

COMPETING IN THE LOOKING-GLASS MARKET: IMITATION, RESOURCES, AND CROWDING

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I examine two dominant processes of organizational interdependence—imitation and resource competition—and develop a theory that integrates predictions about firms' propensity to change market locations based on both. The cornerstone of the model is the argument that both processes operate concurrently and are driven by the departure of peer firms from a shared resource space. I also argue that the imitation effect, which reflects shared perceptions and interpretations among ecologically proximate peers, hinges on the competitive intensity faced by each individual organization in its market location. Analyses of U.S. automobile manufacturers' moves between the industry's three main market segments confirm the predictions of the theory and point to the merits of using an ecological approach to the evolution of market segmentation and the formation of industry structure. Copyright © 2007 John Wiley & Sons, Ltd.

INTRODUCTION

Most sociological and management theories consider position in market and social space to be a primary determinant of organizational behavior. Institutional theory, for example, regards the forces exerted by powerful external agents (such as regulators and non-government organizations) as emanating from the position of collective entities in a particular institutional domain (Wade, Swaminathan, and Saxon, 1998; Scott *et al.*, 2000; Drori *et al.*, 2003). Social movement theory posits that the extent of resource mobilization hinges, among other things, on the presence of similar social movement organizations that can add legitimacy to any given repertoire of collective action (Olzak

and Uhrig, 2001; Minkoff, 1999). Network theory considers similarity in position, or structural equivalence, salient for the operation of diffusion processes (Burt, 1987; Bothner, 2004) and alliance formation (Stuart, 2000). In the management literature, research on strategic groups and mobility barriers relies on ideas of location in competitive space to identify factors that influence firm performance (Caves and Porter, 1977; Mascarenhas and Aaker, 1989; Olusoga, Mokwa, and Noble, 1995). Also, organizational ecologists point to the interdependence of organizations located in overlapping resource niches (Freeman and Hannan, 1983; Hannan and Freeman, 1989; Baum and Singh, 1994; Dobrev, Kim, and Hannan, 2001).

There is much less research about how and why organizations change locations collectively and over time and what consequences such transitions bring about for the market or social domain in which they operate. In the ecological paradigm, research on position moves by organizations in a population typically centers on investigating the

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impact of changes in location on firm-level outcomes like survival and adaptability. But the collective transitions of firms in market space also have pronounced consequences for the evolution of market structure, and ultimately, for the social construction of markets. As Stinchcombe (1990: 136) noted, 'socially organized market segments carry different information,' and organizational structures reflect these differences.

The basic argument I advance here builds on the ecological premise that the movement of entities in social space is a collective process driven by similarity in resource dependence (Hawley, 1992: 3). This premise has two important implications. First, investigating the movement dynamic requires the construction of origin and destination states based on distribution of resources along the lines that distinguish groups of entities with shared resource dependence. Second, the ecological proximity among resource-sharing organizations provides the basis for social reference. Similarity in position leads to the evolution of shared perceptions that may evolve into collective identities, which in turn define cognitive boundaries around specific market locations (i.e., resource niches). So, from an ecological perspective, resources and cognition are the two key operative conditions that drive the propensity of firms to choose positions in the market. And since both resources and cognition are shared among ecologically proximate peers, positioning among organizations in a population and any change in their location are fundamentally a collective phenomenon.

Early research in organizational ecology articulated the causal primacy of environmental resources on which organizations depend over other strategic choices made by organizations in positioning themselves in order to secure those resources (Hannan and Freeman, 1977, 1989). More recently, advances in ecological theory sought to develop the theory of cognitive legitimation by emphasizing the key role of organizational identities (Polos, Hannan, and Carroll, 2002) and the formation of cognitive schemas (Hsu and Hannan, 2005).

With theoretical notions of resources and identities well developed, a step forward would be to integrate these ideas and investigate how the resource and cognitive dimensions interrelate and impact each other. For example, although most ecological theories (e.g., resource partitioning)

assume an uneven (typically unimodal) distribution of resources within a population niche, arguments of emerging collective identities implicitly attribute a single identity to an entire organizational population (e.g., density dependence theory). However, if external resources on which organizations depend have precedence and guide the construction of shared cognitive maps, and if resources in a population are unevenly distributed, then shared perceptions among ecologically proximate organizations emerge at the level of within-population niches, distinguished on the basis of resource clusters. If this premise is correct, what needs to be studied is the collective movement of firms between different resource niches within a population. This impels the use of the sociological concept of a resource niche to define market segments differentiated based on level and type of resources available (Swaminathan, 1998; Dobrev and Kim, 2006).

I study firms' transitions between segments but focus only on the collective nature of the process by which firms abandon their positions. My theoretical predictions about the likelihood of firms to leave their market segment as a function of collective identities and shared resources rest on arguments from two well-received organization theories: imitation and resource competition. Of course, imitation may involve not only contagion in exit behavior but also in adoption of new positions. I do not theorize about this process here because it seems logical that the decision to abandon current position precedes that of choosing a destination state, and there is no solid reason to necessarily tie the two processes together (at least theoretically). Moreover, evaluating the appeal of destination states in modeling position moves is complicated by considerations of organizational misalignments related to the process effect of the transition. That is, the transition between market states increases selection pressures, which not only elevate failure chances (in which case a firm may not reach its destination state), but may also produce outcomes only loosely or not at all related to the original intent. Even if adaptation attempts are survived, they may result from transitions to states that are different from the ones initially aspired.

So, focusing only on market segment exits by firms, I develop arguments that integrate seemingly opposite predictions based on theories of imitation and resource crowding. I also surmise that the effects of these forces on the likelihood of

position moves are modified by the competitive intensity faced by each individual organization. In the complete model, actions by organizations leading to position moves in market space produce shifts in the boundaries of each market segment and its collective identity. This, in turn, incites further positional search by organizations. In this cyclical pattern, firms' trajectories both shape and are shaped by the market reality they collectively constitute. In the next section, I briefly summarize the historical evidence pointing to the formation and persistence of categorical distinctions along the lines of market segment boundaries in the U.S. automobile industry, the empirical context in which I test my theory.

THEORY AND HYPOTHESES

Market segmentation in the U.S. automobile industry

Here, I investigate the movement dynamics of automobile firms in the U.S. industry by examining position moves within an organizational population over its entire history. In a production market, resource niches within a population reflect product categories, so I study transitions between market segments defined along product clusters in technology space. For conceptualization of market segments, I rely on arguments that link ecological and institutional accounts. From ecology, I borrow the notion that shared reliance on resources determines proximity in sociodemographic space (Hannan and Freeman, 1977; McPherson, 1983). I rely on institutional theory for the argument that collective identities develop among actors in socially proximate positions (DiMaggio, 1988; North, 1990; Rao, Davis, and Ward, 2000). This conceptualization of market segments accords with earlier studies demonstrating that firms tend to identify their peers along product categories (Porac *et al.*, 1995) and generally define the market based on their subjective perceptions and evaluations of relevant peers (White, 1981).

In some industries, collective identities based on product segments are strong enough to form sharp boundaries and eventually lead to the social codification of these identities into novel organizational forms (Carroll and Hannan, 2000: 59–81). This has been the case with the U.S. beer-brewing industry, where distinctions between macro- and

micro-brewing techniques reflect not merely a difference in production methods, but opposing ideologies as well (Carroll and Swaminathan, 2000). These distinctions have been sharp enough to preclude position moves between segments or to sanction them strictly when they occur. In other industries, such as the automobile market, collective identities never reached a point at which they were associated with punitive codes. Consequently, movement between industry segments has been and still is frequent (as with Daimler-Benz's recent retreat from the market center by way of its sale of the Chrysler subsidiary, or with Ford's intended retreat from the luxury market through the sale of its Volvo subsidiary¹).

The conception of the U.S. automobile market as comprising three main product technology segments—a market center eclipsed by economy car and luxury/sports car segments—is supported by extensive accounts of industry historians (Rae, 1965; Carson, 1976; Abernathy, 1978; Abernathy, Clark, and Kantrow, 1983; Flink, 1988; Womack, Jones, and Roos, 1990). This vast literature also provides direct evidence of the collective identities that developed among producers located in each segment. In large part, segment-level identities evolved as a result of competition between segments for the largest possible amount of existing industry resources. For example, the industry began with proliferation of producers in the upper segment that served affluent customers able to afford a luxurious product like the early automobile. Another cluster of firms occupied the low-end periphery and offered affordable 'buggy' style cars based on the surrey design (Rae, 1965).

Perhaps the clearest example of market segment identities is found in the institution-building efforts of industry incumbents. Predictably, organizational proliferation in the luxury segment influenced the early perception of the automobile as a luxury product and a 'pleasure vehicle' (*Horseless Age*, 1903). This perception persisted for the entire history of the luxury segment even though it did not always serve the interest of manufacturers positioned in it. For example, in the 1930s, luxury cars were stoned as their owners drove past breadlines. This spontaneous expression of social discontent

¹ In its 16 July 2007 issue, *The Wall Street Journal* interpreted Ford's impending sale of its Volvo unit as 'the abandonment of Ford's move into the lucrative luxury-car market.'

in large part precipitated the eventual demise of the luxury car segment (Flink, 1988: 218).

The first trade association in the industry, the Association of Licensed Automobile Manufacturers (ALAM), was established in 1903 in the heyday of the luxury segment. Its function was to protect the interests of firms in this segment by exercising patent rights with obscure validity that were nevertheless used to limit competition from manufacturers in the lower segments. The reaction from the small car manufacturers ('the independents,' as they referred to themselves) operating in the low-end segment arrived without much delay, and in 1905 the independents organized in the American Motor Car Manufacturers' Association (AMCMA). The fact that producers within each segment identified with each other is revealed by the AMCMA chairman's remarks directed explicitly at competitors in the other segments: 'We, manufacturers on an independent basis, have simply decided to take the bull by the horns and cooperate for mutual benefit' (cited in Flink, 1988: 54). Initial clustering of producers in the upper and lower periphery also precipitated the organization of their customers in separate representative entities—the Automobile Club of America emerged as an organization 'of the motoring elite,' while economy-car consumers were 'represented ... by local clubs of the American Automobile Association' (Flink, 1988: 27).

As the automobile market began to swiftly consolidate in the 1930s, identities shifted accordingly, reflecting the substantial turnover that each segment experienced. The resulting oligopoly in the market center came to be associated with coordinated efforts to influence public policy, examples of which are the joined efforts by the Big Three to battle import tariffs and emissions regulations (Adams and Brock, 1995). During the mature stages of the industry, the low-end segment came to be associated with hobbyists who experimented with electric car production. The association between such manufacturers was initially based on common interest in a specific technology with potentially unrealized potential. As the number of these tiny manufacturers grew in the 1970s, their collective actions drew the government's attention 'and that triggered the availability of official funding for electric vehicle programmes' (Westbrook, 2001: 25). Ironically, the rising success of the electric car producers—their ability to

be noticed by powerful constituents and to procure additional funds—also drew the interest of dominant competitors and eventually dissipated the 'different technology' frame of reference that linked these highly specialized entrants. Subsequently, as the Big Three increased their efforts in developing electric vehicles, manufacturers in the lower periphery redefined themselves as categorically different, not with reference to technology, but by espousing an ideology emphasizing environmental concern and social responsibility.² At the same time, a major reason for the eventual demise of firms in the lower segment has been their inability to establish a consistent image—firms in this segment have often branded their products as a crossover of all-terrain vehicles, mobility vehicles, light tractors, and golf carts.

Overall, the history of the automobile industry clearly suggests the presence of market segments associated with different resource levels and distinct cognitive categories, even though the boundaries between these segments have been fluid and have varied continuously over time. As Fairén explains:

Traditionally, the automobile market has been divided in segments ... the traditional segmentation still conditions most manufacturers marketing policy and the way the average consumer views the market. Therefore, it is in their context where the effect of imitation and competition is actually relevant. (Fairén, 1996: 146)

The marketing policy of every manufacturer continues to reflect its segment position—a fact that is understood as an attempt to preserve the resources shared by proximately positioned peers. Clearly not an example of altruistic tendencies, these marketing efforts simply reflect the fact that firms' individual identities mirror the broader identity associated with product categories (Laufer and Paradeise, 1990). The point that this historical summary helps to make is that from the early beginnings of the industry producers' choice of location in market segments—local ecologies demarcating resource clusters within the population's niche—not only defined their resource base but also their reference set of peers and competitors. In the backdrop of this historical observation,

² The laconic tagline appearing on the web site of one current electric car producer is illustrative: 'as green (and clean) as it gets' (Gorilla Vehicles company: www.gorillavehicles.com).

I will next develop arguments about the effects of interorganizational imitation and competitive resource crowding on firms' likelihood to desert their market segment.

Imitation, shared position, and collective identities

The origins of the conjecture that social actors develop a collective identity based on the immediate context in which they exist date back at least to Cooley's (1919/1909) 'primary group' and Mead's (1962/1934) 'generalized other.' These ideas have been influential in sociological inquiry and have led to formulating important constructs like 'the reference group' (Hyman, 1959) and 'the social frame of reference' (Merton and Rossi, 1968/1949). Although this is rarely acknowledged, these ideas bear a strong ecological component because the formation of a constitutive category emerges from cognitive processes of observation and interpretation at the level of a reference group—that is, a collective of actors who are related by way of proximity in sociodemographic space. This ecological proximity is what allows interaction to be *symbolic* and not necessarily vested in tangible forms of social exchange. Applied to organizational analysis, the notion that perceptions of social actors tend to reflect the ways in which they are perceived by others purports a metaphor of a *looking-glass* market (Cooley, 1967/1902), constructed through processes of sense-making and reflective interpretations by firms within a reference group.

Ideas about observation and interpretation within a set of proximate peers in market space are also central to White's (2001) model, where firms determine their trajectories (i.e., strategies) and trial-and-error searches (i.e., position moves) by observing the behavior of their peers. They operate by gathering information made available on a market that resembles a looking glass—a one-way mirror that 'shows [the producer] the reflection of its comparable peers' but not of its customers (White, 2001: 34). Firms' apparently deliberate choices are in fact largely shaped by how they interpret their strategies and positions in reference to those with whom they compete. In this way, 'producers are not just embedded in a market . . . they actually constitute the market's inference in, and as the set of, their perceptions and choices' (White, 2001: 8). It is in this context that processes

of imitation and resource competition interact to shape the dynamics of change in market position.

Building on the legacy of symbolic interactionists, institutional theorists have elucidated an array of *normative* systems that define institutional environments (Powell and DiMaggio, 1991). Mimetic isomorphism, for example, results from the pressures for conformity exerted by institutionalized and legitimized myths of rationality (Meyer and Rowan, 1977). Organizations imitate in pursuit of legitimized, taken-for-granted practices that have been adopted by many other organizations (Tolbert and Zucker, 1983; DiMaggio and Powell, 1983). Or, firms mimic peers who possess high status (Fombrun and Shanley, 1990) and leadership positions (Haveman, 1993a; Kraatz, 1995). In what has been termed outcome-based imitation, organizations copy a practice, structure, or behavior that they interpret as successful (Haunschild and Miner, 1997). In short, institutional accounts emphasize normative over purely cognitive frameworks for interpreting imitation and isomorphism among organizations (Scott, 1992).

The literature on interorganizational imitation is rife with hypotheses about what drives mimicry. Institutional theories posit that contagion effects arise because firms experience exogenously generated conformity pressures from their environments or because they strive to attain legitimacy by adopting structures or practices that have previously been implemented by others. Despite voluminous research that offers empirical support for such propositions, theoretical arguments explaining the specific mechanism that triggers imitation have been scant, leading to the inevitable conclusion that 'we know . . . little about why firms imitate other firms' (Haunschild, 1993: 588). At least partly, this inconclusiveness stems from the difficulty of modeling second-order effects without controlling for simpler, baseline predictions that may account for the purported normative effects.

Since there are a lot of competing answers, it is reasonable to begin with a simple prediction of ecological contagion among proximate social actors; the mechanism behind this endogenous process is information exchange through peer observation; the assumption is that ecological proximity in resource space leads to categorical similarity. Normative pressures for conformity aside, firms may imitate their peers simply as a way of interpreting reality and acting in accord with it. In this way, 'guided and confirmed by the signals it reads

from the operations of its peers, each . . . firm can maneuver for position' (White, 2001: 14). Imitation of behavior in organizations can be understood in terms of the way in which organizational decision makers construe other relevant organizations and themselves—as a unitary group bounded by a shared frame of reference that over time may evolve into a collective, socially defined identity. When firms leave one market segment and transition to another, they simultaneously affect the distribution of resources and the cognitive framework that defines the collective identity of all firms in the origin segment (Carroll and Swaminathan, 2000; Rao, Monin, and Durand, 2003). In both outcomes, the departure effect is realized as the number of exiting firms increases.

Observation-driven contagion is perhaps the simplest mechanism behind imitation among ecologically proximate peers with similar resource needs. This is the ecological component of the argument. That these peers also share cognitive frameworks of interpretation constitutes its institutional component. Strang and Meyer (1993) argue that such cognitive processes need not necessarily be a function of direct relations like friendship or exchange as frequently theorized in relational models of imitation (for example, consider the variety of studies that view corporate board interlocks as a source of interfirm mimicry). Instead, actors absorb cues that guide behavior by looking at those whom they perceive to be socially similar. In other words, if there exists a 'cultural understanding that social entities belong to a common social category . . . where actors are seen as falling into the same category, diffusion should be rapid' (Strang and Meyer, 1993: 490). If this premise is correct, the first step in understanding the origin of imitation among market participants should be to define the bases on which the cultural links that connect actors in a category emerge.

From an ecological viewpoint, proximity in position along relevant resource distributions takes precedence. Firms with similar products seek to brand themselves as legitimate to external valuers (like customers, investors, and the like) in a similar way. They lay claims to the use of specific and often scarce resources in a certain fashion and for the outcome most closely tied to what they do. Consequently, variance in the levels and types of resources available leads to the formation of cognitive distinctions germinating cultural categories, and thus sorts out firms by their membership in

these categories. When firms make decisions about future actions (including abandoning their market location), they observe the behavior of other firms and are influenced by it. By this logic, the basic mechanism behind imitation is observation-driven information sharing based on ecological proximity.

If, as surmised above, information exchange does not require tangible ties of social exchange but only ties of observability among socially similar entities with ecologically proximate positions, it is necessary to articulate the mechanisms that make such observation possible along the operative dimension chosen. In my empirical application, this dimension is technology—I approximate market position with position in technology space because it closely maps onto other relevant market dimensions like pricing and marketing strategy, while it also makes it possible to compare firms across disparate historical periods.

Historical evidence from the U.S. automobile industry suggests that information exchange regarding position changes in technological space by automobile firms occurred through three important means. First, the press regularly reported the technological achievements of car manufacturers. As Flink reports, 'virtually no development in automotive technology went unreported in one or another of the engineering journals, bicycle periodicals, automotive trade journals, newspapers and popular magazines of the day' (Flink, 1988: 13–14). Second, the annual automobile exhibitions from the onset of the industry until the present have put on display the latest models in car production—'the annual automobile show became a popular institution in the United States after its inauguration in five American cities in 1900' (Flink, 1988: 30). And third, the large variety of car racing events and long-distance reliability runs served to compare car models of similar type. The results were subsequently propagandized to the press—always eager to cater to a public fascinated by automobility. Of course, each firm's own marketing efforts also sought to expound on the technological features of its products, and this effort predictably centered on getting the attention of the media:

Close cooperation between the press and the automobile industry was established early . . . On May 13, 1897, Pope initiated the custom of the press interview as a part of introducing new automobile models to the public. The press interview was soon institutionalized and became more elaborate.

Manufacturers commonly brought reporters long distances at company expense to be entertained and given a preview of new models. (Flink, 1988: 30)

With information exchange about technological shifts in position facilitated in this manner, I expect that automobile producers changing positions between market segments will exhibit a pattern of ecological contagion based on peer observation.³ In this sense, the term ‘follow the leader’—commonly applied to dynamics of imitation (Haveman, 1993a)—refers not to mimicking the behavior of organizations in leadership positions (i.e., large size or high status), but to noticing and interpreting the observed strategies of peers who engage in a search for something sufficiently different to redefine external expectations associated with their current operation. In the automobile industry, there is ample anecdotal evidence that suggests this to have been the case (*Time*, 1973). Of course, the decision to change position following others was rarely formulated in terms of transitioning between market segments, or formalized in any pragmatic fashion. But technologists, managers, and entrepreneurs often decided to reshuffle their product line based simply on observations that other similar firms were doing the same (Kimes *et al.*, 1996: 1332).

Overall then, I expect that as its peers begin to desert the market segment, a firm positioned in that segment may be prone to follow suit because consistency with the actions of those whose presence defines the firm’s individual identity is its default mode for interpreting reality. I also expect that the imitation effect will be non-monotonic and this expectation is built into the arguments developed above. While it is possible that categorical distinctions become socially legitimated to a point where they reach a taken-for-granted, rule-like standing, I believe that in the majority of cases (including my empirical application) this is not the case. And while *codified* categories are slow to delegitimize and may evoke punitive sanctions for those who straddle across or shift between them (Zuckerman, 1999), simple cultural distinctions that underpin

imitation of position abandonment may be prone to wear off quickly (as with those we typically consider to be driven by *fads* or *spin*). A shared frame of reference may disintegrate if members of the reference set defect in large numbers and subsequent turnover effects dilute the constitutive meaning of the category. The continued withdrawal of organizations from a focal firm’s reference group gradually weakens the collective identity associated with the market segment. So, while increases in the number of departing peers will make a firm more likely to follow suit, as this number continues to increase, a focal firm’s propensity to exit the segment will either reach a threshold and plateau or may eventually decline, reflecting the cognitive shifts or disruptions caused by a sufficiently large number of peer exits.

Position change and resource competition

So far, I have considered imitation as a purely cognitive process where actors look at similar others for cues of behavior. But, the formation of cognitive boundaries and the ensuing processes of social comparison may moderate the imitation effect as similar firms ‘find themselves enmeshed in competitive emulation’ (Strang and Meyer, 1993: 491). Indeed, a broad set of theoretical arguments in industrial economics views competition as the main mechanism behind imitation (Lieberman and Montgomery, 1988; Pepall, 1995; Fairén, 1996). Almost by default, such arguments focus on *destination states* in firms’ transitions (e.g., the practices or technologies that firms copy and adopt rather than the ones they abandon) and employ references to cost-reduction strategies that are argued to allow second movers to minimize exposure to risk and to lower the cost of innovation. An ecological approach can shed light on this reasoning by forcing a consideration of the *origin state* from which such moves occur. Specifically, if we consider a set of proximate social actors at risk of changing position, the issue of the current competitive relationships among these actors becomes highly relevant for explaining competitive considerations in the propensity to imitate. The decision to mimic the exit behavior of peers who presently share resources in a market segment with a firm considered at risk of imitation should be judged against the backdrop of the competitive relief that such a firm would invariably experience once its rivals exit the shared resource space.

³ This contagion effect among firms changing positions has been empirically documented in several studies: California banks’ and loan associations’ entry into new markets (Haveman, 1993a), the expansion of wineries into new territories (Delacroix and Swaminathan, 1991), and radio stations’ transitions to different content formats (Greve, 1995) provide examples of such contagion effects in different market contexts.

According to well-confirmed ecological models (Delacroix and Carroll, 1983; Carroll, 1985), the exit of competitors frees previously occupied resources⁴ that are up for grabs by remaining competitors. This fact alone should deter the sequential departure of remaining firms, who in effect benefit from the unmet demand for the outputs of exiting peers (Delacroix and Carroll, 1983). In organizational ecology, the most systematic approach to investigating the link between shifts in resource levels and organizational choice of market location is Carroll's (1985) resource partitioning model. The theory makes the unorthodox prediction that as large firms are consumed by even larger ones, they are replaced by smaller specialized entrants. Even though consolidation means that some firms get to grow very large, the overall combined area in resource space controlled by such dominant firms decreases somewhat because utilizing all available resources likely leads to diseconomies of scale (Carroll, Dobrev, and Swaminathan, 2002). The resources availed following consolidation provide staying power to firms that get to deploy them so long as they avoid direct competition with dominant scale producers. So, some firms can thrive on unexhausted resource patches that open up once consolidation drives out existing firms in the market center. What is relevant for my argument here is that organizational exits lead to reduced competition and partitioning, which makes the position of incumbents and new entrants alike more viable.

Processes of scale competition, consolidation, and resource partitioning shaped the evolution of the American automobile industry (Dobrev, Kim, and Carroll, 2002; Dobrev and Carroll, 2003). Historical accounts also reveal that at least some of the firms competing for the market center did not necessarily fail directly as a result of scale-based selection. For these firms, the effect of competition was indirect as they resorted to exploration of peripheral market locations and thus became exposed to the perils of inertia-driven selection. Moves in the opposite direction—from the periphery to the center—were also frequent throughout

⁴ Highlighting the parallel to bioecology, the use of the term *resources* in organizational ecology refers not to production inputs as commonly understood in economics but to the set of environmental conditions that allow an organizational population to experience non-negative growth. For business organizations, resources are typically understood as market share or demand since a firm cannot survive unless it can sell its products or services—that is, its customers are its fundamental environmental resource.

the industry's history and were mostly incited by the resource munificence in the center and the according opportunity for growth in scale. In a nutshell, many organizational processes that give rise to transitions between market segments are likely to result in increased resource availability in the defected segments and the alleviation of crowding there, providing an incentive for remaining firms to stay.

In contrast to earlier studies that examine imitation and resource competition as separate dynamics, I consider the two processes as intricately related because they occur simultaneously and are both driven by the exit of a focal firm's peers from a shared resource space. Although both processes unfold at once, the effects they generate on the propensity to move are not even. Low-level increases in the number of exiting peers elicit a strong response among remaining firms. At this level, the imitation effect is strong as shared perceptions of market conditions, including prevalent technologies and resource munificence, trigger collective inferences among remaining firms seeking to reinvent their positions in light of their peers' departures. Importantly, with only a few peer exits occurring, the amount of resources that are freed up is likely modest and not sufficient to counter the contagion effect. So, constitutive processes matter more than potentially incremental gains in market share; and, consequently, the observed outcome is an increased propensity to follow firms leaving the segment.

As the number of exiting peers continues to increase, the propensity to imitate diminishes while the drawing force of resource release intensifies. A rising number of peer departures continuously augments the amount of resources availed to firms remaining in the segment. Accordingly, ecological contagion in position moves out of the segment is subdued while rising levels of resource release improve the appeal of the segment.⁵ So, high-level increases in the number of peer exits mean both weakened contagion and an increased incentive to stay in the segment. In empirical terms, this implies non-monotonic rate dependence; that is, the likelihood that a firm will abandon its market segment is a non-monotonic function of the number of other

⁵ Of course, this argument requires that variation in the absolute level of segment resources is accounted for as I do in my empirical specification.

firms departing the segment and has an inverted U-shape.

Hypothesis 1: Within an industry segment, the propensity of a firm to abandon its segment increases with the initial rise in the number of its peers' departures, but declines as this number continues to increase.

Imitation, resource competition, and organizational niche crowding

In prior studies of position change, researchers have theorized about organizational properties that impact propensity to move. Some analysts have treated imitation as a direct function of organizational demographics like age and size (Delacroix and Swaminathan, 1991; Haveman, 1993b; Dobrev, Kim, and Carroll, 2003), while others have considered their intervening effects on the likelihood to imitate (Greve, 1995). Of course, imitation and resource competition affect all organizations in a market segment, but this effect undoubtedly varies along the lines of organizational-level differences.

Received theory contains a plethora of predictions about organizational properties that can be used to extend the predictions of the imitation–resource release model developed above. Arguments about liability of smallness and scale, of newness and senescence, of inertia and exploration, etc., all likely intervene in shaping a firm's propensity to move positions. But, while integrating such arguments with Hypothesis 1 may help to define scope conditions for the theory, the most crucial contingency—from a theoretical standpoint and given the causal primacy of resources in my model—seems to be the extent of crowding for resources faced by each individual organization. The main reason for this assertion is the important distinction between levels of resources in a market segment and the competition that a firm faces for securing some or all of these resources. After all, it is possible that a firm's position is highly contested even if it operates in a sparsely populated market location with high resource munificence, just as it is possible that a firm enjoys a positional advantage in a tightly packed segment with generally scarce resources. In these two very different cases, the firm's likelihood to change positions as a function of imitation will differ accordingly. Perhaps more importantly, my central thesis here is that a

model that *integrates* cognitive and resource-based arguments can produce new insights. If cognition leads to imitation and if resource abundance determines intensity of competition, the theoretically interesting prediction should go beyond their direct effects on position moves (as per Hypothesis 1) and also explain how these two forces *interact* to shape a firm's likelihood to move. Specifically, it is important to look at how the competitive crowding experienced by a firm weakens inferences of peer-related categorical similarity that propel imitation. In this way, crowding exerts a second-order effect on a firm's chances of exiting the market segment.

Earlier studies of position moves by organizations show convincingly that processes of mutualism and competition among ecologically proximate entities exert powerful forces on their chances of transitioning to a new location (Haveman, 1993a; Baum and Singh, 1996; Dobrev *et al.*, 2001; Dobrev and Kim, 2006). Research in this direction provides strong empirical support for the finding that mutualistic interdependence pulls organizations to remain in their current location, while competitive intensity strongly increases their chances of changing positions. The competitive effect arises from crowding in the firm's resource niche and is a function of the number of other firms whose niches overlap at least partly with that of the focal firm—a case of high firm niche overlap density. Substantively, the crowding effect on position moves is explained by the purposive (if often misguided) attempt of organizational leaders to search for a less contested sector of the resource space. In this way, the movement of firms in market space leads to increasing population heterogeneity and territorial differentiation, consistent with arguments dating back to Hawley (1950: 203), Park (1936: 10), and Durkheim (1893/1984: 217).

What are the implications of crowding-induced propensity to move for imitation of exits by segment peers? If a firm has greater chances of leaving its segment as a function of crowding in its niche, then it is also less constrained by a collective frame of reference. That is, if a firm is seeking relief from intense resource rivalry, its search for an alternate location outside its segment is preceded by a decoupling of individual and collective identities. Social actors are less likely to derive similarity inferences from those whom they are trying to evade. As per Hypothesis 1, the initial rise in peer exits triggers a response

based on collective inference. But, for firms disengaged from the peer category, this response is subdued and reflected in their position choices. In such cases—when stiffened competition precipitates a mismatch between socially conferred interpretive schemas and a firm's own vision of stated goals and *raison d'être*—ecological contagion is less likely to occur.⁶ That is, a firm's propensity to imitate proximate peers declines with the crowding of its niche because heightened rivalry creates tension between (and eventually disjoins) its peer-based and self-defined identities. It follows:

Hypothesis 2: Within an industry segment, as the number of firms overlapping its market position increases, the higher likelihood of a firm moving to a different market segment due to peer departures decreases.

DATA AND METHODS

I use a dataset constructed from reports of automobile historians and collectors, which includes entries for all automobile producers ever known to operate in the United States from the dawn of the industry in 1885 until 1981.⁷ The end of the observation period reflects the last year covered in the most comprehensive data source, a multi-volume encyclopedic book that provides thorough authoritative coverage: *The Standard Catalog of American Cars* (Flamang, 1989; Kimes and Clark, 1989; Gunnell, Schrimpf, and Buttolph, 1992; Kimes *et al.*, 1996; Kowalke, 1997). Supplementary information for recent periods was also obtained from Kutner (1974) and *Automotive News* (1993). The collection effort revealed an abundance of producers, many of whom were small, short-lived, and obscure firms that introduced highly novel automobile designs and production schemes. The data include information on the range of products (i.e., automobiles) built by each firm in each year of its existence. Coding the size of the engine used in each car model offered by each firm makes it possible to compute a measure of the product technology space in which each

firm operates. When this measure is aggregated across all producers in the industry, it generates a time-varying measure of the technological bounds of the entire market space.

Delineating the boundaries of the market space

My empirical analysis models the movement of automobile firms between market segments. To define market boundaries, I use a technological dimension calculated on the basis of examining the scope of engine horsepower in car models offered by each firm for each year of its tenure in the automobile industry. So, the measure of the market space is continuous, based on the aggregate range of technologies offered annually by all existing producers. As noted above, to determine the structure of market segments, I followed many historical and industry accounts that contain notions of categorical distinctions between market niches. Based on this review, I divided the market space into three segments: low periphery (economy cars), market center (passenger sedans), and high periphery (luxury and sports cars).⁸ My goal was to map as accurately as possible these widely perceived categorical distinctions in technology space so I could compute position measures. The most important decision rule relates to establishing the boundaries of the market center, the area where production carries the greatest appeal to the 'average' consumer and offers the highest potential for large scale.

The challenge is to define the market center in a way that allows for this segment to reflect the area where resources are most abundant, but also to allow it to develop 'naturally' over time as the industry evolves and becomes concentrated. Given the dominant evolutionary trend of concentration in the U.S. automobile industry, and the rise to dominance of a few large organizations, I follow

⁶ Incidentally, it may be precisely under circumstances in which constitutive associations based on ecological proximity are broken (like intense resource competition) that normative processes leading to outcome-based imitation become salient.

⁷ See Hannan *et al.* (1998) for extensive description of the data.

⁸ The dataset does not include Japanese or other foreign manufacturers because production in the United States by an international automaker began in 1982, a year after our data window closes. (In 1982 Honda rolled out the first vehicles built in its Marysville, Ohio plant). Most of the cars manufactured in Japan and sold in the United States prior to 1982 were marketed under the brands of American producers. This was the case with Isuzu, which began manufacturing the Opal for General Motors in 1976, and Mitsubishi, which started producing the Dodge Colt for Chrysler in 1971. The data also do not include information on U.S. manufacturers' production of trucks and vans because I consider these products to fall in the domain of an entirely different industry, consistent with all available accounts by historians, publicists, and industry analysts.

the logic of the C4 concentration measure (the proportion of total industry output produced by the four largest firms) to define the boundaries of the market center. This approach is desirable, given previous empirical investigations of the U.S. automobile industry which show that C4 is a powerful explanatory covariate that not only directly affects industry dynamics, but also modifies the effects of many other important effects (Dobrev *et al.*, 2002). Moreover, the C4 measure has an advantage over other concentration measures (e.g., the Herfindal index) because it directly applies to concentration in the market center while allowing peripheral segments to develop independently and to operate under different competitive structures.

The definition of market center uses the niches of the four largest firms in the industry each year. Based on this approach, the center segment lies between the mean of the lower niche bounds of the four largest firms and the mean of the upper niche bounds of these firms. I define the two peripheral market segments as the area surrounding the center. The low periphery comprises the area between the low end of the market and the low end of the market center, and the high periphery falls within the high end of the market center and the high end of the market. This definition allows the market segments to vary by year and also relaxes the assumption that peripheral segments necessarily must exist throughout the entire industry evolution.

To illustrate how the measure works, consider the 21 firms that existed in 1950. These firms produced models ranging from 6 to 165 horsepower, the endpoints that marked the boundaries of the market space for that year, as defined by our measure. The largest four firms during that year—GM, Ford, Chrysler, and Studebaker—had technological niches ranging from 90, 95, 97, and 60 on the low end to 160, 152, 135, and 118 on the high end, respectively. So, the mean of the lower niche bounds of these firms was 85.5, and the mean of their higher niche bounds was 141.25—the endpoints of the market center in 1950. Accordingly, in 1950, the low periphery extended from 6 to 85.5, and the high periphery lay between 141.25 and 165.

Figure 1 plots the historical densities and the number of firm exits out of the three industry segments. How does the pattern revealed by the figures match the historical evidence? Quite well, as it turns out. For example, as noted above, the industry began with the clustering of producers

in the two peripheral segments, while the market center did not fulfill its long-anticipated promise until volume production was first achieved by Olds circa 1904 (Flink, 1988: 31–32). Accordingly, the figures reveal that at the turn of the twentieth century density in the low-end and the high-end segment greatly surpassed the number of firms in the center. Once assembly-line mass production revealed the enormous advantages of scale in the industry (Ford's legendary Model T appeared in 1908), the pattern reversed and density in the center far outweighed density in either periphery. The ensuing consolidation of the center segment is reflected in the gradual decline in number of producers positioned there in the 1920s and 1930s, while Figure 1(a, c) reveals a much sharper drop in the densities of firms in the two peripheries. Further, the two spurs in density in the low-end segment around 1950 and in the late 1970s reflect the entry of small specialized firms mostly devoted to production of electric vehicles. By contrast, the steep density decline in the high periphery proved relatively permanent, consistent with industry accounts that consider '1933 as marking the end of the true luxury car market in the United States' (Flink, 1988: 218; see also Carson, 1976: 48–52).

Defining the outcome space and the risk set

Each firm's position in a segment is calculated based on the midpoint of the firm's niche and which segment it falls into in any given year. Change in market segment position is measured by an indicator variable that marks up observations in which a firm's mid-niche falls in different market segments between two consecutive years *and* in which that firm's niche midpoint changes between two consecutive years. Defined this way, the measure ensures that a firm itself must change its niche for a segment move to be observed and eliminates events where a firm's position change between market segments is solely a function of shifts in market segment boundaries.

One implication of delineating market segmentation based on a conception of a market center defined by the niches of the four largest competitors is that in years when four or fewer firms existed, it is implausible to consider these firms at risk of leaving the central segment. So, I excluded years in which total population density was lower than five. This eliminated the first decade of the industry's history and reduced the data range to the

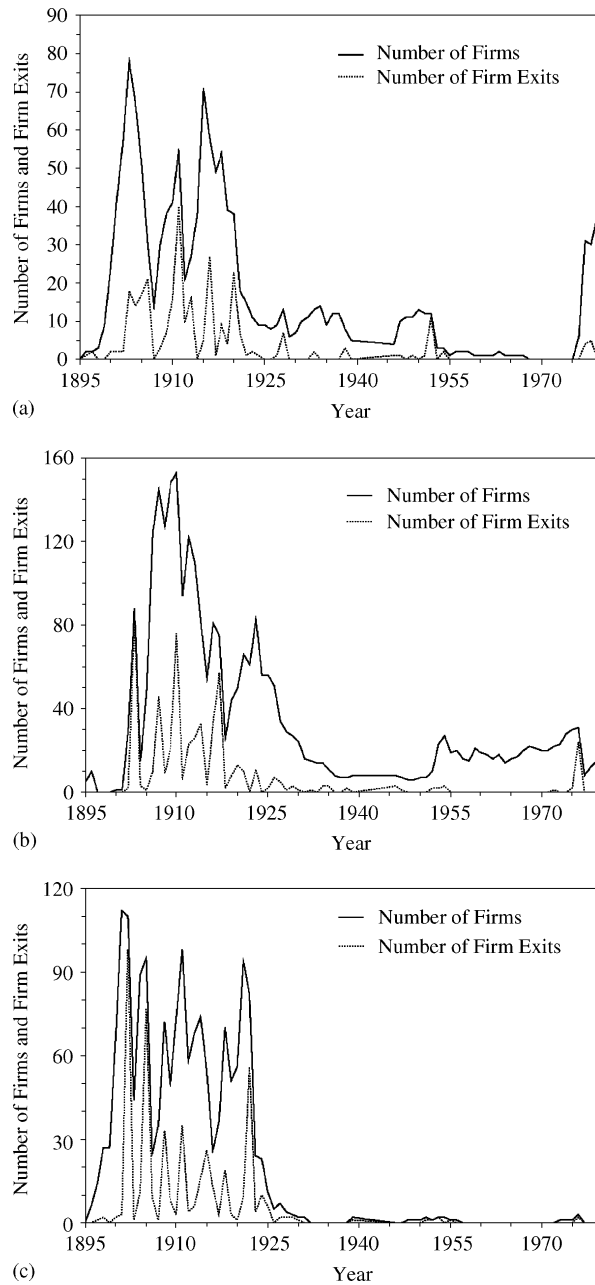


Figure 1. (a) Number of firms and firm exits from the low-periphery segment of the U.S. automobile industry. (b) Number of firms and firm exits from the market-center segment of the U.S. automobile industry. (c) Number of firms and firm exits from the high-periphery segment of the U.S. automobile industry

period 1895–1981. This data-trimming decision is also justified from a historical perspective because it is unrealistic to speak of market segmentation in the very early years of the industry when commercial activity was practically nonexistent and production was entirely confined to experimentation.

Covariates

The main explanatory covariate, *number of departing peers* (NDP), counts the number of firms exiting a particular market segment in any given year. To measure the extent of competitive intensity experienced by the firm, I measure *firm niche*

overlap density (FNO) as the count of firms whose niches overlap at least partly with the niche of a focal firm. At the firm level, controls include the firm's *tenure in the industry* (u) and its *tenure in the market segment* (μ), both of which are continuous clock-type measures. The market segment clock is reset each time a firm moves to a different market segment. An indicator variable marks up whether the firm has changed position between segments before (*prior move*) and controls for occurrence dependence, capability differences, and learning effects among organizations. To account for the scale-based nature of competition in the automobile industry, I measure *relative size* as the ratio of each firm's annual production to the annual production of the largest firm in the industry. *Firm niche width* (FNW) is defined as the range of engine capacity in horsepower across all models the firm produces in any given year (a realized niche).⁹

To control for effects associated with the external context, I include measures at the level of the market segment, the industry/population, and the economy. Four variables control for the differences between market segments across time and space. The measure of *segment resources* (SR) aggregates the total production output of firms operating in each segment each year. *Segment niche width* (SNW) is analogous to firm niche width and refers to the area in technological space defined by segment boundaries. *Segment density* counts the number of firms in a particular segment. To get at the difference between the resource-rich market center and the two peripheries, I control whether the firm's position is in the *market center segment* (MCS).

Controls at the industry/population level include *market concentration*, defined as the ratio of the annual production of the four largest firms to total industry output (C4), a measure of the market center segment's niche width to that of the entire population (*center proportion*), years of *economic depression*, the level of the *gross national product* (GNP) adjusted for inflation (taken from Madison, 1991), and three *industry regimes* (Mass Production, Product Differentiation, JIT/TQC) as defined by Womack *et al.* (1990). In accord with earlier analyses of the U.S. automobile data, I exclude

the years of the Second World War because automobile production for commercial purposes was minimized for the duration of the war. All independent variables in the event-history file are lagged by one observation period and descriptive statistics are presented in Table 1. Following convention, this is a 'split-spell' file which permits updating of the time-varying covariates by artificially censoring the spells each year.¹⁰

Model specification and estimation

I use event history analysis to model the transition rate between segments (r_i) as a repeatable event with organizational failure events treated as right-censored cases. I estimate the hazard as a function of tenure in the industry (u); industry age (t); a vector of organization and segment level control variables (s'_{iu}) including relative size, prior move, origin segment, segment tenure, firm niche width, segment niche width, segment resources, and segment density; and a vector of population/industry level control variables (x'_i) including center proportion, C4, GNP, depression year, and industry regimes. The functions for assessing the arguments made in the hypotheses relate to the effects of the number of departing peers (linear and squared terms) and its interaction with firm niche overlap, denoted by $\Psi(\cdot)$.

I modeled variation in industry tenure (u) as a stochastic piecewise-exponential function where the breakpoints for the pieces are denoted as $0.5 \leq \tau_1 \leq \tau_2 \leq \dots \leq \tau_p$. With the assumption that $\tau_{p+1} = \infty$ there are P periods: $I_p = \{u | \tau_p \leq u \leq \tau_{p+1}\}$, $p = 1, \dots, P$. Based on distribution of events and estimates from exploratory analyses, I split the duration scale into five pieces along the following breakpoints in years: 1, 3, 7, 15. The

¹⁰ Because the data on industry entry and exit dates for some firms are only specific to the year, each firm's first year in the industry is divided into two half-year spells. This makes it possible to include firms that entered and exited the industry in the same calendar year and whose tenure is assumed (following Petersen's, 1991, recommendation) to be 6 months. This specific analysis, however, models the effect of origin market segment characteristics on the likelihood to move positions. Consequently, I excluded from the risk set all firms during the first one-half year of their industry tenure (i.e., their first observation spell in the data). *De novo* firms (new industry entrants or new foundations) 'arrive' in a new market segment but do not have an associated origin segment, and so their rate of transition cannot be specified as a function of the explanatory covariates. The dataset used in the analysis presented here consists of 6,688 firm-year spells representative of the life histories of 1,482 firms.

⁹ Consistent with Dobrev, Kim, and Carroll (2002), I added 0.01 to each firm's niche to avoid having to speak of zero niche width.

Table 1. Descriptive statistics for variables in the life-history spell file

Variable	Min.	Max.	Mean	S.D.
Industry tenure	0.5	78	6.43	10.05
Depression year	0	1	0.17	0.38
GNP	55.9	977.1	211.01	228.79
Mass production	0	1	0.93	0.26
Production differentiation	0	1	0.15	0.36
JIT/TQC	0	1	0.09	0.29
Segment tenure	0.5	54	3.02	5.03
Prior moves	0	1	0.44	0.50
Market center segment (MCS)	0	1	0.46	0.50
Concentration (C4)	0.31	1	0.66	0.21
MCS • C4	0	1	0.32	0.37
Center proportion	0	0.87	0.22	0.16
Relative size • 10 ²	0	100	3.35	13.77
Segment niche width • 10 ⁻² (SNW)	0	3.60	0.47	0.68
Segment resources • 10 ⁻⁶ (SR)	0	9.68	1.02	2.21
Firm niche width +0.01 (FNW)	0.01	552.01	14.93	35.48
Firm niche overlap • 10 ⁻² (FNO)	0	3.62	0.84	0.83
Segment density • 10 ⁻²	0.01	1.70	0.73	0.46
Number of departures by peers (NDP)	0	98	10.58	16.78
NDP ² • 10 ⁻²	0	96.04	3.94	12.22
NDP • FNO	0	309.68	12.33	27.87

complete model has the form:

$$r_i(u, t) = \exp(m_p) \exp(s'_{iu} \alpha + \mathbf{x}'_i \pi) \cdot \Psi(\text{NDP}_{iu}, \text{NDP}_{iu}^2, \text{FNO}_{iu}), u \in I_p.$$

Here m_p denotes a set of industry tenure-specific effects and the log-linear link imposes the constraint that the baseline hazards be non-negative. To confirm hypotheses, I expect to find: $\psi_1 \text{NDP}_{iu} > 0$, $\psi_2 \text{NDP}_{iu}^2 < 0$, $\psi_3(\text{NDP}_{iu} \cdot \text{FNO}_{iu}) < 0$. Consistent with earlier analyses of these data that show FNO to directly increase organizational failure chances (Dobrev *et al.*, 2002), I model the likelihood of position move out of the segment and the likelihood of organizational failure as competing risks by using the maximum likelihood functions implemented in TDA 5.7 (Rohwer, 1994; Blossfeld and Rohwer, 1995).

FINDINGS

The results from the transition-rate analysis appear in Table 2, which presents three nested models. The baseline *Model a* includes only a linear term for the effect of peer exits on the transition rate. Compared with a model without the peer exit covariate, model fit improves significantly ($\Delta \text{LL} = 35.2$; $\Delta \text{d.f.} = 1$; $p < 0.05$). This monotonic specification yields a negative effect, probably because it conflates the imitation with the resource competition effects. These effects are parsed out by including the squared term of peer exits in *Model b* and it significantly improves model fit ($\Delta \text{LL} = 31.4$; $\Delta \text{d.f.} = 1$; $p < 0.05$). The estimates now reveal the non-monotonic pattern predicted by Hypothesis 1. I proposed that the effect of departing peers on the focal firm's likelihood of leaving the segment would increase at first but eventually will reverse direction, reflecting changes in intensity of competition weakened by defecting competitors. This prediction receives strong support from the estimates—the first-order effect of the number of departing peers is positive and the squared term is negative. Importantly, the effect of the squared term is larger than the effect of the linear term. This indicates that increases across high counts of peer exits make the firm less likely to leave the segment than if no peer exits occur, consistent with the logic of shifting identities and resource release arguments.

I also argued that the imitation effect will be weaker for firms in tightly packed niches. Since imitation and resource release operate at once, this proposition implies that the resource release effect will dominate the imitation effect even at low-level increases in peer exits. Thus, a firm's likelihood to imitate peer exits should decrease as crowding in its niche increases. This proposition, developed in Hypothesis 2, is tested by adding an interaction term between number of peer departures and firm niche overlap density in *Model c*. The estimated effect is negative and significant, yielding support for the hypothesis and improving model fit substantially over *Model b* ($\Delta \text{LL} = 15.0$; $\Delta \text{d.f.} = 1$; $p < 0.05$).

To ease interpretation of the results, I plotted the combined effects across the full range of the data in Figure 2. The figure reveals that, absent competitive crowding in the firm's niche, the non-monotonic effect of departing peers has an inflection point (the point at which the effect changes

Table 2. Effects of covariates on the rate of market segment transition of U.S. automobile manufacturers

	Model a	Model b	Model c
<i>Industry tenure (u)</i>			
0.5 ≤ u < 1	-1.77* (-5.38)	-1.63* (-4.94)	-1.91* (-5.62)
1 ≤ u < 3	-3.01* (-8.96)	-2.84* (-8.47)	-3.13* (-9.03)
3 ≤ u < 7	-2.56* (-7.28)	-2.44* (-6.95)	-2.71* (-7.51)
7 ≤ u < 15	-2.40* (-6.45)	-2.29* (-6.19)	-2.57* (-6.76)
u ≥ 15	-2.51* (-6.31)	-2.34* (-5.88)	-2.62* (-6.44)
Depression year	-0.33* (-3.57)	-0.31* (-3.37)	-0.25* (-2.68)
GNP	-0.01* (-4.36)	-0.01* (-4.36)	-0.01* (-4.10)
Mass production	2.11* (8.85)	1.96* (8.16)	1.97* (8.16)
Production differentiation	1.44* (3.72)	1.59* (4.03)	1.61* (4.01)
JIT/TQC	3.07* (4.97)	3.11* (4.97)	2.97* (4.69)
Segment tenure	-0.01 (-0.96)	-0.02 (-1.20)	-0.02 (-1.06)
Prior moves	0.17† (1.88)	0.20* (2.19)	0.19* (2.03)
Market center segment (MCS)	-0.55* (-2.22)	-0.52* (-2.03)	-0.56* (-2.20)
Concentration (C4)	0.13 (0.37)	-0.07 (-0.19)	-0.01 (-0.02)
Market center segment • C4	1.15* (2.81)	1.06* (2.55)	1.11* (2.69)
Center proportion	-2.27* (-5.34)	-2.12* (-4.94)	-1.93* (-4.47)
Relative size	-0.01† (-1.90)	-0.01† (-1.74)	-0.01† (-1.73)
Segment niche width (SNW)	-0.04 (-0.33)	-0.04 (-0.38)	-0.07 (-0.72)
Segment resources • 10 ⁻⁶ (SR)	-0.20* (-4.52)	-0.19* (-4.23)	-0.18* (-4.17)
Firm niche width (FNW)	-0.01* (-2.13)	-0.01* (-2.17)	-0.01* (-2.19)
Firm niche overlap density • 10 ⁻² (FNO)	0.48* (9.07)	0.47* (8.95)	0.61* (9.62)
Segment Density • 10 ⁻² (SN)	-0.53* (-5.04)	-0.58* (-5.49)	-0.54* (-5.04)
Number of departures by peers (NDP)	-0.01* (5.51)	0.02* (2.91)	0.03* (4.36)
NDP ² • 10 ⁻²		-0.05* (-4.93)	-0.04* (-4.38)
NDP • FNO			-0.01* (-3.87)
Log-likelihood/d.f.	-5364.3/23	-5348.6/24	-5341.1/25
LR test/Δ d.f.	35.2/1	31.4/1	15.0/1

* Significant at the 0.05 level; † significant at the 0.10 level; two-tailed tests. Numbers in parentheses are *t*-statistics; number of spells: 6,688; number of transitions: 1,143; number of firms: 1,482.

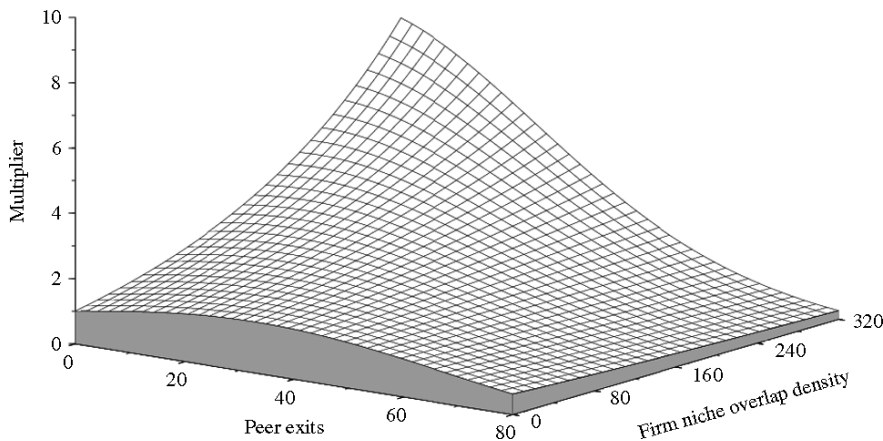


Figure 2. Number of peer exits by firm niche overlap effect on the rate of market segment transition

from positive to negative) of about 30. As the firm’s niche becomes more packed, the inflection point gradually decreases in value until eventually the effect becomes entirely negative. That is, a firm

located in a highly contested part of the market segment becomes less likely to leave its segment due to increasing number of peer departures. This effect is independent of the baseline effect of firm

niche overlap density, which greatly increases a firm's propensity to change position across market segments, consistent with earlier theory and findings.

Most of the control variables show strong and significant effects that complement the arguments tested by the main explanatory covariates. For example, firms that have changed positions in the past are more likely to change positions again, suggesting that there may be important capability differences between producers that are adequately accounted for in my model. The negative effect of relative size implies that larger organizations are less likely to move, consistent with earlier theorizing that links size with complexity and inertia. The strong positive effect of the interaction between market concentration and position in the market center agrees with previous analyses of these data that demonstrate the operation of resource partitioning processes—as the center consolidates, more firms are likely to retreat toward the market periphery. As the technological niche of the center segment increases relative to the two peripheries (an outcome of high consolidation when dominant firms seek to increase scale through scope), position moves from all segments are suppressed.

The effect of segment resources on the transition rate is negative, pulling firms to remain in their segment when resources abound. Although substantively trivial, this finding is important in light of the assumption that resources released by peer exits are attractive to remaining organizations. Segment density, which has been argued to drive commensalistic mutualism and collective action, has the previously predicted negative effect on the rate. Finally, the negative effect of firm niche width is consistent with the manner in which I measure the boundaries of the market space (i.e., based on the technological niches of all contemporaneous firms)—the broader the niche of an organization, the less choice the organization has in moving within the market space. Firm niche width is also an important control given my mid-niche measure of firm position, which allows for broad niche firms to straddle across more than one market segment.¹¹

¹¹ To further eliminate the risk that firms whose niches straddle more than one market segment may conform to a different (unobserved) position move schedule, I also included a control that marks up such firms. The effect of this indicator was positive

Measurement and internal validity: modeling resource partitioning

There is one potentially serious concern with the validity of the results presented above. I argued that organizational action is not only constrained by population structure, but also shapes the evolution of structure. Accordingly, the measures of market segments I constructed are entirely endogenous. Consistency between theory and modeling efforts is, of course, essential, but in this case it brings into question the internal validity of the research design. After all, I claim that the study of organizational moves between market segments is important because the construct of a market segment reveals meaningful differences between within-population niches. Identifiable resource clusters in technological space also carry socially organized information that produces shared cognitive inferences and collective identities (Stinchcombe, 1990). Although the results from the transition-rate analysis confirm my theoretical predictions, there is a danger that if the segment measures are inadequate the estimated effects may reflect some unobserved patterns potentially unrelated to the substantive arguments. Despite the fact that this threat to internal validity fades against substantial historical evidence and a variety of industry accounts, further empirical analysis may be useful.

The choice to construct boundaries for the market center based on the niches of the four largest firms in the industry each year reflects the understanding that this is the area of the market where resources are most concentrated and competition is most intense. If relying on resource distribution and competitive intensity to define segment boundaries is indeed warranted, then position in these segments ought to be consequential not only for position moves but also for survival chances. Several prior empirical analyses of the automobile data I use here convincingly show that issues related to large scale, consolidation, resource competition, and position relative to the market center have pronounced effects on the disbanding hazard of U.S. automobile firms. If my research design

and significant but did not affect the strength, significance, or direction of any of the causal variables. I do not include the model here (it is available upon request) because it is not clear how to interpret this effect—it may partly derive from firms with narrow niches that hover around segment boundaries, or it may relate to firms centrally positioned in their segments but with very broad niches.

strategy is correct, then I should be able to corroborate earlier findings by relying on the measures I introduce here. So, in the models below, I test the effect of location, concentration, and scale on survival chances using theoretical predictions from resource partitioning theory (Carroll, 1985), which predates some of these issues.

Although many studies confirm the operation of resource partitioning processes (Carroll *et al.*, 2002), in empirical applications the theory is typically tested by estimating whether survival chances of specialist organizations improve when industry concentration rises. The core thesis of resource partitioning concerns crowding and location—it predicts that the failure of firms in the market center opens up patches of untapped resources on the periphery. However, rather than measuring location in the market center or in the periphery, analysts generally use measures reflecting qualitative distinctions between generalist and specialist organizations. That this distinction maps rather neatly onto a distinction based on location in the market center vs. location in the periphery is implicitly

assumed. Using my segment measures, I set out to demonstrate not only the internal validity of these measures but also how they can be adapted in future empirical applications of resource partitioning.

I surmise that if market segments in the transition analysis are defined meaningfully, the results should confirm that position in the market center lowers mortality (the resource abundance effect), but as concentration increases and the center consolidates, the effect will reverse direction (the crowding-out effect). Similarly, I expect that prior to the consolidation of the industry (i.e., when concentration is low) organizational position in either periphery (where resources are thin) will be associated with higher mortality rates; yet as concentration increases, this trend will reverse and location on the periphery will benefit organizational survival.

Table 3 presents piecewise exponential models of the failure rate of U.S. automobile manufacturers. To assess improvement of model fit, I begin with a simple model (*Model a*) showing

Table 3. Effects of market segment position and industry concentration on the failure rate of U.S. automobile manufacturers

	Model a	Model b	Model c	Model d
<i>Industry tenure (u)</i>				
0.5 ≤ u < 1	-0.47* (-3.07)	-0.21 (-1.24)	-0.64* (-3.91)	-0.46* (-2.75)
1 ≤ u < 3	-1.04* (-6.60)	-0.78* (-4.36)	-1.22* (-7.14)	-1.03* (-5.98)
3 ≤ u < 7	-1.40* (-7.58)	-1.15* (-5.62)	-1.58* (-8.04)	-1.39* (-7.01)
7 ≤ u < 15	-1.86* (-8.16)	-1.60* (-6.61)	-2.04* (-8.58)	-1.84* (-7.68)
u ≥ 15	-2.17* (-7.75)	-1.93* (-6.62)	-2.37* (-8.17)	-2.16* (-7.43)
Depression year	-0.19* (-2.44)	-0.16* (-2.00)	-0.16* (-2.13)	-0.19* (-2.40)
GNP	-0.03* (-3.34)	-0.03* (-3.10)	-0.03* (-2.95)	-0.03* (-3.42)
Mass production	0.16 (1.48)	0.15 (1.29)	0.15 (1.34)	0.14 (1.22)
Production differentiation	0.49 (1.62)	0.33 (1.06)	0.37 (1.19)	0.49 (1.62)
JIT/TQC	-0.04 (-0.08)	-0.06 (-0.14)	-0.10 (-0.22)	-0.01 (-0.02)
Segment tenure	0.01 (0.70)	0.01 (0.57)	0.01 (0.62)	0.01 (0.67)
Prior moves	-0.06 (-0.74)	-0.05 (-0.67)	-0.05 (-0.62)	-0.06 (-0.69)
Relative size	-0.15* (-6.73)	-0.15* (-6.77)	-0.15* (-6.78)	-0.15* (-6.74)
Concentration (C4)	0.50* (2.15)	0.06 (0.22)	0.72* (2.94)	0.56* (2.21)
Market center segment		-0.56* (-2.84)		
Market center segment • C4		0.92* (2.93)		
Low periphery segment			0.63* (2.92)	
Low periphery segment • C4			-0.94* (-2.80)	
High periphery segment				0.10 (0.45)
High periphery segment • C4				-0.24 (-0.63)
Log-likelihood/d.f.	2900.5/14	2896.2/16	2896.4/16	2900.2/16
LR test/Δ d.f.	—	8.6/2	8.2/2	0.6/2

* Significant at the 0.05 level; two-tailed tests.

Numbers in parentheses are *t*-statistics; number of spells: 6,688; number of failures: 1,356; number of firms: 1,482.

that relative size in the scale-intensive automobile industry greatly diminishes the failure rate while rising industry concentration has a deleterious effect on survival. *Model b* includes the market center position variable and its interaction with industry concentration. The estimated effects are negative and positive, respectively. Both are statistically significant and confirm the operation of resource partitioning while also lending credence to the validity of my market segment measures. Model fit also improves significantly ($\Delta LL = 8.6$; Δ d.f. = 2; $p < 0.05$). In *Model c* and *Model d*, I test the effects of position in the low and high periphery, respectively. The estimates also agree with predictions from resource partitioning: the positional effects are positive and their interactions with concentration negative in both models, though only statistically significant in the low periphery (*Model c*)¹²—position in the periphery improves once the center consolidates. Data fit improves in *Model c* where the additional effects are significant ($\Delta LL = 8.2$; Δ d.f. = 2; $p < 0.05$). Overall, this ancillary analysis helps to establish the validity of the segment definitions by showing that position within these segments matters considerably for firms' survival chances. That it does so in a manner predicted by the resource-partitioning model presents an opportunity to apply these constructs in future analysis.

DISCUSSION

The purpose of this paper was to develop a theory that explains collective departures by organizations from segments within an industry market. Using ideas about imitation and resource competition from existing theories, I argued that the two processes operate concurrently and are both driven by the number of firms departing a focal segment. But, at different levels, the count of peer exits drives imitation and resource competition in different degrees. At low levels, such departures trigger reactions arising from the cognitive maps and perceptions shared by proximately located organizations, but create limited additional

resource openings. At high levels, collective identities may be shifted or broken, thus possibly decreasing or at least placing a ceiling on the imitation effect, while the amount of vacated resources increases, so firms become prone to remain in the segment. The underlying logic of this imitation-resource competition model follows directly from the theory of density dependence (Hannan and Freeman, 1977; Hannan and Carroll, 1992). My finding that an ecological dynamic—increases in the number of firms leaving a shared resource space—affects the performance and behavior of other firms, thereby shaping the evolving structure of the market, validates the approach to modeling population dynamics inherent in density dependence theory.

I argued that imitation can be understood as a purely cognitive process without disputing the higher-order processes arising from normative pressures and intensified interaction over ties of social exchange, both of which can increase mimicry. By this view, imitation produces cascading moves by market peers that constitute collective adjustments in response to ecological dynamics. The dynamics are ecological because categorical similarities are assessed on the basis of proximity in market and resource space and shaped by the number of exits from that shared location. Accordingly, I suggested that ecological contagion among categorically similar organizations constitutes the most basic theory that can explain the observed similarity in the social behavior of collective actors.¹³ Based on this social similarity among a set of ecologically proximate peers, I argued that firms look at each other—perceive and interpret others' behavior—as cues to help them understand their own positions and form their own strategies. The imagery of a looking-glass market, inspired by work in classic social psychology (Cooley, 1967/1902) and contemporary institutional (Strang and Meyer, 1993) and structural theory (White, 2001) captures this dynamic well.

Relying on the mechanism of ecological contagion in future analysis, it may be easier for both institutional and network analysts to show how imitation is amplified when organizations are subjected to pressures from specific subsets of

¹² Of course, the fact that I do not find evidence of resource partitioning in the upper segment is by itself evidence in support of the measures' validity. As discussed earlier, the luxury car segment in the U.S. auto industry essentially disappeared in the 1930s in the sense that almost no producers solely devoted to the manufacture of luxury cars existed thereafter.

¹³ Dobrev (2005) makes a similar argument about behavioral similarities among individuals in the context of examining contagion in managers' career changes between industries.

their peer organizations or by the presence of network linkages among members of peer organizations. For example, an argument about the pressure exerted by powerful organizations (DiMaggio and Powell, 1983; Tolbert and Zucker, 1983) would be easier to defend if these effects are shown to operate over and above the baseline ecological contagion effect. Similarly, network effects attributed to information sharing through interpersonal networks among members of peer organizations (Galaskiewicz and Wasserman, 1989; Haunschild, 1993; Guillén, 2002) would be more convincing if they can be shown to operate in addition to (or despite the lack of) mimicry effects among peer organizations not related via ties of social exchange. This approach may be particularly helpful given the need for network theorists to better explain why in relational models repeated interaction leads to imitation rather than conflict and differentiation.

Finally, I argued that imitative tendencies among organizations that develop a collective identity through mutual perceptions and observations are minimized when these organizations experience intense resource competition. This conjecture asserts a theoretical focus on the interdependence between processes unfolding along different niche dimensions. If, as I propose here, the concept of the niche in organizational sociology can be applied with sufficient analytical utility at three different levels—the population, the market segment, and the organization—then understanding how niche position at one level affects position at the other levels becomes salient. Specifically, my results show that characteristics of the organization's competitive position (high levels of firm niche overlap density) impact the same organization's membership in a categorically distinct set (diminished likelihood to identify with categorically similar peers). In other words, position in a crowded space of the segment leads a firm to sever cognitive associations and to a misalignment between its identity and the collective identity shared by segment peers.

A note on selection and adaptation

The theory developed here builds on ideas from institutional theory, structural network theory, social psychology, and human ecology; I argued that these ideas can productively be integrated

within an organizational ecology model by drawing on substantively different but compatible propositions. An important question remains: If organizational position change within a market is principally an instance of organizational change, and if the dominant logic in organizational ecology is environmental selection, how plausible is it to integrate this logic with the pronouncedly adaptationist views espoused by the other paradigms? After all, institutional theory sees imitation as resulting in structural isomorphism (mimicking entities survive and adopt the aspired structure or position), human ecology sees shared resource dependence as leading to structural homogeneity (commensalistic entities face the need to align with the same external conditions), and White's (2001) model predicts that market peers observing each other arrange on the production frontier in a way that differentiates them from each other (firms observe others' position shifts and locate in areas left vacant). Having argued the similarities between these perspectives and my theory, I now briefly digress into why understanding the differences is important as well.

To my knowledge, the most productive way to think of selection and adaptation in an integrative model is the content-process framework proposed by Barnett and Carroll (1995). It essentially differentiates the properties of the origin and destination states in a transition from the perils of undergoing the transition. Adaptation occurs when the advantages of position in the destination state outweigh those of position in the origin state *and* when this net benefit is sufficiently large to offset the likely disruptions arising from the transition itself. In short, adaptation is about emphasizing effects associated with the content of the transition states and selection is about highlighting the destabilizing effect of the process of change (which weakens organizational reliability and accountability and exposes the firm to selection pressures).

Within the vast literature on organizational change, studies of imitation generally emphasize destination over origin state effects—there are many studies of contagion in processes of *adoption* but almost none in processes of *desertion* or *abandonment* (see Greve, 1995, for an exception). Underspecifying origin effects, of course, means that the key mechanisms behind any theory of transition also remain insufficiently developed. Consider the conflicting predictions of two theories discussed here. Both White's (2001) and Strang and

Meyer's (1993) models agree that cultural and cognitive linkages among proximate peers in the origin state give rise to collective action in transitions but, where White predicts differentiation, Strang and Meyer expect isomorphism and homogeneity. It is not clear how similar processes in origin states relate to different outcomes in transitioning to destination states. Applying such unlike predictions to models of position moves in market space can be partly rectified with recourse to my theory. Peers engage in exit imitation by observing each other's behavior but decisions about where to locate are also driven by considerations of resource crowding and competitive intensity. Explicitly modeling contagion in origin and in destination states in transitions, it may be useful for future research to investigate whether imitation perhaps only relates to position abandonment (as I showed here), while choosing a destination state is predicated on the search for vacant market positions. It may also be interesting to study whether differentiation resulting from divergent destination states in collective position moves is largely unintentional as firms grapple with process complexity and selection pressures to complete their transitions to the originally intended end-states.

CONCLUSION

This research studies niche dynamics along two relevant dimensions—identity and resources—and shows how the two dimensions interrelate. As Podolny, Stuart, and Hannan (1996) demonstrate, there are strong advantages to this approach. First, unlike most niche studies which choose a dimension of external resources exogenous to the population, here I add a niche dimension that emerges as a consequence of interorganizational dynamics. Specifically, the evolution of shared perceptions and identities among organizations that cluster in different resource spaces is driven by the dynamics of position moves that place organizations in ecologically proximate market locations. Second, the interdependence between the two dimensions emphasizes the process by which actions by organizations both define their environment and are constrained by it. Firms locate in market areas that offer certain resources. A firm's presence in or departure from its market location affects the munificence of resources and the cognitive frameworks shared by other firms positioned in that area.

At the same time, my findings suggest that position moves by organizations are strongly conditioned by the actions of peer organizations. This duality of actor and position, inherent in most sociological theories, impels a conceptualization of organizations and environments in multidimensional niche space.

Although acknowledging the multidimensionality of social niches is important for understanding how actors' positions in one domain can influence their position in a different one, it is ultimately positioning along the resource dimension that gives rise to second-order social processes like social exchange and interaction, identity building, collective action, deference of status, and the like. If resources within a market are evenly distributed, then the classic prediction from Hotelling's (1929) model holds true—producers will likely cluster in proximate locations within a single area of the market so as to maximize the appeal of their offerings to current and potential consumers. But, resources are rarely evenly distributed and the heterogeneity of social forms in the world of organizations—particularly to the extent that it reflects segregation processes within populations—is sound evidence for this. As in Downs' (1957) theory of political action, the emergence of different ideologies reflects the uneven distribution of political tastes among the electorate—there will likely be as many political parties as there are peaks in the distribution of political preferences. In short, cognitive processes (like the formation of political ideologies) develop on the basis of position similarity around peaks in distributions of relevant resources. More broadly, political as well as cultural and economic forms of social association and institution building develop on the basis of simple ecological organization (Park, 1939/1972: 137–140).

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