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The Genesis and Dynamics of Organizational Networks

Gautam Ahuja

Stephen M. Ross School of Business
University of Michigan

Giuseppe Soda

Bocconi University
Department of Management and
SDA Bocconi School of Management

Akbar Zaheer

Carlson School of Management
University of Minnesota

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Abstract

A cursory look at the organizational network literature presents a rather unbalanced picture in terms of the focus of current research. Specifically, while an extensive body of knowledge exists on network outcomes and on how network structures may contribute to the creation of outcomes at different levels of analysis (individuals, groups, organizations and populations of organizations), less attention has been paid to understanding how and why organizational networks emerge, evolve and change. A more robust, influential and useful theory of networks should combine both dynamic and structural complexity. In this paper we propose an integrated theoretical framework that encompasses the micro-foundations and micro-dynamics, processes and forces shaping the genesis and the evolutionary trajectories of organizational network architectures. We then proceed to theorize specifically on the mechanisms by which time shapes the relationships between network structures and outcomes. Such a theoretical advance is important because without a better comprehension of the factors that shape network structures over time, scholarly understanding of organizational outcomes is incomplete.
Classic works have theorized generally about the determinants of inter-organizational relationships (Oliver 1990, Galaskiewicz 1985) and some research has demonstrated how specific industry events shape networks over time (Madhavan, Koka, and Prescott 1998). More recent research has addressed the macro-dynamics of networks to understand how organizational fields evolve (Powell et al. 2005). However, while scholarly understanding of the factors that influence the formation of relationships between entities exists, a research issue that appears to demand attention involves identifying the origins and the evolution of alternative types of network structures. How and why do organizational (and interorganizational) networks evolve to take the forms that they do, and what are the consequences of such evolution for the organizations that comprise them? In this paper, we define organizational networks as representations of connections between organizations or organizational units.

At the interpersonal and intra-organizational level, Kilduff and Brass (2010) have recently offered an overview of network antecedents: spatial, temporal, and social proximities (Festinger, Schacter & Back, 1950); homophily (e.g., McPherson, Smith-Lovin and Cook, 2001); balance (e.g., Heider, 1958); human and social capital (e.g., Lin, 1999); personality (e.g., Mehra, Kilduff, & Brass, 2001); social foci (e.g., Feld, 1981); and culture (e.g., Lincoln, Hanada, & Olson, 1981). Some of these mechanisms operate exclusively at the interpersonal level while others transfer to the interorganizational level.

Nevertheless, while research on network outcomes and the formation of network relationships or ties is valuable, less attention, with a few exceptions (e.g. Gulati and Gargiulo 1999, Zaheer and Soda 2009), has been paid to understanding how and why networks emerge, evolve and change. The limited attention to network genesis and
evolution has been noticed. For example, Powell and his colleagues (2005: 1133) observe that, “In the [still] most comprehensive text on network methods, there is only a paragraph on network dynamics in a section on future directions (Wasserman and Faust, 1994).” As well, a research focus on the factors and processes behind the formation of network structures and their evolution is important because “cross-sectional analyses of networks often leave causal relations ambiguous” (Brass et al. 2004: 809). As consequence, for a considerable period research has developed with the implicit assumption that network architectures are static.

Some noteworthy research on explaining the origin of ties has advanced the notion that past ties predict future ties (Walker, Kogut, and Shan 1997; Gulati and Gargiulo1999). However, explanations for the creation of ties do not always carry over into an understanding of the creation of network structures. In particular, a focus on tie creation glosses over the nature and origins of the portfolio of ties for a focal organizational actor and importantly, an understanding of the reasons for the presence or absence of ties among the focal actor’s alters (those to whom a focal actor is connected) as well as the origins of the structure of the network as a whole. A focus on the creation and evolution of networks rather than ties is important because structure explains outcomes and collective behaviors in a different way than do ties. Outcomes such as organizational performance cannot merely be explained with a tie-based perspective. Rather, explanations drawn from structure add a qualitatively different dimension to an understanding of social action and behavior.

In this paper, we take on the challenge of theoretically addressing some of the key research issues of network genesis and dynamics that are still open in literature. The genesis of networks and their evolutionary trajectories are closely related because they are two sides of the same coin. Thus, the processes, the mechanisms, and the forces that contribute to
network genesis are in many aspects similar to those that explain network dynamics. We believe that such understandings will provide a crucial contribution to the development of an organizational theory of networks. This is important because without a better comprehension of the factors that cause network structure to come about in the first place, scholarly understanding of organizational outcomes emerging from network structure is incomplete.

**Network Genesis and Network Dynamics: Open Research Questions**

We know a great deal about the effects of organizational networks; given a network structure or network position, researchers have assembled an impressive body of theory and supporting (and sometime conflicting) empirics to help us understand what implications we might see in terms of behavior or outcomes of the organizational actors enmeshed in those networks (e.g. Hansen 1999, Ahuja 2000, Reagans and Zuckerman, 2001, Reagans and McEvily 2003). Yet, most of our theorizing often suggests a curiously static and passive approach on the part of these actors with respect to the network itself. While these actors respond to the constraints and opportunities of the network in many ways, empirical network research rarely considers the most direct line of attack on a constraining network – to change the network itself (Emirbayer and Goodwin, 1994).

For instance, we know that actors that span structural holes can use their position to benefit themselves as they trade information, favors and the like. Yet, this raises the natural question – do structural holes remain unfilled? If yes, why? What happens as other players in a network observe the returns to network entrepreneurship of the sort envisaged most notably by Burt (1992)? Would they be induced to replicate these returns by restructuring their own networks? Or would they respond by trying to partially appropriate the benefits
that have emerged through side-payments rather than through restructuring the network structure? Thus, why do opportunities conferred by a network not get redistributed through the reorganization of the network? Burt’s conception of brokerage as social capital highlights an entrepreneurial role for organizational actors in the creation of this valuable form of social structure (Burt, 1992; Hargadon and Sutton, 1997). At the same time, this approach is clearly a static that misses out the opportunity to illuminate the complexity of actions and micro-dynamics occurring over time. Thus, if intentional actors – agents – can purposively enact their social structures creating powerful positions, in order to understand why some specific network structures emerge, a static and restricted ego perspective offers only a partial view.

Similarly, it has often been argued that networks also serve as sources of constraint, restricting the focal actor’s ability to change by embedding them in a web of relationships. Yet, one might surmise that once an actor senses this limitation it is only natural for them to try to find release from these constraints. Limited, if any, research has so far examined whether such constraints can and are removed as actors change their patterns of embeddedness in response to their survival needs in an evolving environment (Rowley, Behrens and Krackhardt, 2000). Alternatively, networks have often been argued to be a form of governance structure, a set of relationships that promotes trust and thus fills an institutional void enabling economic activity. Yet, most institutions in societies are themselves evolving, and it is likely that institutional voids are often filled by the emergence of new institutions or the strengthening of old ones. If so, are networks then redundant, their constraint costs now exceeding their opportunity benefits? Moreover, the genesis of specific network structures or architectures does not interrupt their evolution. In fact, the emergence of network architectures form micro mechanisms and processes may create
conditions which subsequently shape the evolution of the networks. Thus, what are the main evolutionary trajectories of network evolution and what are the forces operating behind them?

In this paper we offer a theoretical framework which take on the challenges proposed by this these questions. We proceed by developing our theory of network genesis and evolution.

**Toward a theory of network genesis and evolution**

In this paper, we develop a theoretical model of network genesis or emergence and its evolution based on several stages. First, we focus from an ego perspective on the role played by micro-foundations of organizational networks, factors operating at the tie and nodal levels, which we connect through micro-dynamic mechanisms, changes and interactions at these elemental levels, to the genesis and emergence of different types of network architectures. Second, we identify higher level evolutionary patterns of networks by which these architectures generate inducements, constraints and opportunities that affect micro-foundations and in turn shape the evolution of networks at the lower tie and nodal levels. Thus, we build our theory through a model that links the elemental levels of ties and nodes to the overall structure of the whole network and vice-versa. This approach to network evolution is consistent with how many evolutionary theories address the issue of economic and social dynamics (Coleman 1990). Third, we shift our focus to the relationship between networks and outcomes and the role of time in this process.

In understanding the process of cumulative changes in these network social structures, we highlight the role of the mutual influence, interdependence and co-evolution between specific micro-foundations and their dynamics or mechanisms, and the general
evolutionary changes that these bring about at higher levels. For example, at the whole network level we may observe over time structural dynamics such as increasing structural properties of network closure or evolution in smallworldliness or the network’s core-periphery structure. Such network evolution is generated by a complex combination of the underlying micro-foundations and the micro-dynamic changes that they generate.

It is important to note that although micro-foundations are the origins of changes at the network level, this may not necessarily always be the case. Thus, a network may remain structurally stable over time with relatively unchanged values of density, clustering, or smallworldliness, because the micro-dynamics might cancel each other out, for example by some ties being dissolved but compensated for by new structurally equivalent ties being formed at the same time. So, hypothetically, from an overall network standpoint a network may remain structurally stable over time but at the tie and node level it could be quite dynamic.

**Micro-foundations and micro-dynamics of network genesis and evolution**

We argue that the genesis and the evolutionary trajectory of networks is determined at the level of ties and nodes by mechanisms that derive from the micro-foundations of network evolution. By “micro-foundations” we mean the basic factors, the actions, behaviors and conditions that drive or shape changes at the levels of ties and nodes in a network. In using this term, we do not make reference to the traditional distinction in the social sciences between micro-individual and macro-organizational levels. Rather, we include in the concept of micro-foundations the tie and nodal level dynamics of networks, which, parenthetically, could apply at all networks, including the inter-organizational, intergroup and interpersonal.
We posit that at a general sense, three primary micro-foundations can be identified to explain the genesis and the evolution of networks. These micro-foundational explanations can be respectively termed as *agency* (Sewell 1992; Emirbayer and Goodwin 1994; Emirbayer and Mische 1998); *norms*, including pressures for persistence and change (Giddens, 1984; Portes and Sensenbrenner, 1993; Coleman, 1988); and *exogenous and random* factors. *Agency* refers to the focal actor’s motivation and ability to shape relations and create a beneficial link or structure. *Norms: persistence and change* refer to the inertia generated by the persistence of social structures as well as the social processes by which the focal actor’s actions are influenced, directed and constrained by norms and institutional pressures. Finally, we do not exclude, consistent with the view of complexity theorists, that the emergence of network structures may be a result of exogenous factors that emanate from beyond the network, or from simply random processes, whether generated inside or outside the network (Mizruchi, 1989).

These micro-foundations operate via mechanisms that we refer to as network *micro-dynamics*, such as brokering or reciprocating, that embody causal logics and processes and which result in a set of changes at the node and tie levels. These micro-dynamics cause changes in network membership through dissolution or formation of ties, changes in tie content, strength and multiplexity, as well as the transformation of nodal attributes. The complex combination of micro-dynamics at the tie and node levels in a network affects the ego network. In turn the aggregation of ego-level changes determines the structural evolutionary trajectory at the level of network as a whole. At the same time, structural transformations at the whole network level create new inducements, opportunities and constraints which in turn affect the network’s micro-dynamics and consequently ego level tie and nodes in the subsequent period. Thus, the network level structural changes and the micro-dynamics at the
tie and nodal levels co-evolve in a complex, interdependent fashion. We proceed to discuss each of the micro-foundations.

*Agency.* A promising but both theoretically and empirically under-explored factor promoting the creation and the evolution of networks is the notion that actors purposively enact their social structures, generally referred as agency behavior (White, 1992; Emirbayer and Mische, 1998; Burt, 2005). They do so by choosing or not choosing to establish connections with certain other actors in their networks, by forming or dissolving network links, by strengthening or weakening relationships, or by modifying the content that flows through the connections. In this view, actors deliberately seek to create social structures that favor them in some way. Burt’s idea of structural holes as social capital is consistent with this explanation, which highlights an entrepreneurial role in the creation of this valuable form of social structure (Burt, 1992). Such a conception, as Nohria and Eccles put it, “treats actors as purposeful, intentional agents” (1992: 13). As a result, network structures emerge as a result of self-seeking actions by focal nodes and their connections.

We theorize about the role of agency as one of the micro-foundations, or nodal-tie level foundational factors, in the network evolutionary process. Within this framework, network research may include both structural, such as overembeddedness, and nodal level factors, such as entrepreneurial orientation, as agency-driven predictors of network change. Emirbayer and Mische view agency as “the temporally constructed engagement by actors…which, through the interplay of habit, imagination and judgment, both reproduces and transform structures” (1998: 970). From this perspective, a useful approach to agency is one that incorporates all of these different components; it is not just about the idea that
actors “could have acted otherwise” (Giddens 1979: 56) but that the actors can devise unique responses to improve their own situations in the network.

Using the micro-foundation of agency can be particularly useful in testing theories that explain how network strategies are manifested in a dynamic context. Agency behaviors and actions shape the evolution of networks through an instrumental perspective, and can be more directly interpreted as emanating from a self-interested, utility reasoning.

We argue that agency operates through several micro-dynamic mechanisms: We describe the operation of some key micro-dynamics from the perspective of ego: specifically, modifying dependency, and ego-level preferential attachment.1 By establishing or dissolving ties which enhance their own brokerage power, or reduce the brokerage power of others over themselves, actors modify alters’ dependency on itself. By modifying dependency we mean that the focal actor either reduces its own dependency on alters or increases alters’ dependence on itself (Pfeffer and Salancik, 1978; Sytch et al. in this issue). In a network context, this modification of dependency is achieved in several ways. On the one hand, by establishing or dissolving ties which enhance their own brokerage power, actors increase alters’ dependency. On the other hand, focal actors can reduce the control and information power of other brokers by filling disadvantageous structural holes and creating ties with other alters. At the same time, agency may also be the motivation for tie dissolution, if past high cohesive network structures among similar alters are unsatisfactory and promote negative lock-in type behaviors around ego. Agency then provides the motivation to seek through more open structures a more heterogeneous set of alters by reconfiguring past schemas (Zaheer and Soda, 2009).

1 We note that preferential attachment is typically viewed as a network level phenomenon – but we can also apply preferential attachment at the ego level as an agency-driven mechanism.
Preferential attachment at the ego level is the propensity of an actor to form relationships with highly connected, central and prominent alters. By virtue of their prominence in the network, highly central and high status actors receive an abnormal share of new network ties over time (Washington and Zajac, 2005). A central or high status actor is potentially highly active in the tie formation arena and is also more likely to form new relationships and, hence, is more likely to enter bridging relationships by random chance (Mizruchi, 1989). Similarly, low status actors seek to form ties with high status actors in order to signal their inherent quality to the market (Podolny, 2005). This mechanism is essentially based on the idea that the status of an actor derives from the status of alters with whom it is affiliated (Benjamin and Podolny, 1999). Such a signal is valuable when market uncertainty increases (Podolny, 1993). As a result of this process, Powell and his colleagues (Powell et al. 2005) suggest that central and high status actors are likely to receive a disproportionate share of new ties. They refer to this network evolutionary process as “accumulative advantage.”

Moreover, preferential attachment may amplify changes in the structural characteristics of networks. In fact, accumulative advantage can indirectly influence the redundancy of a network by reinforcing the brokerage position of prominent actors (Fleming and Waguespack, 2007). More specifically, high status and high central actors would be reluctant to embed themselves in tightly-connected networks where the risk of knowledge spillovers would be higher than in open networks. By using their selection power based on their privileged network position, high status actors establish connections with others which are not highly structurally embedded in order to reduce the possibility of spillovers and the leakage of competitive information.
In sum, even though the structuration processes underlying network dynamics and evolution are complex at the ego level, we argue that networks are not epiphenomenal, nor only the consequence of random events, but also an outcome of the systematic agency-driven determinants such as increasing brokerage due to egos’ need for greater power and control.

Norms: Reciprocity and Trust. Rather than being created or destroyed by agency, ties and nodes in the network themselves also tend to persist or change through norms, values, rules, reciprocity and trust that both induce inertial social pressures and pressures for change. Persistence and the implied network stability also matters because the factors that impede or inhibit change in networks may be as relevant for network evolution as those that enhance change. In turn, this process creates forces that shape and constrain an actor’s behavior over time. It is important to note that rather than the structure itself, it is the content or the social processes flowing through the structure that acts as a mechanism encouraging network persistence. This notion reflects Blau’s idea of the structural context of opportunities (Blau, 1994) and includes the argument that actors tend to prefer linking within groups rather across them (Li and Rowley 2002).

Giddens’ (1984) conception of the duality of structure and action is also apropos. He views the two concepts of structure and action as acting and interacting in ways that mutually reinforce and perpetuate the social structure through a ‘structuration’ process (Sydow and Windeler 1998). Network persistence through inertia is the extent to which network interactions are reproduced over time and across a number of actors who develop what Giddens (1984) refers to as “structural properties” or institutionalized frameworks that are reproduced across time and space. Thus, ego network structure may not driven in such
cases by teleological behaviors or judgment or reconfiguration as much as by trust and reciprocity that capture the inertial, constraining effects of prior patterns of relationships.

Furthermore, different kinds of social structures may weather time to different extents. Scholars have also pointed out that different types of ties persist to different extents over time. For example, Feld (1997) shows that supportive, stronger ties are more likely to persist over time. Burt (2002) also discusses the decay of relations over time, while noting that little research exists on the stability of relations over time. Beyond a point, of course, relations may have decayed to a level from which they can no longer be reconstructed.

An example of a concept that typifies the effect of norms is structural cohesion or closure which embodies ties that are reinforced over time. These are expressions of accumulated and socially embedded relationships that constrain the ability, motivation and preferences of individual actors toward preserving past patterns in future networks. Thus, actors linked together in the past may tend to also be reciprocally connected in a future period. Networks with high cohesion in the past may tend to find themselves in tightly-linked structures in subsequent period because they tend to replicate previous connections. The persistence argument also relies on another class of explanation, which derives from tie strength or relational embeddedness (Granovetter 1973; Uzzi 1997; Nahapiet and Ghoshal 1998). This structural explanation suggests a strong role for stability and path dependence, and emphasizes the role of inertia and relational lock-in in network dynamics.

It should be noted that even when the micro-foundations are built upon norms, there is likely to be a nodal-level ego action, such as by allowing the tie to persist, which may invoke some form of agency. Thus the distinction between these foundations is not completely clear. Nevertheless, we have attempted to draw this distinction, based on the idea that some actions are primarily driven to benefit ego than are other actions. Thus, these
micro-dynamics are not necessarily “automatic” in shaping actors’ behaviors. As Sytch et. al. (this issue) note, organizations “economize in their search” for alters by choosing those familiar to them.

Random/Exogenous. Ego network changes may also just come about through random factors beyond the control of ego, or exogenous from outside the network (Jackson and Rogers, 2007). For example, being nominated together for an institutional board may quite randomly create a tie between two organizations (Bell and Zaheer, 2007). When cumulated, it is conceivable that systematic patterns can be generated in the overall whole network through purely random processes at a very high level. Thus, Watts and Strogatz (1998) demonstrated how the whole network took on small world properties when some long links were randomly added in an ordered network. However, while such structural random or exogenous factors under certain conditions may result in regular patterns at times, they do little to help us understand the social behaviors, or the micro-foundations, underlying the creation of such patterns (Uzzi, Guimera and Spiro, 2005). We have theorized up to this point about the micro-foundations of ego-network change, and illustrated how some of the mechanisms emerge from the micro-foundations and create the micro-dynamics of network change. These changes includes changes to ties (creation or dissolution; changes in content, strength or multiplexity) and as well as changes to ego-network structure. Among the micro-dynamic changes we identify at the tie and node levels, research on network dynamics has mostly focused on tie creation rather than tie dissolution (Ahuja and Polidoro, 2009; Rowley et al. 2005 are exceptions). Together, as noted earlier, these micro-dynamic changes modify the ego network, and cumulating changes in the ego networks comprise the whole

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2 While we do not systematically address this issue, an important driver – and outcome – of network change is the extent to which the node itself is modified in terms of its identity and characteristics. Thus, an important direction for research is the extent to which, and how, nodal-level changes drive changes in the network as a whole and how conversely, network change influences changes in nodal attributes.
network in turn create new patterns and structures at overall network level a discussion we take up next.

**Micro-dynamics and network architectures**

We now address key questions regarding the processes and the conditions that give rise to transformations of networks and their structural characteristics, and the influence of micro-dynamics on overall network and on the changes at the network level. In the temporal evolution shaped by micro-dynamics, network architectures may be structured in a variety of forms and configurations. The way in which micro-foundations and the ego-structures interact and result into network configurations is complex and strongly affected by micro-dynamics. Beyond such evolutionary complexity including the influence of exogenous and random processes, research has identified some dominant forms or architectures which emerge and evolve over time. In this part of our paper, we present a model linking the micro-dynamics we have identified to specific networks structures that might emerge over time. We note that our discussion here reflects a probabilistic rather than a deterministic stance, recognizing that complex and evolutionary change processes are unlikely to ever be completely deterministic.

We begin by arguing that network architectures and their emergence are complex processes because of the underlying nonlinear dynamics of the nodes (Strogatz, 2001). We define network genesis or emergence as the complex processes and mechanisms that shape the ways in which formation and dissolution of ties influence the form and the structural configuration of the network (network architecture over time. More precisely, the complex cumulation of the changes engendered by the micro-dynamics at the ego-network level, when aggregated up to the whole network, is likely to result in specific patterns and architectures at the higher level. We build our theoretical model on predicting the emergence of some basic network archetypes or structures:
fully connected, dense networks, multiple isolated clusters, open networks with structural holes, small worlds and scale-free networks.

Clearly, the mechanisms we are proposing are not exhaustive of the potential range of causal factors that can generate the micro-dynamics resulting in network trajectories but they are particularly important at the organizational level of analysis. However, they encompass the dominant explanations that research has offered to the scholarly understanding. The framework we present in the table below is based on how the micro-dynamic mechanisms, and interactions between them are likely to result in the emergence of a specific network structure or archetype. Table 1 synthesizes our theoretical framework.

**Table 1 about here**

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**Genesis and Emergence of Network Architectures**

**Dense Networks**

In contexts where actors are induced and motivated by norms, including reciprocity and trust, ties, their strength, and the resulting social structures are created as the results of actors’ compliance with group expectations or institutional pressures (Portes and Sensenbrenner 1993). We refer to this complex family of mechanisms as “bonding” (Putnam, 2000). This view suggests that social structures are formed through both the reproduction of norms and behaviors embedded in past social structures and from similarity, or homophily, between actors (Giddens, 1984). Moreover, norms also promote egos’ actions like deepening the network by strengthen ties to existing network, preserving existing ties and overlaying social ties over purely business relations or transactions (see Vissa this issue). Thus, over time, ties may be repeated and consequently
become stronger and more durable; time enables relations to be cemented and developed. This process generates nodes familiarity, reciprocal obligations and norms that shape the evolutionary trajectory of networks. To be admitted into the network, eventual newcomers should be also attached with the cement of persistent relationships.

As these forces shape the network and are manifested in the degree of reciprocity, balance and transitivity in relations, they are important indicators of the stability and institutionalization of actor's positions. Some theorists feel that there is an equilibrium tendency toward dyadic relationships to be reciprocated (Hanneman and Riddle 2005). Moreover, networks that have a predominance of reciprocated ties are arguably more stable than networks with a predominance of asymmetric connections, such as hierarchical networks, or open networks with structural holes. As a result, the patterns of network evolution and network expansion will be affected by actors' familiarity or past ties, and network members are more likely to connect with similar others as well past ties will persist over time. Thus, due to trust, reciprocity and familiarity networks become more dense over time and relationships stronger and multiplex. In this way, network density increases until its maximum value is reached, in a fully-connected network.

Soda and Usai (1999), provide an example of network genesis at industry level based on these micro-dynamics. The normative and social pressures in the construction industry generate a "network of indebtedness," a particular form of embeddedness that capture a norm of reciprocity and the subsequent reiteration of relational patterns connecting a group of actors. As a result the industry network grows around a single component, increasing over time its density and connectivity. Moreover, indebtedness amplifies the entry barriers to newcomers and, in the case that reciprocity is not respected, provides for sanctions that may
even include expulsion from the network. This finding is consistent with the arguments proposed by Walker et al (1997: 111): “[..] all firms in an industry had relationships with each other, interfirm information flows would lead quickly to established norms of cooperation. In such a dense network, information on deviant behavior would be readily disseminated and the behavior sanctioned.” In synthesis, the closure of these networks strengthen the mutual monitoring capability of member actors, making the expected costs of opportunistic behavior higher (Coleman, 1988).

Multiple Isolated Clustered Networks

Norms and reciprocity at the micro-dynamic level also drive the creation of a network with multiple isolated clusters. In such networks, the structure is based on sub-sets in which the actors are closely and intensely tied to one another and connections across clusters are missing. Using the language adopted by the literature on complex systems a network with isolated clusters is a fully decomposable system (Ethiraj and Levinthal, 2004).

In many situations, network actors interact with a fairly small set of alters, many of whom know one another. The extent of local clustering in networks is an important structural characteristic. Broadly, actors are embedded in clusters since they represent categorical social units or sub-populations defined either by shared attributes or shared membership. These clusters or sub-populations can be either open, or connected with other clusters or closed the extent to which most actors play out most of their relational activities within the boundaries of these clusters.

Some specific contingencies can also influence the processes described for dense networks earlier and result in network architectures that are based on numerous multi-separated, highly connected but isolated clusters. When a munificent context attracts a large number of actors, trust and reciprocity are likely to interact with high competition and divergence of interests, resulting
in a network architecture that may take the form of multiple isolated clusters. Over time, by virtue of this mechanism, a large proportion of the network’s ties become highly clustered into local neighborhoods. Under these conditions the persistent patterns of ties generated by bonding behaviors create identifiable self-reproducing network positions and segment the network into semidetached clusters of repeatedly cooperating sets of actors.

Conversely, when these exogenous forces operate in the opposite direction – low number of newcomers and convergent interest – the emergent network architecture is more aligned with a fully connected one.

Open networks with structural holes

A number of authors have referred to the value provided by “bridging ties” or “linking” forms of social capital (e.g. Adler and Kwon, 2002). While an extensive literature in a number of fields exists on the outcomes and benefits of structural holes, remarkably little work focuses on the origins of structural holes in particular (Zaheer and Soda, 2009). Actors may deliberately seek to create social structures that favor them in some way. In fact, Burt’s idea of structural holes as social capital is consistent with this explanation highlighting the entrepreneurial role of creating such a valuable social structure. Specifically, we theorize that it is necessary to assume a significant role for agency in the motives that actors may have for creating structural holes in their social structures. Under the agency micro-foundation, we distinguish between three different micro-dynamics for the creation of open networks with structural holes: one, market signaling (Podolny, 1993), two, bridging, and three, brokerage and control.

The first mechanism, market signalling, operates through organizational actors signalling their inherent quality by seeking connections with high status and prominent
because the status of a focal actor derives from the status of alters to whom it is affiliated (Benjamin and Podolny, 1999, Castellucci and Ertug, 2010). Such signals of high status are particularly valuable when market uncertainty is high (Podolny, 1993), since other cues about the inherent quality of the actor are missing. The relationship between status and structural holes has been addressed by Podolny (2005) who suggests a high correlation between the two constructs because an actor that seeks structural holes is likely to be prominent in the overall network and status signals will attract disconnected ties to the high status actor. As a result, the emergent network architecture will be an open one, characterized by few actors with a strong brokerage and mediation power.

The second mechanism, bridging, comes into play when, in creating or dissolving ties, actors seek variety, novelty, and new ideas from their alters. As the well-established literature on structural holes indicates, network actors deliberately search for disconnected alters with the expectation that these will provide it the requisite diversity and novelty. Consistently, Reagans, Zuckerman and McEvily (2004) find that greater actors’ diversity enhances structural holes. Such a conception of structural holes is consistent with the logic of weak ties as bridges to distant and likely diverse sources of information and knowledge (Granovetter, 1973). From this perspective, all actors belonging to bridged groups may benefit from the weak tie-bridges and the overall network may reach a stable, even temporary, equilibrium.

A third explanation derives from actors gaining brokerage, control and arbitrage benefits. As we noted earlier actions aimed to occupy and exploit bridging opportunities of distant social circles, disconnected information and knowledge, and integration across fragmented sub-groups are likely to result in small-world structures (thus, combination of bridge ties and local clustering), the effects of control and information arbitrage logic are more directly related with the emergence
open networks rich of structural holes. However, this structural architecture of the network represents a more instable and short-term structural equilibrium.

It is important to note that even though the structure of the open network with structural holes may be similar in both the cases we have just discussed (i.e. weak tie bridges and brokerage), the stability of the network will differ because of the content of the spanned ties.

**Small world networks**

Recently, several studies have focused on a special kind of organizational network, the small world (Milgram, 1967; Kogut and Walker, 2001; Fleming and Marx, 2006). The simple small world network occupies a large region of $p$ values where clustering coefficient $C(p)$ is high relative to its random limit $C(I)$, and the average path length among actors $L(p)$ is as “small” as possible. Small world networks have been shown to arise in a surprisingly wide variety of organized systems, such as scientific collaborations, creative teams, inter-firm alliances, investment banks at different levels of analysis. (Baum et al. 2003; Sytch et al. this issue).

In a recent paper Kilduff (2010) has highlighted the distinction between “strategic interactions,” as the mechanisms behind structural holes -- brokerage -- and the “serendipitous embeddedness” that more likely leads through weak ties to small worlds. Thus, consistently with the original intuition of Granovetter (1973), while weak ties are channels for bridging social distance, the idea of structural brokering captures the bridges across gaps and the ego control of information hold by disconnected others. By virtue of the combination of bonding dynamics, and weak ties bridging the emergent network takes on a small world architecture. Specifically, tie persistence and transitivity, ego-network deepening, and reciprocity lead to the formation of local communities and dense clusters of tightly interconnected actors. As a consequence, actors tied to
common partners can access more reliable information. Further, the sharing of common ties signals that they are regarded as trustworthy partners by common alters. Moreover, ties with common third-parties reduce information asymmetries (Krackhardt, 1999).

However, information advantages deriving from weak-tie bridging induce actors to create network subset spanning positions between key actors from different clusters, binding them together into a small world architecture. In a context of inter-organizational relationships, Baum et al. (2003) highlight three alternative dynamics which can explain the formation of ties among tightly connected clusters and lead to network ‘smallworldiness.’ First, clusters may come about by sheer chance “...without any strategic intent of the part of spanning firms” (2003: 704). A second mechanism, which they label “insurgent partnering,” is based on the idea that the peripheral actors who want improve their positions or alter their dependency will have strong incentives to form ties between unconnected clusters. Third, another agency mechanism operates through the motivation of prominent and high status actors wanting to establish relations with actors of similar status, even if positioned in different clusters, in order to signal their superior hierarchical position and preserve their high status. In this way, the two non-random dynamics, bridging and high status attaching, that operate to create bridges across clusters, take us back to agency micro-foundations. Thus, norm driven behaviors and the agency-driven pursuit of strategies aimed at creating advantageous network positions or status signals, shape over time the formation of tightly coupled clusters and spanning-ties among them. In sum, the interaction between bonding dynamics and the agency-derived incentives creates small world networks.

**Scale free networks**

Scale free networks are those dominated by a power law distribution, which suggests a few hubs with a very large number of ties, and a many nodes with only a few ties (Barabási and
Bonabeau, 2003). Like many networks, the emergence of networks whose degree distribution follows a power law is largely determined by attaching to highly prominent, central and popular actors, creating “cumulative advantages” as originally defined by Price (1976). This mechanism is rooted on a social phenomenon by which “success seems to breed success” (Price, 1976: 292). Attaching to prominent actors is based on the idea that the popularity or the prominence of an actor derives from those of alters with whom it is affiliated (Benjamin and Podolny, 1999). So, when “popularity is attractive” the random network equilibrium is strongly altered by the tendency of actors to form ties with high prominent others. As a consequence, network growth leads to a scale free architecture (Dorogovtsev and Mendes, 2003).

As a result of this process, Powell and his colleagues suggest that prominent firms in collaboration networks are likely to receive over time a disproportionate share of new ties shaping the evolution of the entire industry (2005). Further, this accumulative advantage can amplify changes in the structural characteristics of networks. In fact, it may indirectly influence the redundancy of a network by reinforcing the position of prominent actors (Fleming and Waguespack, 2007).

It is important to note that, while the micro-dynamics and the logic of attachment is similar to one of the mechanisms driving the creation of small world networks, scale free network rely exclusively on this mechanism, which is based on increasing attachment to popular actors rather than the selection mechanisms implied by status orderings. Thus, the number of new ties in the growth and emergence of the scale-free architecture will be higher than in the case of the small world, in which selection is implied through pure status-based mechanisms.

At the same time, some scholars suggest that the genesis of a scale free network cannot be directly understood by observing the intentions or agency of actors, but it is the outcome of a more complex processes. More precisely, Barabási and its colleagues suggest that these structure
are not created directly by actors’ actions but, while evolving, networks “organize themselves” into scale-free structures (Barabási and Albert, 1999). Put differently, these scholars suggest that in the genesis of a scale-free network a self-organization mechanism overcomes the actions and the intentions of network actors (Dorogovtsev and Mendes, 2003).

Overall, in this section, we have built on the theoretical micro-foundations of network emergence to identify pathways through which the micro-dynamics and their interactions lead to the emergence of different organizational network architectures. We emphasize again that the architectures that we identify are not deterministic outcomes of the micro-foundations and the related micro-dynamics. Rather, we see these as probabilistic patterns of network emergence. In the next section, we outline some ideas on how these network architectures that we have identified evolve over time.

**Network evolution**

This part of our theory is based on the idea that the emergence of a specific type of network does not interrupt its evolution. In fact, the genesis and the emergence of network architectures from the micro-foundations and their micro-dynamics itself creates conditions which subsequently shape the evolution of the network architectures we identified. We proceed to discuss some of these key evolutionary trajectories for each of the network architectures we have identified.

*Dense networks*

In general terms, fully connected are subject to inertia and path dependence, and represent stable, institutionalized patterns of relationships suggesting that ties generated by micro-processes of trust and reciprocity tend to persist over time. As a consequence, structures with high density would therefore continue to exhibit high connectivity over time, and resist pressures to get
converted into different types of structures. Strogatz (2001) describes such a network process as a case in which nodes have stable fixed points and no other attractors, and as a consequence the network tends to become locked into a static, repeating pattern.

Nevertheless, such stable fully-connected dense networks are not immune to change. From the original intuition of Coleman (1988) we know that some key effects of network closure and local stable equilibrium, such as increasing similarity and conformity among nodes, are amplified over time. As a consequence, the stable pattern of dense networks stimulates the actors to search for new and diverse ties to break with common mental models, groupthink, and unproductive lock-in. Thus, over time actors’ stable embeddedness creates an unfavorable context that induces the activation of a network reconfiguration mechanism seeking for disconnections from the persistent, stable ties in the dense network (Zaheer and Soda, 2009). The network thus over time, exhibits greater fragmentation, lower overall density, and possibly the creation of isolated clusters. Furthermore, under such conditions, bridging ties will be particularly beneficial, providing significant advantages, and therefore the motivation, to agency-driven actors.

Multiple Isolated Clustered Networks

Multiple isolated clustered networks may evolve through different paths, depending on the specific characteristics of the settings. Fleming and Marx (2006) propose an evolutionary process of network progression from multiple isolated clusters to the small world while Ethiraj and Levinthal (2004) explain how multiple isolated clusters can evolve into nearly-decomposable systems.

Fleming and Marx (2006) use the co-authorship network of U.S. patent inventors in which engineers and scientists traditionally tended to work within local clusters of collaboration that were isolated. More recently as people have become increasingly mobile, changing jobs with greater frequency, these formerly isolated clusters have begun to interconnect into larger networks.
through which information flows more freely between companies. Thus, the authors argue, in the evolutionary process from multiple isolated structures to fully connected networks, the clusters are increasingly connected to each other as well, shaping the network as a small world (Newman Strogatz and Watts 2000, Amaral et al. 2000, Uzzi and Spiro 2005).

When some connections develop across clusters in a network of multiple isolated clusters, the network tends toward what Simon described as a “nearly decomposable system” which is characterized by intense interaction within clusters but weak connections across them (Simon 1962, 1981). Such an evolutionary trajectory can result in a network with a single component with the variance in the centrality index among nodes being high by virtue of the presence of central actors. By taking into account the directionality of ties, which essentially distinguishes nearly decomposable system from a small world system, Ethiraj and Levinthal (2004) argue that a nearly decomposable system can be both hierarchical and non-hierarchical depending on the degree of asymmetry (the extent to which ties are non-reciprocal) in the interactions connecting the local clusters (modules). Thus a network may evolve from multiple isolated clusters to a nearly decomposable when new ties are formed and connect local clusters. However, when the new ties connecting local cluster are not reciprocal (asymmetric) the network will converge to a nearly decomposable and hierarchical, by contrast if the ties are reciprocal the nearly decomposability takes the form of non-hierarchical system which is then indistinguishable from a small world network.

Open networks with structural holes

The evolution of open networks with structural holes emphasizes the short-time nature of information or knowledge reach by bridging. If the value of such information is inherently short term, the timing advantage of networks rich in structural holes is directly destroyed by the passage of time. Specifically, network structures based on brokerage are likely to be more unstable because
while all actors belonging to groups or social circles benefit from weak ties bridges (Kilduff, 2010),
the advantages of structural brokering are typically limited to brokers. As a consequence, as
research shows (Soda et. al, 2004; Baum et. al. this issue) the benefits of structural holes are
essentially short term because of the rate at which most information declines in value.
Alternatively, even if the information has potential longer-term value, it is possible that over time
other nodes will gain access to the once-privileged information through the wider network.
Further, Burt (2002) notes that brokerage ties are costlier to maintain because not only is the cost
borne by fewer people but it is inherently more difficult to sustain relationships with those unlike
oneself, which is likelier to be a characteristic of alters connected through brokerage ties.

We suggest that different conditions may trigger the evolution of an open, structural-hole
rich network beyond its inherent instability. At the same time, networks dominated by brokerage
may be very dynamic and show complex fluctuations of dissolution and re-generation of structural
holes, because the rapid decay determined by the information asymmetry and the short-term
nature of their advantages. If the power of brokerage is unequally distributed, then the
disadvantaged alters may not be able to do more than close a structural hole, while the erstwhile
broker may create further structural holes in the next period. In such a situation, the open
network will temporarily close but then become open again. Such a pattern also assumes strong
agency on the part of the broker who misses the brokerage value the prior structural holes
provided and strives to recreate it in the future (Zaheer and Soda, 2009). If on the other hand, the
bridging or brokering ties remain stable, but the hole gets filled forming a triad, the network will
evolve toward a more closed network.

Small world networks Like other networks, the evolution of the small world network architecture
develops out of the processes that created the structure in the first place. As we noted earlier
above, the emergence of the small-world network is due to the interplay of two mechanisms: agency via the exploitation of brokerage advantages which creates the linking ties across the network; and norms, which via bonding mechanisms, creates the formation of highly cohesive clusters. In this issue Sytch, Gulati and Tatarovickz, demonstrate how the dynamics of inter-organizational small-worlds take the form of an inverted U-shaped evolutionary pattern, such that an increase in the smallworldiness of a network is followed by its later decline. The small world network follows this kind of evolutionary pattern because the information regarding the availability, reliability, and resource profiles of potential partners is not perfectly distributed. As a consequence many organizations tend to economize in their search for partners by selecting those with whom they have some familiarity and stability, either directly or indirectly. However, the decline of the small world is influenced by the limited and short-term advantages of information brokerage, which reduce the actors’ propensity to form bridging ties. In this way, a globally separated network is formed, which may then approach the structure of multiple isolated clusters.

Scale free networks. Scale free networks are known to show unusual stability against failure and random perturbations (Strogatz, 2001). Such networks are in fact vulnerable only to deliberate attacks on their prominent hubs and their resilience to failure partially explains why they are so widespread (Dorogovtsev and Mendes, 2003).

Networks, time and outcomes.

Beyond network evolution and its mechanisms, also little research exist on how networks influence performance and outcomes explicitly incorporates a time or an evolutionary dimension (Burt, 2002; Soda et. al 2004; Baum et. al this issue). Thus, parallel to the genesis and evolution of
networks there is also a relevant theoretical issue on the role of time in the relationship between network architectures and network outcomes. Broadly, the position we take is that since networks are constantly changing and evolving (Gulati & Gargiulo, 1998; Madhavan, Koka, & Prescott, 1998), outcomes may not be completely explained by existing network structures. Influential scholars have suggested that the passage of time is required for relationships to be cemented, strengthened and become imbued with trust and affect (Krackhardt, 1992). On the other hand, as network links dissolve, reform, and the effects of accumulated obligations and reciprocity weaken with the passage of time, past relations may decline in potency. Consequently, dim memories of past ties may dilute or modify the effects of older network structures on current behaviors and performance. Thus, the question of whether network structure represents a stock of social capital, or whether it is more akin to a flow that must be currently exploited, should be a key focus of research on network dynamics. Put another way, there is a need of theory on how durable the advantages of different network architectures are.

Our logic about time and network outcomes is manifested, in part, in the idea that “networks have memories” (Soda et. al 2004). In fact, current networks of relations reflect both the past social structure and the accumulation of historical experience through past network ties. We argue that there are at least two mechanisms throughout network memories can shape the evolution and changes into current networks. First, network memory provides organizational actors the possibility of reconstructing the social structures that they experienced in the past. Second, network memories also allow them to draw on the accumulated knowledge and information resources that have accrued to them through past relations. We refer to the latter as accumulated relational content.
Reconstructing social structures. By the virtue of its technological platform, a significant part of
the five-hundred million current users of Facebook have had a chance to re-activate – or
“defreeze” – their past, often very old, relationships. Beyond the opportunities provided by
technology, the extent to which the social structure can be reconstructed depends not only on the
structure itself, but also on the nature of the tie, its strength, and the amount of time that has
elapsed since the tie was last active. Different kinds of social structures may weather time to
different extents. Scholars have also pointed out that different types of ties persist to different
extents over time. For example, Feld (1997) shows that supportive, stronger ties are more likely to
persist. Burt (2002) also discusses the decay of relations over time, while noting that little research
exists on the stability of relations over time. Beyond a point, of course, relations may have
decayed to a level from which they can no longer be reconstructed.

The amount of time elapsed since a tie – or even a social structure – was active has a
complex effect on the tie. As scholars who study time have observed, time has both a subjective
and an objective dimension (Ancona and Chong, 1996). While the subjective dimension of time
is important in interpreting the nature of a relation, the objective aspect of time clearly influences
the link too. Objective time heightens the probability that ties may be repeated and consequently
become stronger and more durable. Overall, the effect of time on relationships is cumulative,
non-linear and socially determined.

Accumulating relational content. Network memory is the sum of experiences, an imprinting of
all previous interactions, from a relational past. It represents a heritage that may embody a range
of elements, including knowledge and information, norms and values, and influence and affect
(Krackhardt, 1992). Knowledge and information that network actors accumulate over time
represent resources that can be drawn on, much like the notion of intellectual capital (Nahapiet
and Ghoshal, 1998). Values and norms include trust, obligations, and reciprocity, which together also shape future actions and relations (Gulati and Gargiulo, 1998). Influence and affect reflect the mimetic and the emotional content of the relationship, which, too, exerts a bearing on prospective behavior of the actors in the relation. Thus, the accumulated relational content aspect of network memory is, as we noted earlier, a ‘shadow of the past’ which enables and influences, but may also constrain, future action in the network.

We proceed now by theorizing about the role of these processes in shaping the relationship between networks and outcomes.

A large body of research has distinguished between brokerage – literature as referred to this idea through the concepts of bridge ties, structural holes, open networks, range - and cohesion as different and alternatives types of network and social structures (Pollock, Porac, and Wade, 2004). The distinction between these two concepts of social capital goes to the heart of the debate in the network literature on the value of different structures (McEvily and Zaheer, 1999; Burt, 2005). We believe that brokerage and cohesion are similar in the sense that they are both structural properties of the network and to that extent both represent ways of accessing social capital. Nevertheless, the sources of social capital implied by the two concepts are driven by different underlying social structures (Xiao and Tsui, 2007). Most importantly, they are conceptually quite different in the basic mechanisms, logics, causal drivers, and sources of the advantages that underlie the two concepts.

As well in understanding the effect of different types of network structures on performance, even though the time dimension has been frequently invoked in network research, this effect has been little examined a dynamic context (Suitor et al., 1997). Given that time may influence the strength of the tie, as we have pointed out above, different network structures – cohesion and
brokerage—may evolve and change differently over time (White, 1992). Ties underlying alternative forms of social structures are conduits for meanings and time shapes and influences them differently. The performance consequences of certain social structures may be reinforced by the passage of time while others may atrophy. Furthermore, while structure may change over time in different ways, time may also modify the nodes themselves in diverse ways, and in consequence the social structure linking the nodes (Leik and Chalkley, 1997; Suito and Ketton, 1997).

As Soda et al. have argued (2004) the network structures of bridging ties and cohesion evolve differently and exert different effects on current outcomes. In this issue Baum and his colleagues (Baum et. al. this issue) theorize and test that performance benefits of closure ties increase with age, while benefits of bridging ties decrease with age. Moreover benefits yielded by hybrid network positions, combining elements of both closure and bridging, are greatest when old closure ties are combined with either very young or very old bridging ties.

However, depending on the context and the nature of outcomes considered, research is also showing more complex dynamics. In this issue, McEvily et. al focus on the temporal and historical conditions under which bridging ties from the past affect current organizational outcomes. They propose a theoretical reasoning that goes beyond previous research that has shown that bridging ties have high decay rates and short-term effects. In fact they explore the possibility that bridging ties may produce benefits over an extended period of time. Thus, they contrast the conventional view of bridging ties having rapidly decaying effects with two alternative network dynamics suggesting two effects: “accumulating” and “imprinting”. More precisely, while bridging ties have accumulating effects due to learning and redeployment of cumulated knowledge, bridging ties exhibit an imprinted effect whereby the founding conditions surrounding the formation of some, but not all, ties yield long-lasting network benefits.
Also the effect of time on dense networks can be complex and not linear. More precisely, even though longitudinal work in the network domain is rare, some research in the broader literature and theory supports the general notion that cohesion is a long-lasting phenomenon. For example, Gulati (1995) demonstrates the effect of repeated ties on subsequent tie formation. Krackhardt (1998) shows that students in high-closure networks, those with mutual friends, were more likely to maintain ties over time. Burt (2002) too finds that bankers with more mutual ties showed slower decay in their relationships. Soda et al. show that not only is the positive effect of cohesion long lasting, but that the effect of current network cohesion on performance is non-existent.

The available body of research on the relationship between network structures and outcomes is largely build on the basis of the assumption that outcomes of network structures are exogenous to the structures that created them. This assumption, we believe, is a more insidious one in the extant literature (Mouw, 2006). A potential simultaneous co-determination implies endogeneity between network structures and outcomes, which necessitates appropriate methodologies and the use of specialized statistical procedures. Research on network dynamics have to explicitly incorporate this key issue. In fact, in addition to the very important theoretical and practical reasons for drawing attention to network dynamics, there is also an important methodological reason. As Baum and Rowley point out (2008), although the idea that structural advantages are available to occupants of certain network positions is widely accepted, this idea is based on cross-sectional studies. In reality, it is possible that some advantages precede, rather than follow, network positions.

To the extent that changes in the network emerge as a consequence of motivated actors driving those changes it becomes important to control for the econometric implications of network change, even to obtain accurate estimates of the network’s effects
on behavior and performance. Modeling this endogeneity and assessing its role in driving existing results on network effects may be another reason to focus on understanding network dynamics. A second, and related, issue with the organizational network literature is the strong likelihood that the current set of results in the literature that relate network structure to outcomes such as performance, may be spurious because they assume that network structural positions are exogenous. However, both the creation of and the positions that actors (whether individuals, groups, or firms) occupy in networks are likely to be endogenous to network outcomes. In other words, structure and outcomes are not independent of each other and without considering their endogeneity, the results cannot be relied upon.

Formally, the problem of endogeneity can stem from reverse causality. To solve this issue statisticians point out that lagged variables are good candidates for instruments or antecedents because it is hard to conceive of a scenario under which they are affected by the dependent variable of, say, performance when they have taken place a number of years prior to that performance (Stock, Wright & Yogo, 2002). Different statistical procedures are available to researchers to face this potential problem, such as Two Stage Least Square (2SLS) and Structural Equation Models. Baron and Kenny (1986) recommend the use of 2SLS for controlling possible reverse causality from the outcome to the mediator. Shaver has recently suggested that 2SLS “...is an effective estimation strategy in a much broader set of circumstances…even when feedback is not a concern” (2005:339). A second manifestation of endogeneity is sample selection bias (McKenzie and Sasin, 2007). This bias can be very dangerous in network research, especially at individual level of analysis. A third aspect of endogeneity is unobserved heterogeneity. To resolve this issue, a context where
organizations and actors are continuously re-created may avoid this potential cause of endogeneity.

Broadly, a longitudinal research design can limit the impact of endogeneity and contribute to discover in a more appropriate and rigorous way the logic and the processes behind the relationships between network structures and network outcomes.

Conclusions

Empirical research on network dynamics has been quite sparse. The paucity of empirical research likely stems from challenges such as the practical difficulties posed by obtaining longitudinal network data, the complexities of handling networks over time, and a lack of attention with the theoretical and econometric handling of endogeneity concerns. In order for the field to advance, a cumulative body of empirical evidence is needed to advance our understanding about the emergence, evolution, and dynamics of networks.

In this paper we offer a theory of network genesis and evolution by highlighting two main and interconnected processes: the micro-foundations and micro-dynamics of network formation, and the evolutionary trajectories of network architectures. We theorize on how both the micro-dynamics of agency and norms, as well as their interaction, shape the emergence of specific archetypes of networks. Moreover, we also disentangle the mechanisms of key macro evolutionary process by which emergent network architectures may change or decline over time. Further we highlight the role of time in the relationship between network structures and performance and we theorize on the main mechanisms which take place in this relationship: the reconstruction of social structures and the accumulation of relational content.
By offering an overarching theoretical framework on the micro and macro evolutionary patterns of network evolution and change, we argue on how logics of creating network structures shift over time. Our effort is part of a general tendency in network research that encourages investigations of temporal sequences, path dependencies, and evolutionary patterns. A fundamental reason for our theory on network dynamics is the issue of whether networks can be considered in social sciences as epiphenomenal or whether they emerge from a set processes and mechanisms which we can systematically identify and relate to a more integrated framework.

We believe that a better comprehension of the factors that generate and shape network structures can also contribute to discovering the mechanisms and processes which drive network outcomes. Without a comprehension of the logic that drives network creation, scholarly understanding of their outcomes remains incomplete (Salancik, 1995). A more integrated knowledge of the entire chain clarifies and establishes the temporal sequencing of causal mechanisms behind the emergence, evolution and outcomes of networks.
REFERENCES


### Table 1: the theoretical framework

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