INTRODUCTION

The relationship between environment and organizations holds a central position in organizational theory. To analyze it, various research traditions adopt an open systems view and among them organizational ecology is often regarded as a case supporting two apparently diverging principles, one based on environmental selection forces and the other based on endogenous population dynamics (Carroll and Hannan, 2000; Hannan, Polos and Carroll, 2006). In either case, environments and organizations tend to be represented as relatively homogenous sets of resources or agents. The nature and structure of relationships connecting environments to organizations are constitutive elements of ecological theory but remain separated. This perspective seems to exist in stark contrast with social network theory, which depicts external environments and their boundaries as consisting of social sets defined by direct relations (and lack thereof) between specific agents (Scott, 1992).

This paper addresses two main questions: 1) what is the role of interorganizational networks in shaping the evolutionary dynamics of organizational populations, and 2) how network structure and relations affect ecological processes. Building on social network theory, we examine the structural properties of the relational space in which organizations are embedded and the nature of their interaction over time. Specifically, we look at the influence of two network mechanisms, the degree of aggregate connectivity and the repetition of exchange ties with the same partners, on organizational survival.

The ecological theory of density dependence

The density dependence model is a core component of the research program in organizational ecology seeking to understand organizational evolution. In its broadly accepted view, the model posits that organizational populations tend to evolve to (almost) stable numbers of operating organizations through two counterbalancing processes of constitutive legitimation and diffuse competition in a finite-resource environment (Hannan, 1986). Such processes govern vital rates of foundings, disbandings and growth. In this formulation, forms and populations are treated as synonymous but the implicit assumption is that the latter are instantiations of the former (Carroll and Hannan, 2000).

Organizational forms receive legitimation why they are considered to possess a genetic code that is socially recognized (Meyer and Rowan, 1977). At the time of their appearance on the market organizations generally lack this kind of recognition, for instance the institutional environment needs time to notice their presence (Carroll and Hannan, 2000). An increase in density augments stimulates social acceptance as taken-for-grantedness, hence fostering new entries and diminishing the mortality of established organizations. However, as density further increases the environment becomes unable to accommodate the growing population tapping the same pool of resources and competition intensifies. Competition assumes a diffuse connotation because each organization depends on the same, increasingly scarce, resources (Hannan and
Freeman, 1977). Higher density levels depress the growth and survival rates of existing firms and stifle new entrepreneurial initiatives (Hannan, 1986).

Evolution explained by density dependence is based on observable properties of populations. Recent reformulations of the theory emphasize the role of social expectations and audiences (Hsu and Hannan, 2005, Hannan, Polos and Carroll, 2006). Organizational action is subject to social scrutiny of a variety of external agents, including other organizations, public authorities, intermediaries and consumers. Such agents consider the features and activities of organizations in relation to what they expect organizations are supposed to or can do. The set of expectations originate social codes that generate approval and advantages if respected, but also pose limits because implies sanctions if violated. When audiences validate organizational action the social code gets applied by default. The default application in turn indicates that organizations possess a collective identity, which is taken for granted in the social environment. Such interactive process creates and sustains organizational forms. Density dependence comes to define one process through which the status of organizational form can be reached (Carroll and Hannan, 2000). Organizations to which audiences apply a code are considered members of the same population and play a part to density dependence with varying intensity. Patterns of resource utilization and network ties are aspects that induce audiences to consider different organizations as belonging to the same population (but membership is not necessarily discrete and is separate from density).

A network perspective to ecological processes

The implications stemming from the original formulation of density dependence and its recent revisions are critical for the theoretical argument we seek to develop in this paper. On the one hand, population micro-structures are only one alternative and overlook the influence of ties to the environment on organizational evolution. As noted by Carroll and Hannan (2000) legitimation and competition processes are sensitive to macro-structures, i.e., the variation that the position of a population occupies in the broader social context. First, populations gain “institutional standing from the emergence of networks of tangible ties that develop between their members and other kind of actors” (p. 245). In this sense, actors include other populations that supply inputs, absorb outputs, and so forth. Second, social structure also can affect competition in shaping organizational life chances because institutionally linked population members seek more and more scarce resources (Baum and Oliver, 1991). As a result, ties between populations and their environment affect vital rates, and density might influence organizational evolution by a more complex process than the original theory anticipated.

On the other hand, organizations do not operate in a social vacuum but are embedded in a dense system of relationships that significantly affect their decisions, behaviors, and thereby performance and survival chances (Granovetter, 1985). These connections represent the “building blocks of ecological communities” as they embed populations within higher-order collectivities in the broader organizational domain (Baum and Oliver, 1992). Yet it is not only organizations that are interconnected, organizational populations are too. Therefore, a focus on network-based mechanisms, particularly relations between a focal population and another population with which it interacts, allows incorporating the notions of environment, social structure and audiences.

Over the past decade, a number of studies have built on network embeddedness arguments to show how social relationships shape organizational level outcomes. Our concern is specific to the form of embeddedness embodied by interorganizational networks and has organizational life chances as the other focal point, so the literature we consider deals mainly with this relationship.

Hypotheses

In this study we focus on two network mechanisms that influence organizational exit rates at two different levels of analysis. First, we argue that an organization’s survival chances are affected by the competitive effects induced by the degree of connectivity of the broader interorganizational network structure in which that organization and its population are immersed. Second, we focus on the dyadic level of analysis to conceptualize the direct competitive implications of forming repeated ties with the same partners. While the position of any organization within the larger interorganizational field is a macro level consequence of the relational behavior of all organizations in that field, the creation and reiteration of ties reflect more explicitly the initiative of each organization in the system and its propensity to switching from a more adversarial to a
more collaborative behavior. In developing our theory we therefore unpick both (diffused) structural and (focused) behavioral dimensions of organizational networking.

As they form their networks, whether by forging new linkages or deepening existing ones, firms make relational choices without being fully aware of the macro-implications of their micro-behavior. The aggregate result of these individual relational choices is an inter-organizational topology whose properties define the institutional underpinnings of any given organizational domain (Powell and DiMaggio, 1983). One topological property that plays a critical role in this process is the degree of network connectivity. A network is connected to the extent that it consists of a high percentage of mutually reachable nodes. The connectivity is maximal if the network is structured as one unique giant component that connects all the nodes in the network. Conversely, a network is maximally fragmented when it assumes a purely atomistic form where the number of components is equal to the number of nodes (basically the network is a disjointed set). We argue that increasing network connectivity gives access to a broader exchange community, wider ranges of information and knowledge flows, and lower ambiguity about organizational identity, thereby enhancing organizational survival.

Hypothesis 1: Connectivity in the interorganizational network reduces organizational exit rates.

Network connectivity may have different survival implications depending on whether population density is low or high. Under conditions of diffuse interorganizational connectivity, the scope for “information variation” – i.e., the likelihood of being exposed to information not available to other firms – is usually low and there is less competitive variety than in more fragmented networks. In more fragmented topologies it is in fact harder to reach consensus around a single organizational form (McKendrick and Carroll, 2001), or diverse “schools of thought” are more likely to emerge. Second, because organizations in interconnected fields can monitor each other easily, they tend to follow mimetic behavioral patterns (Kogut, Walker, and Dong-Jae, 1995). This might in turn reduce the scope for population internal variation leading to suboptimal solutions. The lack of search and variation could lead the population to adopt a suboptimal form (e.g., a technology) as a standard. Firms will tend to adopt the first, well-functioning organizational traits that are discovered and will not take time to explore potentially better one (March, 1991).

Hypothesis 1a: At low population density levels, connectivity in the inter-organizational network has a positive relationship with exit rates.

At high levels of density, organizations struggle to gain control over resources. In the face of resource pressures and the need for reliability and consistency of action, organizations strive to reduce variability in the quality of decision making and efficiency of task performance (Hannan and Freeman, 1984). Under such conditions, the presence of a diffuse interorganizational texture has at least two important implications. On the one hand, diffuse connectivity allows for interorganizational coordination (Kogut, 2000) over the use of increasingly scarce resources, thus enabling a more efficient use of resources. In this phase efficiency of action is highly rewarded because organizations in a social domain have coalesced around one prevailing form and the emphasis has moved from genetic variety of routines to refinement of existing ones. Moreover, increasing the level of connectivity between organizations may facilitate concerted action to stabilize competitive forces. The spreading of information across diffuse ties among organizational members fosters convergence towards one set of shared norms. Organizations that break such norms by taking competitive initiatives against other organizations will be quickly identified and subject to immediate sanctions.

Hypothesis 1b: At high population density levels, connectivity in the inter-organizational network has a negative relationship with exit rates.

The particular position of any organization in the larger network field is the macro level consequence of interaction involving all other organizations. By contrast, the creation and repetition of ties more explicitly reflects the initiative of each organization in the system. As organizations repeat their collaboration, they get to know each other more deeply, increase their mutual trust and establish norms of reciprocity (Granovetter, 1973). Thanks to improved relational understanding they can develop joint problem solving arrangements. Repeated interaction supports norms and values that encourage organizations to seek the help of others in
framing and solving the problems they face in their activities. As more interaction takes place, partners are more likely to develop mutual trust. Higher levels of trust increase the willingness to undertake risky initiatives because the emergence of norms of reciprocity reduces opportunistic behavior. In turn, this facilitates the exchange of reciprocally relevant information and knowledge, often of tacit type (Uzzi, 1996).

The repetition of exchange ties generates effects on organizational outcomes through ecological processes but distinctly from organizational density. On the one hand, the development of a special communication language between exchange partners engaged in repeated transactions assimilates a history of common experience that includes a substantial tacit dimension. The use of such language omits detailed references to objects, people and locations that are nonetheless assumed in the communication. This suggests such entities and their properties become taken for granted. On the other hand, the advantage of communication efficiencies due to tie repetition is likely to spill over beyond the original partners. Moreover, tie repetition can shield embedded partners from competitive pressures by providing various benefits such as reduced search costs and higher likelihood of concluding present and future transactions. Besides trust and norms of reciprocity, an important benefit accruing to upstream organizations from repeating their collaboration with downstream partners is to gain easier access to the final market (Dyer and Singh, 1998).

Hypothesis 2: Organizational exit rate declines as organizations engage in repeated interaction with the same partners.

The influence of exchange repetition on organizational life chances changes with ecological density. Organizations gain institutional standing from the emergence of networks of tangible ties that develop between a population and other kinds of actors (Carroll and Hannan 2000: 245). As they repeat ties with the same partners, however, organizations may set up the “wrong” protocol of interaction or develop a defective language of communication. Organizations that engage in repeated interaction in fact risk committing too soon to inefficient or incomplete sets of norms that will not be retained or will receive limited diffusion. The benefits typically associated to durable and repeated ties might therefore disappear when the situation is fluid like in the early stages of the evolution of an organizational population or in other cases where density is low. At low densities, those rules of interaction, however, consist more of local rather than public knowledge about an activity that is required to increase taken-for-grantedness (Hannan and Freeman, 1986).

Hypothesis 2a: At low population density levels, repeated ties with the same partners in the interorganizational network have a positive relationship with exit rates.

At high density, on the contrary, competition intensifies because the system becomes unable to accommodate a growing number of organizations competing for the same pool of scarce resources (Hannan and Freeman, 1977). However, as a result of repeated interaction, both within and across organizational populations, organizations might wind up perceiving the benefits of sharing existing resources as well as creating new resources together instead of competing for them (Kogut et al., 1995). Tie repetition may therefore insulate organizations from competitive pressures: For example, a history of past exchanges between a supplier and a buyer makes it more likely that they engage together in further exchanges and this dependence benefits the supplier especially when the number of competitors for the same buyer is large. Resource buffering is not the only effect at play. When density is high, the patterns of private interaction lose their idiosyncrasies and can become generalized systems of exchanges. Competition diffuses to all organizations who engage in similar interaction. Through repeated ties with the same partners, organizations can maintain features specific to their exchanges, thereby reducing the impact of diffuse competition vis-à-vis organizations considered members of the same system of general exchange. Social networks, therefore, lessen the competitive intensity and the number of encounters generated by high density for the actors involved in repeated exchanges. As a result, we expect repeated exchanges to moderate density effects on exit rates.

Hypothesis 2b: At high population density levels, repeated ties with the same partners in the interorganizational network have a negative relationship with exit rates.

Empirical analysis
Our empirical study examines the U.S. feature film industry over the period 1912-1970. Three main activities are related to making and commercializing motion pictures. Production refers to the operations aimed at making and delivering the first copy of the film. Distribution consists of the reproduction of the first copy of the film to be screened in movie theaters. Exhibition is concerned with showing in front of an audience of a reproduced copy of the film. Each activity is carried out by specialized but interdependent organizational populations. We rely on an original database of life histories of the populations of motion picture production and distribution companies from 1912, the year when the first feature film was released in the domestic market, to the end of 1970. The American Film Institute Catalog of Motion Pictures (AFI) serves as the primary data source. This directory comprises reviews of all motion pictures distributed in the U.S. between until 1970 and provides detailed information on each film. On the one hand, production companies supply their most important output to distribution and distribution companies use production output as the primary input for their activities. On the other, production and distribution companies interact for other purposes, i.e. distributors may provide funds to finance production and are responsible for allocating to producers box-office income obtained through exhibition or secondary markets. Therefore, the population of distribution companies represents a crucial portion of the environmental resource space in which production companies operate. To gauge the structural dynamics of the network connecting these two vertically-related populations we modeled it as a valued bipartite undirected network with film producer organizations and distributor organizations as the two actors/exchange partners (Asratian, Denley, and Haggkvist, 1998). In this network each film title represents an attachment (i.e., production companies supplying a movie to a distributor) between the two sets.

Our dependent variable is exit rates of feature film producer organizations from the market. The key explanatory variables are density counts, measures of network structure and their interaction. We modeled production company exit using as the instantaneous risk of exiting and adopted piecewise exponential regression estimation, which allows the base rate of exit to vary flexibly with organizational age. Our empirical analysis finds support for all hypotheses.

Conclusion

The investigation of ecological processes and interorganizational network relationships is important for several reasons. First, our study lends support to a re-establishment of the original statement of density dependence. When no left-truncated schemes are observed, the combined examination of population density and relational embeddedness continues to support density dependence. Second, our analysis indicates that such processes are distinct but also interact. Third, our study provides a theoretical bridge between two traditions in ecological research, one relying on observable properties of populations and one relying on normative basis of organizational forms. The empirical strategy employed in this study illustrates an untested solution to addressing audience-organization interactions in ecological processes. Fourth, this study contributes to network theory by showing that ecological processes influence systematically organizational evolution via exit rates. Social network studies distinguish between relational and structural forms of embeddedness. While the former addresses the features of dyadic ties the latter is related to networks as a whole or ties beyond a specific dyad. Our findings suggest implications relevant for both types of studies. Relational embeddedness as reflected by repeated interaction seems beneficial to survival through flows of information and knowledge that are private to exchange partners. Structural embeddedness instead fosters the flow of public information and knowledge within and across populations, increasing integration within the ecological community especially by sustaining the legitimation process. Overall, our results suggest the viability of a research approach that integrates social network and organizational ecology theories in studying organizational evolution.

REFERENCES


