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INTER-  
ORGANIZATIONAL  
RELATIONS

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## CHAPTER 12

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# EVOLUTIONARY PERSPECTIVES ON INTER- ORGANIZATIONAL RELATIONS

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## INTRODUCTION

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We define the evolution of inter-organizational relations as a process of cumulative change involving organizations that are somehow related. As this definition makes clear, we think that processes of boundary emergence, maintenance, shift, and erosion around organizations are what an evolutionary approach to inter-organizational relations must explain (Hannan and Freeman 1986; Fontana and Buss 1996).

Inter-organizational relations bound evolutionary processes and define exactly what organizations are affected by a given process of change. Relations among

organizations can be direct, diffuse, or perhaps more often a combination of the two (Hannan and Freeman 1987; Rao 2002; Barnett and Pontikes 2005). Relations are direct when they involve some element of mutual awareness among the actors involved (Burt 1992). When this happens, individual organizations tend to think of their environments as composed of identifiable alters with and over whom they may have projects of cooperation, competition, or control. For this reason, direct relations can only involve a relatively small number of organizations (White 1988, 1992, 2002). As an example of this way of thinking about inter-organizational relations, consider the notion of markets as roles structures (White 1981, 1988; Leifer and White 1987). Here, producers select their market 'position' not on the basis of aggregate information about demand, but rather on the basis of their assessment of the volume-revenue relation that characterizes other producers that are perceived as comparable. In this perspective, inter-organizational relations are the outcomes of frames of comparability established by individual organizations through their production decision and competitive strategies (Odorici and Lomi 2001).

If relations are diffuse, then organizations perceive their environment 'parametrically', that is, as an estimate of the joint effect of a variety of external influences. Almost by definition diffuse relations are linked to evolutionary processes affecting entire organizational populations and communities (Barnett and Carroll 1987). While it is analytically convenient to think of relations bounding the evolutionary processes as being exclusively direct or diffuse, this is rarely plausible. It is perhaps more realistic to acknowledge that different types of direct, 'local' relations may interlock to generate a variety of network *motifs*, eventually generating structures that are highly differentiated internally, but that exhibit recognizable global 'organizational' properties (Lomi and Larsen 1996, 1999; Robins *et al.* 2005; Lomi and Pattison 2006). The relational substratum created by processes that are both local and global induces evolutionary change that occurs across multiple levels of analysis. For this reason, some might object that choosing inter-organizational relations as the level of analysis is at the same time too 'micro' and too 'macro'. After all, there are possible levels of evolutionary analysis both below it, such as those of single organizations (Langton 1984) and of individual decision routines and learning processes (Cohen and Bacdayan 1994), and above it, such as those defined by the evolution of industries, policy domains, and organizational communities (Malerba *et al.* 1999; Freeman and Audia 2006). This continuing tension has made the study of inter-organizational evolution a fertile middle ground (or a battleground, as some may say) to test the implications of managerial, economic, and sociological theories of organizations.

Examples of topics that are recurrently addressed in studies of inter-organizational relations inspired by general evolutionary ideas include the dynamics of inter-organizational collaboration (Gulati and Gargiulo 1999; Powell *et al.* 2005), the maintenance of status ordering in markets (Podolny 1994), the relation between networks and niches within organizational populations (Podolny

*et al.* 1996), the effect of niche overlap on organizational vital rates (Baum and Singh 1994a, 1994b), processes of industry concentration and differentiation (Carroll and Swaminathan 2000), change in governance structures (Davis and Greve 1997), the long-term implications of state intervention on the structure of inter-organizational fields and policy domains (Dobbin 1994), the emergence and organizational implications of spatial structures (Lomi and Larsen 1996, 2001), technological change (Podolny and Stuart 1995), the organization and coordination of illegal activities (Baker and Faulkner 1993), the origins of markets (White 1981), and processes of sense-making and meaning construction in inter-organizational fields (Sutton and Dobbin 1996). While this list does not begin to exhaust the topics that are of interest to students of inter-organizational evolution, it does give the sense of the wide landscape that a review of 'inter-organizational evolution' has to cover. Despite their apparent eclecticism, studies taking an evolutionary view on inter-organizational relations have at least one element in common: they all are about how changes in social, market, cultural, and organizational systems happen over time.

In an evolutionary perspective, organizational change is analysed through the generic conceptual scheme of variation, selection, and retention (Campbell 1969; Aldrich 1999). Examples of variations affecting inter-organizational relations include technological innovation (Dosi 1988) and the appearance of new organizational forms (Stark 1996; Padgett and McLean 2006). In an evolutionary perspective variation may be blind or purposeful. This apparent indifference toward the origins of variation does not mean that organizations cannot (and do not) invest consciously in their capacity to 'absorb' or even amplify potentially profitable variations. In fact organizations may do so in many interesting ways (Cohen and Levinthal 1994). In either case, blind or deliberate as it might be, variation provides the raw material for selection. Selection implies change in the relative frequency of observed behaviour, in the incidence of organizational forms in a society, or in the distribution of particular organizational traits in a population. The typical processes through which selection manifests itself are organizational mortality (Hannan and Freeman 1989), growth (Barron 1999), and the extinction of organizational forms (Aldrich and Wiedenmayer 1993; Ruef 2004). In its most general sense, retention implies some form of maintenance, routinization, or the construction of some other form of action repertoire (Cyert and March 1963; Nelson and Winter 1982). Retention is associated with processes of learning and adaptation, as well as with their apparent opposite—organizational inertia (Hannan and Freeman 1984; Levinthal 1991). One of the distinctive features of evolutionary theories of organization is their attempt to resolve the inherent tension between innovation (variation, or exploration) and maintenance (retention, or exploitation) by specifying mechanisms of selection behind observed organizational outcomes (March 1991).

After this general introduction, we organize our chapter as follows. In the next section we briefly discuss the background and the intellectual context in which

evolutionary thinking about organizations and institutions has been growing and developing. We emphasize the mechanisms through which inter-organizational evolution is assumed to operate and provide examples of how they might be working across levels of organizational analysis. In his recent commentary Greve observes that 'inter-organizational evolution takes place at the level of the inter-organizational field, population, or community' (2002: 557). Hence, any characterization of inter-organizational evolution is highly dependent on the principles behind the definition of these aggregate entities. For this reason, in the third section we link this general discussion about the origins of evolutionary thinking in the study of organizations to conceptions of organizational environments. Building on the insight of ecological approaches to the study of organizations, in the fourth section we present ways in which inter-organizational relations have been examined among members of organizational populations and communities. The fifth section examines studies of inter-organizational relations that have built more explicitly on network representations, models, and imagery, with reference to organizational fields rather than populations and communities. We conclude the chapter with an overview of a wide range of emergent research themes suggested by evolutionary perspectives on inter-organizational relations and a discussion of the promises that evolutionary approaches hold for our understanding of inter-organizational relations.

## EVOLUTIONARY THINKING IN THE STUDY OF ORGANIZATIONS

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In their recent assessment of the state of evolutionary thinking in economics, Nelson and Winter (2002) remind us that evolutionary ideas have been present in economics throughout the modern history of the discipline. Yet it is only with the work of these authors (Nelson and Winter 1982) that the constitutive elements of an evolutionary approach to individual organizations became explicitly codified. The part of Nelson and Winter's evolutionary theory of economic change with more direct organizational implications owes much to the earlier behavioural tradition of Simon (1945), March and Simon (1958), and Cyert and March (1963). Thus, we can directly extend to organization theory Nelson and Winter's argument about the role that evolutionary thinking has played in economics: evolutionary ideas have been present in organization theory throughout much of its modern history.

There is at least one more element of similarity between the development of evolutionary thinking in economics and organization theory. As Nelson and Winter (2002) clearly explain in the context of economics, early evolutionary ideas recognizable in the works of Koopmans, Marshall, and Schumpeter progressively lost

ground to a rival theoretical framework that increasingly emphasized equilibrium and optimality concepts (Samuelson 1947) and deliberately ignored the institutional and organizational details behind the working of markets (Debreu 1959). In organization theory, a younger and epistemologically less mature discipline, complex ideas about the long-term evolution of organizational structures (Stinchcombe 1965) have anticipated, but at the same time been obscured by the emergence and rapid diffusion of a theoretical framework emphasizing concepts of equilibrium and the static alignment, congruence, or 'fit' between individual dimensions of organizational structure and environmental constraints determined by exogenous patterns of resource availability (Lawrence and Lorsch 1967; Padgett 1992). While Stinchcombe (1965) portrayed evolutionary processes of organizational emergence, change and, selection as conditional on social structures that were themselves changing both incrementally and abruptly over long periods of times, empirical studies inspired by contingency views painted an essentially static picture of the relation between *organizational change* and *social change*. Studies based on static observation plans found an unsurprising association between measure of 'fitness' and dimensions of organizational performance and these results provided the basis for the belief in a systematic connection between 'equilibrium' configurations and 'performance', which became for many years an institutionalized assumption in the study of organizations (March and Olsen 1984).

It is only in the late 1970s that ideas about the dynamics of organizational evolution not directly rooted in earlier behavioural theories of the firm were re-discovered and taken as the basis for the elaboration of a more systematic and complex theoretical narrative on the relation between organizations and their environments (Aldrich and Pfeffer 1976; Hannan and Freeman 1977; Meyer and Rowan 1977; Pfeffer and Salancik 1978). The conceptual framework for studying organizational evolution was made explicit by Aldrich (1979). Building directly on Campbell's model of socio-cultural evolution (Campbell 1969), he defined three basic mechanisms underlying the process of organizational evolution: variation, selection, and retention. According to this view, variation involves the generation of new patterns of action (or new 'practices') that, if selected, become permanent operational features of a given organizational system. A background assumption was made that evolutionary processes were possible only in a situation characterized by competition for scarce resources (Lomi *et al.* 2005). Although rarely examined directly, the assumption of resource scarcity can be traced in virtually all subsequent research that built more or less directly on evolutionary ideas (Nelson and Winter 1982; Hannan and Freeman 1989; Carroll and Hannan 2000). The assumption of competition for scarce resources is made explicit by Aldrich and Ruef (2006) who introduce 'struggle' as the fourth subprocess of organizational evolution after variation, selection, and retention.

Evolutionary approaches to the study of organizations have themselves evolved considerably since their emergence (March 1994). To be recognized as evolutionary,

attempts to understand organizational processes of growth, change, development, and decline must be based on a combination of at least some of the following six claims:

- (1) organizational change is a process that may require little or no foresight (March and Levinthal 1993);
- (2) organizational change is a consequence of processes of local search (Cyert and March 1963; Dosi 1988; Cohen and Levinthal 1989);
- (3) a selection environment exists such that major episodes of change in patterns of resource availability trigger processes of 'rotation' at the population and community level, that is, processes whereby new organizations and new organizational forms supplant old ones (Aldrich 1999);
- (4) organizational fitness criteria are highly contingent on complex competitive, political, and institutional details and on a variety of historical events (March and Olsen 1989; Carroll and Harrison 1994; Malerba *et al.* 1999);
- (5) organizations learn by encoding past experiences into routines that guide behaviour (Nelson and Winter 1982);
- (6) once an organization has learned to do something well, it may be very difficult to get it to learn something that is significantly different, at least in a useful time (Hannan and Freeman 1984). As a consequence, the determinants of organizational performance and survival are never obvious *ex ante*, that is, before selection processes have produced observable consequences (Hannan and Freeman 1989).

Roughly speaking, the first two statements are related to processes of variation, defined as any change from existing routines, traditions, or established practices. Variation may be intentional or blind, and it usually happens across levels of analysis (Aldrich and Ruef 2006). At the organizational level, variation may be a consequence of search (March and Simon 1958), exploration (March 1991), or chance (March 1981). At the population level, variation may be introduced by the arrival of new organizations (Hannan and Freeman 1989) or by recombining resources and relations into new organizational forms (Stark 1996; Padgett and McLean 2006).

The third and the fourth statements describe mechanisms of selection, that is, forces that eliminate or amplify actually realized variations. Within organizations, processes of selection may be related to the survival of strategic initiatives (Burgelman and Mittman 1994) and administrative rules (March *et al.* 2000). At the population and community level, selection operates through processes of organizational mortality (Hannan and Freeman 1989) and possibly extinction of organizational forms (Ruef 2004).

Finally, the last two statements are about ways in which organizations retain successful variations by canalizing them into stable routines. Replication (Winter and Szulansky 2001), routinization (Nelson and Winter 1982), and learning (Cohen

and Levinthal 1989; Greve 1998; Zollo and Winter 2002) are all examples of retention mechanisms operating at the organizational level. At the population and community level, particular features of organizational structures are retained and replicated through the proliferation of specific types of organizations (Swaminathan 1995) and through a variety of processes of imitation (Miner and Raghavan 1999) and population-level learning (Miner and Haunschild 1995). The stabilization of boundaries around organizational identities is another powerful process of retention.

Evolutionary approaches attempt to combine these various claims into hypotheses about change in the world of organizations. The view that evolutionary approaches are trying to articulate is of organizations as incomplete entities that acquire inputs from their environments and transform them into outputs through a set of interdependent operational and administrative routines (Nelson and Winter 1982). As this production process unfolds, organizations themselves are changed by the rich variety of competitive, institutional, and learning processes triggered by acts of physical transformation of inputs in outputs (Padgett *et al.* 2003). Understanding how, exactly, these processes interact to build and change institutional, industrial, and corporate structures is the main objective of evolutionary models.

## ORGANIZATIONS AND OTHER ORGANIZATIONS

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The way in which patterns of resource availability change directly affects processes of variation, selection, and retention within and between organizations. The view of organizations as incomplete entities stressed by evolutionary approaches shifts the focus of attention from individual organizations to links between organizations and their environments, an insight that evolutionary theories share with other approaches to inter-organizational relations (Aldrich and Whetten 1981; DiMaggio and Powell 1983; Mizruchi and Galaskiewicz 1993). Because environments of organizations are other organizations (Aldrich and Pfeffer 1976; Pfeffer and Salancik 1978; Pfeffer 1987), the link between organizations and their environments is basically synonymous with inter-organizational relations. As a consequence of this conception of the environment, the identification of exactly what resources are relevant to any given organization cannot be made without reference to structures of local interaction that tie the reference organization to its 'neighbours' (Lomi and Larsen 1999, 2001; Robins *et al.* 2005). How are these neighbours chosen? Or, equivalently, what are the principles of 'bonding' that organizations follow to forge their own environment (Laumann and Marsden 1982)?

To address these and related questions, it seems obvious that organizations should not be considered in isolation but as active members of larger sets of organizations. The problem is indeed how to define these larger sets that at the same time bound evolutionary processes and affect how they unfold to shape industrial and corporate structures over time (Doreian and Woodard 1999). Without pretending to offer an exhaustive classification, we can identify two very general orientations, or strategies, to resolve the problem of how organizations are linked to their environments and to other organizations. As we discuss below, these strategies have far-reaching implications for the ways in which we think about inter-organizational relations.

The first strategy is based on the notion of organizational population. A population is a set of organizations that are characterized by similar external dependencies (Hannan and Freeman 1989). As Polos, Hannan, and Carroll clarify, 'the whole point of defining and identifying populations is to allow analysis of *local* social structures and the interactions they entail. A useful specification of a population should single out a set of entities that are expected to interact strongly both because they fall within the same system boundary and they share a common, highly-specific external identity' (Polos *et al.* 2002: 106, emphasis in the original). Examples of organizations that have been studied as members of populations include American Labor Unions (Hannan and Freeman 1989), American beer producers (Carroll and Swaminathan 2000), various types of financial institutions (Barron *et al.* 1994; Lomi 2000), international automobile manufacturers (Hannan *et al.* 1995), and semiconductor companies (Hannan and Freeman 1989).

An alternative strategy to define meaningful organizational aggregates allowing an analysis of local social structures and the interaction that they entail is based on the notion of inter-organizational field. According to DiMaggio and Powell, members of organizational fields include organizations that jointly compose 'a recognized area of institutional life: key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services or products' (1983: 148). Examples of organizational fields that fit this definition include the US art museums studied by DiMaggio (1991), organizations that participate in the US biotechnology industry studied by Powell *et al.* (2005), Southern Italian producers of means of transportation studied by Lomi and Pattison (2006), and the college book publishers studied by Thornton (2004). Perhaps the best examples of 'inter-organizational field' as defined by DiMaggio and Powell are 'civic arenas', inter-organizational settings in which 'actors must forge some sort of common framework for communication and joint action' (Mische and Pattison 2000: 167). Clearly, samples collected and analysed with the idea of inter-organizational field in mind tend to be more internally heterogeneous than samples selected to study organizational populations (Carroll and Hannan 2000). Hence, choice between populations and fields implies a different theoretical understanding of the sources of variation in processes of inter-organizational evolution.

While not necessarily mutually exclusive, approaches based on organizational populations and inter-organizational fields emphasize different aspects of the relation between organizations and their environments. Next, we turn our attention to an assessment of the research literature that has been inspired by these two broad approaches. While they remain clearly distinct, we believe that important elements of convergence towards a common set of themes will progressively become more visible.

## ORGANIZATIONAL POPULATIONS AND COMMUNITIES

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One way to think in evolutionary terms about inter-organizational relations is to consider individual organizations as members of a more general class of similar organizations—an organizational population (Hannan and Freeman 1977, 1989; Carroll and Hannan 2000). Relations then can be identified among organizations belonging to the same population or among organizations belonging to different populations. This latter case defines the community level of analysis (Freeman and Audia 2006).

Organizational populations are typically regarded as context-dependent manifestations of more general blueprints for organizing so-called 'organizational forms'. To what extent different organizations have the same form (and therefore belong to the same population) depends on structural features that they share (Hannan and Freeman 1984) and on the perceptions of external constituencies (or 'audiences') about expected lines of action (Hsu and Hannan 2005). Forms can be defined on the basis of a variety of elements including, but not limited to, common resource dependencies (Hannan and Freeman 1977), institutional or legal constraints (Barnett and Carroll 1993), similarity in network position (DiMaggio 1986; Burt and Talmud 1993), and identities coded in cultural rules (Polos *et al.* 2002), and are usually considered as the basis of the unitary character of organizational populations (McKelvey and Aldrich 1983; Ruef 2000).

Research on the dynamics of organizational populations and communities has developed several models to explain how inter-organizational relations affect organizational evolution (Carroll and Hannan 2000). Within this framework, the model of density-dependent organizational evolution represents perhaps the most prominent and best-documented example (Hannan 1986; Hannan and Freeman 1989; Hannan and Carroll 1992). The basic theory of density dependence argues that forces of social legitimation and competition drive changes in vital rates in organizational populations over time. Social legitimation is the process by which social

actors perceive and come to support a certain organizational form as a natural, taken-for-granted way to perform some kind of action (Meyer and Rowan 1977) and indicates the degree of social and institutional acceptance of a certain organizational form. Increasing legitimation implies that more resources are available in the organizational niche, defined as the environmental space in which the population's growth is non-negative. The number of organizations in a population controls the legitimation process. Increasing initial density enhances the legitimation of the form and therefore of the population that embodies the structural characteristics of such form. The organization's ability to mobilize financial and human resources increases when those who control resources take a given form as the default solution to perform certain activities. For this reason, this theory predicts that organizational founding rates are proportional to the level of constitutive legitimation (Carroll and Hannan 2000). In our opinion this argument reveals the implicit relational basis of processes of density dependence that most studies leave unspecified by considering legitimation as a diffuse process. More specifically, one could see the relational basis of density-dependent legitimation as a consequence of the fact that:

Once the first organization of a particular type has been founded, its members, clients, customers, and staff become potential sources for the further diffusion of information about that organizational form. Presumably, such people are convinced of the usefulness of the organization of which they are a part... Therefore, it is reasonable to suppose that they might act as sources for the propagation of such attitudes, thereby boosting pragmatic, moral, and cognitive legitimacy.

(Barron 1998: 216)

Because all organizations in a niche depend on common, limited resources, density also affects the intensity of competition existing among organizations. For new as well as existing organizations, the returns to legitimation decline as density continues to increase, since an environment can only support a limited number of organizations consuming the same limited resources. At high levels of density, additional entries lower life chances for members of the population. As was the case for legitimation, in ecological theories of organizations competition assumes a diffuse connotation (Hannan and Freeman 1977). Diffuse competition increases at increasing rates with density: as the number of organizations increases linearly, the possible competitive relations increase geometrically. As observed when discussing legitimation, considering competition exclusively as diffuse may tend to mask the relational character of competition as a process emerging from and inducing a variety of local configurations among subsets of organizations in a population (Burt 1992). Important steps in documenting and clarifying the local relational character of competitive processes have been made in the study of organizational niche width and overlap (Baum and Singh 1994a, 1994b; Podolny *et al.* 1996), organizational positioning (Dobrev and Kim 2006), size-localized competition (Ranger-Moore *et al.* 1995), and in studies that have linked processes of resource partitioning

to more general positional concepts such as that of strategic group (Carroll and Swaminathan 1992). While a systematic analysis of the multifaceted results produced by these various strands of research developed within ecological theories of organizations would distract us from the main purpose of this chapter, we are convinced that these studies well illustrate the considerable value of combining elements of the evolutionary approach with networks ideas for our understanding of the dynamics of inter-organizational relations. In general, we can say that ecological studies that have examined the implications of network-based processes behind the formation of technological niches have significantly advanced our understanding of the relation between industry structure and technology (Podolny and Stuart 1995; Stuart 1998), which is arguably the defining concern of evolutionary economics (Nelson and Winter 1982; Winter 1984; Dosi *et al.* 1997).

We think that the connections between the micro-relational structure of organizational populations and the aggregate regularities that ecological models of organizations take as their point of departure are most clearly visible in studies that have analysed inter-organizational roles and status ordering within and between organizational populations (Podolny 1993, 1994; Podolny and Stuart 1995). Studies of role-based inter-organizational ecologies start from the observation of a variety of mechanisms of endogenous structuring that emerge from local processes of interaction (Podolny *et al.* 1996). For example, it is common for organizations to form alliances with other organizations, exchange directors and enter into a wide range of collaborative agreements (Baker and Faulkner 2002). These activities of inter-organizational exchange give rise to complex local structures that induce internal partitions of organizational populations into classes of variable stability. As a consequence of this 'classification' process, differences emerge in reputation, status, and prominence among members of organizational populations (Stuart *et al.* 1999; Park and Podolny 2000). Once established, these differences feed back on exchange processes and tend to crystallize into enduring structures (Podolny 1993; Podolny and Stuart 1995). Stable population structures and correspondingly recognizable organizational identities emerge from these network-based processes of differentiation. In some cases, industries can develop structures with distinction between generalist and specialist organizations, while in other cases population structures take the extreme configuration of status, ordering, where organizations occupying higher status positions obtain greater recognition and rewards for performing a given task, while lower-status counterparts receive correspondingly less. In industries such as investment banking and wine production that are characterized by high uncertainty in the determination of quality, consumers tend to rely heavily on signals sent by producers' status, which may represent a relatively poor proxy for real product quality (Podolny 1993). Since high status organizations can produce signals of high quality at lower costs, the returns to high status contribute to reproduce a stable market order over a relatively long period of time. The implication of status differentiation for competition is clearly

illustrated in a study on the worldwide conductor industry (Podolny *et al.* 1996). From a definition of technological niches based on patent citation patterns, Podolny and his colleagues argue that organizational life chances improve with increasing organizational status, calculated as an aggregate deference vector of direct scientific citations from all other organizations. Unlike indirect connections that would reveal common technological antecedents, direct ties (citations) from organization A to organization B constitute an implicit acknowledgement of the importance of B's contribution. Therefore, robust position associated with high status in a market structure provides advantages. Yet, while the status effect is especially influential in sparsely crowded niches, it dissipates when crowding in the niche increases. In fact crowding, calculated as the sum of the overlaps in patent citations, reduces monotonically organizational life chances. These authors find support for these hypotheses of conditional status advantages in an examination of technological competition in the semiconductor industry between 1984 and 1991.

Status effects generate benefits beyond the individual organization that has built a robust position in the market structure, a kind of 'basking-in-reflected-glory' effect (Cialdini *et al.* 1976). For example, the effect of high status extends to organizational affiliations. The position of actors represents a means to claim membership and acceptance in a social community, but also to gain access to resources that incumbents and claimants utilize to pursue their interests. While an obvious reason for structural interactions between interdependent actors has to do with access to resources or markets, this is not the only one. In a study of strategic alliances in the biotech industry, Stuart and his colleagues find that small and young firms obtain better access to capital when they develop strong relationships with prominent organizations, due to the higher reputation of the latter (Stuart *et al.* 1999). High status organizations transfer their reputation to lesser known partners, which in turn are more likely to obtain positive evaluation from external actors and improve their performance despite the lack of experience. This is because the affiliates' characteristics (in this case, high social prominence) provide a reference point for resolving uncertainty about the quality of a young or unknown organization. The more general implication is that actors' reputations and identities are constructed in part from the reputations and identities of their associates. In a related study on the semiconductor industry, Stuart (2000) finds additional evidence of asymmetric positive externalities based on status, with young and small firms benefiting more than old and large ones from their association with large and innovative partners. Concomitantly, his study demonstrates that the effects of status transfer depend on the features of both parties to the association, particularly their resource profiles.

Despite their considerable degree of internal heterogeneity, most of the contributions to the growing literature on the origins and consequences of localized structures within organizational populations hinge crucially on identification and analysis of inter-organizational roles. Because the sociological notion of role can be reconstructed as a formal relational concept (White *et al.* 1976; Boorman and White

1976) there is a clear connection between some of the contemporary studies of organizational populations, communities, and identities, and the analysis of inter-organizational networks, fields, and role structures (DiMaggio and Powell 1983; DiMaggio 1986; White 1992). In the next section we review some of the evidence in favour of this claim.

## INTER-ORGANIZATIONAL NETWORKS AND FIELDS

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As we have discussed, ecological perspectives on organizations have been progressively moving away from early conceptions of organizational populations as monolithic collective actors and are beginning to recognize the importance of local structures for the evolution of organizational populations. In studies of organizational populations, local inter-organizational relations are typically reconstructed on the basis of 'pseudo-relations'—connections among nodes established by virtue of differences (or 'distance') in individual attributes such as organizational size or location (Baum and Mezias 1992; Dobrev and Carroll 2003).

However, the positions jointly occupied by organizations in a population (or 'organizational niches') may be represented not only in terms of attribute-based pseudo-relations, but also in terms of directly observable exchange relations (Burt 1992; Burt and Talmud 1993). DiMaggio (1986) has probably been the first to propose that organizational niches be defined in reference to patterns of observable exchange flows taking place within broader organizational fields. During the last twenty years this programmatic statement contributed to increase the interest in the analysis of networks between organizations. These networks are frequently interpreted as 'social' because they involve exchange across settings that are hard to reduce to any individual transaction (Fonti 2002). In other studies the social character of inter-organizational networks derives from the fact that the relevant relational contents involve direct connections among individuals, or 'dual' relations between individuals and organizations (Breiger 1974, 2002; Breiger and Mohr 2004; Wezel *et al.* forthcoming).

Evolutionary theories of organizations are first and foremost theories of change (Nelson and Winter 1982; Hannan and Freeman 1984; Barnett and Carroll 1995). Studies of inter-organizational networks have retained the strong static flavour that is typical of studies of intra-organizational relations inspired by network concepts and imagery (see also, Kenis and Oerlemans, Chapter 11, this volume). Analysis of social networks works best in well-bounded contexts, a characteristic that evolving inter-organizational fields simply do not exhibit (Powell *et al.* 2005). While the need

to study change in networks is now widely acknowledged (Doreian and Stokman 2003; Kilduff and Tsai 2003; Kim *et al.* 2006), studies of the network dynamics of inter-organizational relations have remained rare, with most of the received research based on cross-sectional samples (Ebers 1997). The scarcity of studies that have addressed the dynamic of network change can be in part attributed to problems and costs related to the collection of high-quality longitudinal data on complete networks. A second limiting factor is the methodological difficulty of specifying (and estimating) statistical models for network dynamics and change. The relatively few studies based on longitudinal research designs have the important merit of framing processes of formation and change of inter-organizational networks in explicitly dynamic terms (Gulati 1995; Madhavan *et al.* 1998; Stuart 1998; Gulati and Gargiulo 1999; Ahuja 2000; Owen-Smith and Powell 2004). These studies also share the limitations that are inherent to the independence assumptions that are typically imposed in the analysis of network dyads.

In general terms, it is probably fair to conclude that the development of an evolutionary approach to the study of inter-organizational networks has remained insufficiently articulated. Studies based on cross-sectional samples face the insurmountable difficulty of discriminating the direction of the causal process. In other words, in a static framework it is rarely clear whether observed network structures cause observed behaviour, or are caused by it. Our view is that this state of affairs is the consequence of the fact that the evolution of inter-organizational networks unfolds through two strictly related processes. While studies of inter-organizational networks have analysed only specific aspects of these processes, without appreciating their strong co-evolutionary character, research on intra-organizational networks seems to have made faster progress in the adoption of an explicit co-evolutionary framework (see Fonti *et al.* 2006 for an example).

The first is a process of selection that regulates the dynamics of attachment among organizations (Robins *et al.* 2001). Selection has to do with how actors structure their networks. This process of structuration may be more or less conscious (Leenders 1997) and requires the specification of what Laumann and Marsden (1982) called 'principles of organizational bonding' in their prescient article on network microstructure. Selection is affected both by characteristics of the actors as well as by endogenous, network-based, forces (Ebers 1997). Examples of selection processes based on characteristics of the actors include partner similarity, or homophily (McPherson *et al.* 2001) and functional complementarity (Ring and Van de Ven 1992). Examples of endogenous forces behind partner selection include transitivity, prominence, and reciprocity (Granovetter 1973; Oliver 1990; Burt 2005). The second is a process of influence that observed network structures exercise on the behaviour of individual organizations (Robins *et al.* 2001). Influence happens when an organization adapts its behaviour to that of its partners, learns from their experience, or emulates their strategies. Influence does not necessarily require direct interaction, as it may be induced by joint occupation of network

position, such as in the case of structural equivalence (Burt 1987). Influence takes on a number of contextual forms: network influence effects might be detectable in measures of organizational performance or in the diffusion of particular types of organizational practices and strategies (Galaskiewicz and Burt 1991; Burt 1992; Uzzi 1996). A good example of 'network effect' on organizational performance is Ingram and Roberts's study of friendship relations among competitors in the Sydney hotel industry, where they estimate that 'each friendship with a competitor contributes approximately \$268,000 to the annual revenue of a typical hotel' (2000: 417).

High-quality organizational research is available on each one of the sub-processes into which inter-organizational network evolution can be decomposed. Inter-organizational partner selection is an extensively researched topic at least since the ground-breaking work of Pfeffer and Salancik (1978) on resource dependence. The studies of Powell, Koput, and Smith-Doerr (1996), Beckman, Haunschild, and Phillips (2004), Baum *et al.* (2005), and Rowley *et al.* (2005) provide more recent examples of research on partner selection. Endogenous network-based processes have been emphasized in studies of alliances where firms have been shown to repeat alliances with previous alliance partners (Gulati 1995) and studies of knowledge diffusion (Chang and Harrington 2005). Gerlach's monograph (1992) on inter-organizational relations in Japan represents an extensive case study of selection based on individual characteristics of the partners. The topic of network influence on corporate behaviour has also been extensively researched (see also, Kenis and Oerlemans, Chapter 11, this volume). Examples include the effects of similarity in patterns of inter-organizational endorsement on organizational performance (Stuart *et al.* 1999), the effect of embeddedness on organizational performance (Uzzi 1996), and the effects of network affiliation on a multitude of organizational outcomes such as performance (Lincoln *et al.* 1996), diffusion of corporate practices (Davis 1991), changes in governance structures (Davis and Greve 1997), and adoption of organizational forms (Palmer *et al.* 1993).

To the best of our knowledge, though, no studies of inter-organizational relations are available that have specified processes of selection and processes of influence in the same model, discussing how network structures emerging from partner selection and behaviors deriving from network influence co-evolve. A notable exception is the study by Powell *et al.* (2005) on inter-organizational relations in the life sciences. These authors specify statistical networks models for testing four alternative hypotheses about the principles of inter-organizational attachment. The first principle is cumulative advantage—a sort of positive feedback in network ties. The second principle is homophily, according to which new partners are chosen on the basis of their similarity to network partners. The third principle is called 'follow the trend' and assumes that partner selection choices are driven by a sort of herd-like behaviour whereby organizations match their choice to the dominant choice of others. Finally, multiconnectivity implies that partner choice is driven by the main organizational goals to increase the reach and the diversity of inter-organizational

networks. In our language, these mechanisms of inter-organizational attachments represent alternative selection principles or principles of 'organizational bonding' (Laumann and Marsden 1982). Powell and his co-authors also explore the possible consequence of these principles for the choices and opportunities available to the members of the inter-organizational field, or in our language, patterns of network influence. These authors find that 'organizations with diverse portfolios of well connected collaborators are found in the most cohesive, central positions and have the largest hand in shaping the evolution of the field' (Powell *et al.* 2005: 1187). They also find that that no single logic of attachment dominates over the course of the period covered by their study (1988–99).

## OPEN QUESTIONS AND DIRECTIONS FOR FUTURE RESEARCH

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During the last quarter of a century, evolutionary interpretations have made available new concepts and solutions, but have also posed new theoretical questions and empirical challenges to students of organizations. As a consequence, virtually all the dominant theoretical paradigms that inspire contemporary organizational research can be viewed as confronting more or less explicitly problems that admit evolutionary explanations and have evolutionary implications (March 1994; Greve 2002; Nelson and Winter 2002; Aldrich and Ruef 2006). In the present commentary we have restricted the focus of our attention to the application of evolutionary ideas to the study of inter-organizational relations. We have acknowledged only in passing the fact that evolutionary processes involve change across multiple levels of analysis. Yet, the Chinese box-like character of intra- and inter-organizational hierarchies implies that evolutionary change is essentially a multi-level process: what happens at one level is difficult to understand without reference to what is happening simultaneously at lower and higher levels of aggregation (Breiger 2002). For this reason, many questions remain open about the appropriate level and unit of evolution in organizational research. For a general framing of these problems we refer interested readers to the recent discussions contained in Lomi and Larsen (1999), Baker and Faulkner (2002), Warglien (2002), Monge and Contractor (2003), and Aldrich and Ruef (2006). In the more general context of dynamic analysis of hierarchical structures, an important intellectual antecedent of these discussions is represented by the work of Simon on quasi-decomposable systems (Simon and Ando 1961; Simon 1962).

We started our broad commentary by drawing attention to the dynamics of boundaries of organizational populations and fields for understanding processes of

inter-organizational evolution (DiMaggio and Powell 1983; Hannan and Freeman 1986). Then we introduced the distinction between indirect and direct approaches to the evolution of inter-organizational relations. These approaches are used to draw boundaries around sets of interdependent organizations and, while both useful, they are based on different assumptions about what are the most interesting inter-organizational phenomena. Indirect approaches are mainly interested in an 'ecology of nodes' and interpret inter-organizational relations as mediated by aggregate demographic variables (Hannan and Freeman 1989). Indirect approaches typically see the evolution of inter-organizational relations as unfolding within organizational populations and communities. The main analytical advantage of indirect approaches is that they facilitate the specification of dynamic models of evolutionary change at the organizational and population level. In its original formulation, the main limitation of the indirect approach is that it assumes a high degree of homogeneity in the network structure of organizational population. Building on the insights of earlier network traditions (Boorman and White 1976; White *et al.* 1976), direct approaches concentrate on observable exchange flows among organizations in the context of broader fields (DiMaggio 1986; Powell *et al.* 2005). The main advantage of direct approaches is their ability to represent structural differentiation within an 'ecology of edges'. Their main limitation stands in the difficulty of providing a joint representation of mobility and classes, and in keeping track of change happening across the multiple levels of analysis that a relational perspective implies (Monge and Contractor 2003). The various chapters of the volume edited by Breiger (1990) collectively demonstrate the unitary character of this problem across apparently unrelated research settings.

While these two approaches appeal to different bodies of theory and remain clearly distinct, at times bordering on the mutually contentious, in our discussion we identified some elements of potential convergence. Studies of inter-organizational relations inspired by the indirect ecological approach are beginning to incorporate network-based processes of internal differentiation within organizational populations. Conversely, studies of inter-organizational relations inspired by direct network approaches are beginning to recognize the importance of framing issues of network formation and network influence jointly and in explicit dynamic terms. Important steps have already been taken in the direction of convergence. As evidence for this claim, we would add to the various studies that we have reviewed in this chapter the work of McPherson and colleagues on the dynamics of niche overlap in populations of voluntary organizations (McPherson 1983; McPherson and Ranger-Moore 1991; McPherson *et al.* 1992). Much work remains to be done. As we have discussed, we see progress in the evolutionary understanding of inter-organizational relations as heavily dependent on our ability to develop, specify, and test statistical models for network dynamics (Doreian and Stokman 2003; Snijders 2005). The application of these models to the study of inter-organizational relations is in its infancy. Available models are still of limited usefulness for the analysis of

samples that are as large as those routinely analysed in contemporary empirical studies of organizational populations, communities, and fields.

At a more general conceptual level, one of the main issues still awaiting serious scrutiny within evolutionary theories of organization is related to the ambiguity of the distinction between organizational 'genotypes' and 'phenotypes'. With their characteristic emphasis on behaviour, evolutionary theories of organizations tend to confound routines—structured repositories of information that regulate production activities and that are highly reproducible—and their behavioural expressions, which arise from the interaction of routines with the environment (Warglien 2002). In biophysics, the process linking 'genotypes' (routines in our terms) to 'phenotypes' (organizational forms or perhaps identities in our terms) is called development, and it plays a crucial role in the conversion of random mutation into systematic innovation (Fontana 2002). The evolutionary trajectories of organizational populations and fields simultaneously depend on and affect processes of organizational development (Malerba *et al.* 1999; Nelson and Sampat 2001; Lomi *et al.* 2005). Reaching a detailed understanding of the feedback structures that regulate processes of evolutionary development—or 'evo-devo'—is a crucial task for contemporary evolutionary theories (Maynard-Smith *et al.* 1985; Gould 2002) and is perhaps the final test for the relevance of evolutionary interpretations to the study of inter-organizational relations.

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