licensing contracts are between non-affiliated parties. Given the binary nature of the dependent variable we use a logistic regression to estimate the parameters of our model (Agresti, 1996; Long, 1997).

Independent variables

Data for the independent variables was obtained from responses to the survey.

Technology Recipient's Need for Supporting Skills: Our measure of the Indian partner's technology assimilation capability and hence the extent to which it needs supporting skills was obtained by asking respondents to indicate whether they required management, marketing, and other technical assistance to implement the technology contributed by the foreign technology transferor. The variable takes the value 1 if only one of these three forms of assistance was required, 2 if two were required and 3 when all forms were required. A higher value on this measure thus indicates a greater dependency on transfer of tacit supporting skills from the foreign firm. To test our U shaped hypothesis we mean-centered this variable and entered a quadratic term in the regression.

Codifiability: Survey respondents were asked to indicate on a scale of 1 to 5 whether the technology being acquired in the collaboration could be described in a manual. Higher values on this variable suggest greater codifiability.

Patent is a dummy variable equal to 1 if the technology has been patented in India and 0 if not.

Age of technology: Our age variable takes the value 1 when the respondent indicated that the transferred technology had been introduced in the transferor's home country within the past year, 2 when it was two to three years old, 3 when it was three to five years old and 4 when its first introduction was more than five years ago.

Prior transfer of know-how: This variable takes a value of 1 if the technology transferor transferred the technology in question to India prior to its transfer within the present collaboration, either to the responding Indian firm within the framework of an earlier alliance or to any other Indian firm, and 0 otherwise.

Centrality of the transferred know-how to the technology recipient: Survey respondents were asked if the technology was core to the recipient Indian firm and this was coded 1 when they responded in the affirmative and 0 otherwise.

Centrality of transferred know-how to the technology transferor: Centrality of know-how to the technology transferor is measured by a dummy variable which takes a value of 1 when the respondent indicated that the know-how was core to the transferor and 0 otherwise.

Control variables

A technology transferor who has already been exporting to India at the time of the collaboration may be more willing to make greater resource commitments, i.e. to choose a joint venture over a licensing agreement. We control for this with *Prior Export*, a dummy variable that takes the value 1 if the respondent answered that the technology

transferor had exported its products to India prior to the present collaboration and 0 otherwise.

We use the Kogut and Singh (1988) index of cultural distance to measure and control for any potential effect on governance choice of the cultural distance between India and the technology transferor's home country. Indian firms may lack the resources to implement large-scale projects and may choose joint ventures with technology transferors to obtain financing. *Size of investment* reflects the scale of investment needed. The variable takes a value of 1 for investments of less than US$10m, 2 for investments between US$ 10 and 45m, 3 for investments between US$45 and 110m, 4 for investments between US$110 and 220m, and 5 for those above US$ 220m.

To control for changes in Indian regulations towards incoming foreign investment we include a *post-liberalization* dummy that takes a value of 1 if the collaboration was started after 1991, i.e. after many restrictions on foreign equity ownership were lifted, and 0 prior to that date.[2]

2.5 RESULTS

Table 2.1 shows descriptive statistics and pair-wise correlations between the variables.

[2] Given our small sample size and relatively large number of industries, we chose not to include industry dummies. Nevertheless, we probed our data for industry effects. We relied on variance partitioning methods to break down the total variance in our dependent variable into industry level-variance – variance accounted for at the industry level – and residual variance. Using a random-intercept model we estimated both these variances and the intra-class correlation, which reveals the extent to which observations are correlated within industry groups. The estimates reveal that a very small portion of the variance in our dependent variable is accounted for by industry level factors. The industry level variance estimate was 0.0009119 and this constituted a very small proportion of the total variance. We also ran a chi-square test of difference in proportions of equity alliances between industries within an ANOVA framework (this is analogous to testing for industry fixed effects) and found no significant difference. It thus appears that in our sample, observations are not dangerously correlated within industry and hence our omission of industry dummies is not likely to corrupt the standard errors of our coefficient estimates.

TABLE 2.1

Means, standard deviations and correlation

		Mean	Std Dev	1	2	3	4	5	6	7	8	9	10	11
1	JV	0.589	0.494											
2	Recipient's need for supporting skills	1.128[a]	0.998	0.313										
3	Codifiability	3.04	1.027	0.001	-0.053									
4	Patent	0.20	0.402	0.216	0.157	0.019								
5	Age of know-how	3.74	0.707	0.041	0.134	-0.102	0.03							
6	Prior know-how transfer	0.144	0.353	0.158	0.016	-0.016	0.080	-0.077						
7	Centrality of know-how to recipient	0.779	0.417	0.149	-0.029	0.040	0.075	0.063	-0.071					
8	Centrality of know-how to transferor	0.878	0.328	0.123	0.138	-0.071	-0.013	-0.055	-0.158	0.449				
9	Prior export by transferor	0.219	0.416	0.159	-0.058	-0.036	-0.073	-0.187	-0.053	0.068	0.057			
10	Cultural distance	7.24	1.619	-0.065	-0.052	0.070	0.009	-0.038	-0.061	0.030	0.056	0.002		
11	Size of investment	1.43	0.959	0.164	0.229	0.076	0.231	0.107	0.141	-0.031	0.018	-0.011	0.194	
12	Post liberalization	0.544	0.500	-0.179	-0.011	-0.027	-0.064	-0.056	0.101	-0.095	-0.084	-0.059	-0.061	-0.040

a Mean of the variable before mean-centering. Correlations are reported after mean-centering *recipient's need for supporting skills*

Correlations between independent variables are not high enough to suggest multicollinearity. The highest correlation is between *centrality of transferred know-how to the technology transferor* and *centrality of transferred know-how to the technology recipient* (0.449). Most other correlations are below 0.20. We also mean-centered the *recipient's need for skills* variable, since we are introducing its quadratic transformation in the models (Aiken & West 1991). To examine if the standard errors of our coefficient estimates could be inflated by multicollinearity, we also computed Variance Inflation Factors (VIF). VIFs for independent variables were found to be below 1.54 with a mean of 1.22 and hence quite satisfactory. Nevertheless, we entered our hypothesized variables hierarchically into the model to ensure robustness of the results.

The results of the logit estimation are presented in table 2.2 (standard errors in parentheses). A positive sign for the coefficient implies that the corresponding variable has a positive effect on the probability of choosing a joint venture over a licensing agreement and a negative sign implies the contrary.

Model 1 is the base model with control variables. In model 2 we include the recipient's need for supporting skills and its quadratic term in order to test hypothesis 1. Model 3 includes knowledge characteristics while controlling for recipient capability (i.e., *recipient's need for supporting skills*) while model 4 is the full model where centrality of know-how to recipient and transferor are entered.

The model likelihood ratio (LR) chi-square (which is analogous to the F statistic in multiple regression) is highly significant in all models ($p<0.05$ for model 1 and $p< 0.01$ in all other models) implying that they have significantly higher log likelihoods and fit the data better than an intercept only model.

TABLE 2.2
Determinants of the choice between joint venture and licensing as modes of technology acquisition by Indian firms.

Variable	Model 1	Model 2	Model 3	Model 4
Recipient's need for supporting skills		0.766*** (0.250)	0.776*** (0.279)	0.843*** (0.294)
Recipient's need for supporting skills Squared		-0.186 (0.224)	-0.153 (0.247)	-0.183 (0.259)
Technology Codifiability			-0.048 (0.215)	-0.026 (0.223)
Patent			1.215* (0.655)	0.847 (0.689)
Age of technology			0.030 (0.352)	-0.127 (0.394)
Prior transfer of technology			1.690** (0.754)	2.335** (0.965)
Centrality of technology to recipient				1.071** [a] (0.670)
Centrality of technology to transferor				0.414 (0.840)
Prior export by transferor	0.860 (0.538)	1.103* (0.579)	1.315** (0.658)	1.125* (0.677)
Cultural distance	-0.205 (0.128)	-0.188 (0.133)	-0.186 (0.142)	-0.160 (0.153)
Size of investment	0.499* (0.265)	0.349 (0.273)	0.151 (.304)	0.153 (0.314)
Post liberalization	-0.655* (0.398)	-0.697* (0.423)	-0.893** (0.454)	-0.938** (0.484)
Constant	1.41 (0.973)	1.669 (1.027)	1.567 (1.911)	-0.586 (2.217)
Nr of observations	118	118	114	107
LR ratio	11.44(df=4)**	21.83 (df=6)***	29.81 (df=10)***	32.10 (df=12)***
Change in log likelihood		5.195237 (χ^2(1) vs model 1= 10.39***)	6.066968 (χ^2(4) vs model 2= 12.13**)	5.928156 (χ^2 (2) vs model 3= 11.86***)
McFadden R square	0.0721	0.1376	0.1929	0.2215

Notes: *** p < 0.01, ** p < 0.05, *p < 0.1

Table 2.3 shows the proportion of correctly classified observations using the estimates from each model. All models appear to perform better than a random proportion model which has an accuracy rate of $p^2 + (1-p)^2$ (Morrison 1974). On the basis of our observed data, we estimated p, the probability of the occurrence of the event, as the number of joint ventures over the total number of observations. Since our sample sizes vary from model to model, so does our p estimate. For example, in model 3, p= 75 / 114 = 51.54%, and in model 4, p=67/107 = 51.58%. Including *recipient's need for supporting skills* in model 2 increases the proportion of correctly classified observations from 61.86% to 72.03%. The full model (model 4) has a correct prediction rate of 74.77%, clearly superior than the rate than would be obtained by a random prediction (51.58%). It is also worthwhile to note that the increase in prediction accuracy is greatest from model 1 to 2, where the recipient assimilation capability variable is included. Together with the mediocre improvements in the hit rate from models 2 to 3 and 3 to 4 where knowledge heterogeneity variables are entered, this suggests that the recipient need for supporting skills is primarily responsible for the high predictive precision of our models.

TABLE 2.3

Estimates of fit of logistic regression models

Observed	Predicted				Random proportion model
	Equity	Contractual	Total	Percent correct	
Model 1					
Equity	56	30	86		
Contractual	15	17	32		
Total	71	47	118	61.86%	52.07%
Model 2					
Equity	60	22	82		
Contractual	11	25	36		
Total	71	47	118	72.03%	52.07%
Model 3					
Equity	56	18	74		
Contractual	11	29	40		
Total	67	47	114	74.56%	51.54%
Model 4					
Equity	51	15	66		
Contractual	12	29	41		
Total	63	44	107	74.77%	51.58%

We also look at the improvement in log likelihood from baseline to fuller models. The inclusion of the recipient need for supporting skills in Model 2 results in a significant improvement in log likelihood over the baseline model (χ^2 with one degree of freedom = 10.39, $p< 0.01$). Also the explained variance – indicated by the McFadden R square-- increases substantially from 0.0721 to 0.1376. The coefficients of the control variables in model 2 show that prior export increases, while entry into India in the post liberalization period decreases, the probability of choosing a joint venture. These effects remain in all other models, but vary in their levels of significance. The coefficient of *recipient need for supporting skills* is highly significant ($p<0.01$) but that of its quadratic term is not. The lack of significance of the quadratic term at conventional levels leaves us with inadequate support for H1. However, the significant first order term suggests that the overall correlation between *recipient need for supporting skills* and the propensity to joint venture is positive.

We have argued that heterogeneity in the nature of technology transferred to the recipient could systematically affect the choice between joint venture and licensing. Model 3 tests this hypothesis by including technology characteristics – codifiability, patent status, age of the technology and prior transfer history. Compared to model 2, there is a significant improvement in log likelihood (χ^2 with four degrees of freedom = 12.13, $p< 0.01$) and the R squared statistic increases to 0.1929, suggesting that technology characteristics do have a significant effect on the choice of governance. We find positive and significant coefficients for whether the technology was patented in India and whether know-how had been previously transferred to India, suggesting that partners have a higher propensity to choose joint ventures over licensing in those cases.

Both these observed effects are contrary to what we expected in hypotheses 3 and 5. Codifiability and age of the technology are not significant.

Model 4 includes variables denoting the centrality of the transferred technology to recipients and transferors. The inclusion of these two variables results in a significant improvement in log likelihood over the previous model (χ^2 with two degrees of freedom = 11.86, $p< 0.01$). The coefficients and standard errors suggest that when technology transferred is core to the recipient firm there is a significantly higher likelihood that the alliance takes the form of a joint venture. This result corroborates H7b. The results further suggest no significant effect of the relative importance of the technology to the transferor. Interestingly, the patent variable is no longer significant, suggesting that technology centrality and patent status might be correlated.

To ensure that our conclusions based on statistical significance of variable coefficients are not trivial or meaningless, we also calculate the marginal effects for each independent variable (cf. Shaver, 2006). Calculating effect sizes is also useful given that the coefficients in models one to four do not provide for easy interpretation as they denote effects on log-odds rather than probabilities.

Table 2.4 largely corroborates the conclusions made above. Since the patent variable shows slightly unstable behaviour across model 3 and model 4 in table 3, we report effect sizes for each variable using the estimated parameters of both models 3 and 4. Recipient need for supporting skills, patent, prior transfer of know-how, and centrality of technology to recipient appear to have positive and non-negligible effects on the probability of the alliance being a joint venture. With the caveat that the variables are scaled differently and hence effect sizes may not be truly comparable, prior transfer of the technology to India appears to have by far the largest impact on the dependent variable. Also, though it appears insignificant in model 4, patent status does have a non-

negligible effect size. Interestingly, and contrary to our expectations in hypothesis 3, patented technologies are more likely to be transferred through equity joint ventures than through licensing.

2.5.1 Further probing the effect of recipient need for supporting skills

The lack of support for our U-shaped prediction of recipient capabilities on governance choice is intriguing. We sought to probe this further to understand the observed relationship in our data.

The first order term of *recipient need for supporting skills* gives us a sense of the general nature of the relationship (Aiken & West, 1991). The significant positive coefficient of this term suggests that the propensity to form equity alliances is an increasing function of the recipient need for supporting skills.

One plausible explanation for empirically observing only the upward sloping portion of the hypothesized U-shaped effect is that appropriation concerns which are primarily responsible for the downward sloping portion of the U curve do not strongly affect governance choice (please see figure 2.2). In other words, in our sample, joint ventures are preferred over licensing when effective technology transfer requires the transferor to transfer, beyond the technology itself, a range of tacit supporting skills. In that case the greater incentive alignment that characterizes equity transfers (and hence equity joint ventures) helps alleviate information asymmetries and provides greater incentives to both transferor and recipient to effect the transfer. That this factor primes appropriation hazards is not entirely surprising given our context. One would expect the cost of appropriation hazards to transferors be a function of the severity of the consequences of having the recipient compete with them. This should

TABLE 2.4
Changes in estimated probabilities of dependent variable (JV=1)

	Model 3	**Model 4**
Predicted probability holding independent variables at mean or modal values[a]	0.38	0.2135
	Effect of changing independent variable by one standard deviation or one unit[b]	
Variables	**Model 3**	**Model 4**
Recipient's need for supporting skills	0.1533	0.1308
Codifiability	-0.012	0.0045
Patent	0.3031	0.2150
Age of know-how	0.005	-0.015
Prior know-how transfer	0.3886	0.5236
Centrality of know-how to recipient		0.128
Centrality of know-how to source		0.061

[a] Continuous variables are held at their mean values and binary variables at their modal values

[b] Changes in probability of JV following (a) for continuous variables: a one standard deviation change from mean values (b) for binary variables: a change from 0 to 1, holding all other continuous variables at their mean and binary variables at their modal values

in turn depend on the overlap in geographic markets between the transferor and the recipient and of the age of the technology. In some cases in our sample, licensing contracts specifically exclude the possibility of exporting back to the home country of the licensor, and the bulk of the technologies transferred in our sample are not cutting edge – in 85% of observations, technologies are more than five years old. Hence, managers of foreign firms transferring knowledge to India may perceive appropriation hazards to be low because they see Indian firms as unlikely competitors in their home and other crucial markets.

The notion that contractual hazards rooted in information asymmetries outweigh those based on appropriation concerns is also mirrored in our results for *centrality of technology to the recipient*. If appropriation concerns are the key contractual problems, as we argue in hypothesis 7a, we should observe a negative relationship between centrality of technology to the recipient and the probability of joint venture. We find, however, that when the technology transferred is core to the recipient, JVs are more likely than licensing contracts. This is because in such situations the recipient is particularly concerned about the sender being untruthful and overstating the value of the technology. This in turn accentuates information problems between the buyer and seller (Arrow, 1974). A licensing agreement does not alleviate this problem since the sender is partly paid upfront for the technology; a joint venture, where both parties' returns depend on the successful implementation of the technology, becomes necessary. The empirical results for both *recipients need for supporting skills* and *centrality of technology to the recipient* thus seem to suggest that the contractual hazards in our sample of alliances are driven more by information problems rather than appropriation concerns.

2.6 DISCUSSION

Previous studies of the governance of technology alliances have typically underemphasized variations across alliances in recipient capabilities and technology characteristics. Both these constructs have indeed been examined in the broader context of the boundaries of the firm (Kogut & Zander, 1993; Martin & Salomon, 2003), but few studies have specifically examined their role in determining the governance form in alliances. This is what we do in this paper – we examine how both technology assimilation capability of the recipient and characteristics of the technology influence the choice between licensing and joint venture as governance forms for technology alliances. Using transaction cost theory, we argue that the contractual hazards that drive this choice hinge on information costs facing the technology buyer and on the potential for technology misappropriation facing the technology transferor. These information and appropriation costs in a given alliance, in turn, depend on the technology capability of the recipient and on characteristics of the technology being transferred.

In contrast to much of the transaction cost approach to alliances (Oxley, 1997; Sampson, 2004) which has hypothesized that the choice between contracts and equity relationships depends on the level of appropriation hazards, we model the choice between licensing and equity joint ventures as hinging on both information costs and appropriation hazards. The traditional argument has been that equity joint ventures are preferred over contracts such as licensing whenever transferor and recipients have similar technological capabilities because in that case the consequences to the transferor of knowledge misappropriation by the recipient are severe (Colombo, 2003; Sampson, 2004). We argue that this argument overlooks the information problems faced by technology buyers (cf. Arrow, 1974; Hennart, 1989) whereby they often find it difficult to assess ex ante the value of the technology. One way to alleviate this information

asymmetry problem is to align the interests of technology transferor and recipient by having them become co-owners of the venture, i.e., by having them set up an equity joint venture. While the appropriation hazards argument suggests that equity joint ventures will be chosen when the technological capabilities of the parties converge, arguments based on information and enforcement costs suggest that they will be chosen when they diverge. Assuming that both hypotheses are correct, we hypothesize that the relationship between the technological capability of the recipient and the propensity to choose equity joint ventures over licensing contracts is U-shaped, with equity joint ventures chosen when the technological capability of the partners is either very strong or very weak.

In contrast to the extant literature that has mostly used secondary data, we use a survey instrument to better measure the key variables that we hypothesize affect the governance of alliances. Proponents of the appropriation hazards argument have operationalized the cost of misappropriation by the similarity in the knowledge base of the parties which they have measured by the overlap in the patent portfolio of the parties (Sampson, 2004). This measure has some drawbacks because it is not transaction specific, since the overall overlap may not always map with the overlap for a specific transaction, and because it only measures similarity in patentable skills, thus ignoring potential dissimilarity in non-patented tacit skills. By using a survey, we are able to measure the similarity in skills for the specific transaction. We also can measure the extent the overlap between transferor and sender in non-patented tacit skills.

Previous authors have also measured the characteristics of the technology transferred by the characteristics of the technology stricto sensu, i.e. without considering the set of supporting skills that are required to implement it. Kogut and Zander (1993), for example, measure the characteristics of technology by asking transferors. Yet technology recipients are likely to choose the mode of technology transfer based on the

effective technology package they need, that is based on the technology stricto sensu plus the supporting skills that they need to implement it. Because supporting skills are usually tacit, and hence difficult to obtain by contract, technology recipients that need them are likely to prefer equity modes of transfer. Hence it is important to take these supporting skills into account when assessing the characteristics of the technology. Focusing on technology stricto sensu, and not on the effective technology package needed by the recipient, misses a large part of what is relevant in technology transfer. In our survey we specifically ask technology recipients to evaluate the extent to which they possess the supporting skills needed to implement the technology being accessed.

Testing our model of the determinants of the choice made between equity joint ventures and licensing contracts to organize the transfer of technology between foreign and Indian firms, we find no support for our hypothesized U-shaped relationship between the Indian partner's technological capabilities and their propensity to choose equity joint ventures over licensing. Instead we find that the Indian partner need for supporting skills is a powerful factor that leads both parties to prefer equity joint ventures over licensing. Hence, in our case, it is divergence in technological capabilities, not similarity, as found in other contexts, that lead to the choice of equity joint ventures to govern the transaction.

The weak effect of appropriation concerns is perhaps because foreign managers perceive Indian firms to be less likely to emerge as powerful competitors in their home and other crucial markets. This finding suggests that conceptions of transaction costs being solely a function of appropriability hazards (Sampson, 2004) have limited generalizability.

Our results also suggest that multi-theoretical perspectives may be necessary to fully understand the alliance governance phenomenon. From a transaction cost standpoint we argued that prior transfers of technology should make it easier to transfer it

subsequently through arm's length contracts. Instead we find in our sample that the fact that the transferor has previously transferred the knowledge to India enhances the probability that it will effect a subsequent transfer through joint ventures rather than licensing. What could be happening is that while such prior transfers make subsequent transfers through licensing contracts relatively easier (Teece, 1977; Davidson & McFetridge, 1985; Kogut & Zander, 1993) they also imply that the foreign firm has had prior first hand experience with the economic and technological performance of its know-how in India. Having overcome initial uncertainty in that regard, foreign firms are being more willing to make greater resource commitments. Our findings that firms that have had prior exports to India are more likely to choose joint ventures is consistent with the predictions of the Uppsala internationalisation model (Johanson & Wiedersheim-Paul, 1975; Johanson & Vahlne, 1977) that firms follow an incremental process of foreign expansion by which an increase in knowledge of the foreign market is matched by an increase in commitment. Firms thus move from low commitment (exports, licensing) to higher commitment modes (joint ventures and wholly-owned affiliates).

In conclusion, our research contributes to the alliance governance literature by carefully examining the effects of technology characteristics and recipient capability simultaneously. We also contribute to transaction cost theory by showing that the relevant sources of contractual hazards in technology transactions are context dependent. In samples from lesser-developed countries such as ours, information costs pose greater hazards than appropriation concerns. This finding is consistent with an important body of literature on technology transfer (Baranson, 1969; Hennart, 1989). Finally, this is to the best of our knowledge the first transaction-level study to examine the choice between contractual and equity alliances in India. We thus add to our currently quite limited

knowledge on knowledge transfer between foreign and local firms in emerging economies (Tse et al., 1997; Hagedoorn & Sedaitis, 1998; Meyer, 2001).

CHAPTER 3

MULTI-MARKET COMPETITION, MOMENTUM, DENSITY DEPENDENCE, AND ENTRY DETERRENCE: SEGMENT ENTRY BY FOREIGN FIRMS IN THE US AUTOMOBILE INDUSTRY[3]

Abstract

Product markets are typically characterized by discontinuities in buyers' traits and preferences. These discontinuities give rise to 'market segments' within which buyers are relatively similar in their tastes and preferences. Firms entering such segmented product markets face non-uniform distributions of buyers and competitors across these segments and hence, have differing propensities to enter a given segment at a given point in time. In this paper, we investigate the factors that shape the decision of foreign firms to enter various product segments in a given industry of a host country. Our dependent variable is whether or not a foreign firm enters a given market segment in a particular year. We develop predictions from multiple theoretical perspectives – multi-market competition, strategic momentum, population ecology and spatial economics – and test them using data on market segment entries of foreign assemblers in the US automobile industry over a period of nearly two decades (1986 – 2003). Our results suggest support for multi-market competition, momentum, and spatial competition theories.

[3] This paper has benefited immensely from discussions with Jean-Francois Hennart, Xavier Martin, and Renata Kosova. I also thank the department of Organization & Strategy, Tilburg University for funding the data collection.

3.1 INTRODUCTION

Product markets are rarely homogeneous but more usually characterized by discontinuities in buyer preferences. These discontinuities give rise to 'market segments' which are parts of the market where buyers have relatively homogeneous tastes and preferences. External resources that are necessary for firm survival – primarily potential buyers, but also other factors of production such as knowledge, suppliers, and so on. – are often unevenly distributed across these segments, leaving some more abundant in resources than others. Similarly, current market incumbents are also non-uniformly distributed in this segmented product space.

Firms targeting a given product market – both *de novo* entrants and incumbents seeking to diversify within the product market – are confronted with these non-uniform distributions of buyers and incumbents, and hence, have differing propensities to enter a given segment at a given point in time. For example, Eastman Kodak waited on the sidelines until recently while many other players such as Canon and Hewlett-Packard expanded much earlier into the digital camera segment of the photography equipment market.

Segment entry decisions are of vital importance because they shape over time the market footprint of firms in product space. A firm's posture in product space has direct implications for the volume of goods it can sell and the extent of competition from incumbent firms it will face. Also, as proponents of the resource partitioning perspective in organization ecology have argued, where the firm chooses to locate within a resource distribution influences its odds of survival (Baum & Mezias, 1992; Dobrev et.al., 2001; Carroll, Dobrev & Swaminathan, 2002).

Interestingly though, we do not seem to have much knowledge of how firms choose which market segments to enter (but see Haveman 1993; Baum & Haveman,

1997; Martin & Mitchell, 1998; Greve, 2000) or of what accounts for the variation in their propensities to enter a given segment at a given point in time.

While studying 'entry', however, one issue that needs to be clarified is the 'risk set' – the set of firms that are considered potential entrants or at 'risk' of entry. Defining the risk set haphazardly can mix up different managerial decision processes. For example, not separating new firms (*de novo*) entering a segment from diversifying incumbents (*de alio*) can potentially conflate organizational founding and segment entry decisions because, for *de novo* firms, founding of the firm and entry into a segment occur simultaneously. That is, the decision to enter a segment for these firms is embedded in the decision to start up. Consequently, the cost of entering a segment in a given year is not the same for *de novo* and *de alio* firms – new firms face costs of both starting up as well as entering a market segment, while incumbents have already incurred the fixed costs of starting up. The decision of which segment to enter in a given year is thus characteristically different – and needs to be treated separately – between these two sets of firms. One approach to this problem is to remove all new firms and define the risk set as existing incumbents seeking to diversify into other market segments (cf. Haveman & Nonnemaker 2000: 242). Alternatively, one could geographically separate the founding and segment entry processes by defining the risk set as foreign firms in a given host country. In this case, the (foreign) firms at risk are founded elsewhere but are still at risk of entry into various segments of the host country market. Their founding and segment entry decisions are less likely to be intertwined.

In this paper, we adopt the second approach and study the segment entry decisions of foreign manufacturers in the US automobile industry over nearly two decades (1986 - 2003). Our dependent variable is whether or not a foreign manufacturer *i* entered segment *j* in a given year, and we argue that multiple perspectives can lend

themselves to understanding this decision. Drawing from strategic management, strategic momentum, population ecology and spatial economics/industrial organization perspectives, our hypotheses predict that a firm's propensity to enter a given segment depends on the extent of its multi-market contact with rivals and on its prior experience in that segment, on segment density, and on the extent of entry barriers and spatial competition in the segment.

Our results show that a foreign car manufacturer's decision to enter a given market segment is significantly influenced by the extent of multi-market contact it has with incumbents in the segment, as well as by its prior entry experience and the number of other participants in the segment. Multi-market competition and the firm's prior entries into a segment have non-monotonic effects; we find that prior entry has a positive but diminishing effect on segment entry while that of multi-market competition follows an inverted U-shaped pattern, increasing initially and then decreasing after a point. The number of other participants in the segment –its density – has a negative, deterring effect on the propensity to enter. We interpret these results as corroboration for multi-market competition, strategic momentum and spatial competition predictions. Support for the population ecology perspective, which predicts an inverted-U effect for segment density, is limited.

This paper makes significant contributions with respect to both dependent and independent variables. There have been a few studies of segment-entry, but these differ from ours either in the way segments or the risk set are defined. For example, Greve (2000) studies niche-entry in the Tokyo banking industry, but defines a niche as a particular geographic location, in his case a county or a ward in Tokyo. So essentially, his is a study on how managers choose where to locate when setting up a new bank branch. Haveman (1993) and Martin & Mitchell (1998), on the other hand, define, as we

do, niches based on discontinuities in the product market, but their risk sets consist of all incumbents and not only foreign firms.

On the independent variables side, we use multiple theoretical perspectives to predict segment-entry. This is innovative, given that most of these perspectives have not been employed at the market-segment level of analysis. Given this, our study explores whether the theoretical mechanisms suggested by these perspectives can explain firm behavior at the segment level. Furthermore, each perspective holds specific assumptions about managerial action and decision-making, and strikingly differs from the others in predictive content. Given this theoretical rivalry, our hypotheses tests serve as a contest between competing theoretical priors and predictors for explaining variance in segment-entry propensities.

3.2 THEORETICAL BACKGROUND

Several theoretical perspectives can potentially explain segment entries (Greve, 2000). Both industrial organization theorists and population ecologists have studied distributions of firm entries. While the former typically examine variations in entry rates in a cross section of industries (Caves & Porter, 1977) and how they are influenced by entry barriers (Bain, 1956), the latter are concerned with rates of entry in populations of firms in an industry over time (Hannan and Freeman, 1977; 1989). Both these perspectives, hence, could be brought to explain variations in segment-entry as well. Spatial economics which initially studied the pricing and location behavior of firms in geographic space (Hotelling, 1929) and later on in product space (Prescott & Vischer, 1977; Schmalensee, 1978; Stavins, 1995), is another useful lens to study where foreign entrants locate in product space. The Behavioral perspective which proposes a set of theories to understand decision-making under uncertainty (e.g. experiential learning and

strategic momentum) is yet another potential way to approach the question of how managers of foreign firms make niche entry decisions. This is particularly so because such decisions are typically made in the face of uncertainty about their outcomes (Greve, 2000). Finally, from a 'strategic management' perspective, proponents of multi- market competition and mutual forbearance theories suggest that a firm's competitive context will influence its behavior (Gimeno & Woo, 1999; Haveman & Nonnemaker, 2000). From this perspective, segment entry can be approached as one such strategic behavior taken in response to change in a firm's strategic interdependencies with rivals across multiple markets.

The above four perspectives and related theories have different underlying assumptions and predictive content, and generate contradictory predictions in some cases, making testing them against each other particularly interesting and valuable.

For example, the theories listed above differ in the assumptions they make about the relevant time frame managers consider when making decisions (Greve, 2000), and the role of managerial action in firm behavior and survival.

Momentum theory suggests that what firms do is largely determined by what they have successfully done in the past, as they tend to repeat routines developed through past actions (Amburgey & Miner, 1992). For example, firms that have repeatedly made acquisitions are more likely to acquire in the future as well (Haleblian, Kim & Rajagopalan, 2006). Mutual forbearance theory, on the other hand, argues that the potential for future action or retaliation by rivals is what matters – managers will shape their current behavior in a way that insures against future aggressive reaction from rivals. In this sense, while momentum theory emphasizes the past, mutual forbearance theory focuses on the future as the relevant time-frame for managerial decisions.

Theories also differ in the role they ascribe to managerial action. Density dependence theorists from the population ecology perspective largely assume environmental determinism; founding into a population is a selection process and managers can do little to increase their chances of being selected by adapting to environments. Momentum and mutual forbearance, on the other hand, are more managerial action – based theories.

The theories we contrast in this paper also differ with respect to predictive content, i.e., the factors they consider most relevant to explaining firm behavior. The concept of density dependence in population ecology, and to some extent, the industrial organization notions of entry barriers and entry deterrence by incumbents, emphasize the role of the firm's target environment. The number of organizations in the target market, the key independent variable in density dependence theory, is argued to shape opportunities and constraints for potential entrants. Industrial organization theories are similar to the extent that they also highlight the role of industry structure - sunk costs, barriers and deterrents to entry – in shaping a market's attractiveness to future entrants. Strategic momentum and learning theories, however, emphasize the firm's past experience and historical behavior more than environmental conditions. Multi-market competition and mutual forbearance theories highlight yet another determinant: the extent of multi-market contact between firms, which they argue shapes the propensity of firms to engage in aggressive strategic behaviors such as entering a new market (Haveman & Nonnemaker, 2000; Stephan & Boeker, 2001).

Predictions from these perspectives are not only different but also sometimes contradictory. Density dependence and industrial organization approaches make differing predictions as to how initial incumbent densities affect the attractiveness of a market. Density dependence theorists attribute a legitimating or 'signalling' role to initial entries

in the niche. These first few entries, they argue, signal the presence and viability of the niche and hence attract new entrants. Industrial organization theory, on the other hand, suggests that early incumbents, if they are few in numbers, will be able to collude to deter entry so as to protect their above normal monopoly or oligopoly profits. Hence low density of firms in a niche deters future entry.

A similar set of opposing predictions follows from momentum and mutual forbearance theories (Greve, 2000). While the former suggests that experiences gained in a particular market segment induces firms to stick to segments in the immediate vicinity of their past entries, mutual forbearance theory suggests that future rivalry is best deterred when firms adopt multiple market contacts with rival firms. Thus, while learning and momentum theories seem to suggest "focus" in market positions, mutual forbearance suggests "spread".

To summarize, while a number of perspectives help us understand the segment entry decisions of firms, they highlight different determinants, are based on different underlying assumptions, and sometimes proffer opposing predictions. Developing and testing hypotheses from such alternative approaches, while theoretically interesting, also offers several empirical benefits, such as the ability to test for the relative explanatory power of different theories in a given setting. This is something single-theory studies cannot do. Also, we are able to rigorously test for hypothesized effects while controlling for other theoretical influences in a much better way.

Table 3.1 summarizes the perspectives, corresponding theories, and key predictors that we test in this paper.

3.3 HYPOTHESES

3.3.1 Multi-market contact, mutual forbearance and segment entry

Multi-market competition scholars argue that a firm's interdependence with its competitors in terms of the number of markets jointly contested influences its competitive and strategic behavior. They have studied the effect of multi-market competition on various dependent variables such as prices (Gimeno & Woo, 1999), exit (Boeker et.al., 1997) and to a lesser extent, entry into markets (Baum & Korn, 1996; Haveman & Nonnemaker, 2000). While studies on multi-market competition and entry have looked primarily at entry into geographic markets, the theoretical argument can be extended to entry into market segments as well.

TABLE 3.1
Summary of perspectives, theories and key predictors

Perspective	Theory (ies) / Concepts	Key predictor
Strategic Management	Multi-market competition, Mutual forbearance	Extent of multi-market competition with incumbents in a given market segment
Behavioral	Strategic momentum, experience	Number of prior entries into a given segment
Population ecology	Density dependence theory	Segment density – the number of participants in the segment
Industrial organization / Spatial economics	Entry deterrence, spatial competition	Segment density – the number of participants in the segment

The key multi-market competition argument is that contact with competitors in multiple as opposed to single markets can serve as a deterrent to rivalrous actions by firms. Rivalry between firms that meet each other in a single market is limited to just that one common market. Any retaliation by a single-market rival to aggressive behavior by the focal firm will be confined to only that shared market. On the other hand, when firms jointly contest each other in multiple markets, an aggressive action in one market could lead to retaliation against the aggressor in any or all of the other common markets as well. The huge cost of this potential large-scale multi-market retaliation, especially in those markets where the aggressor is most vulnerable, will lead firms with multi-market contact to refrain from aggressive behavior against each other. Scholars call this 'mutual forbearance'.

When applied to behavior such as entry into markets, however, this tendency for mutual forbearance cannot be assumed to be uniformly active across all levels of multi-market contact. In fact, recent studies (Baum & Korn 1999; Haveman & Nonnemaker, 2000; Stephan & Boeker, 2001) have added a caveat to the above mutual forbearance argument and propose an inverted U-shape relationship between the extent of multi-market contact a firm has in a target market and its propensity to enter that market. At relatively low levels of multi-market contact, they argue, the primary motivation of the focal firm will be to create more contact points in order to have an effective deterrent against any future aggressive behavior by its competitors. That is, when current points of contact are low, firms may in fact be motivated to expand the scope of their interaction with rivals by entering other markets where the rivals are already present. This expansion could also be driven by the desire to learn about rivals' strategies and behavior in different markets. Furthermore, because of low multi-market contact, firms do not see

themselves as huge threats to each other in other markets and so, mutual forbearance does not yet set in. On the other hand, at very high levels of multi market contact, firm jointly contest a large number of common markets and correspondingly there is considerable overlap in their market footprints. With such overlap, the fear of potential retaliation by incumbent firms sets in and deters the focal firm from performing an aggressive act such as market entry. In our case, we are looking at entry into different segments of the US automobile industry, so "multi-market' refers specifically to 'multi-segment'.

Hence from a multi-market competition point of view:

Hypothesis 1: There is an inverted U-shaped relationship between the extent of multi segment contact a firm has with its rivals in a segment and its propensity to enter that segment. That is, the probability of entry into a segment increases and then decreases with the extent of multi-segment competition a firm faces with rivals in that segment.

3.3.2 Prior experience, momentum and entry propensity

Past strategic behavior can be argued to have two types of impact on firms and their future behavior. First, as research from a 'momentum' perspective (Amburgey & Miner, 1992; Martin & Park, 2004) suggests, past adoption of a particular strategic behavior can lead to repeating what the firm has done in the past and hence to inertia against adopting a different strategy. The key argument is that experience with a particular routine or strategy causes firms to get better at it and hence to specialize in it (Levitt & March, 1988:322). If firms can be seen as executing routines (Cyert & March, 1963), then as they repeat the same routines over and over again they tend to get better at them. As they get better, the routines start to deliver favorable performance outcomes.

This positive feedback again reinforces the repeated use of the routine. Negative outcomes do not necessarily cause the abandonment of the routine since managers tend to attribute the failure not to the routine but to flaws in the way it was executed (Amburgey & Miner, 1992). In short, organizations tend to repeat strategies because they become better at executing them. Amburgey & Miner (1992) find evidence for such repeated momentum in merger activity.

Second, experience with a task is also uncertainty reducing (Henisz & Delios, 2001). When particular strategies are repeated, managers become more familiar with the different possible outcomes and with ways to enhance the odds of the favorable ones. Behavioral theory suggests that managers tend to avoid confrontation with uncertainty and search for solutions in the vicinity of their past experiences. If this is true, we should observe managers sticking to paths similar to those defined by their past actions and staying away from more unfamiliar strategies and routines. They will stick close to those market segments which they have entered and in which they have previously operated.

The notion of managers' predilection for uncertainty avoidance underlies international business theories of international expansion such as the Uppsala stages model. This model suggests that managers of internationalizing firms minimize the uncertainty they have to face by expanding first into similar countries and by adopting modes of entry that entail low commitment. In a separate study on the choice of location for foreign manufacturing plants and the role of prior location experiences in that decision, Delios & Henisz (2003) find that prior experience with politically hazardous countries reduces the negative effect of political hazard on entry. Past experience with politically stable countries, on the other hand, increases the negative effect of a country's political hazard on entry. These results from the international business literature further support the notion that when faced with complex decisions such as those related to

market entry, managers tend to avoid uncertainty and minimize the extent of unfamiliar information with which they need to contend. They do this by limiting their expansion to familiar settings.

Applying strategic momentum and uncertainty avoidance arguments to entry into market segments, we expect managers to repeat past entry behavior and to shun entering new segments. It is useful to note that unlike entry into a population of firms in a home country (i.e., 'organizational founding') or in new country markets (i.e., expansion into a given foreign market), entry into market segments can be repeated. That is, firms can re-enter market segments either with new or updated products to replace their existing product line in the segment, or, when the market segment is large enough, to be sold alongside their existing product.

However, while we may expect a 'momentum effect' in segment entry where firms with prior experience in a segment are on average more likely than other firms to enter the segment again in a given year, it is unlikely that this effect will be monotonic (e.g. Martin & Park, 2004). As with experience with most tasks, the marginal effect of each additional repetition on subsequent segment entry will decrease, rather than remain constant. This is because at higher levels of familiarity with a specific task, it is less likely that an additional occurrence will generate substantially new insights or learning about the task. Also, old experience may become less useful over time. In other words, any momentum effect in segment entry is likely to dissipate gradually (Argote, 1999). Hence:

Hypothesis 2: A firm's propensity to enter a segment at a given time increases, but at a decreasing rate, with its number of prior entries in that segment

3.3.3 Density dependence and segment entry

The notion of density dependence has been traditionally used by population ecologists to study entry and exit (i.e., organizational founding and mortality) in populations of organizations (see Amburgey & Rao, 1996 for a review). The argument is that temporal variation in the rates of entry and exit into an environment can be at least partially explained by the density of organizations in that environment. At lower levels of densities, increases in the number of organizations tend to legitimize the organizational form by giving it a "taken for granted" status (Meyer & Rowan 1977; Hannan & Carroll, 1992). A given environment has, however, a finite "carrying capacity", in other words there is a upper limit to the number of organizations that it can support with its resources; hence, after a threshold, competition for resources forces a decline in the rate of entries.

While the original 'founding' model was developed to explain rates of entry into populations (for example in the Dutch accounting industry), it can also, with two modifications, be used to model entry into product segments. The first modification is with respect to the phenomenon the model is intended to explain. The original model explains the entry of previously non-existent firms into a population (this is termed 'organizational founding'). Every population of business firms, however, is also distributed across a product space. While being similar to foundings to the extent that they also are 'entries', segment entry decisions are about where to locate, or which particular location to enter in this product space. In many cases a firm's entry into the population overlaps with its first segment entry(ies), but this need not always be the case. In instances where firms are incorporated but have a gestation period before launching their first product (every product is launched to cater to a segment and represents the firm's entry into that segment), 'founding' (entry into the population) and 'segment

entry' are distinct. Also, while an organization can be founded only once, segment entry, either into the same or different segments, can be repeated. Despite these differences, however, we think density dependence theory can be fruitfully employed to understand entries into segments because the theory is essentially about how the structure of the target environment – the population or the market segment - makes it either attractive or unattractive for entry.

The second modification that we need to make to the original version of the density dependence model is on the level at which the dependent variable is measured. Organizational ecologists typically count "entry rates", the number of new firms in a population in a given year. This dependent variable is (i) defined and measured at the population level and (ii) varies *temporally*. To understand how individual firms make segment entry decisions, we need to define our dependent variable as the individual propensities to enter a given segment. Clearly, the level of analysis here is no longer the population, but the firm, and more precisely, the firm-segment. The variation in the dependent variable defined this way is both *cross-sectional* and *temporal*. The segment entry propensities vary across firms and segments, and for each firm-segment combination, across time.

To summarize the two points above, while organizational ecologists primarily use the density dependence model to explain temporal variation in founding rates in populations of organizations, in this paper we use the model to explain cross-sectional and temporal variation in individual firms' propensities to enter a given market segment.

Density dependence theory of segment entry

The density dependence hypothesis suggests that the propensity of firms to enter a given market segment depends on the number of other participants already present

there. Firms are assumed to be boundedly rational and to have limited abilities to evaluate all possible entry alternatives. Firms at first may not even be aware of an open segment in the market, and even when they are, may not be fully aware of the potential for entry or availability of resources therein. The first entrants, however, progressively signal the viability of the segment and in this sense, legitimize entry into it. Potential entrants are then less uncertain about the potential of the segment and hence more likely to enter.

However resources are finite and every environment has a limited carrying capacity (Hannan & Carroll, 1992). While initial entries signify the viability of a segment, the marginal legitimating effect from an additional entry is likely to diminish as more and more entrants enter. After a threshold, larger densities are likely to convey a signal that the niche is crowded. Also competition for the limited resources is likely to increase with the number of incumbents. This will reduce the probability a firm will enter that segment. Hence,

Hypothesis 3: There will be an inverted U-shaped relationship between a firm's propensity to enter a given product segment and the density of that segment.

3.3.4 Spatial competition, entry deterrence and segment entry propensity

Spatial competition scholars argue that rivalry among firms is largely localized. That is, assuming that firms offer products that can be represented on various points on a line which summarizes their characteristics, individual products compete the most with those in their neighborhood (Schmalensee, 1978:309). In other words, firms and brands near each other, both in a geographic and product space sense, compete more intensely than those that are far apart (Greve, 2002). Taking this into consideration, Prescott & Visscher (1977) argue that firms that enter sequentially tend to locate far away from

neighbors: “firms do not try to imitate an existing product, but rather aim for the “gaps” in the existing product spectrum” (Prescott & Visscher, 1977:380). The number of open gaps and thus profitable product locations, however, will be a negative function of the number of past entries (Greve, 2002). When there are fewer existing products in the market, there are more potentially viable open spaces and vice-versa. This line of argument suggests that there is a negative correlation between segment density and future entry propensity. To some extent, this prediction from spatial economics overlaps with that of density dependence theory, but only at the higher ranges of segment density. From a spatial competition point of view, there is little reason to expect, as density dependence theory does, a positive relationship between density and entry at lower levels of segment density. The industrial organization literature on market structure suggests alternative predictions for density effects at the lower range of segment density. Industrial organization theorists studying entry have emphasized the notion of entry barriers (Bain, 1956) and entry deterrence strategies by incumbents (Spence, 1977; Dixit, 1980; Kessides, 1990). The key insight here is that incumbents enjoying monopolistic or oligopolistic profits have incentives to sustain these profits in the long term by deterring entry by new firms. Entry deterrence mechanisms can take different forms. Bain (1956) suggested that incumbents may engage in limit pricing – charging lower that the full monopoly price – in order to limit the attractiveness of the market for potential entrants. It has also been shown that firms can deter entry by committing resources to excess production capacity. These investments signal the incumbent’s commitment to increase production in the event of an entry so that the threat of a price war is credible (Spence 1977). Other ways by which incumbents can signal a defensive intent are through strategic investments in learning, R&D and advertising (Fundenberg & Tirole 1984) and by brand proliferation to fill up product space to leave few profitable niches for potential

entrants (Schmalensee 1978, Stavins 1995). While these arguments primarily apply to entry into an industry, they can also be brought to bear on entry into industry market segments (Caves & Porter 1977).

The collective propensity for entry deterrence behavior in a market segment is likely to be higher when there are fewer participants or when the market is highly concentrated. This is because, with small numbers and relative price inelasticity, incumbents are more price-makers than takers and enjoy abnormal profits. New entry into the segment might lower prices and hence profit margins. Also, when there are fewer participants and product offerings, it is more likely that incumbents can benefit from economies of scale in production than if there were multiple products in the market. Furthermore, with fewer numbers, collusion is easier because there is less likelihood for free riding, which is the spillover of deterrence benefits to incumbents who have not put in the deterring effort (Olson, 1965). All these reasons, we argue, should motivate the existing few incumbents to deter future entry.

Hence, contrary to the density dependence notion in population ecology, the industrial organization view suggests that incumbents, when they are few, are more likely to set up entry deterrence mechanisms which make entry less attractive. As the number of incumbents increase, the propensity and ability to co-ordinate and erect effective entry barriers does diminish. But the spatial competition forces explained above which results in fewer viable open spaces in the segment ensure that entry is still discouraged. As a result, putting industrial organization and spatial competition arguments together, there is very little reason to expect that a potential entrant's propensity to enter a segment will increase and then decrease with a rise in segment density. Instead:

Hypothesis 4: There is a negative relationship between a firm's propensity to enter a given product segment and the density of that segment.

3.4 DATA & METHODS

3.4.1 Setting

We test these hypotheses using data on entries of foreign manufacturers into segments in the US automobile industry between 1986 and 2003. We define foreign manufacturers as firms based outside the US but selling at least one car line in the US market. By focusing on a single host country and industry we are able to keep industry and host country influences constant. By focusing on foreign rather than domestic manufacturers we are able to ensure that organizational founding and entry into the segment are not intertwined. More than 90% of foreign manufacturers in our sample had already entered the US market by 1986 and hence, to a very large extent, we were also able to empirically separate (foreign) market entry and segment entry.

The US automobile market is an excellent setting to test our hypotheses. The industry includes a good number of active foreign manufacturers. There were twenty two foreign manufacturers present in 1987, though this number fell down to fifteen by 2003. The mean market share of these foreign manufacturers was 45%, varying from 35% in 1986 to 64% in 2003.

Segments are also relatively well-defined in this industry. As we have seen earlier, segments are confluences of buyer demand that can sustain a particular product type. Market segmentation relies on the basic premise that customers are not homogeneous and have differing preferences about the set of attributes they desire in their purchases. These preferences are distributed across a number of dimensions relevant to the purchase. For example, newspaper buyers differ along dimensions like age, education, political affiliation and location of residence (Carrol, Dobrev & Swaminathan 2002). Each combination of values on each dimension which has a feasible customer

population comprises a market segment (e.g. young, educated, republican New Yorkers in the case of newspapers).

In the car industry, the key dimensions along which buyer preferences vary are body type, car size, and price. Along the body type dimension customers are differentiated into those that prefer the 'coupe', 'sedan', 'hatchback', 'cross-utility', 'sport-utility', 'vans' or 'pickup' body types. Along the size dimension, preferences fall under 'small', 'middle' or 'large' and, on the price dimension, under 'lower', 'upper' or 'luxury'. Different combinations of body type, size and price give rise to confluences of preferences, such as 'upper middle sport utility', 'luxury large cross-utility' and so on, that are different enough from one another that a single product will not simultaneously satisfy buyers in two separate segments. In the automobile industry, buyer preferences are quite heterogeneous and this makes the market segments relatively easy to identify.

The third reason why the auto industry serves as an appropriate setting is because it offers considerable variation on our theoretical variables. For example, the industry comprises both specialist and generalist types of manufacturers. Specialists (e.g. Ferrari) focus solely on specific segments of the product space, catering only to specific types of customers, while generalists (e.g. General Motors) straddle multiple segments with a more diversified product range. This heterogeneity in segment focus translates into a wide range of multi-market contact in the industry. That is, specialist firms, competing only in one or few product segments will tend to have low multi-market contact with competitors while the generalists compete in different product segments and have higher levels of multi-market contact. This type of variation is crucial to testing our hypotheses, in this particular case, the one with multi-market competition as predictor.

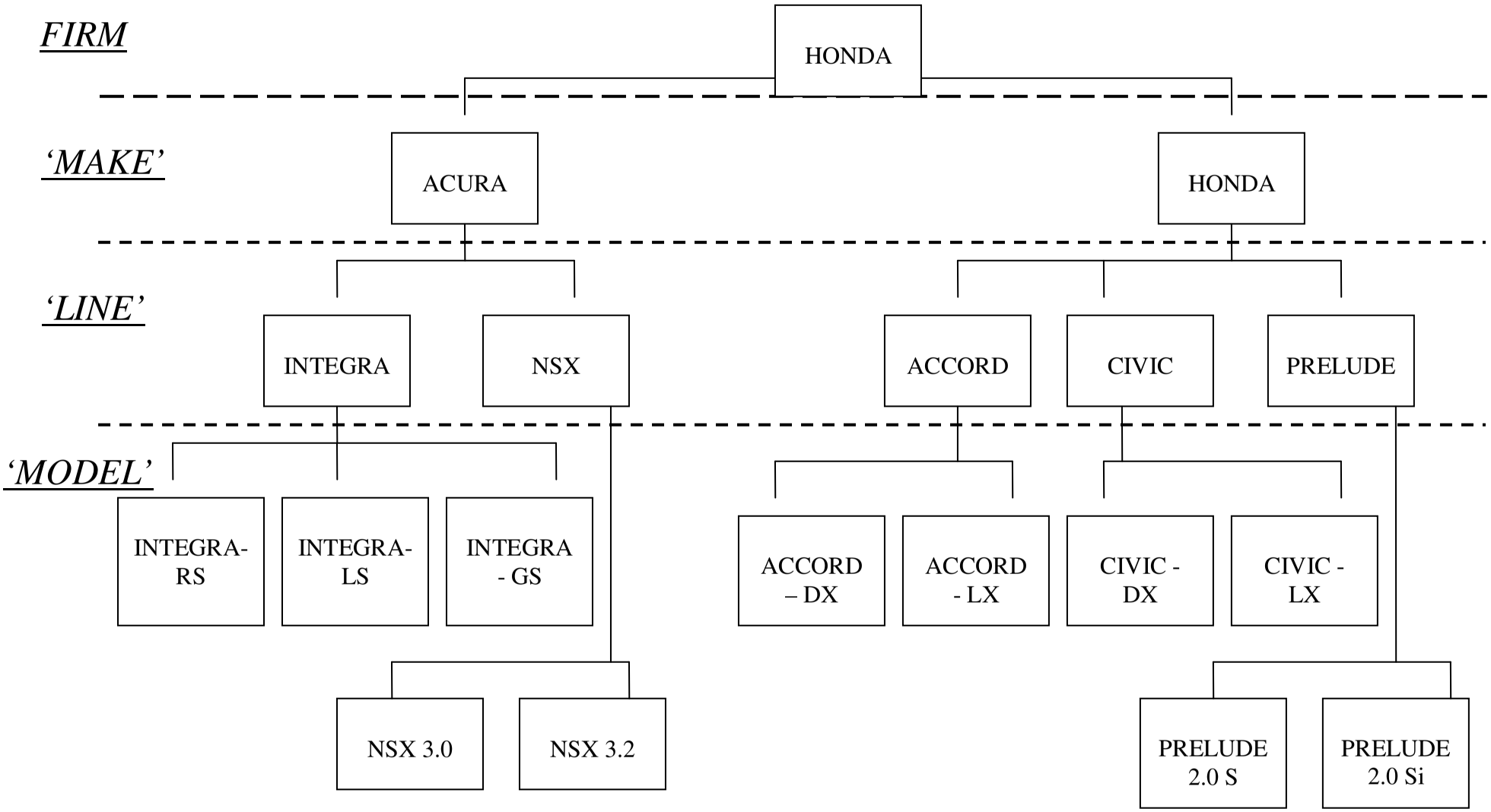
3.4.2 Segment entry in the automobile industry

The product portfolios of automobile manufacturers are made up of 'makes', 'lines' and 'cars' (White, 1971:5). Each manufacturer produces and sells one or more 'makes'. Makes usually involves a separate design and production organization within the company, separate advertising campaigns, separate dealer organizations and separately designed car lines or series. These are broken down further into 'models' or 'cars'. For example, Honda sells cars in the US under two different 'makes' – Acura and Honda. The Acura make consists further of several 'lines' – e.g., Acura Integra, Acura NSX and Acura RSX. Each line may come in several variants, which we call 'models' or 'cars'; for example, the Integra was available in Integra-RS, Integra-LS and Integra-GS models while the Acura NSX came in NSX 3.0 and NSX 3.2 variations. Figures 3.1 and 3.2 provide examples of makes, lines and models for Honda and Volkswagen, two foreign assemblers in the US.

Given this multi-tiered product structure, it is important to carefully consider what does and what doesn't constitute 'entry' into a segment. Whereas at the conceptual level, our dependent variable - whether a foreign firm entered a given segment in a given year or not – is straightforward, at the empirical level there are at least three ways we can define segment entry: as the launch of (a) a new 'make', (b) a new 'line' or (c) a new 'car / model' by a firm into a segment. These three ways of coding entry increase in the level of detail and disaggregation as we move from the first to the third, i.e., from entry with 'makes' to entry with 'models'. In the first case we would code Honda's launch of the Acura make as an entry into the luxury sport segment. In the second, we would consider its introduction of the Acura Integra or Acura NSX lines as an entry into that segment; and in the third case, we would code the launch of the Acura Integra RS model as an

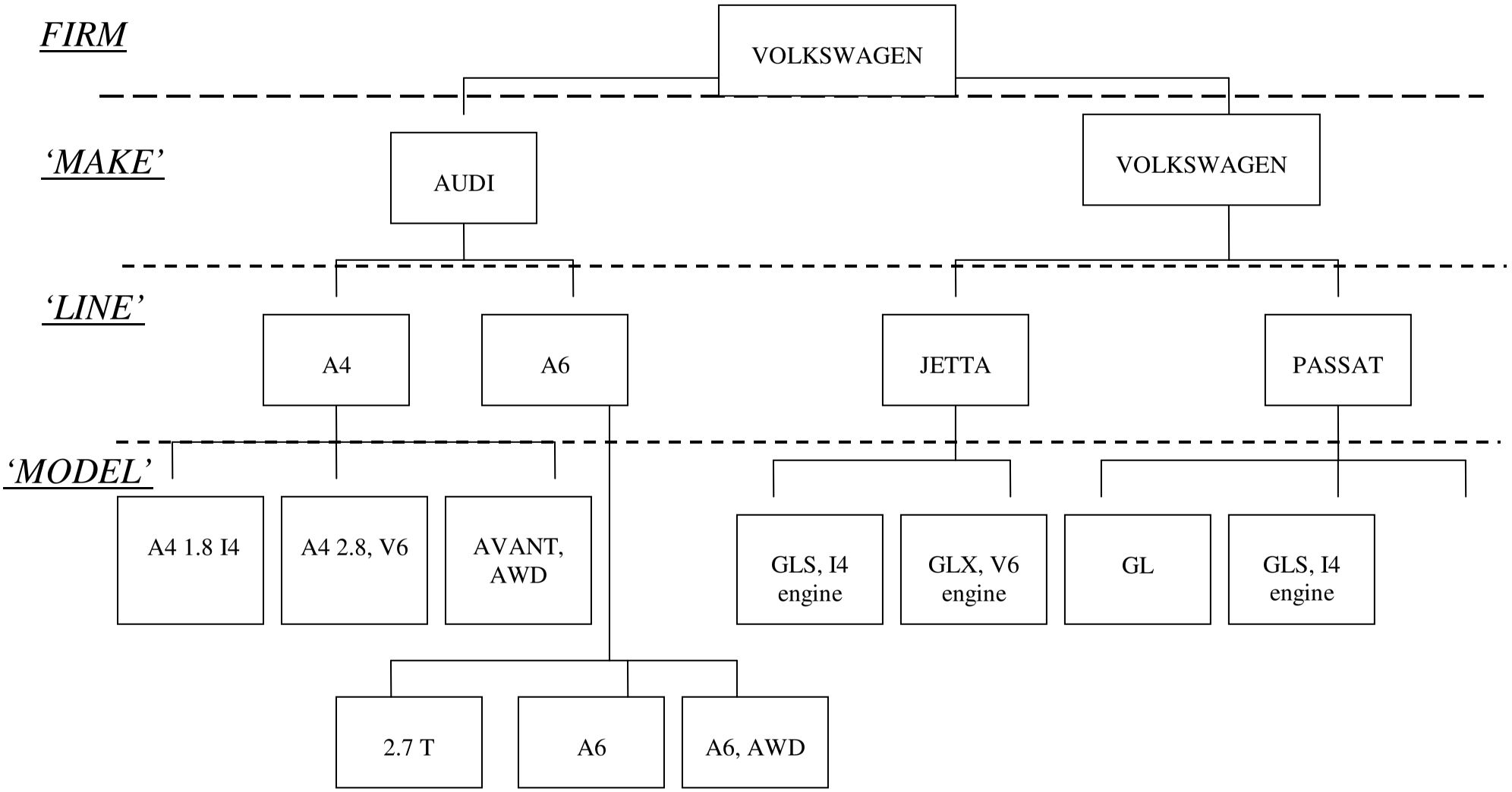
entry. The ‘make’ level is probably too aggregated and is likely to obscure a good deal of the dynamics of entry in the industry. Counting ‘cars’ or ‘models’, on the other hand, may give rise to spurious entry observations because differences between ‘models’ are generally minor. For example, the difference between the Z3 1.9 and Z3 2.8, two ‘models’ sold in the luxury sports segment under BMW’s Z3 line, is mainly in engine size and not much else. Likewise the difference between the 850 Ci, which BMW launched in the luxury specialty segment in 1993, and the 850i which it introduced three years earlier consists only in the addition of dual air bags and a fold down rear seat (Covello, 2002: 159). It is clearly erroneous to count the launch of the Z3 2.8 model in the luxury sport segment or the 850 Ci in the luxury specialty segment as an entry. Hence, given that ‘makes’ under-count, and ‘cars’ over-count legitimate entries into segments, we coded our entries at the ‘line’ level. That is, we only considered the launch of a new ‘line’ into a segment, and not the introduction of new ‘makes’ or ‘models / cars’, as an entry. For example, while we considered the launch of the BMW Z3 in 1996 in the luxury sport segment as an entry, we did not count the addition of specific models, like the Z3 1.9, Z3 2.3 or Z3 2.8 in 1998 and 1999 as entries.

FIGURE 3.1
Break-up of product portfolios in the automobile industry into 'makes', 'lines', and 'cars'



Note: this table does not include all lines and cars Honda sold in the US during our observation window. We list only a few lines and cars to illustrate the multi-tiered character of product portfolios in the industry

FIGURE 3.2
Break-up of product portfolios in the automobile industry into 'makes', 'lines', and 'cars'



Note: this table does not include all lines and cars Volkswagen sold in the US during our observation window. We list only a few lines and cars to illustrate the multi-tiered character of product portfolios in the industry

3.4.3 Sample

In line with our research question and focus we defined our "risk set" as the population of foreign automobile manufacturers in the US. Accordingly, the first step in putting together our sample was to identify which foreign firms were selling cars in the US market each year from 1986 to 2003. We did not restrict the sample only to firms that had assembling plants in the US (e.g. Honda) but also included firms that imported their fully or partly assembled cars from off-shore plants into the US (e.g. Porsche). While our risk set consists solely of foreign assemblers, some of our independent variables such as segment density – how many incumbents were in a given segment - do not distinguish between foreign and US firms. Hence we also collected data on domestic assemblers during this period.

Next, we relied on Ward's Automotive Yearbook to provide us with the segmentation of the market for each year. Ward's segmentation is based on consumer preferences for body style, size, and price. Over time, and as product markets have matured, buyer preferences have become more sophisticated and variegated. Accordingly, the number of segments in the industry has also varied over time. From 1986 until 1994, Ward's Automotive Yearbook listed twenty-three segments, between 1995 and 1999, twenty-four, and between 2000 and 2003, twenty-six. The rise in the number of segments indicates the emergence of new classes of consumers. For example, the two new segments in 2000 are a result of the rise of a group of consumers preferring mid-sized cross-utility and luxury cross-utility vehicles. The concept of the cross-utility car wasn't common until then. Table 3.2 provides a list of all segments in our data.

TABLE 3.2
List of segments in the auto industry

Segment	Examples of lines in the segment
Lower Small	Daewoo Lanos, Kia Rio, Toyota Echo, Chevrolet Metro
Upper Small	Daewoo Nubira, Dodge Neon, VW Golf
Small Speciality	Toyota Celica, VW Beetle
Lower Middle	Daewoo Leganza, VW Jetta, Chevrolet Malibu
Upper Middle	Acura Integra, Chrysler Sebring, Nissan Maxima
Middle Speciality	Mitsubishi Eclipse, Ford Mustang
Large	Chrysler Concorde, Buick LeSabre
Lower Luxury	Audi A4, BMW 3 series, Lexus IS 300
Middle Luxury	Audi A6, BMW 5-series, Cadillac DeVille
Upper Luxury	Audi A8, Lexus LS 430
Luxury Sport	Acura NSX, BMW Z3, Chevrolet Corvette, Honda S2000
Luxury Speciality	Cadillac Eldorado, Mercedes Benz CLK
Small Sport Utility	Jeep Wrangler, Kia Sportage, Suzuki Vitara
Middle Sport Utility	GMC Jimmy S, Nissan Pathfinder
Large Sport Utility	Chevrolet Suburban, Toyota Sequoia, Dodge Durango
Luxury Middle Sport Utility	Landrover Discovery, Range rover, Mercedes M-class
Luxury Large Sport Utility	Lexus LX 470, Toyota Landcruiser
Small Cross Utility	Toyota Rav4, Chrysler PT cruiser
Middle Cross Utility	Honda CRV, Hyundai Santa Fe, Mazda Tribute
Middle Luxury Cross Utility	BMW X5, Lexus RX 300, Acura MDX
Small Van	Chevrolet Astro, Honda Odyssey, Plymouth Voyager
Large Van	Dodge Ram van, GMC Savanna
Luxury Van	Mazda MPV, Oldsmobile Silhouette
Small Pickup	Toyota Tacoma, GMC Sonoma
Large Pickup	Toyota Tundra, GMC Sierra pick-up
Commercial Chassis	Chevrolet P model, Isuzu NPR, Chevy Tiltmaster

Source: Wards Automotive Yearbook 2001

Having compiled lists of foreign and domestic manufacturers in the US as well as market segments over the observation window, we then put together a list of all car lines sold in the US by all these manufacturers for each year in our sample. We also collected segment, make and manufacturer identification information on each of these car lines from Ward's Automotive Yearbook and reconfirmed this information using the *Standard Catalogue of American cars* (Gunnell, 2002) and the *Standard Catalogue of Imported cars* (Covello, 2002).

The segment identification for each 'line' allowed us to track segment compositions over time. That is, for each year, we could construct listings of 'lines' that belonged under each segment. Also, by following these segments over the years, we were able to flag the appearances of new lines in the segment. When a new line was seen to appear in a segment in a given year, it was coded as an 'entry'. For example, when Honda's S2000 line appeared for the first time in the luxury sport segment in 1999 we coded that as an entry. Since we had information to link lines to 'makes', and 'makes' to manufacturers, we were able to correctly assign each entry to a manufacturer. In the above case, for instance, we assigned that particular entry into the luxury sport segment to Honda. There were 361 such entries by foreign manufacturers in our observation window.

While some of our independent variables are at the segment level (e.g. segment density), others are at the firm-segment level (e.g. a firm's experience in a segment). The latter vary across firm-segment pairs and for each firm-segment, across years. Our dependent variable – whether a firm entered a segment or not in a given year - is also at the firm-segment level. In order to be able to include these variables, we created year-

firm-segment spells. That is, for each year, we created all possible combinations of firms and segments. With 18 years of data, the number of foreign firms per year varied between 22 in 1986 and 15 in 2003 and the number of segments per year between 23 and 26. Hence the number of firm-segments, i.e. the number of firms multiplied by the number of segments, varied from year to year and in the final sample we had 8173 firm-segment-years.

3.4.4 Measurement

Dependent Variable

We use a dummy variable E_{ijt} to capture the decision of a foreign assembler to enter a market segment or not in a given year. We code E_{ijt} 1 if a firm *i* in the risk set entered segment *j* in year *t* and 0 otherwise. There were 361 firm-segment-years in which an entry by a foreign assembler occurred.

Independent variables

We propose two types of independent variables; for a given year, the first varies across firm-segments (e.g. firm's past experience in a segment) while the second varies only across segments (e.g. segment density).

All independent variables were lagged, so they predict entries for the year following the one for which they were computed. Understandably, the number of useable observations falls because of this procedure. Lagged values are returned as missing in all cases where the firm-segment pair did not exist in the previous year such as at the start of our observation window in 1986 and when either the firm or segment was new (i.e., the foreign firm had just entered the US, or the segment had just emerged). We were finally left with 7010 useable year-firm-segment spells.

Our measure of multi-market contact is derived from the number of market segments in which a pair of firms overlaps. Given that the firm-segment level is our level of analysis, it is impossible to include a dyad-level measure of multi-market contact; a dyad-level measure is possible only when the level of analysis is firm-pairs. Hence, we aggregate multi-market contact between pairs of firms into a firm-in-segment measure (Gimeno & Jeong, 2001) thus getting at the aggregate level of a firm's multi-market contact with all its multi-market rivals in a given segment. Specifically, we adopt the Haveman & Nonnemaker (2000) measure which aggregates across all multi-market rivals of a firm in a segment. Our measure is thus the ratio of the number of market segments a firm shares with each multi-market rival to the total number of segments in which the firm is present. This measure gives an indication of the intensity of multi-market contact between a firm and its multi-market competitors that are present in a given segment in a given year. Essentially the measure is:

$$\mathrm{MMC}_{\mathrm{imt}} = \sum_{j \neq i} \left[MPR_{ijt} \times D_{jmt} \times \frac{\sum_{n=1}^{k} \left(D_{\mathrm{int}} \times D_{jnt} \right)}{\sum_{n=1}^{k} D_{\mathrm{int}}} \right]$$

where, $\mathrm{MMC}_{\mathrm{imt}}$ is the aggregate of multi-market contact firm *i* faces in segment *m* in time *t*, $\mathrm{MPR}_{\mathrm{ijt}}$ is a dummy that takes 1 if *j* is a multi-market competitor of *i* in time *t*, $\mathrm{D}_{\mathrm{jmt}}$ is a dummy that takes 1 if *j* was present in segment *m* at time *t*, $\mathrm{D}_{\mathrm{int}}$ and $\mathrm{D}_{\mathrm{jnt}}$ are dummies that takes 1 if *i* was present in segment *n* at time *t*, and if *j* was present in segment *n* at time *t* respectively, and k is the total number of segments available for entry in a given year.

For example, in 1995, Toyota was present in fifteen segments including the luxury sport car segment. It shared the luxury sport segment with ten other manufacturers, nine of which were Toyota's multi-market competitors. That is, nine of the ten firms in the luxury sport segment competed with Toyota in other market segments as well.

To compute the multi-market contact measure for Toyota in the luxury sport segment for 1995, we first calculated for each of Toyota's multi-market competitor in the segment the ratio of the number of segments shared with Toyota to the total number of segments Toyota was present in that year, in this case 15. Toyota competed with Nissan in ten segments that year and hence its multi-market contact with Nissan was 0.66, i.e., 10 divided by 15. Toyota overlapped with Mazda, yet another one of its multi-market rivals in the luxury sport segment, in 8 market segments that year. Toyota's multi-market contact with Mazda was therefore 0.53 (i.e. 8 divided by 15). We then added up the ratios for all nine multi-market competitors in the segment to arrive at the final measure of the intensity of multi-market competition Toyota faces in that segment. To test for an inverted U-shaped effect, we also include a quadratic term.

Experience of a firm with a segment for a given year is captured by counting the number of prior entries into the segment by that firm. In order to model a decreasing marginal effect, we use a logarithmic transformation of this count. To avoid undefined logarithmic values, we first added 1 to the number of prior entries and then computed the logarithm.

We measure segment density as the count of all car lines in a segment in a given year. We include car lines belonging to both US and non-US assemblers in this count. In

order to test hypothesis 3, we also include the squared term of this variable. To test hypothesis 4, which suggests a linear negative effect, we run a separate model without the quadratic term.

Control Variables

It is potentially dangerous to compare intensity of competition across segments using the variable *segment density* without taking the size of the segment into consideration. For example, a segment with only five car lines could still entail more competition between lines than a segment with, say, twenty lines if there are significant differences in total market demand in the two segments. To scale the segment density variable across time and across segments, we controlled for the size and growth of the segment. We used the total number of cars sold in the previous year as a proxy for segment size and the percentage change in sales over the previous year to measure segment growth.

There is a potential confound between our multimarket competition measure and firm size. Larger firms, ceteris paribus, are more likely to be present in multiple market segments and hence more likely to have higher levels of multi-market contact with other firms. In order to separate the effects of multi-market contact and size, we explicitly controlled for firm size. We measured firm size as the total number of cars sold across all market segments in a given year. The firm size variable also controls for other possible size-correlated influences on a firm's propensity to enter a segment such as the availability of slack managerial and financial resources and the ability to access new funds for the expansion.

Similarly, large rivals are more likely to be present in multiple segments and thus have high levels of multi-market contact with the focal firm. To separate the effects of size of the rivals from our multi-market contact measure we need to control for the size of multi-market rivals in a segment (Haveman & Nonnemaker, 2000). Given that our analysis is at the firm-segment level, we cannot control for the individual size of each multi-market competitor. So, using total sales as a proxy for firm size, we calculated the aggregate size of multi-market competitors a firm faces in a segment. We counted the total number of cars sold in a year for each multi-market rival a firm faced in a segment and aggregated this across all its multi-market rivals in the segment.

Furthermore, firms may have different propensities towards diversity in their segment portfolio and this could affect their propensity to enter a given segment at a given time. To capture this influence, we included a firm's present level of diversification across segments. We assume that the current level of diversification across segments is indicative of a firm's inherent preference for diversity. Firms that prefer generalist market postures straddling multiple segments may be more likely to enter a given segment in a particular year than firms that maintain more focused, narrow portfolios. To measure diversification, we used an application of the Hirschman-Herfindahl index (Blau, 1977; Haveman & Nonnemaker, 2000). The index for firm i in time t was calculated as the following ratio summed over all segments:

$$\sum_{i=1}^{k}\left[\frac{Number\_of\_lines\_in\_a\_segment}{Total\_number\_of\_lines}\right]^2$$

where k denotes the total number of segments in a given year. To get a measure that increases with product diversification, we subtracted this summed ratio from

1. For firms that operate in only one segment this index takes the value of 0. If all lines are equally distributed across all segments and there are, say, 25 segments the index will equal 1 – (1/25) = 0.96

Three design-related issues we need to tackle in our data are the problems of left truncation, potential non-independence of observations and unobserved firm heterogeneity.

Left-truncation

Given that our observation window starts in 1986, we are potentially susceptible to problems of left-truncation. We do not have information on firms that exited the U.S market before 1986. Also, while almost all of our firms had made segment entries prior to 1986, we do not explicitly have information on when these entries occurred. However, we are not totally ignoring information from pre-1986 entries. We do use information from these entries to compute our density count, prior experience and multi-market competition variables. In addition, since over 90% of the foreign firms in our sample had entered the US market before 1986, left truncation of the data at the year 1986 enabled us to separate the foreign market entry and segment entry decision processes.

Non-independence of observations

Our unit of analysis is the firm-segment and in our data we pool observations on firm-segments over time. So in essence, we have repeat observations of firms and segments across years. In such datasets more general firm-level factors could influence the behavior of firms in all segments and the more general segment-level factors could influence the behavior of all firms in a given segment. Repeated observations could be a source of non-independence of observations and potentially lead to cross-sectional

autocorrelation. To reduce this source of potential correlation between observations, we included both time varying, firm-level control variables (firm size and firm-level product diversity) as well as firm-level dummies. We expect that these firm-level controls will take out the firm-level influences that otherwise would cause correlation between error terms within a firm over time. To attenuate error-term correlations due to segment-level influences, we included both time varying, segment-level control variables (segment size and growth) as well as segment dummies. Together with year dummies, we believe these control variables should remove the sources of correlation between error terms and attenuate the risk of downward biased standard error estimates. To be completely sure, however, we also adjusted our standard errors to allow for clustering on firm-segments, using the "cluster" command in STATA.

Unobserved firm heterogeneity

The third issue we need to confront is unobserved heterogeneity in the propensities of firms to enter particular segments in a given year. One potential source of this heterogeneity is inter-firm alliances and cross-ownership. For example, Ford owns a controlling stake in Mazda, and GM and Toyota have a joint-venture, NUMMI, to manufacture and sell cars in the US. One could argue that given these cross-firm interests Mazda and Toyota may not enter segments where their American partners are present.

Another unobserved firm-level influence on entry propensity is the product portfolio of foreign firms in their home country. If Honda already makes a small car in Japan, it is more likely to enter the small car segment in the US as well. Unfortunately we were not able to explicitly control for this firm-level influence due to the unavailability of data on product portfolios of the firms in their home and other countries.

Scale economies are yet another unobserved effect. Since designing, developing and producing engines and platforms for a car line entail significant overhead costs, firms may try to share these across different car lines. This could mean that a firm may have higher propensities to re-enter with a new line a market segment it is already in or to enter adjacent market segments in order to gain economies of scale in design and production. Since our data is not detailed enough, we are unable to identify when technologies and platforms are shared across lines and hence we are unable to explicitly control for this effect.

However, we do account for the fact that firms may have different propensities to enter a given segment in a given year due to unobserved reasons, above and beyond those we hypothesize. We allow baseline entry propensities to vary across all firm-segment-year combinations by employing firm segment and year fixed effects. The constant term in our model represents the baseline hazard – the autonomous propensity of a firm to enter a segment in a given year. Without fixed effects, this is set to be the same for all firms. By including dummies, however, we allow this baseline hazard to vary by firms, segment and years. That is, we set the autonomous probability of entering to be different for every firm in every segment for every year[4]. These fixed effects also reduce any potential endogeneity biases that could result if unobserved firm, segment or year-level influences are correlated with any of our independent variables[5].

[4] We are aware that firm, segment and year fixed effects control for unobserved firm, segment, and year effects independently, and strictly speaking, are not the most appropriate controls for unobserved effects in our context. Please see appendix A at the end of this chapter for our discussion on this.

[5] We thank Renata Kosova for pointing this out to us.

Finally, we used robust standard errors in our estimation to control for any sort of heteroscedasticity. This was over and above adjusting the standard errors to accommodate data clustering at the firm-segment level.

Modelling procedure

We use a discrete-time hazard rate model to analyze segment entry (Allison, 1984; Henisz & Delios, 2001). The hazard rate H_{ijt} is defined here as the probability that firm *i* will enter segment *j* in time *t*. We model the hazard rate to vary with our theoretical and control variables while allowing the autonomous hazard rate – the baseline hazard – to vary across every combination of firm, segment and year by including firm, segment, and year dummies along with the intercept in our model. To bound the hazard rate between 0 and 1, we used a logit transformation log $[(H_{ijt}) / (1 - H_{ijt})]$. The model we are estimating is:

$$\log\left[\frac{H_{ijt}}{1-H_{ijt}}\right] = \mathbf{b}\,\mathbf{X}_{jt} + \mathbf{c}\,\mathbf{X}_{ijt} + \boldsymbol{\varepsilon}_{ijt}$$

Where **b** and **c** are vectors of coefficients and $\mathbf{X}_{jt}$ and $\mathbf{X}_{ijt}$ are matrices of explanatory segment-year and firm-segment-year varying variables respectively. $\boldsymbol{\varepsilon}_{ijt}$ contains the error term. Like in other logit models, estimation uses the maximum-likelihood method.

TABLE 3.3
Means, Standard deviations and correlation

	Mean	Min	Max	Std Dev	1	2	3	4	5	6	7	8	9
1. Segment entry	0.0442	0	1	0.205									
2. Multi-market competition	2.934	0	11	2.247	0.2546								
3. Segment experience	0.122	0	52	1.092	0.52	0.1325							
4. Segment density	11.74	1	47	7.93	0.1548	0.4201	0.1369						
5. Segment size	632293.2	1	2778662	628762.2	0.0366	0.2761	0.0102	0.4898					
6. Segment growth	0.086	-0.998	21.76	1.184	0.0372	0.0196	0.0042	-0.0056	0.0427				
7. Firm size	274925.3	331	2549387	426907.9	0.1058	0.2442	0.0245	-0.0335	0.0096	0.0310			
8. Size of multi-market rivals	7517713	0	1.69e07	4904312	0.1306	0.8141	0.0441	0.2319	0.2987	0.0672	0.3360		
9. Product diversification	0.787	0	0.9971	0.302	-0.01	0.0713	-0.0123	0.014	0.0597	0.0114	0.0675	0.0852	

TABLE 3.4
Results of Discrete Time Logit Analysis of multi-market contact, segment experience and segment density on entry

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
1.Multi-market competition		0.80***	0.730***	0.753***	0.75***
		(0.20)	(0.197)	(0.191)	(0.191)
2.Multi-market competition squared		-0.04**	-0.043**	-0.04**	-0.04**
		(0.018)	(0.02)	(0.018)	(0.018)
3.Segment experience (log)			0.511***	0.504***	0.505***
			(0.178)	(0.178)	(0.179)
4.Segment density				-0.073	-0.05**
				(0.076)	(0.024)
5.Segment density squared				0.001	
				(0.001)	
6.Size of the segment	1.21e-06***	1.19e-06***	1.21e-06***	1.83e-06***	1.72e-06***
	(3.92e-07)	(3.98e-07)	(3.98e-07)	(6.10e-07)	(5.10e-07)
7. Segment growth	0.201***	0.214***	0.201***	0.207***	0.210***
	(0.06)	(0.062)	(0.066)	(0.067)	(0.067)
8.Firm Size	7.10e-07	9.33e-07	6.36e-07	6.46e-07	6.47e-07
	(6.15e-07)	(6.16e-07)	(6.44e-07)	(6.47e-07)	(6.46e-07)
9.Size of Multi-market rivals	2.67e-08	-1.63e-07***	-1.36e-07***	-1.40e-07***	-1.41e-07***
	(2.74e-08)	(4.26e-08)	(4.19e-08)	(4.23e-08)	(4.21e-08)
10.Product diversification	-0.037	-0.235	-0.192	-0.20	-0.201
	(0.295)	(0.322)	(0.320)	(0.322)	(0.322)
11.Constant	-39.06***	-38.41***	-39.50***	-39.36***	-39.47***
	(1.48)	(1.22)	(1.64)	(1.53)	(1.87)
Nr of observations	7010	7010	7010	7010	7010
Wald test chisquare	1057.40***	1105.73***	1131.57***	1135.95***	1135.80***
McFadden R square	0.16	0.18	0.19	0.19	0.19

Notes:
1. *** p < 0.01, ** p < 0.05, *p < 0.1
2. Coefficients of firm, segment and year dummies are not reported

3.5 RESULTS

Table 3.3 shows descriptive statistics and pair-wise correlations between the variables. There are some significant correlations between our theoretical variables, multi-market competition, segment experience and density. To ensure the robustness of our results, we entered these variables hierarchically into our analyses. This allowed us to observe the stability of our coefficient estimates across models.

The results of the discrete time logit model are presented in table 3.4 (standard errors in parentheses). A positive sign for a coefficient implies that the corresponding variable has a positive effect on the probability of entry into a segment, and a negative sign implies the reverse.

Model 1 is the base model with control variables. In model 2 we include the multi-market competition variable and its quadratic term in order to test hypothesis 1. Model 3 includes prior segment entry experience while controlling for multi-market competition and model 4 is the full model where segment density and its squared term are entered as well. Model 5 is yet another specification where we drop the quadratic term of the segment density variable in order to test for any linear effect of segment density (hypothesis 4).

Likelihood ratio tests are useful indicators of model fit when using maximum likelihood methods. They test for statistically significant improvements in log-likelihood values between models when one is nested within the other. These tests in our analyses show significant improvements in log-likelihood as our theoretical variables are gradually

entered in models 2, 3 and 5[6]. The Wald test chi-square (which is analogous to the F statistic in multiple regression) is highly significant in all models, implying that the variables in each are jointly significant and fit the data better than an intercept only model.

Across all models, we find that the size and growth rate of a segment have positive effects on the propensity of a given firm to enter. In all specifications except model 1, we also find a significant negative relationship between the aggregate size of a firm's multi-market rivals in a segment and that firm's probability of entering that segment in a given year. These results are in line with our expectations and suggest that firms are attracted to segments that have large buyer populations that are still growing but, at the same time, that they are deterred by the presence of large competitors. The inclusion of these variables, as explained earlier while discussing control variables, also serves to normalize the segment density variable across segments and time, and partial out any competitor size effect from the multi-markets competition measure.

Model 2 includes variables denoting the extent of multi-market competition a potential entrant faces with incumbents of a given target segment. To test our prediction of an inverted U-shaped relationship, we include both the main term *multi-market competition* and its squared term *multi-market competition squared* in this model. The coefficient of the first order term is positive and significant ($p<0.01$) and that of the quadratic term is negative and significant ($p<0.05$). These two results, together with the fact that the point of inflection is within the range of the multi-market competition variable in our sample, offer support for hypothesis 1. The predominant effect of multi-

[6] Model 4, though, where we test for a quadratic effect of segment density, does not show any improvement in fit over model 3. Also, model 5 shows significant improvement in log-likelihood over model 3 but not over model 4.

market competition on entry is positive, however, given that the point of inflection occurs at a high value of multi-market competition. In other words, we find that a firm will enter a given segment up to the point where it faces incumbent competitors in quite a few other market segments as well, after which its rate of entry slows down.

We argued that prior entry experience in a segment positively influences the propensity to enter that segment at a given point in time, but at a decreasing rate. Model 3 tests this hypothesis by including *segment experience*, a logarithmic transformation of the number of prior entries a firm has made into the segment. We find a highly significant positive relationship between *segment experience* and entry, and thus support for hypothesis 2.

In model 4, the coefficient of the first order term *segment density* is negative while that of the quadratic term *segment density squared* is positive. Both these coefficients are not significant and we are thus unable to corroborate hypothesis 3 which predicts an inverted-U shaped effect of segment density on entry propensity. Model 5 is an alternative specification similar to model 4 but for the fact that we leave out the quadratic term, *segment density squared*. In this specification, the coefficient of *segment density* turns out negative and significant ($p<0.05$). We interpret this as empirical support for hypothesis 4 which, from a spatial competition perspective, predicts a negative relationship between segment density and entry propensity.

3.6 DISCUSSION

This paper sets out to explain variations in the propensity of firms to enter industry segments. We argue that multiple theoretical perspectives can be brought to bear on the phenomenon and develop predictions from strategic management, behavioral,

population ecology and spatial competition perspectives. The key predictors of segment entry that emerge from these perspectives are multi-market competition, momentum or prior experience, and segment density. We then test for the effect of each of these constructs using data on market segment entry decisions of foreign manufacturers in the US automobile market over the 1986 to 2003 period.

Our results suggest that multi-market competition, strategic momentum and spatial competition theories are worthwhile lenses to use when explaining segment entry. Everything else constant, low levels of multi-market competition encourage entry. This effect weakens and reverses, however, at very high levels of our multi-market competition measure. We also find that while segment density – the number of car lines already in the segment – has a negative effect, a firm's prior segment entry experience has a positive effect on its propensity to enter that segment.

Our key conceptual contribution lies in the application of various theoretical perspectives to the market segment level. Market segments are pockets of relatively homogeneous customers within markets and we know relatively little about whether organizational theories can predict firm behavior within these market sub-structures. Therefore, in addition to opening up a new, interesting level of analysis – the firm-segment level –, this paper takes up the theoretical mandate to explore whether and how organizational theory can be brought to predict firm behavior at this level.

Our level of analysis is interesting from the point of view of population ecology research. There seems to be some confusion among ecologists about the boundaries of a population. While earlier empirical work assumed that an industry within a country constituted a 'unitary population', recent work has started to suggest that populations can

be more heterogeneous than that. Scholars have sought to explore the fundamental processes of legitimation and competition within and across different "slices" of populations. For example, Cattani et.al. (2003) slice the population along geographic lines to suggest that legitimation and competition processes unfold at much lower levels than earlier anticipated, in their case at the level of Dutch provinces. Despite these advances, however, most of the intra-population heterogeneity has been thought to come from spatial differences. That is, rather than assuming that all organizations in, say, the Dutch accounting industry are similar, these studies suggest that these organizations can differ across provinces. Our study offers yet another means of taking intra-population heterogeneity into account. We define sub-populations on the basis of market segments and hence the demarcating line is not geography but discontinuities in the resource endowment of a market. By examining ecological dynamics at this level, we contribute to current debates in population ecology on the boundaries of populations and on the appropriate level of analysis.

Furthermore, studies in the ecological tradition of organizational founding and entry into a population can rarely distinguish between foundings and non-foundings. This is because it is very difficult to define a risk set in founding studies. The sample selection protocol does not pick up firms that tried to enter but failed. Hence one would assume that the diversity of organizations in founding studies is underestimated (Amburgey & Rao, 1996). In studying the niche entry of a defined population such as foreign firms, we observe both firms that enter and those that do not enter a niche. This design allows us to observe more organizational heterogeneity in the risk set.

The level of analysis in our study is also immensely relevant to international business research. International business researchers studying the geographic scope of the firm and especially entry into foreign markets have tried to explain differences in a firm's propensity to expand abroad (Hennart & Park 1994; Martin & Salomon, 2003), as well as how internationalizing firms differ in their choice of entry and governance modes (Hennart, 1991; Hennart & Park 1993). Another strand of foreign market entry research has examined variations in plant location, both across potential host countries (Henisz & Delios, 2001) and within a single host country (Chung & Alcacer, 2002). There hasn't been much research, however, on variations in segment entry propensities in a given host country market. In other words, while managers of internationalizing firms need to make decisions on entry modes and plant locations, they also need to choose which market segments to enter; and international business research has not examined this decision in much detail. Our study seeks to bridge these gaps: we add to extant research by examining a different type of variation (i.e. variation in foreign firms' market segment entry behavior) in the international expansion process, focusing on the market segment as the level of analysis.

Discussing various perspectives, we offered entry deterrence and spatial competition arguments as rival approaches to density dependence theory to explain segment-entry. We argued that the predictions from both perspectives with regard to the role of *segment density* differ. Our results do not seem to confirm the density dependence prediction that previous entries encourages further entry at low levels of density because of legitimizing forces while it discourages entry at high levels of density because of overcrowding. Instead, the data suggests a linear and negative relationship between

segment density and entry propensity, which we interpret as support for the spatial competition argument. Nevertheless, we do not hasten to conclude that legitimation forces are totally unimportant, or to claim to invalidate the whole set of prior empirical support in the population ecology literature for the density dependence hypothesis because of differences between our study design and that of organizational founding studies that test density dependence theory. In order to convincingly show that density dependence theory is irrelevant to market segment entry, one would have to do so using a research design similar to that of traditional density dependence studies on entry. Typically, such studies adopt the population as the level of analysis, consider the target population as being at risk of experiencing entry, and use a count of the number of entries in a given population in a given year as the dependent variable. In our study, the firm-segment is the level of analysis, the foreign firm, and not the target segment, is considered at risk of entry, and the dependent variable is not a count of entries, but rather a discrete variable denoting if a firm entered a given segment in a given year or not. These differences may account for our lack of support for the density dependence argument.

Our results are also interesting for research on multi-market competition and strategic momentum. We add to the range of contexts in which both theories have been held to operate. We show that the theoretical mechanisms proposed by multi-market competition theorists are operational at the market-segment level. The stream of multi-market competition has focused primarily on issues such as prices charged and market exit. With the exception of Haveman & Nonnemaker, 2000; Stephan & Boeker, 2001 and Greve, 2000, there hasn't been much research on multi-market contact and how it affects

market entry. The functional form of the effect has also been under contention. For example, while Greve (2000) suggests a linear effect, Haveman & Nonnemaker (2000) emphasize a non-linear, quadratic effect. This study adds to the weight of evidence behind the notion that the extent of a firm's strategic interdependence with rivals does indeed influence its behavior. We find that across the lower range of overlap in market segments, firms are motivated to enter new segments to further solidify their interdependencies with rivals. At much higher ranges of multi-market contact, however, these very interdependencies act more as a deterrent to entry.

Also, while there is prior evidence for strategic momentum in the case of acquisitions (Amburgey & Miner, 1992) and alliance formation (Martin & Park, 2004), our study may offer further validation for momentum theory in the case of market segment entry. One caveat, however, is that we do not have direct evidence for our arguments of momentum and uncertainty avoidance. We observe firms re-entering segments but cannot unequivocally assert that this is due to momentum or learning effects. It could be that firms are re-entering segments to exploit the fixed costs already incurred in entering the segment.

It is possible that our results are specific to the specific industry and observation window we have chosen. Future research could increase their generalizibility by studying segment entries in other industries, and by using different time periods. One promising avenue for theoretical development is to tease out specific conditions under which one perspective will have stronger effects or predictability relative to the others. A longer panel would also allow us to examine if certain theories predict relatively better during

specific stages in the growth of the industry. This would help us better understand some of the boundaries within which each of the relevant perspectives operates.

APPENDIX A

We are aware that firm, segment and year fixed effects control for unobserved firm, segment and year effects independently, and strictly speaking, are not the most appropriate controls for unobserved effects in our context. This is because fixed effects assume that the unobserved characteristics we are controlling for are "fixed" and non-varying. For example, firm fixed effects account for firm-level determinants of segment entry that vary between firms but are constant across segments and years. Firm dummies, thus, do not completely take care of the effect of, say, alliances, simply because the effect of alliances is not fixed – it varies from segment to segment, and exists only for the years the alliance is operational. In the years after they are formed, alliances may increase a firm's probability to enter segments where such entry is part of the alliance strategy and decrease its probability to enter such segments where the alliance partner is already present (i.e., where entry will entail competition with products of the partner). So clearly, since alliance effects are not constant across years and segments, firm fixed effects cannot completely account for them. Instead, we need to use firm-segment-year interaction dummies that allow firm effects to vary across segments and years.

However, while they are indeed the strongest controls, adding interactions between firm, segment and year dummies is impractical, because there will be one dummy for every observation in our data.

A second-best alternative is to use firm-segment dummies instead. This is better than simple firm dummies because it allows firm-level effects (such as that of alliances) to vary from segment to segment. Firm-segment dummies too, however, come at a cost. Firstly, this will again mean adding a large number of dummy variables to the model – one for each firm-segment- taking away considerable degrees of freedom. Secondly, these dummies absorb all the cross-sectional variation in our data, leaving its panel nature to provide all the necessary variation. For example, *multi-market competition* and *entry experience*, two variables in our model, vary cross-sectionally across firm-segments (the multi-market competition a firm faces differs from segment to segment, and a firm's entry experience for each segment is different), and temporally for each firm-segment (e.g., the segment-specific multi-market competition a firm faces changes over time, as its multi-market rivals enter that segment. Also, as a firm makes new entries into a given segment, its entry experience for that particular segment varies over time). Adding a dummy for every firm-segment will take away all the variation in these variables that is cross-sectional, i.e., across firm-segments. That leaves us only with the variation in variables that comes from their change over time. In our study, it is new entries by the focal and other firm that provide temporal variation in the variables. For example, in a given firm-segment, the experience variable changes as the firm makes new entries into the segment. Similarly, in the multi-market competition variable, for a given firm-segment, it is entries by the focal firm and its competitors in successive years that provides variation over time. Given the relatively limited number of entries in our data, temporal variation in the variables is rather limited; most of the variation is cross-sectional. Taking out this cross-sectional variation by using firm-segment dummies would then leave us with statistically insignificant results.

As a third alternative, we ran models with firm-year and segment-year fixed effects to allow for firm and segment effects that vary across years. In these specifications our results did not differ from those we report here, because these dummies take away only temporal and not cross-sectional variation.

CHAPTER 4

BOUNDARIES OF DENSITY-DEPENDENCE: FOREIGN ENTRY RATES IN THE US AUTOMOBILE INDUSTRY, 1986 – 2003[7]

Abstract

Density dependence theory suggests that legitimation and competition forces shape founding, entry and mortality rates in a population of firms, and thereby, its evolution. In its original form, the theory focuses primarily on temporal evolution of populations - on how populations grow over time and how density dependent processes of legitimation and competition shape this growth. There has been relatively less attention to the spatial distribution of populations, i.e., the clustering of organizations in different areas in the population. Correspondingly, we also know relatively little about the spatial boundaries of the density effect: whether the density dependent processes (of legitimation and competition) have a population wide spatial reach or whether they are strongest within such spatially clustered sub-populations of firms.

In this paper we seek to bridge this gap and examine the boundaries of the density effect. We argue for 'local density dependence' where density effects are strongest among firms that have similar resource dependencies, e.g., firms inhabiting the same market segment and thus depending on the same buyer base. We also argue that the effects will be strongest among firms that share similar identities such as among foreign firms operating in a given host country. Our empirical analyses, using data on the entry of foreign firms into various market segments in the US automobile industry between 1986 and 2003, suggest that density effects are indeed stronger among firms in the same

[7] I thank Jean-Francois Hennart and Xavier Martin for their valuable comments on various drafts of this chapter

market segment. We also find that the number of foreign incumbents in the segment significantly influences the entry rates of foreign firms into that segment.

4.1 INTRODUCTION

Organizational ecologists have been interested in explaining the evolution of populations of organizational forms. Correspondingly, they have focused considerable energies on studying the entry and mortality rates of organizations, which together determine the pattern of population evolution over time.

Density dependence theory, a central argument in organizational ecology, suggests that legitimization and competition forces in a population shape its entry and exit rates. Legitimization and competition in turn are a function of population density - the number of organizations in the population. Proponents of the theory expect an inverted U shaped relationship between population density and entry rates. In the early stages of population growth, when there are very few organizations in the population, additional entries convey positive signals to other potential entrants about the viability of the organizational form and the munificence of resources to sustain it. This will 'legitimize' and attract new entries into the population. However, this legitimization effect will not persist indefinitely. Given the fact that any environment has a limited carrying capacity, additional entries at high levels of population density cause over-crowding and intense competition for scarce resources. This 'competition effect' will make entry unattractive, and decrease entry rates into the population. These two effects of density on entry rates – the positive but diminishing legitimization and subsequent

negative competition effects - give rise to the inverted U shaped curve that density dependence theorists expect.

In its original form, the theory focuses primarily on the temporal evolution of populations, that is, on how populations grow over time and how the density dependent processes of legitimation and competition shape this (Greve, 2002; Hannan & Carroll, 1992; Hannan & Freeman, 1989; Hannan, 1986). There has been relatively less attention by ecologists to the spatial distribution, i.e., the clustering of organizations in different areas in the population space, and to the boundaries of populations (Lomi, 1995; Singh, 1993). Correspondingly, we also know relatively little about the boundaries of the density effect. Do the density dependent processes of legitimation and competition have a population wide spatial reach or do they operate largely within spatially bounded sub-populations of firms? While we do know from past research that legitimation and competition effects influence population entry rates over time, the question still remains as to the levels of spatial aggregation at which these ecological processes function.

There has also been relatively less attention to intra-population heterogeneity, again due to the predominantly temporal focus of density dependence theory. An implicit assumption so far has been that populations, typically defined at the national-industry level (e.g. populations of US brewing firms and telephone companies), are largely homogeneous and unitary in character. A notion that further derives from this assumption is that all organizations equally influence and are equally influenced by other organizations in the population (Baum & Amburgey, 2002: 315). In other words, all incumbents contribute, and all potential entrants react uniformly, to legitimation and competition forces in the population. Yet organizations are heterogeneous and it is

plausible that they may contribute differently to the density effect; for example, larger firms may exert more competitive pressures than smaller ones (Barnett & Amburgey, 1990). Also, potential entrants into a population could also be influenced differently by the density effect. They could be selectively sensitive to signals from particular kinds of incumbents, such as those from other similar firms. And this could result in stronger density effects among such firms.

Our key focus in this paper is on boundaries of the density effect on entry rates into populations. For a boundary to be meaningful, it should effectively segregate ecological processes so that the density effect is stronger within than across the boundary. In fact, theorizing about boundaries effectively equates to specifying levels of aggregation in the population where legitimization and competition forces – which together constitute the 'density effect' – are operational, and have strongest effects. The forces should also be relatively weaker across the sub-populations thus defined.

We propose two levels of aggregation that bound the effect of legitimation and competition. First, we aggregate firms based on their location in resource space and argue that legitimation and competition are strongest among firms that share similar resource dependencies e.g., among those selling highly substitutable products to consumers in the same market segment and thus depending on the same buyer base for survival. Second, we aggregate firms based on shared identities. We propose that density effects do not affect all firms equally strongly but will be strongest among firms that share similar identities, in our case foreign firms in a host market. Because of similarities in identities, we argue, potential foreign entrants are more alert and sensitive to legitimation and competition signals from foreign than from domestic incumbents. And as a result, the

density effect will be stronger within that sub-population, as opposed to across sub-populations of foreign and domestic firms. In short, the boundaries to the density dependence effect that we specify are based on proximity between firms, both in their resource dependencies and their identities.

To test these ideas, we chose the empirical context of the entry of foreign firms into the US automobile industry over a period of nearly two decades. Specifically, we looked at the entry rates of foreign firms into various segments of the US automobile market and the effect on these entry rates of densities of foreign and US incumbents in those segments. Market segments are confluences of buyers with relatively homogeneous traits and so firms selling in the same segment are dependent on the same kind of buyer for survival. We use market segments to represent areas in resource space where firms share similar resource dependencies. Segments are relatively easy to identify in the automobile industry and this makes it a suitable setting to test our hypotheses. Also, since foreign firms share common identities relative to domestic US firms, foreign entry into segments in the US market allows us to test if shared identities bound the density effect; i.e., if potential foreign entrants are more sensitive to density effects from other foreign incumbents in the segment than from domestic ones.

The empirical results support our main hypotheses. We find that the existing number of competitors in the segment (segment density) has a significant effect on entry rates of foreign firms into those segments. This shows that the segment, rather than the population as extant literature suggests, is a relevant level of aggregation at which density-dependent processes operate. We also find that foreign firms contemplating entry do not seem to look at all the firms already in the segment, but mostly at other foreign

firms in the segment. In other words, for them it is the foreign component of segment density which is significant. When we include foreign density – the count of foreign participants in the segment – into the model, segment density becomes insignificant and foreign segment density shows the traditional inverted U relationship with foreign entry rates into the segment. We interpret our results as suggesting that the density effects uncovered in the population ecology literature do not uniformly apply across the whole population. Indeed our results show that they work better within sub-populations. Specifically they work better at the segment than at the industry level, and better between firms that share similar identities than between all organizations.

4.2 THEORY AND HYPOTHESES

4.2.1 Segment-level density dependence

In its original form, density dependence theory focuses on temporal evolution and is relatively ambiguous about the spatial boundaries of a population. Correspondingly, theorists have also been relatively unclear about the boundaries of density dependent legitimation and competition. An implicit assumption hitherto has been that legitimation and competition have uniformly strong effects throughout the entire population.

Some recent research (e.g. Cattani et.al., 2003; Greve, 2002; Lomi, 1995), however, has started to evaluate this assumption by focusing on the spatial dimension of populations. These scholars depart from a nationally homogeneous conception of a population and suggest that populations are homogeneous, but only within narrow geographical boundaries such as regions, states or provinces. Entry and mortality rates vary across these regionally bounded populations, and hence the two ecological processes

of legitimation and competition need to be sought and explained at these local, non-national levels of aggregation as well. In essence, their argument is that one can use geographic boundaries to infuse a spatial dimension into the definition of populations and correspondingly, to specify the boundaries of legitimation and competition effects.

These scholars argue that legitimation and competition have stronger effects within regional populations. This is because diffusion of legitimacy can be hampered by spatial distance and because rivalry for local resources, such as buyers and suppliers, is most intense within a region. Thus in this view legitimation and competition forces generated in one part of the population may not be uniformly influential throughout the population, but more strongly felt by organizations in the immediate vicinity. For example, Cattani et.al (2003) argue that the founding rate of accounting firms in the Brabant province of Holland is more conditioned by the density of incumbent firms in the province than by the number of incumbents in the Dutch accounting industry as a whole. Similarly, in a study on the founding of American breweries, Carroll & Wade (1991) observed that density effects are stronger at city and regional as opposed to higher levels of analysis. Greve (2002) and Lomi (1995) found similar results for Tokyo banks and Italian rural cooperatives.

We position our research within this type of refinement of the traditional density dependence model, and subscribe to the view that density dependence effects are bounded at a more local than national level. However, while prior research has looked for intra-population boundaries to the density effect in geographic space, we look at boundaries to this effect in resource-space.

The notion of 'resource space' has been used by organizational ecologists (Carroll, Dobrev & Swaminathan, 2002) to denote the endowment and distribution of resources, mainly potential buyers, that sustain organizations in markets. Resources are distributed across multiple dimensions, each dimension consisting of categories or a smooth gradient of categories (Carroll, Dobrev & Swaminathan, 2002). For example, newspaper buyers differ along dimensions like age, education, political affiliation and residence. Potential buyers fall into 'market segments' defined by combination of categories on each dimension (e.g. the young, educated, republican New Yorker). Thus, resource spaces, according to ecologists, are rarely homogeneous, but characterized by pockets of resource homogeneity, typically called 'market segments' or 'niches'. Buyers are relatively similar within, but different across such pockets.

All firms, through their product offerings, are present in one or more locations in this resource space. The *New York Times*, for example, is located higher than the *Daily News* on the education dimension of the newspaper market, (Carroll, Dobrev & Swaminathan, 2002). Porsche and Daimler Benz are situated on the higher price end of the car market than, say, Honda or Toyota. In other words, just as much as resources, firms too are distributed across the resource space, with firms situated in the same location, i.e. those catering to the same market segment, relying on the same resource base. Firms in the same market segment thus could be said to have similar resource dependencies for survival.

Segment-level competition and legitimation

The logic of prior research which has argued that competitive interdependencies are higher among geographically proximate firms is that the extent of competition between firms depends on the ease with which they can sell their products in each others' market. This decreases with spatial distance (Greve, 2002; Cattani et.al, 2003) and hence, competition is most intense between firms in the same geographical space.

Our argument is similar, but we are interested in competitive interdependencies on a different plane, that of resource space. As demonstrated above, firms occupying the same location in resource space have similar resource dependencies. We suggest that competitive interdependencies are strongest when two firms need to share the same resource base (Baum & Mezias, 1992; Hannan & Freeman, 1989). Just as spatial distance, distance and boundaries in resource space also act as isolating mechanisms that separate organizational populations from direct competition. Distance in resource space implies greater dissimilarities in resources, and firms distant from each other in the space essentially have different resource dependencies. Competitive pressures will be higher for firms that cluster together in resource space and feed from the same set of buyers (Baum & Singh, 1994a; Baum & Singh 1994b; McPherson, 1983). As we argued before, market segments represent such clustering of firms that share the same set of buyers and hence, competition effects should be strongest within market segments. Segment walls serve as boundaries to the competition effect.

Legitimation, too, may have a more local than infinite reach in resource space. In the organizational ecologists' notion of 'legitimation of an organizational form', what is essentially being legitimized, along with the form, is a location in resource space. In other

words, legitimation of form is basically a diffusion of knowledge about the existence, viability and attractiveness of the corresponding market segment or resource endowment in resource space. This duality between organizational form and niche has been acknowledged by organizational ecologists (Hannan & Freeman, 1989: 50) and what it implies is that legitimation effects are localized in areas characterized by similar resource endowments.

Both these arguments of localized competition and legitimation tell us that segments within a resource space are potential levels to explore the ecological processes of legitimization and competition. In this paper, we test the density dependence theory at the level of market segments. We argue that when the segment is occupied by very few entrants, there is likely to be an increase in entry rates due to its legitimation. But at higher levels of segment density, the resulting competition for the same set of buyers will lead to a decrease in entry rates. Thus:

Hypothesis 1.a: There will be an inverted U-shaped relationship between segment density and rate of entry of foreign firms into that segment

Also,

Hypothesis 1.b: The density effect at the segment level will be stronger than that at the national industry level.

4.2.2 Shared identities and density dependence

Organizational ecologists typically define populations as firms belonging to the same industry with the assumption that firms within an industry are similar. An implicit idea that flows from this conception is that each organization equally influences and is equally influenced by ecological processes. That is, all firms exert the same level of

competitive pressure on other firms in the population and all they all have similar legitimization effects. This is clear from the Lotka-Volterra equation (Hannan & Freeman, 1989) which shows that the competitive intensity in a population is dependent on the number of firms, irrespective of the size or nature of firms (Barnett & Amburgey, 1990). Disagreeing with this unitary and homogeneous depiction of a population, some scholars argue that competition and legitimation effects are different in different parts of the population. Some have argued, for example, that the strongest competitive pressures come from the larger firms (Barnett & Amburgey, 1990) and are stronger within the confines of small spaces (Cattani et.al 2003; Greve, 2002; Lomi, 1995). We seek to bring attention to another form of intra-population heterogeneity based on firms' nationality: whether they are foreign or local / domestic.

Our argument is that ecological processes are more likely to be stronger among firms that share common identities. Legitimization of a resource space is essentially an information spillover from incumbents to potential entrants regarding the viability and attractiveness of the niche. Similarly, what actually determines if a potential entrant will enter the niche is not so much the actual level of competition in the niche, but the signals of overcrowding that they get from the number of existing incumbents. The question is whether all potential entrants are equally receptive of these signals. Do potential entrants pay selective attention to the actions of particular kinds of firms? Do they have the cognitive capabilities to monitor actions of all other firms in the target industry or segment?

As Porac & Thomas (1990) have shown, information spillovers are stronger between firms that share similar identities. Since the information processing demands of

scanning entire competitive fields are immense, managers make sense of their competitive environments by forming mental models where they categorize other firms based on their salient attributes, and define the most similar ones as relevant competitors to select out for close monitoring. In other words, firms engage in selective scanning; they select and monitor other firms that they perceive similar, and hence, cognitively relevant to themselves. Haveman (1993) suggests that size is one dimension on which managers define similarities. In her study on diversification in the California thrift and saving industry, she predicts that firms will identify other firms of similar size, monitor them closely, and imitate their diversification strategies. Empirical tests, however, do not corroborate this hypothesis, and she concludes that size was perhaps not the most important discriminating variable among the firms in her sample.

We suggest that "foreignness" is a potential attribute on which potential entrants form mental categorizations. Foreign firms in a given host country share similar identities vis-à-vis domestic firms on several counts: First, they have places and conditions of origins that are dissimilar to those of domestic firms, and, as Hannan & Freeman (1989) would argue, have different "imprintings". Second, they face similar constraints and the common challenge of setting up business and finding effective ways of selling their products in an alien country. Finally, given that they have all expanded into the same host country, they probably share similarities in strategic direction, decisions making tendencies, and organizational structures.

International business research has documented evidence that foreign firms have a collective identity, and more specifically, that foreign incumbent firms in a market can influence the behavior of other foreign firms. For example, Shaver, et.al (1997) argue that

foreign entrants observe actions of earlier foreign entrants in the host market and learn from them. Researchers adopting an institutional-mimetic isomorphism perspective have documented that foreign firms tend to follow the actions of other foreign entrants in host countries (Henisz & Delios, 2001; Yiu & Makino, 2002). Earlier, Knickerbocker (1973) observed "follow the leader" behavior in foreign market entry which again suggests that foreign firms are sensitive to the signals from the community of foreign firms already in the host country.

These arguments and findings suggest that the group of foreign firms in a host country is a cognitively relevant community to potential foreign entrants and hence that there are stronger information spillovers between foreign incumbents and potential foreign entrants than between foreign incumbents and all entrants. We thus expect that density dependent processes of legitimation and competition will be stronger within sub-populations of foreign firms, rather than across sub-populations of domestic and foreign firms. In other words, potential foreign entrants will be influenced more by the density effects from foreign, rather than domestic incumbents in the market segment.

Hypothesis 2: There will be an inverted U-shaped relationship between density of foreign entrants in a segment and entry rates of foreign firms into that segment.

4.3 SAMPLE

4.3.1 Setting

We test these hypotheses using data on entries of foreign assemblers into market segments in the US automobile industry over a period of nearly two decades (1986 – 2003). This setting is appropriate for our purposes for two main reasons.

First, the US automobile industry has many active foreign manufacturers. There were twenty two foreign manufacturers present in 1987, though this number was down to fifteen in 2003. The mean market share of these foreign manufacturers was 45%, varying from 35% in 1986 to 64% in 2003. We define foreign manufacturers as firms based outside the US but selling at least one car line in the US market. Second, segments are relatively well-defined in this industry. Segments are basically confluences of resources (mainly demand) that can sustain a particular product type. Firms are distributed across these market segments and firms targeting the same market segment have similar resource dependencies. The relatively easy segmentation of the market is helpful in testing our ideas on how similar resource dependencies strengthen the density effect.

Market segments in the car industry

Market segmentation relies on the basic premise that customers are not homogeneous but have differing preferences about the set of attributes they desire in their purchases. Buyer preferences are distributed in a space defined by a number of dimensions relevant to the purchase. For example, newspaper buyers differ along dimensions like age, education, political affiliation and location of residence (Carrol, Dobrev & Swaminathan 2002). Each combination of values on each dimension which has a feasible customer population comprises a market segment (e.g. the young, educated, republican New Yorker constitutes a market segment for newspapers).

In the car industry, the key dimensions along which buyer preferences vary are body type or frame, car size and price. Along the body type dimension customers are differentiated into those that prefer the 'coupe', 'sedan' or 'hatchback', 'cross-utility', 'sport-utility', 'vans' or 'pickup' body types. Along the size dimension preferences fall

under ‘small’, ‘middle’ or ‘large’ and, on the price dimension, under ‘lower’, ‘upper’ or ‘luxury’. Different combinations of body type, size and price give rise to confluences of preferences such as ‘upper middle sport utility’, ‘luxury large cross-utility’ and so on, that are different enough from one another that a single product will not simultaneously satisfy buyers in two separate segments.

4.3.2 Sample

The first step in putting together our sample was to identify which foreign firms were selling their cars in the US market for each of the years in our panel. We did not restrict the sample only to firms that had assembling plants in the US (e.g. Honda) but also included firms with off-shore plants that imported their fully or partly assembled cars into the country (e.g. Porsche). One of our independent variables, segment density, i.e. counts of segment participants, does not distinguish between foreign and US firms, so we also collected data on domestic assemblers during this period.

We relied on the Ward’s Automotive Yearbook to provide us with the segmentation of the market for each year. The Ward’s segmentation is based on consumer preferences for body style, size and price. Over time and as product markets mature, buyer preferences become more sophisticated and variegated. Accordingly, the number of segments also varies over time. From 1986 until 1994, Ward’s Automotive Yearbook listed twenty-three; between 1995 and 1999, twenty-four, and between 2000 and 2003, twenty-six segments. The rise in the number of segments indicates the emergence of new classes of consumers in the market. For example, the two new segments in 2000 are a result of the rise of a group of consumers preferring mid-sized and

luxury cross utility vehicles. The concept of the cross-utility car wasn't common until then.

Having compiled lists of foreign and domestic manufacturers in operation as well as information on market segmentation during our observation window, we then put together a list of all car lines sold in the US by all manufacturers for each year in our sample[8]. We also collected segment, make and manufacturer identification information on each of these car lines from the Ward's Automotive Yearbook. We reconfirmed make and manufacturer identification information for car lines using the *Standard Catalogue of American cars* and the *Standard Catalogue of Imported cars*.

The segment identification for each car line allows us to track segment compositions over time. That is, for each year, we construct listings of lines that belonged to each segment. And by following these segments over the years, we are able to flag the appearances of new lines in the segment. When a new line is seen to appear in a segment in a given year, for example when Honda's S2000 line appeared for the first time in the luxury sport segment in 1999, we coded that as an entry. Since we had information to link lines to 'makes', and 'makes' to manufacturers, we were also able to correctly assign the entries to manufacturers in our sample. In the above case, for instance, we assigned that particular entry into the luxury sport segment to Honda. There were 428 entries by foreign manufacturers in our data during the observation window.

As we argue in the previous chapter, given that product portfolios of automobile manufacturers comprise makes, lines, and cars, we could have counted the appearance of a new make or car in a segment as an entry. However, coding entry at the make level is

[8] See Chapter 3 for the definition of car line.

probably too aggregated and likely to obscure a good deal of the dynamics of entry in the industry. Counting cars or models, on the other hand, may give rise to spurious entry observations because differences between models are generally minor. Hence, given that makes under-count and cars over-count legitimate entries into segments, we coded our entries at the line level. That is, we only considered as entry the launch of a new line into a segment, and not the introduction of new makes or models or cars. For example, while we considered the launch of the BMW Z3 in 1996 in the luxury sport segment as an entry, we did not count the addition of specific models, like the Z3 1.9, Z3 2.3 or Z3 2.8 in 1998 and 1999 as entries.

Our dependent variable is a count of the number of entries by foreign firms in a segment in a given year. That is, for each year, we aggregated entries to the segment level. We had 18 years of data and the number of segments per year varied between 23 in 1986 and 26 in 2003. The number of segment-years, as a result, varied from year to year and in the final sample we had 430 segment-years.

4.3.3 Measurement

Dependent Variable

As mentioned above, our dependent variable was a count of the number of foreign entries into each segment for each year in our sample. We observed 428 entries over 430 segment-years.

Independent variables

We measure *segment density* as the count of all car lines in a segment in a given year. We include car lines belonging to both US and non-US assemblers in this count. In order to test hypothesis 1a, we also include a squared term of this variable.

To test if density dependence operates at an industry level as well (hypothesis 1.b), we created an *industry density* variable. This, essentially, was the aggregation of *segment density* across all segments for each year of data. It measures the total number of car lines in the market in a given year and varies by year, but not by segment-year. To test for non-monotonic effects, we also included a quadratic version of this variable.

To test hypothesis 2, we created *foreign segment density*. This is similar to the *segment density* variable, but in this case we only count car lines belonging to foreign manufacturers. *Foreign segment density* thus denotes the count of car lines in a segment that belong to non-US manufacturers. Again, we also included a quadratic term to test for the predicted inverted U shape effect.

All independent variables were lagged, so they predict entries for the year following the one for which they were computed.

Control variables

We seek to explore the effects of segment and foreign-firm densities on segment entry rates. In order to get correct estimates for our coefficients, we sought to control for two different types of alternative influences on segment entry.

First, we controlled for segment-specific influences, such as segment size and growth potential which vary across segments and could potentially affect the density effect. Secondly, we included year-level effects, such as yearly industry wide sales growth, which are time varying, but, within a given year, constant across segments.

Segment level controls

It is potentially dangerous to compare intensity of competition across segments using the variable *segment density*, without taking the size of the segment into

consideration. For example, a segment with only five car lines could still entail more competition between lines than a segment with, say, twenty lines if, in the former case, potential demand is modest. To scale the segment density variable across time and across segments, we controlled for the potential market size of the segment. We used the total number of cars sold in the segment in the previous year as an indicator of segment size.

Irrespective of segment density, segments could still be attractive to potential entrants if demand in the segment is growing. Competition forces start to set in only when the number of incumbents exceeds the carrying capacity of the environment. In order to control for the case where carrying capacity itself is expanding, we included a lagged value of *segment sales growth rate*. We use the rate of growth of car sales in the segment to proxy for changes in its carrying capacity.

Keeping with prior literature on entry and founding rates (Hannan et.al., 1995; Delacroix & Carroll, 1983) we also included a count of prior year entries into the segment and its quadratic term. A surge of previous entries could indicate favorable conditions in the market segment, which attracts future entry as well. However, these entries take away from the pool of potential entrants and the availability of resources, and thus the positive effect on entry rates should weaken at higher levels of prior entries. This variable also helps correct for possible autoregressive influences (Li, Yang & Yue, 2007)

Time-varying controls

To control for the general health of the automobile industry during the period under study, we included the variable "industry sales", which measures the total number of cars sold in the US automobile market in a given year.

There could be other unobserved, time varying influences on segment entry rates. To capture these, we also employed year fixed effects by including year dummies into our model specification.

Two other issues we need to tackle in our data are the problems of left truncation and the potential non-independence of observations.

Left-truncation

Given that our observation window starts in 1986, we are potentially susceptible to problems of left-truncation. We do not have information on firms that exited the U.S market before 1986. Also, while almost all of our firms had made segment entries prior to 1986, we do not explicitly have information on when these entries occurred. However, we are not totally ignoring information from the pre-1986 entries. We do use information from these entries to compute our density count variables. In addition, since over 90% of the foreign firms in our sample had entered the US market before 1986, left censoring of the data at the year 1986 enabled us to separate the foreign market entry and the segment entry decision processes.

Non-independence of observations

Our unit of analysis is the segment and in our data we pool observations on segments over time. So in essence, we have repeat observations of segments across years. Repeated observations could be a source of non-independence and potentially lead to autocorrelation. To reduce this source of potential correlation between observations, we included time varying, segment-level control variables (segment size, segment growth potential and prior entries into the segment) expecting that these controls will take out the

segment-level influences that cause correlation of the error terms within a segment over time. Together with year dummies, we believe these control variables should remove the sources of correlation between error terms and attenuate the risk of downward biased standard error estimates in our analyses. To be completely sure, however, we also adjusted our standard errors to allow for clustering on segments, using the "cluster" command in STATA.

4.3.4 Method

Poisson regression is a potential way to model count dependent variables. Interestingly, "the Poisson model has been used in the analysis of event count data as far back as 1898 when von Bortkiewicz conducted his classical study of accidental death by mule kick in the German army" (Carroll & Wade, 1991:284). However, Poisson distribution has restrictive assumptions about equality between conditional mean and variance of the event count. In our data, the mean number of entries is 0.995 and variance is 3.37, which suggests potential overdispersion. Using the Poisson model in this situation could produce smaller but erroneous standard errors for our coefficient estimates. We therefore use negative binomial regression methods as they have the flexibility to accommodate this kind of overdispersion (Cameron & Trivedi, 1986 in Carroll & Wade, 1991).

4.4 RESULTS

Table 4.1 and table 4.2 show descriptive statistics and pair-wise correlations between the variables. The results of the negative binomial regression model are presented in table 4.3 (standard errors in parentheses).

TABLE 4.1
Descriptive statistics: Means, Standard deviation, Minimum and Maximum Values

	Mean	Std. Deviation	Minimum	Maximum
Entry count	0.995	1.836	0	12
Segment density	11.61	7.64	1	47
Segment foreign density	6.44	6.226	0	42
Industry density	150.446	13.50	125	173
Size of the segment	633784.5	634799.6	1	2778662
Segment sales growth	0.100	1.26	-0.998	21.759
Industry sales	1.52e07	1406064	1.23e07	1.76e07
Number of entries in the previous year	1.01	1.898	0	12

TABLE 4.2
Pair-wise correlation matrix

	1	2	3	4	5	6	7	8	9	10	11
1. Entry count											
2.Segment density	0.0469										
3.Segment density squared	0.1573	0.9307									
4.Segment foreign density	0.1607	0.8875	0.8753								
5.Segment foreign density squared	0.2023	0.7634	0.8901	0.8821							
6. Industry density	-0.2203	0.0855	-0.0466	0.1041	-0.0482						
7.Industry density squared	-0.2172	0.0838	-0.0462	0.1039	-0.0471	0.9990					
8.Size of the segment	-0.0852	0.5278	0.4303	0.2696	0.1595	0.0672	0.0684				
9.Segment sales growth	0.0878	-0.0974	-0.0618	-0.0675	-0.0392	-0.0121	-0.0165	-0.0761			
10.Industry sales	-0.2842	0.2797	0.1202	0.2066	0.0776	0.3900	0.3981	0.2334	-0.0255		
11.Number of entries in the previous year	0.2292	0.4473	0.4353	0.4925	0.4132	0.0379	0.0317	0.0630	-0.0340	-0.1455	
12. Number of entries in the previous year squared	0.2182	0.3390	0.3469	0.3464	0.3085	-0.0062	-0.0119	0.0373	-0.0252	-0.1446	0.9091

TABLE 4.3

Results of Negative Binomial Regression Analysis of Foreign Firm Entry Count on Segment Density and Segment Foreign Density

Variable	Model 1	Model 2	Model 3	Model 4
1.Segment density			0.159***	-0.040
			(0.026)	(0.053)
2. Segment density squared			- 0.002***	-0.0002
			(0.001)	(0.0013)
3.Segment foreign density				0.2478***
				(0.0451)
4.Segment foreign density squared				-0.004***
				(0.0014)
5. Industry density		-0.418	-0.141	-0.287
		(0.356)	(0.325)	(0.333)
6.Industry density squared		0.001	0.0004	0.001
		(0.001)	(0.001)	(0.001)
7.Size of the segment	1.80e-07	1.80e-07	-3.45e-07***	3.34e-08
	(1.17e-07)	(1.17-07)	(1.02e-07)	(1.14e-07)
8.Segment sales growth	0.104***	0.104***	0.138***	0.138***
	(0.039)	(0.039)	(0.038)	(0.029)
9.Industry sales	1.41e-07	6.55e-08	2.01e-07	1.00e-07
	(8.81e-08)	(1.29e-07)	(1.38e-07)	(1.37e-07)
10.Number of entries in the previous year	0.278***	0.278***	-0.001	-0.167
	(0.105)	(0.105)	(0.108)	(0.106)
11. Number of entries in the previous year squared	-0.005	-0.005	0.004	0.0157*
	(0.009)	(0.009)	(0.009)	(0.009)
Constant	-2.85	29.89	5.76	18.185
	(1.357)	(27.48)	(25.14)	(25.73)
Nr of observations	378	378	378	378
Wald test chisquare	153.17***	153.17***	279.08***	475.59***
Log likelihood	-442.4023	-442.4023	-416.06485	-400.64504

Notes: *** p < 0.01, ** p < 0.05, *p < 0.1

A positive sign for a coefficient implies that the corresponding variable has a positive effect on the probability of entry into a segment, and a negative sign implies the contrary. We entered our hypothesized variables hierarchically into the model to ensure robustness of the results.

Models 1 and 2 are baseline models. In model 1 we allow the baseline entry rate to vary with segment size and growth rate, industry sales, and the number of entries in the prior year. In model 2 we include the industry density variable and its quadratic term as a benchmark against which we can assess the effects of segment density and segment foreign density. Model 3 includes segment density while controlling for industry density and model 4 is the full model where the density of foreign incumbents in the segment and its squared term are entered.

The coefficient of *segment sales growth* in model 1 shows a positive and significant effect. This effect remains in all models and supports our notion that entry rates are high when the segment resource endowment is growing.

In model 3, the coefficient of the first order term *segment density* is positive and significant while the quadratic term *segment density squared* is negative and significant. In the same model, we find that the industry density variable remains insignificant. The results on these two variables together corroborate hypothesis 1 to suggest that the density effect is stronger at the segment than industry level.

To test hypothesis 2, we expand our specification in model 4 to include foreign density. Foreign density is significant, as well as its square. That is, we find that segment entry rates of foreign firms increase up to a point with the number of foreign incumbents in the segment, but then decrease. This finding supports our hypothesis that the density effect is significant among groups with shared identities. Interestingly, the segment density variable loses its significance when the foreign density variable is added.

4.5 DISCUSSION

Density dependence theory does not provide clear guidance as to the level of analysis at which forces of legitimation and competition operate (Singh, 1993, Hannan & Carroll, 1992: Ch.7). Given this ambiguity, population ecologists have traditionally applied the theory at the national industry level, for example, at that of US wineries.

This choice of level of analysis also reflects scholars' assumptions about the boundaries of a population. Legitimation and competition, according to the theory, shape the evolution of a population. Hence, to assume that the density effect operates at a given level of analysis equates to defining the boundaries of the population at that very level as well (Lomi, 1995; Singh, 1993). So along with specifying the level of analysis at the national industry level, traditional population ecology research has also implicitly drawn the boundaries of a population at that level. These issues of level of analysis and population boundaries, however, have been a recurring point of debate in the literature.

For example, recent research suggests that populations and density processes are more local than nationally bounded and finds evidence for a stronger density effect at lower levels of analysis such as within regions, states and cities (Cattani et.al., 2003; Greve, 2002, Lomi, 1995; Carroll & Wade, 1991). This stream of research essentially disaggregates populations into their geographical components and explores density dependence at that level.

In this paper, we seek to add to this kind of refinement of traditional density dependence theory. We propose density effects localized within a market segment. Our contribution essentially lies in the fact that we disaggregate industries into market segments and use these segments rather than countries, industries, cities, or regions as levels of aggregation within which legitimation and competition operate, and as potential boundaries to the density effect.

In a nutshell, we argue for a 'local density dependence' where density effects are localized among firms that have similar resource dependencies, i.e., firms inhabiting the same segment and hence proximate in resource space. We also propose ways in which legitimation and competition processes work at the segment level; we hypothesize that these processes are particularly strong among firms which have similar identities, e.g., among foreign firms.

We test this idea of local density dependence by analyzing the entry rates of foreign firms into various segments of the US automobile market, and the effect of densities of foreign and US incumbents in those segments on these entry rates. Our results show that segment density (the count of car lines in a market segment) has stronger effects on entry rates than national-industry density (the corresponding count at the national industry level). We consider this supportive of our notion of density effects bounded by similar resource dependencies of firms (Hypothesis 1a and 1b). However, in a subsequent specification of the model where the density of foreign incumbents in the segment is included (i.e. model 4), this variable is highly significant while segment density loses significance. Given that our dependent variable is the entry rates of foreign firms into the US automobile market, we interpret this as support for our notion that even within market segments, the density effect is stronger among firms with similar identities (hypothesis 2).

It is interesting to know which of the two forces – legitimation and competition - account for the localized density effect. One way to do this is by comparing the ratios of estimated coefficients of variables defined at various levels of analysis (see Lomi, 1995). In model 3, the ratio of the first order terms of industry density and segment density is close to one (1.13). This indicates just a slight difference in the main effect between segment and national specifications of density. On the quadratic term though, the

coefficient in the segment specification (segment density squared) is about five times stronger than that at the industry level (industry density squared). Hence, is seems that the differences between density effects at local and non-local levels is more dominated by the second order (competition) than by the first order (legitimation) effect. Similar results emerge when we look at ratios of main and quadratic terms of industry and segment-foreign density variables as well. The key point in this discussion is that, in line with what Hannan & Carroll (1992:146) argue, the observed stronger density effect at local levels of aggregation appears to be due mainly to stronger competition rather than stronger legitimation.

Theoretical and empirical progress on the level of analysis problem is important in order to push the frontiers of density dependence research. An inappropriate choice of highly aggregated levels of analysis can lead to specification errors (Lomi, 1995). First, if entry rates do vary across lower levels such as regions and segments, aggregating across these levels will hide this variation. The dependent variable will be specified at the wrong level. Second, if entry rates vary with region-specific or segment-specific characteristics, studies at country or industry levels of analyses, by ignoring region and segment-specific covariates, could be prone to specification error (Baum & Amburgey, 2002; Lomi, 1995). Some scholars also think the use of different levels of analysis could explain inconsistent results in density dependence research on foundings and mortality. For example, Carroll & Wade (1991: 272) suggest that: "…founding processes may be more localized. Potential entrepreneurs, while responding to density at the national level, may be even more sensitive to local density. Conversely, the effects of competition and legitimation on organizational mortality may be greater at the national level". We believe that our study, focusing on the market segment, informs the level of analysis issue in density dependence research.

Our paper provides significant insights to international business research as well. International business researchers studying entry into foreign markets have looked at the distribution of foreign entries along a number of dimensions. Scholars have looked at how foreign entries are distributed across various entry modes such as joint venture, wholly owned affiliate, acquisition and greenfield (e.g. Hennart, 1991, Barkema & Vermeulen, 1998). Others have examined the variation in plant location both across potential host countries (Henisz & Delios, 2001) and within a single host country (Chung & Alcacer, 2002). Ours is, to the best of our knowledge, the first paper to focus on how foreign entries are distributed across market segments in a given host country market, and to empirically examine some antecedents of this distribution.

Our study also adds to the growing number of studies that apply organizational ecology ideas to international business issues (Miller & Eden, 2006; Kuilman & Li, 2006; Li, Yang & Yue, 2007; Hannan, 1997: Hannan et.al, 1995; Yie & Makino, 2002).

CHAPTER 5

CONCLUSION

This dissertation addresses important questions about the scope of the firm. Specifically, it studies the determinants and growth of the scope of foreign firms in a host country market. I examine two different strategic decisions that affect this scope: the first is the choice between contractual and equity governance modes in strategic alliances with domestic firms, and the second, the decision of which product segments to enter in the host market. When a firm chooses an equity alliance over a contractual one, it essentially broadens the range of activities it performs in-house, as opposed to externally. And by deciding to enter yet another market segment, a firm is essentially expanding its product-market scope.

The first essay looks at the choice between contractual and equity forms of governance in technology transfer alliances between foreign and local firms in India, and how the technology capability of the local Indian partner influences this choice. The second examines the determinants of the decisions made by foreign firms to enter specific market segments of the US automobile industry. Here I explore the role of the local environment – e.g., the presence of incumbents in the segment and the barriers to entry into the segment, the extent of multi-market competition the firm faces in the segment, and other factors. The third essay looks at aggregate entry rates of foreign firms into various market segments of the US auto industry, again emphasizing the influence of various types of incumbents in the market segment.

5.1 MAIN FINDINGS AND CONTRIBUTIONS

The broader theoretical issue addressed in the first paper is that of the role of firm capabilities in determining the boundaries of the firm. Transaction cost theory, using the

transaction as level of analysis, addresses the question of how a given transaction *i* should be organized. Given that firms engaged in the transaction vary in capabilities, this question needs to be rephrased as "how should firm *j*, given its capabilities, organize transaction *i*?" (Williamson, 1999). The paper takes a first cut at this by exploring how the technology capability of the recipient influences the transaction costs incurred, and thereby, the boundaries of the foreign firm.

The key argument in the paper is that the level of contractual hazards in technology alliances, mainly due to information asymmetry and to the risk of misappropriation, depend at least partly on the technology capabilities of the recipient Indian firm. We argue that when the Indian recipient exhibits low levels of technology assimilation capability, the foreign firm needs to transfer to it not only the core technology but also the supporting skills necessary to implement the transferred technology. The predominantly tacit and complex nature of these skills leads to information asymmetry problems, and hence these skills are best transferred through an equity joint venture. At higher levels of recipient technology assimilation capability, there is less of an information asymmetry problem, but greater appropriation concerns, i.e. concerns that the technologically capable recipient may misappropriate the technology. To resolve these potential appropriation concerns, the contractual hazard mitigating features of equity governance become necessary. Hence, we expect a U-shaped effect of recipient technology capability on the choice of equity governance in the alliance, with the likelihood of equity form of governance being the highest at both lower and upper ranges of the technology capability of the recipient firm.

Our findings, based on a survey of 126 alliances between foreign and local firms in India, reveal new insights. We do find a significant effect of the recipient's technology assimilation capability. However, contrary to our expectations, we find only a negative

relationship between the technology assimilation capability of the Indian recipient and the choice of equity governance. In our sample, it appears that information costs are more relevant determinants than appropriation concerns. The appropriation concerns that are supposed to push firms towards equity joint ventures at higher levels of recipient assimilation capability do not seem to apply in our case, probably because foreign firms do not see local firms from developing countries as capable of harmful misappropriation and hence as credible threats. Based on this finding, we propose that the relevant sources of contractual hazards in technology transactions are context dependent. If the relevant sources of transaction costs vary from setting to setting, then conceptions of transaction costs being solely a function of appropriability hazards (e.g., Sampson, 2004) have limited generalizability.

The key conceptual contribution in chapter 3 lies in the application of various theoretical perspectives to the market segment level. By adopting different perspectives to examine decisions of foreign firms on whether or not to enter a given segment in a given year, this paper opens up a new and interesting level of analysis – the firm-segment level –, and explores whether and how organizational theory can be brought to predict firm behavior at this level.

Our contribution is to use multiple theoretical perspectives to predict entry into segments. Most of these perspectives have not been employed at the market-segment level of analysis. Each perspective holds specific assumptions about managerial action and decision-making, and differs from the others in predictive content.

The third essay addresses research in population ecology. There is still no consensus in that literature about the appropriate level at which the two central processes of legitimation and competition play out, and hence about the appropriate levels of analysis at which density dependence must be studied (Singh, 1993; Hannan & Carroll,

1992: Ch.7). Originally theorists were interested in the temporal evolution of populations and paid little attention to spatial boundaries. They implicitly assumed that legitimation and competition operated at the level of a national industry. Recent evidence, however, suggests that the density effect is strongest at lower levels of aggregation such as that of regions, states, and cities (Carroll & Wade, 1991), suggesting that populations and density processes are more geographically localized (Cattani et.al., 2003; Greve, 2002, Lomi, 1995). While this is indeed welcome progress, most of these studies have looked at density effects in geographic space. In this essay, we seek to expand this research by examining whether density effects are also localized in resource space. The contribution essentially lies in the fact that we use market segments, rather than cities, states and regions, and firm identities (i.e., foreign vis-à-vis domestic) as levels of aggregation within which legitimation and competition operate, and hence, also as potential boundaries to the density effect.

5.1.2 Legitimation and competition at the market segment level – A discussion

According to density dependence theorists, legitimation and competition processes underlie the link between density and entry rates. At lower levels of segment density, additional entries serve to legitimize the segment and thus attract yet newer entries. This legitimation effect wanes, however, as the number of incumbents in the segment increases. Higher levels of segment density trigger greater competition for resources, and this dissuades new entries into the segment.

Testing in chapter 3 this explanation for entry into segments, I do not find an inverted U, but instead a linear and negative relationship between segment density and the probability of entry. This result is intriguing, as it implies that the predominant determinant of entry is the extent of competition already in the segment and not

legitimation. If legitimation is important there should be a positive effect of density on entry at lower levels of segment density.

However, before completely dismissing the role of legitimation, I retested its effect in chapter 4 by modifying the empirical specification in two ways: first, I used Poisson regression, an econometric model commonly used in density dependence research; second, I split the segment density variable into its foreign and domestic firm components to examine the effect on the entry rates of foreign firms of the density of foreign firms in the segment. Once these adjustments are made, I find a quite strong legitimation effect in chapter 4. In the model 4 where all variables are entered together, I do not get significant results for the segment density variable, but the foreign segment density variable yields the expected inverted U prediction.

If the evidence for legitimation hadn't emerged in chapter 4, we could have more confidently dismissed the role of legitimation. However, since that isn't the case, I can only speculate on why these seemingly contradictory results for density dependence appear in chapters 3 and 4.

The first thing to keep in mind is that while they both explore the effect of density on entry into segments, these two chapters have different empirical designs. On the dependent variable side, chapter 3 examines whether or not a given foreign firm enters a segment in a given year, while chapter 4 looks at aggregate entry rates – counts of foreign entries in a segment in a given year. These different dependent variables suggest different levels of analysis – the firm-segment-year in chapter 3 and the segment-year in chapter 4 – and correspondingly, different econometric models – discrete time logit in chapter 3 and Poisson regression in chapter 4. So essentially, chapter 3 examines the effect of legitimation and competition on an individual firm's behaviour, and chapter 4, on the collective behaviour of firms. There are differences on the right-hand side as well.

In chapter 3, along with a host of fixed effects and control variables, I include measures of multi-market competition and prior entry experience of the firm. Given the different level of analysis in chapter 4, I cannot use these variables.

It is thus difficult to rule out the role of differences in empirical models across both chapters in the dissimilar results I get for density dependence theory. That is, it is hard to tell if the different results are simply an artefact of different empirical specifications or due to more substantive reasons.

With the above caveat, one substantive explanation is that legitimation effects are strongest among firms that share both similar identities as well as resource dependencies, e.g., within sub-populations of foreign firms in the same market segment. At levels of aggregation where firms only share similar demand, such as among firms in the same market segment, competition effects are predominant. This shows in the results of chapters 3 and 4 - in chapter three there is no evidence for the legitimating effect of segment density; in chapter 4, while density of foreign firms is significant, that of both foreign and domestic firms in the segment is not.

5.2 CONCLUSIONS AND FUTURE RESEARCH

There are a couple of ways in which the research reported here can be taken forward.

In chapter 2 we examine the choice between licensing and joint venture as modes of governing strategic alliances. However, ours is a cross-sectional study where we look at the choices firms make at a single point in time. An interesting avenue for future research is to examine how governance forms evolve over time, essentially whether and under what conditions licensing agreements get replaced by joint ventures. With longitudinal data one could also examine if information and appropriation costs become less important once the foreign firm has acquired some experience in the host country.

A second way to build on the results presented here is to look at the performance implications of choosing licensing over joint venture or vice-versa. From a transaction cost point of view, making the right governance choice should result in superior performance. One could examine whether making the transaction cost-efficient choice does indeed lead to superior alliance performance.

It is possible that our results in chapters 3 and 4 are specific to the specific industry and observation window we have chosen. Future research could also seek to replicate our study in other empirical contexts. Future research could increase the generalizability of our results by studying segment entries in other industries, and by using different time periods. One promising avenue for theoretical development is to tease out specific conditions under which one perspective will have stronger effects or predictability relative to the others. A longer panel would also allow us to examine if certain theories predict relatively better during specific stages in the growth of the industry. This would help us better understand some of the boundaries within which each of the relevant perspectives operates.

SAMMENVATTING

SUMMARY IN DUTCH

Deze dissertatie bestaat uit drie studies die elk de expansie van buitenlandse bedrijven naar nieuwe markten en de daarop volgende evolutie van deze expansies onderzoeken. De leidraad die door deze drie studies loopt, is de focus op de wijdte van de activiteiten van het buitenlandse bedrijf in het gastland en op hoe de wijdte van de activiteiten wordt bepaald door lokale bedrijven en de omgeving. Ik bestudeer zowel de breedte van de activiteiten van het buitenlandse bedrijf in termen van haar economische grenzen – wat het bedrijf zelf produceert en wat het koopt – als in termen van de produktmarkt positionering van het bedrijf – de produktsegmenten die het bedrijf bezet in het gastland.

In het bijzonder bestudeer ik twee verschillende strategische beslissing die bedrijven moeten maken wanneer ze een nieuw land betreden. De eerste beslissing is de keuze tussen contractuele en hiërarchische governance-vormen in strategische allianties, en de tweede beslissing heeft betrekking op welk marktsegment het bedrijf betreedt in het gastland. Beide strategische keuzes beïnvloeden de grenzen van het bedrijf. Door het verkiezen van een equity joint venture boven een licentiecontract vergroot een bedrijf haar grenzen. Het vergroot namelijk het spectrum van activiteiten dat binnenshuis, in tegenstelling tot extern, wordt uitgevoerd. En door de beslissing om nog een ander marktsegment te betreden, vergroot een bedrijf haar produktmarktwijdte. In de drie studies in deze dissertatie onderzoek ik hoe lokale bedrijven of de lokale omgeving in het gastland deze beslissingen beïnvloeden.

De eerste studie kijkt naar de keuze tussen contractuele en hiërarchische governance-vormen in allianties die technologie overhevelen tussen de buitenlandse

partner en de lokale partner in India, en naar hoe het technologische vermogen van de lokale Indiase partner deze keuze beïnvloedt. De tweede studie bestudeert of en waarom een buitenlands bedrijf een bepaald marktsegment in de Amerikaanse automobiel industrie betreedt. Hier onderzoek ik de rol van de lokale omgeving zoals de aanwezigheid van andere bedrijven, barrières om het segment te betreden, de omvang van "multi-market" competitie waarmee een bedrijf wordt geconfronteerd, enzovoorts. In een derde studie, waarin ik weer de invloed van het reeds aanwezige aantal verschillende bedrijven in het segment benadruk, kijk ik naar geaggregeerde toetredingsratio's van buitenlandse bedrijven in de Amerikaanse automobiel industrie.

Soms moeten bedrijven samenwerken met lokale bedrijven door allianties te vormen wanneer ze een nieuwe markt betreden. Hoewel dat duidelijk is, weten we relatief weinig over welke governance-vormen zulke allianties zouden moeten aannemen. De literatuur met betrekking tot alliantie-governance (e.g., Oxley 1997; 1999; Pisano 1989), focust zich vooral vanuit een transactiekosten perspectief op factoren op het niveau van de alliantie zelf, zoals de functionele en geografische wijdte van de alliantie, maar informeert ons nauwelijks over hoe de capaciteiten van een bedrijf de governance keuze beïnvloeden. Mijn eerste studie probeert deze lancune te vullen door, controlerend voor de karakteristieken van de technologie die gedeeld wordt, het effect van technologische capaciteiten van het lokale bedrijf op de keuze tussen contractuele (een licentiecontract) en hiërarchische (een equity joint venture) governance-vormen te onderzoeken. Ik argumenteer dat de informatie- en toeëigeningskosten die hand in hand gaan met technologische transacties afhangen van zowel de karakteristieken van de te overdragen kennis en de opnamecapacititeit voor technologie van het ontvangende bedrijf. Ik test mijn hypotheses gebruikmakend van data die verkregen zijn door middel van een enquête die uitgevoerd is bij 126 allianties tussen buitenlandse en lokale Indiase

bedrijven, en vind dat wanneer de opnamecapacititeit voor technologie van de lokale Indiase bedrijven laag is de alliantie gestuctureerd wordt als een equity joint venture in plaats van een contractuele joint venture. Dit is, mijns inziens, het geval omdat de zwakke capaciteiten van de Indiase partner het noodzakelijk maakt voor de buitenlandse partner om ondersteunende vaardigheden over te brengen zodat de Indiase partner de essentiële technologie kan absorberen. Omdat de meeste van deze vaardigheden impliciet zijn, wordt de overdracht middels een contractuele oplossing bemoeilijkt door informatieproblemen welke opportunistisch gedrag verminderende eigenschappen van equity governance-vormen onontbeerlijk maken.

De tweede studie bestudeert de wijdte van de activiteiten van het buitenlandse bedrijf in de produktmarkt van het gastland. Produktmarkten zijn zelden homogeen en bestaan meestal uit verschillende segmenten waarin de kopers gelijkaardige smaken en voorkeuren hebben. De wijdte van de activiteiten van het buitenlandse bedrijf in de produktmarkt van het gastland op elk gegeven moment bestaat uit de opeenvolgende beslissingen die het heeft gemaakt in het verleden met betrekking tot het al dan wel of niet betreden van een bepaald marktsegment. De overige omstandigheden gelijkblijvend, hoe groter het aantal segmenten een bedrijf verkiest te betreden, hoe wijder de activiteiten van het bedrijf. Deze studie onderzoekt de determinanten van zulke beslissingen om een marktsegment te betreden. Gebruikmakend van respectievelijk de strategisch management, strategisch momentum, populatie ecologie en industriële organisatie perspectieven, voorspel ik dat de kans dat een buitenlands bedrijf een bepaald segment betreedt in een bepaald jaar afhangt van de omvang van “multi-market” competitie met concurrenten, de voorafgaande ervaring in dat bepaald segment en het aantal actieve bedrijven in dat segment – met andere woorden, de dichtheid van dat segment. Ik test deze hypotheses gebruikmakend van data over de toetreding in

marktsegmenten van buitenlandse bedrijven in de Amerikaanse automobiel industrie gedurende bijna twee decennia (1986-2003). De analyse van de data geeft aan dat al de bovenvermelde factoren van belang zijn. Multi-market competitie en de voorafgaande toetredingen van bedrijf in een segment hebben een non-monotonische invloed. Meer specifiek, een voorafgaande toetreding heeft een positief maar afnemend effect op de kans dat een bedrijf een bepaald segment betreedt terwijl multi-market competitie een omgekeerd U-vormig effect heeft waarbij de kans tot toetreding eerst toeneemt maar na een bepaald punt afneemt. Het aantal actieve bedrijven in dat bepaald segment of de dichtheid van dat segment vermindert de kans dat een bedrijf ertoe toetreedt. Deze resultaten stemmen overeen met de voorspellingen die voortkomen uit de multi-market competitie, strategisch momentum, en spatiale competitie perspectieven. Ik vind echter enkel beperkt bewijs voor het populatie ecologie perspectief wat een omgekeerd U-vormig effect van segment dichtheid voorspelt.

Het beperkte bewijs voor het populatie ecologie perspectief is intrigerend. Daarom, onderzoek ik dit verder in mijn derde studie. Ik gebruik een alternatieve econometrische specificatie die vaak gebruikt wordt in populatie ecologie studies die naar de oprichting van bedrijven kijken, en belangrijker, die de grenzen van het dichtheidseffect bestuderen. Traditioneel gezien hebben "density-dependence" onderzoekers verondersteld dat het proces van legitimatie en competitie, welke de belangrijkste determinanten zijn van het density-dependence effect, spelen op het niveau van de gehele populatie. Recente studies zijn echter begonnen met het benadrukken dat er ruimtelijke heterogeniteit bestaat in populaties en hebben gesuggereerd dat het effect speelt op het niveau van nationale sub-eenheden, zoals regio's and steden (Cattani et.al, 2003; Lomi, 1995; Carroll & Wade, 1991). Ik bouw voort op deze recent contributies en benadruk twee alternatieve niveaus van aggregatie die functioneren als een beperking op

het effect van legitimatie en competitie, en daardoor ook op het density-dependence effect. Allereerst kunnen industrieën opgedeeld worden in segmenten, die overeenkomen met homogene vormen van vraag. Ik argumenteer dat het density-dependence effect sterker is op het niveau van segmenten dan op het niveau van industrieën, dus tussen bedrijven die afhankelijk zijn van gelijkaardige kopers. Ten tweede stel ik voor dat het dichtheidseffect alle bedrijven niet op eenzelfde manier beïnvloedt maar dat de bedrijven die een gelijkaardige identiteit hebben sterker beïnvloed worden. En gegeven dat buitenlandse bedrijven gelijkaardige identiteiten hebben ten opzichte van lokale bedrijven, zullen de density-dependence effecten sterker zijn in de sub-populatie van buitenlandse bedrijven dan tussen buitenlandse en lokale bedrijven. De resultaten die ik verkregen heb door het analyseren van data over de toetredingsratio's van buitenlandse bedrijven in de automobiel industrie in de Verenigde Staten bevestigen mijn hypotheses.

REFERENCES

Agresti, A. 1996. ***An introduction to categorical data analysis***: John Wiley.

Aiken, L. S., & West, S. G. 1991. ***Multiple regression: Testing and interpreting interactions***. Newbury Park: CA: Sage Publications.

Allison, P.A. 1984. ***Event History Analysis: Regression for Longitudinal Data***. Beverly Hills, CA: Sage

Amburgey, T. L., & Miner, A. S. 1992. Strategic Momentum: The Effects of Repetitive, Positional, and Contextual Momentum on Merger Activity. ***Strategic Management Journal***, 13(5): 335-348.

Amburgey, T. L., & Rao, H. 1996. Organizational ecology: Past, present, and future directions. ***Academy of Management Journal***, 39(5): 1265-1286.

Argote, L. 1999. ***Organizational learning: Creating, retaining and transferring knowledge***. Hingham, MA: Kluwer Academic Publishing

Arora, A., & Fosfuri, A. 2000. Wholly owned subsidiary versus technology licensing in the worldwide chemical industry. ***Journal of International Business Studies***, 31(4): 555-572.

Arora, A., Fosfuri, A., & Gambardella, A. 2001a. Markets for technology and their implications for corporate strategy. ***Industrial and Corporate Change***, 10(2): 419-451.

Arora, A., Fosfuri,A., & Gambardella, A. 2001b. ***Markets for technology: the economics of innovation and corporate strategy***. Cambridge, MA: MIT Press

Arrow, K. 1962. Economic welfare and the allocation of resources for invention. In K. Arrow (ed) ***The rate and direction of economic activity***. Princeton: Princeton University Press.

Arrow, K. 1974. ***Essays in the theory of risk bearing.*** Amsterdam: North-Holland Publishing

Arrow, K. 1984. ***The economics of information***. Oxford: Basil Blackwell Ltd

Bain, J.S. 1956. ***Barriers to new competition***. Cambridge, MA: Harvard University Press

Baranson, J. 1969. ***Industrial technologies for developing economies***. New York: Praeger.

Barkema, H. G. & Vermeulen, F. 1998. International expansion through start-up or acquisition: A learning perspective. ***Academy of Management Journal***, 41(1): 7-26.

Barnett, W. P. & Amburgey, T. 1990. Do larger organizations generate stronger competition? In J. Singh (Ed.), ***Organizational evolution: New directions***: 78-102. Newbury Park, CA: Sage.

Baum, J. A. C. & Amburgey, T. 2002. Organizational ecology. In J. A. C. Baum (Ed.), ***The blackwell companion to organizations***: 304-326. Oxford, U.K: Blackwell.

Baum, J. A. C. & Haveman, H. A. 1997. Love thy neighbor? Differentiation and agglomeration in the Manhattan hotel industry, 1898-1990. ***Administrative Science Quarterly***, 42(2): 304-338.

Baum, J. A. C. & Korn, H. J. 1996. Competitive dynamics of interfirm rivalry. ***Academy of Management Journal***, 39(2): 255-291.

Baum, J. A. C. & Mezias, S. J. 1992. Localized competition and organizational failure in the manhattan hotel industry, 1898-1990. ***Administrative Science Quarterly***, 37(4): 580-604

Baum, J. A. C. & Singh, J. V. 1994a. Organizational niche overlap and the dynamics of organizational mortality. ***American Journal of Sociology***, 100: 346-380.

Baum, J. A. C. & Singh, J. V. 1994b. Organizational niches and the dynamics of organizational founding. ***Organization Science***, 5(4): 483-501.

Blau, P.M. 1977. ***Inequality and Heterogeneity***. NY: Free Press

Blomstrom, M & Zejan, M. 1989. ***Why do multinational firms seek out joint ventures?*** Mimeo. Stockholm School of Economics

Boeker, W.P., Goodstein, J., Stephan, J., & Murmann, J.P. 1997. Competition in a multimarket environment. ***Organization Science***. 8: 126-142

Cameron, A. & Trivedi, P. 1986. Econometric models based on count data: Comparisons and applications of some estimators and tests. ***Journal of Applied Econometrics***, 1: 29-53.

Carroll, G. R. & Wade, J. 1991. Density dependence in the organizational evolution of the American Brewing industry across different levels of analysis. ***Academy of Management Journal***, 20: 271-302.

Carroll, G. R., Dobrev, S. D., & Swaminathan, A. 2002. Organizational processes of resource partitioning. In B.M.Staw & R.M.Kramer (Eds.), ***Research in organizational behavior: An annual series of analytical essays and critical reviews research in organizational behavior***, Vol. 24: 1-40: Elsevier Science/JAI Press.

Cattani, G., Pennings, J. M., & Wezel, F. C. 2003. Spatial and temporal heterogeneity in founding patterns. ***Organization Science***, 14(6): 670-685.

Caves, R. E., & Porter, M. 1977. From entry barriers to mobility barriers: Conjectural decisions and contrived deterrence to new competition. ***Quarterly Journal of Economics***, 91(2): 241-262.

Caves, R., Crookel, H. & Killing, P. 1983. The imperfect market for technology licenses. ***Oxford Bulletin of Economics and Statistics***, 45 (August): 249-267

Chung, W., & Alcacer, J. 2002. Knowledge seeking and location choice of foreign direct investment in the United States. ***Management Science***, 48(12): 1534-1554.

Cohen, W., R. Nelson, & J. Walsh .1997. ***Appropriability conditions and why firms patent and why they do not in the U.S manufacturing sector***. Working paper, Carnegie Mellon University

Colombo, M. G. 2003. Alliance form: A test of the contractual and competence perspectives. ***Strategic Management Journal***, 24: 1209-29.

Covello, M. 2002. ***Standard Catalogue of Imported Cars*** (second ed.), Iola, WI: Krause

Cyert, R.M & March, J.G. 1963. ***A Behavioral Theory of the Firm***. Englewood Cliffs, NJ: Prentice-Hall

Davidson, W.H., & McFetridge, D. G. 1984. International technology transactions and the theory of the firm. ***Journal of Industrial Economics***, 32(3): 253-264

Davidson, W.H., & McFetridge, D. G. 1985. Key characteristics in the choice of international technology transfer mode. ***Journal of International Business Studies***, 16(summer): 5-21

Davies, Howard .1977. Technology transfer through commercial transactions. ***Journal of Industrial Economics***, 26 (2): 161-175

Delacroix, J & Carroll, G. 1983. Organizational foundings - An ecological study of the newspaper industries of Argentina and Ireland, ***Administrative Science Quarterly*** 28 (2): 274-291

Delios, A., & Henisz, W. J. 2003. Political hazards, experience, and sequential entry strategies: The international expansion of Japanese firms, 1980-1998. ***Strategic Management Journal***, 24(11): 1153-1164.

Dixit, A.1980. The role of investment in entry deterrence. ***The Economic Journal.*** 90:95-106

Dobrev, S., Kim, T-Y., Hannan, M.T. 2001. Dynamics of niche width and resource portioning. ***American Journal of Sociology***. 106: 1299-1337

Fundenberg, D & Tirole, J. 1984. The fat-cat effect, the puppy-dog ploy, and the lean and hungry look. ***American Economic Association Papers and Proceedings***. 74(2): 361-366

Gimeno, J., & Jeong, E. 2001. Multimarket contact: Meaning and measurement at multiple levels of analysis, ***Multiunit Organization and Multimarket Strategy***, Vol. 18: 357-408.

Gimeno, J., & Woo, C. Y. 1999. Multimarket contact, economies of scope, and firm performance. ***Academy of Management Journal***, 42(3): 239-259.

Greve, H. R. 2000. Market niche entry decisions: Competition, learning, and strategy in Tokyo banking, 1894-1936. ***Academy of Management Journal***, 43(5): 816-836.

Greve, H. R. 2002. An ecological theory of spatial evolution: Local density dependence in Tokyo banking, 1894-1936. ***Social Forces,*** **80**(3): 847-879.

Gulati, R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. ***Academy of Management Journal***, 38(1): 85-112.

Gulati, R., & Singh,H. 1998. The architecture of cooperation: Managing coordination costs and appropriation concerns in strategic alliances. ***Administrative Science Quarterly***, 43(4): 781-814.

Gunnell, J. 2002. ***Standard Catalogue of American Cars*** (fourth ed.), Iola, WI: Krause

Hagedoorn, J., & Sedaitis, J.B. 1998. Partnerships in transition economies: international strategic technology alliances in Russia. ***Research Policy***, 27:177-185

Haleblian, J., Kim, J-Y., Rajagopalan, N. 2006. The influence of acquisition experience and performance on acquisition behavior: Evidence from the U.S Commercial banking industry. ***Academy of Management Journal***, 49(2):357-370

Hannan, M. T. 1986. Competitive and institutional processes in organizational ecology, Technical Report 86-13: Cornell University, Department of Sociology, Ithaca, NY.

Hannan, M. T., & Freeman, J. 1977. The population ecology of organizations. ***American Journal of Sociology***, 82(5): 929-964.

Hannan, M. T., & Freeman, J. 1989. ***Organizational Ecology***. MA: Harvard University Press.

Hannan, M. T., Dundon, E. A., Carroll, G. R., & Torres, J. C. 1995. Organizational evolution in a multinational context - entries of automobile manufacturers in Belgium, Britain, France, Germany, and Italy. ***American Sociological Review***, 60(4): 509-528.

Hannan, M.T. & Carroll, G. 1992. ***Dynamics of Organizational Populations: Density, Legitimation and competition***. New York: Oxford University Press.

Hannan, M.T. 1997. Inertia, density and the structure of organizational populations: Entries in European automobile industries, 1886-1981. ***Organization Studies***. 18 (2): 193-228

Haveman, H. A. 1993. Follow the leader: Mimetic isomorphism and entry into new markets. ***Administrative Science Quarterly***, 38(4): 593-627.

Haveman, H. A., & Nonnemaker, L. 2000. Competition in multiple geographic markets: The impact on growth and market entry. ***Administrative Science Quarterly***, 45(2): 232-267.

Henisz, W. J. & Delios, A. 2001. Uncertainty, imitation, and plant location: Japanese multinational corporations, 1990-1996. ***Administrative Science Quarterly***, 46(3): 443-475.

Hennart, J-F. 1982. ***A Theory of Multinational Enterprise***. Ann Arbor: University of Michigan Press

Hennart, J-F. 1988. A transaction cost theory of equity joint venture. ***Strategic Management Journal***, 9: 361-374.

Hennart, J-F. 1989. Can the new forms of investment substitute for the old forms? A transaction costs perspective. ***Journal of International Business Studies***. 20: (2) 211-233.

Hennart, J-F. 1991. The transaction costs theory of joint ventures: an empirical study of Japanese subsidiaries in the United States. ***Management Science***, 37(4): 483-497

Hennart, J-F. 1993. Explaining the swollen middle: Why most transactions are a mix of market and hierarchy. ***Organization Science***, 4(4): 529-547

Hennart, J-F. 2000. Transaction costs theory and the multinational enterprise. In C. Pitelis and R. Sugden, (Eds.), ***The Nature of the Transnational Firm***, 2nd edition. London: Routledge

Hennart, J-F. & Park, Y.-R. 1993. Greenfield vs Acquisition: The strategy of Japanese investors in the United States. ***Management Science***, 39(9): 1054-1069.

Hennart, J-F. & Park, Y. R. 1994. Location, Governance, and Strategic Determinants of Japanese Manufacturing Investment in the United-States. ***Strategic Management Journal***, 15(6): 419-436.

Hill, C.W.L., Hwang, P., & Kim, C. 1990. An eclectic theory of the choice of international entry mode. ***Strategic Management Journal***, 11 (February): 117-128

Hotelling, H. 1929. Stability in competition. ***Economic Journal***. 39: 41-57

Jaffe, A.B. 1989. Characterizing the technological position of firms with application to quantifying technological opportunity and research spillovers. ***Research Policy***. 18: 87-97

Johanson, J & Wiedersheim-Paul, F. 1975. The internationalisation of firms – four Swedish case studies, ***Journal of Management Studies***, 12:305-322

Johanson, J & Vahlne, J-E. 1977. The internationalisation process of the firm – a model of knowledge development and increasing foreign market commitments. ***Journal of International Business Studies***, 8: 23-32

Kessides, I.N. 1990. Towards a testable model of entry: A study of the U.S manufacturing industries. ***Economica***. 57: 219-238

Killing, Peter. 1980. Technology acquisition: license agreement or joint venture. ***Columbia Journal of World Business***, Fall 1980: 38 – 46

Knickerbocker, F. T. 1973. ***Oligopolistic reaction and the multinational enterprise***. Cambridge, MA: Harvard University Press.

Kogut, B. & Singh, H. 1988. The effect of national culture on the choice of entry mode. ***Journal of International Business Studies***, 19 (3): 411-432

Kogut, B. & Zander, U. 1993. Knowledge of the firm and the evolutionary theory of the multinational corporation. ***Journal of International Business Studies***, 24 (4): 625-645

Kuilman, J & J-T Li. 2006. The organizers' ecology: An empirical study of foreign banks in Shanghai. ***Organization Science***. 17 (3): 385-401

Levin, R.C., Klevorick, A. K., Nelson, R.R & Winter, S.G. 1987. Appropriating the returns from industrial R&D. ***Brookings papers on economic activity***, 14: 551-561

Levitt, B., & March, J. G. 1988. Organizational Learning. ***Annual Review of Sociology***, 14: 319-340.

Li, J., Yang, J. Y., & Yue, D. R. 2007. Identity, community and audience: How wholly owned foreign subsidiaries gain legitimacy in China. ***Academy of Management Journal.*** 50 (1):

Lomi, A. 1995. The Population Ecology of Organizational Founding - Location Dependence and Unobserved Heterogeneity. ***Administrative Science Quarterly***, 40(1): 111-144.

Long, J.S. 1997. ***Regression models for categorical and limited dependent variables***. Thousand oaks, CA: Sage Macmillan

Madhok, A. 1996. The organization of economic activity: Transaction costs, firm capabilities, and the nature of governance. ***Organization Science***, 7(5): 577-590

Martin, X. & Mitchell, W. 1998. The influence of local search and performance heuristics on new design introduction in a new product market. ***Research Policy***, 26: 753-771

Martin, X., & Park, N.K. 2004. Bounded momentum in the formation of strategies: the case of alliances. *Working paper*

Martin, X., & Salomon, R. 2003. Knowledge transfer capacity and its implications for the theory of the multinational corporation. ***Journal of International Business Studies***, 34(4): 356-73.

Martin, X., & Salomon, R. 2003. Tacitness, learning and international expansion: A study of foreign direct investment in a knowledge-intensive industry. ***Organization Science***, 14(3): 297-311.

McPherson, J. M. 1983. An ecology of affiliation. ***American Sociological Review***, 48: 519-535

Meyer, J.W & Rowan, B. 1977. Institutionalized organizations: Formal structure as myth and ceremony. ***American Journal of Sociology,.*** 83: 340-363

Meyer, Klaus. E. 2001. Institutions, transaction costs and entry mode choice in Eastern Europe. ***Journal of International Business Studies***, 32(2): 357-367

Miller, S. R., & Eden, L. 2006. Local density and foreign subsidiary performance. ***Academy of Management Journal***, 49(2): 341-355

Morrison .1974. Discriminant Analysis. In R.Feber (ed) ***Handbook of marketing research.*** NY: Wiley, 2442-2457

Mowery, D., Oxley,J., & Silvermann, B. 1998. Technological overlap and inter-firm co-operation: Implications for the resource based view of the firm. ***Research Policy,*** 27(5): 507-523

Olson, M. 1965. ***The logic of collective action***. Cambridge, USA: Harvard University Press

Osborn, R.N., & Baughn, C. 1990. Forms of interorganizational governance for multinational alliances. ***Academy of Management Journal***, 33(3): 503-19.

Oxley, J.E. 1997. Appropriability hazards and governance in strategic alliances: a transaction cost approach. ***Journal of Law Economics and Organization***, 13(2):387-409.

Oxley, J.E. 1999. Institutional environment and the mechanisms of governance: the impact of intellectual property protection on the structure of inter-firm alliances. ***Journal of Economic Behavior and Organization***, 38(3): 283-309.

Pangarkar, N., & Klein, S. 2001. The impacts of alliance purpose and partner similarity on alliance governance. ***British Journal of Management,*** 12: 341-353

Pisano, G.P. 1989. Using equity to support exchange: evidence from the biotechnology industry. ***Journal of Law, Economics and Organization***, 5(1): 109-126

Porac, J., & Thomas, H. 1990. Taxonomic mental models in competitor definition. ***Academy of Management Review***, 15(2); 224-240

Prescott, E.C. & Visscher, M. 1977. Sequential location among firms with foresight. ***The Bell Journal of Economics***. 8(2):378-393

Reich, R.B., & Mankin, E.D. 1986. Joint ventures with Japan give away our future. ***Harvard Business Review***. March / April: 78-86

Sampson, R. 2004. Organizational choice in R&D alliances: Knowledge based and transaction cost perspectives. ***Managerial and Decision Economics***, 25: 421- 436

Schmalensee, R. 1978. A model of advertising and product quality. ***Journal of Political Economy***. 86 (3): 485-503

Shaver, M.L. 2006. Interpreting empirical findings. ***Journal of International Business Studies***, 37(4): 451-452

Shaver, J.M, Mitchell. W, Yeung, B. 1997. The effect of own-firm and other-firm experience on foreign direct investment survival in the United States, 1987-92. ***Strategic Management Journal*** 18 (10): 811-824

Singh, J. V. 1993. Review essay: Density dependence theory - Current issues, future promise. ***American Journal of Sociology***, 99(2): 464-473.

Spence, M.A. 1977. Entry, capacity, investment and oligopolistic pricing. ***Bell Journal of Economics***. 8(2): 534-544

Stavins, J. 1995. Model entry and exit in a differentiated product industry: The personal computer market. ***The Review of Economics and Statistics***. 77(4): 571-584

Stephan, J., & Boeker, W. 2001. Getting to multimarket competition: How multimarket contact affects firms' market entry decisions, ***Multiunit Organization and Multimarket Strategy***, Vol. 18: 229-261.

Szulanski, G. 1996. Exploring internal stickiness: Impediments to the transfer of best practices within the firm. ***Strategic Management Journal***, 17(winter special issue): 27-43.

Teece, D.J. 1977. Technology transfer by multinational firms: The resource cost of transferring technological know-how. ***The Economic Journal***, 87(346): 242-61.

Teece, D.J. 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. ***Research Policy***, 15:285-305

Telesio, P. 1979. ***Technology licensing and multinational enterprises***. New York: Praeger

Tse, D.K., Pan, Y., & Au, K. 1997. How MNCs choose entry modes and form alliances: the China experience. ***Journal of International Business Studies***, 28 (4): 779-805

White, L. J. 1971. ***The automobile industry since 1945***. Cambridge, Massachusetts: Harvard University Press

Williamson, O. E. 1985. ***The economic institutions of capitalism***. New York: Free Press

Williamson, O. E. 1991. Comparative economic organization: The analysis of discrete structural alternatives. ***Administrative Science Quarterly***, 36(2): 269-296

Williamson, O. E. 1999. Strategy research: governance and competence perspectives. ***Strategic Management Journal***, 20: 1087-1108

Yiu, D. & Makino, S. 2002. The choice between joint venture and wholly owned subsidiary: An institutional perspective. ***Organization Science***, 13(6): 667-683.