

### Networks and Neo-Structural Sociology

Emmanuel Lazega

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*Edited by Ryan Light and James Moody*

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### Abstract and Keywords

This chapter introduces a neo-structural theoretical framework in sociology. It shows how social and organizational network analyses help explore the use of personalized relationships for management of cooperation dilemmas. Notions and measurements of relational infrastructures show how members navigate social processes (including solidarity, control regulation, and learning) to transform them into social capital of their collective. Focus on regulation helps develop a neo-structural institutionalism, tracking, for example, institutional entrepreneurs with high, heterogeneous and inconsistent forms of social status, who punch above their weight in normative controversies by exploiting oppositional solidarities and rhetorics of sacrifice. This framework leads to new examination of social inequalities by introducing dynamic and multilevel relational infrastructures, with notions such as organizational stratigraphy, dynamic invariants, multilevel status of vertical linchpins, intermediary-level social niches, and synchronization costs.

Keywords: cooperation dilemmas, relational infrastructures, social processes, multilevel status, vertical linchpins, intermediary level social niches, joint regulation, dynamic invariant

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### Individual and Collective Capacities

SOCIOLOGY is often presented as knowledge of regular associations between position in a social structure and behavior, individual and/or collective. A simplified version of 20th-century European structuralism identified position in terms of interdependencies: social phenomena (e.g., language, as in Saussure, 1916, or kinship, as in Lévi-Strauss, 1949, or myths, as in Lévi-Strauss, 1978) were construed as structures, that is, self-contained systems of differences between interdependent entities emerging from chaos. Such complex systems of interdependencies were seen as derivable from invariant and dominant rules (e.g., prohibition of incest, norms of reciprocity, difference between sacred and profane) or variables (e.g., macro-level stratification) providing coordinates for position in this system of differences—but also expressing epiphenomenal variety in agency (Wellman &

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Berkowitz, 1988). Behavior was defined as varied manifestations of these underlying structures less than as outcomes of human agency (choice and strategy).

Neo-structural sociology (NSS) revisits this strongly deterministic structuralism by opening it to individual and collective agency. Interdependencies between actors are too important in social life to be left unorganized, and actors and institutions struggle to organize them, to build organized collective actors, and to use these organizations to navigate problematic social processes that cannot be ignored or stopped. Social network analysis can be used, together with other methods, for tracking and understanding actors' positions, embeddedness, and efforts to manage their interdependencies in contexts of cooperation and/or competition where interests often diverge, conflicts flare up, and constraining but often fragile institutions are inherited from the past. As such, it avoids reification of the notion of structure and helps in further developing a sociological theory of collective action and of the management of the latter's dilemmas (Weber, 1978 [1920]; Olson, 1965; Wittek & van de Bunt, 2004; Wittek, Schimank, & Groß, 2007). Intentional, reflexive, and strategic behaviors endogenizing the structure, not blind reproduction of the underlying structure, are also parts of the behavioral assumptions of this approach, including the use of organized settings as (p. 51) "tools with a life of their own" in their "dynamic configuring fields" (Selznick, 1949), that is, as political communities. NSS assumes a form of social rationality: actors themselves articulate these dimensions of individual and collective action by combining identities in reference groups, cultural norms, and authority in their appropriateness judgements (Lazega, 1992, 2014). Reference groups and authority can be methodologically identified with relational infrastructures such as social niches and social status measured with networks. These are also dimensions of agency as identified by the structural branch of symbolic interactionism (Stryker, 1980) or by authors such as Archer (1982) or Donati (2010).

In this framework, relationships can be defined as indicators of interdependencies: as channels for the flows and exchanges of resources of all kinds (material, informational, emotional, etc.), but also as moral or symbolic commitments vis-a-vis the exchange partners (Lazega, 2012a). Commitments in particular are based on rhetorical promises and moral conventions that introduce culture and duration in exchanges. They presuppose a form of social control of their acceptability and credibility. Thus, in these micro-foundations of neo-structuralism, agency mobilizes and combines both structure and culture. Relying on appropriateness judgments to guide socially rational action involves endogenization of structure: individuals are endowed with a capacity to perceive vertical and horizontal differentiations, for example, power relationships and social inequalities. They are assumed to be able to combine these perceptions, their own and others' behavior, and relational choices by using language and culture giving meaning to actions, and to act based on this contextualization. Breiger's (2010; Schultz and Breiger, 2010; Breiger & Puetz, 2015) notion of "weak culture," for example, provides a key link between the normative dimension of appropriateness judgments and relational life.

The transition between the old and new structuralism can be traced back to anthropologists such as Mitchell (1969) and their use of social networks to look at structures of opportunity and constraints. Harrison White's *Chains of Opportunity* (1970), a seminal book that models the labor market in terms of vacancy chains, represents this transition well. It contributes to the old structuralist tradition by creating a link between position expressed in relational terms and chances of getting a job. Newcomers with relational profiles relatively similar to that of leavers have a higher probability of replacing the leavers in the chain. This led to descriptions of structures of opportunity and constraints using models from which measurements and interpretations of his own concept of "structural equivalence" were later derived in the 1970s. By providing a new formalism clustering actors based on similarities in their relational profiles (blockmodeling) and combining the use of this relational approach with a new way of identifying positions, endogenous role sets, and division of work in human groups, White, Boorman, and Breiger (1976) have enriched structural social sciences with an exceptional wealth of new concepts and intuitions and hypotheses. They have allowed social network methods of analysis to become so generic that they can now be used to both identify systems of opportunities/constraints and study social order/discipline and processes in society. But White's (1970) link between structure and mobility also introduces the possibility for other sociologists to look for cues about how actors manage both their interdependencies and their mobility to try to switch positions at the meso level. This is particularly well illustrated in a chapter on "Mobility in Loops," which opens the door to a neo-structural sociology where agency, individual and collective, begins to be taken into account as condition and consequence of opportunities and constraints, reflecting also strategies, navigation of social processes and involvement in social and institutional change.

### (p. 52) **Interdependencies in the Organizational Society: Bureaucracy and Collegiality**

NSS looks at how actors manage their practice-related interdependencies to deal with cooperation dilemmas in socially organized settings defined as small or large political communities (Reynaud, 1989). It relies on numerous methods, from formalizing to interpretive, especially on the analysis of socioeconomic networks, to understand combined interdependencies and conflicts from an organized collective action perspective. As indicators of such systems of interdependences and conflicts in organized social milieus, networks are considered as artifacts of methods, not as modes of coordination in themselves. Network methodology helps describe the morphology of those systems, always beginning with a sociology of work and members' task and functional interdependencies. This leads to a conception of social capital that stems from a general sociological tradition focusing, for example, on social processes supporting and enhancing economic performance, from Durkheim (1893) to Coleman (1990) and Lazega (2009). Social capital is approached as a collective capacity, not so much as an individual capacity (as, e.g., in Burt's [2005] or Comet's [2007] approach to "relational" capital maximizing individual performance in competitive arenas). The methodology helps model these social processes (see later) that,

provided certain conditions are fulfilled, facilitate collective action (Lazega & Pattison, 2001; Lazega, 2006). For example, recurring structural patterns of specific multiplex ties are assumed to be beneficial to collective action among peers because members use them to solve problems of coordination as much as problems of individual action (Lazega & Pattison, 1999). Social rationality and social capital understood in that way create a form of social discipline and collective responsibility that is recognized as legitimate by actors, close to what Elias (1991) called the articulation of external constraints and internalized self-control, characterizing both the individual and the collective levels of agency simultaneously.

NSS's focus on collective action has led to the use of an organizational approach to social life that brings to light a generic meso-social level of society. Sociologists (e.g., Perrow, 1991) assert that contemporary societies are dominated and shaped by large bureaucratic organizations. Beyond this general statement, NSS recenters the study of the organizational society on two kinds of ideal-typical organizational and institutional forms, based primarily on a sociology of work, with an indefinite number of combinations of both forms in real organizational life. At one extreme is the dominant and default form, Weberian bureaucracy, and at the other extreme is an older form, collegiality (as revisited by Waters [1989] and Lazega [2001]). These types can be used to differentiate between two ways of managing cooperation dilemmas. Ideal-typical bureaucracy is meant to carry out routine tasks and mass production, using centralized coordination, hierarchy, and impersonal interactions between affiliated members. Ideal-typical collegiality (not to be confused with congeniality) is meant to carry out nonroutine, innovative tasks, using deliberation and consensus building backed up with collective responsibility that can only be enforced with personalized relationships between (often rival) peers. Governing collective action by impersonal interactions and governing it by personalized relationships are two basic and different models, even in the organizational society where bureaucracy is the default form.

**(p. 53)** One of the main issues that NSS has explored up to now is how personalized relationships are used to steer collective action among rival peers in organizations (Lazega, 2001), but also cooperation in markets (Lazega & Mounier, 2002; Brailly et al., 2018). Beyond reasoning in terms of “embeddedness” (Granovetter, 1985), participation in nonroutine collective action—for example, for professional brainstorming or commercial or political negotiations—requires personalized cooperation with others, including in struggles with competitors. For actors “embarked” more than “embedded”, this steering is based on navigating social processes, whether within or between organizations, in public administrations, businesses, nonprofit associations, cooperatives, or politics and social movements. This cooperation is always problematic and expressed through personalized transfers/sharing or exchanges of the various kinds of resources mentioned earlier. From a neo-structural perspective, this means that specific local relational infrastructures must emerge from multiplex social exchanges—for example, of coworkers' goodwill, advice, sometimes role distance, and emotional support—so that members can cooperate and exchange on an ongoing basis, if not in the long run.

This does not mean that personal relationships do not matter in widespread bureaucratized settings (as documented by a literature presented, for example, in Brass, 1984; Kilduff & Tsai, 2003). It means, however, that one has to be particularly careful in looking at how (which particular blend) and where they matter, at which level in the organizational stratigraphy—for actors and for sociological explanation of collective action. In an already bureaucratized society, their systematic use can be considered inappropriate, if not corrupt, as in Weberian critique of patrimonialism. Indeed, using social network analysis to look at how bureaucracy and collegiality are brought together by combining strongly personalized ties and impersonal interactions in multilevel structures is one of NSS's avenue of future development (see the section on dynamic multilevel networks later). Examples include a network study of how bureaucracy rotates rival peers in a carousel system (recall White's mobility in loops) to counterbalance patronage and clientelism in a corporate law partnership (Lazega, 2000) and a network study of "top-down collegiality" to silence conflicting religious orientations among priests in a Roman Catholic diocese (Lazega & Wattebled, 2011).

## Relational Infrastructures

Among the building blocks of NSS, management of interdependencies produces relatively stable relational patterns, called relational infrastructures, that complexify the fundamental structural notion of position. NSS identifies two kinds of relational infrastructures that facilitate the navigation of generic social processes: a system of "social niches" and a system of heterogeneous (and more or less inconsistent) forms of social status that can be both endogenous and exogenous.

A social niche is a dense position in terms of blockmodeling, that is, a subset of members, at the organizational or interorganizational levels, who are approximately structurally equivalent. They both play a similar role in a system of collective action and establish among themselves durable, dense, and multiplex social exchanges and relations. Actors contextualizing their behavior in organized settings have a trained capacity to detect the existence of niches based on the criterion of cohesion that comes attached to a certain social (p. 54) homogeneity: they use similarities (e.g., in terms of office membership or specialty, hierarchical status, gender, culture, or class, i.e., both endogenous and exogenous attributes from the perspective of the organization). A niche is capable of coordination and collective agency and only makes sense in a system of niches that represents a form of division of work (White, Boorman, & Breiger, 1976). There are many empirical examples of identifications of systems of social niches at the intraorganizational level as well as at the interorganizational level. For example, Delarre (2005) looks at groups of French enterprises (1991–1999) as new social entities characterized by dense and multiple exchanges and strategic alliances between the daughter companies that they include in their holdings. Funding, staff, expertise, control, etc., circulate within such niches and form a system that is able to preserve a flexibility that allows these groups to adjust to

volatile markets, thus managing the “paradox of embeddedness” (Uzzi, 1997; Varanda, 2005; Grossetti, 2011).

Status, a multidimensional and highly complex notion, refers to a member’s relative “importance” in the group, both in the formal hierarchy and in the networks of exchanges (Merton, 1959; Gould, 2002). It involves a mandate that confers collective recognition of the importance of individual or collective contributions, and the authority that comes attached to this mandate, with responsibilities and benefits from various forms of deference. Members with status, as individuals, are thus granted a license (Hughes, 1945) to legitimate participation in specific forms of leadership. It can be exogenous in the Weberian tradition, that is, economic (based on control of the production apparatus and revenue), social (based on honor or prestige, not only from birth, but also from human capital [education]), and political (based on administrative and political control of public institutions, particularly the state). From a more endogenous and relational perspective, status can be achieved in many ways, for example, based on various kinds of centrality (Freeman, 1979), or even endorsement by other members who themselves are endowed with status. It is not surprising, therefore, that members of a group compete for status, but also that this competition is shaped by status heterogeneity, inconsistency (Lenski, 1954) and ranking between these dimensions. Analyzing the correlations between all these dimensions of status is a useful contribution of NSS’s explanation of how various social processes work, including regulation.

Relations between niches and status are dynamic. Niches can produce a fragmentation that is not without risk for organized collectives, hence the paradoxical importance of cross-boundary status competition for organizational integration. Collectively, as relational infrastructure built on heterogeneity and inconsistency rules, bundles of dimensions of status conferred by this competition can paradoxically create solidarity and cohesion when systems of niches are subjected to too many centrifugal forces. Relational infrastructures co-evolve and co-constitute each other. Decomposing networks into sub-structures, as with exponential random graph models (Lusher, Koskinen & Robins, 2013) helps to identify these dynamics.

## **Social Processes as Social Capital of the Collective in the Organizational and Market Society**

Depending on how members involved in carrying out nonroutine, innovative tasks reflexively invest in relational infrastructures, they facilitate or hinder the deployment (p. 55) and navigation of the social processes on which collective action and coordination are recursively based. Among these processes, NSS has focused on modelling the variable forms of particularistic solidarity (measured, for example, with direct and indirect reciprocities, i.e., the forms of restricted and generalized exchange identified by Claude Lévi-Strauss), exclusion, and desolidarization; socialization and collective learning (assessed, for example, with advice networks); social control (measured, for example, with monitoring and sanctioning networks) and conflict resolution; and regulation and institutionaliza-

tion of norms and practices (i.e., politics). Each of these processes is at the heart of social life and collective action.

A first category of social process thus involves the creation of these personalized, particularistic solidarities, desolidarizations, and segregations, inside and across social niches. There are many well-known examples of the existence of solidary processes in markets and industries. Ingram and Roberts (2000) provide a case of seriously friendly relationships between otherwise competing managers in the upscale hotel industry in Sidney. They explain this result by the idea that friendly relationships stabilize the norms of exchange between these managers in that industry. Éloire (2010) provides another example of forms of bounded solidarity based on the reconstitution and analyses of social networks among restaurant owners in a city center. He detects a specific form of homophily among members of a social niche of high-end restaurants (i.e., White's [1981] "paradoxical" market) who are more central, famous, and exclusive than others. The fact that these niches do not seem to exist in all types of Whitian markets reveals the discriminating and strategic nature of this form of bounded solidarity between competitors. Particularistic solidarity cannot be reduced to a purely relational, reciprocity-, multiplexity-, or cohesion-based phenomenon: it is also made possible by social boundaries and norms, the presence of which is confirmed by introducing in the models, for example, effects for various forms of homophily and attribute similarities between actors.

A second category of social processes consists in collective learning, or even the opposite in construction of ignorance, within and across organized settings. Collective learning is understood here in a broad sense: the way in which we think with others and build common knowledge with them, such as reconstituting the history of the collective itself and its own past and changes, mastering together new techniques and how to implement them, adapting together to new environmental constraints—that is, living with "new" limits and transitions. Neo-structural research has examined collective learning based on the study of advice networks and the theory of appropriateness judgments. Relational infrastructures matter here as well. Actors use status criteria when selecting an adviser (see Blau, 1964; Krackhardt, 1990; Agneessens & Wittek, 2012; Škerlavaj & Dimovski, 2006; Lazega & Van Duijn, 1997; Montes-Linh, 2014, among many others). Recognition of status gratifies the advisers by providing them with an incentive to share their knowledge, experience, and educated judgment. In formally organized contexts, following this status rule, members avoid seeking advice from the colleagues "below" them in the formal hierarchy or in the pecking order. But these asymmetries are not necessarily rigid. The recursive and cyclical dynamics of advice networks, as seen later, creates a structural oscillation as the super-centrality of specific actors (in the core of these networks) fluctuates. In addition, empirical research finds many "infractions" to this avoidance rule. Actors use several kinds of similarities among themselves to counteract the conflicting effects of these status games in collective learning. The use of homophily in the choice of exchange partners allows members to cut across status boundaries to access advice from "below." Thus, to the extent that advice (p. 56) networks are structured by status and by the mitigation of status competition in social niches, they tend to become both hierarchical and cohesive, the hierarchical dimension often being stronger than the cohesive dimension. They are al-

so strongly embedded in other types of social networks that also help with mitigating the status rule. Individuals can find social niches to be a safer environment to engage in advice relationships, even sometimes with direct competitors, especially when many high-status players coexist in the social niche and are able collectively to enforce social discipline and rules of protection against opportunistic behavior, turning cutthroat competition into more or less “friendly” competition (Lazega, Bar-Hen, Barbillon, & Donnet, 2016).

Modeling (un)learning processes can be highly heuristic in the study of markets and industries. In markets, the existence of social niches and various forms of status seem to facilitate collective learning between businesspersons and companies. At the interorganizational level, entrepreneurs also seek to learn from each other while still trying to compete on strategic aspects such as market distribution (see, e.g., among many others, Kogut & Zander, 1996; Lomi & Pattison, 2006). As shown by Piña-Stranger and Lazega (2010) in a study of advice networks among biotech entrepreneurs, status games are different at that level from what they are at the intraorganizational level: at the interorganizational level, entrepreneurs do seek advice “below” them in the pecking order. Oubenal (2015) uses the same perspective in his network study of concerted ignorance of risks in the construction of the financial markets for specific products such as exchange traded funds (or *trackers*).

A third generic process consists in using relationships to exercise social control and bring rival peers back to good order. When it is confronted with behavior that is deviant or perceived as opportunistic, and before using costly judicial procedures, an organized collective activates a personalized system of monitoring and sanctioning using reputations and helping in selecting sanctioners able to use personalized relationships and access to the deviant members who need to be reminded of their commitments. That process makes it possible to solve the problem of the “second-order free-rider” problem (Coleman, 1990; Wittek, 1999) by lowering the cost of control thanks to the use of personal relations between sanctioners and targets of social control. It is also based on the existence of social niches in which the threat of losing one’s personal ties is used as leverage against the targets and on a specialized form of social status, that of informal “police.” This link between relational infrastructures (niches, status) and social control is established by observing regularities in the personalized and informal relational paths through which those sanctions are implemented to protect common resources. Lazega and Krackhardt’s (2000) provide analyses of a three-way network dataset (Krackhardt, 1987) for the reconstitution of a lateral control regime exposing such effects of relational infrastructures on this process.

Techniques identifying relational infrastructures being mainly descriptive (blockmodeling, centrality measures, etc.), statistical tests and models combining ties and attributes of actors are needed to confirm the existence and functions of social processes mobilizing relational infrastructures at the more granular level of specific substructures. *p2* (Van Duijn, Snijders, & Zijlstra, 2004) or exponential random graph models (Wasserman & Faust, 1994; Robins, Woolcock, & Pattison, 2005; Snijders, 2005; Lusher, Koskinen, &

Robins, 2013) test for the significant presence of such substructures, for example, of cyclical substructures characterizing indirect reciprocity—and by extension bounded solidarity.

### (p. 57) **Neo-Structural Institutionalism**

Finally, identifying relational infrastructures also helps model the “regulatory” process, that is, the micro-political (re)definition of the rules of the game among members, and institution building that comes attached (as cause or consequence). Classic concepts such as “precarious value” (Selznick, 1957) have already brought together neo-structural and institutional perspectives. Building on such concepts, identifying relational infrastructures in socially organized settings helps model the negotiation of norms and conventions (Reynaud, 1989; Favereau & Lazega, 2002; Lazega, 2016b, 2018) and their institutionalization in stable practices (“living the rules,” as in Glückler, Suddaby, & Lenz, 2018). NSS shows that institutionalization is characterized by specific social dynamics bringing together structure, culture, and agency—that of oligarchical negotiation of precarious values and cultural stabilization (or challenges) of interpretations of the rules *en vigueur*. In these political dynamics, institutional entrepreneurs with heterogeneous and inconsistent forms of social status (measured also in network terms) can have particular influence. They punch above their weight in exploiting or undermining oppositional solidarities to promote their regulatory interests: in definition of priority rules; in use of rhetorics of relative sacrifice to build legitimacy and manage the losers; in articulation of regulation levels as “vertical linchpins,” that is, members who act simultaneously at different, superposed strata of collective agency; etc. Empirical examples based on network analyses can be found among corporate lawyers (Lazega, 2001) and in the case of institutional capture of a commercial court by lay judges coming from the banking industry (Lazega & Mounier, 2012).

At the interorganizational level, network studies of lobbying, for example, provide precious insights into this process of how relational infrastructures stabilize interpretation of the rules and regulation as a relational process (see, e.g., a tradition of work beginning with Laumann & Knoke, 1987). Studies of “unified” (public/private; top-down/bottom up; national and transnational) institutionalization as a form of “government by relational infrastructures” can be usefully framed from an NSS perspective as well. In contemporary neo-liberal capitalism, joint regulation of markets by business and public authorities is becoming increasingly systematic whether through authoritarian States, or as more “regulatory States” establishing general, vague legal frameworks, leaving the task of defining the substance of rules that are *en vigueur* for market participants themselves, in particular finance. Penalva-Icher (2010) offers an example of this type of joint regulatory process by examining the social construction, in France, of “socially responsible” finance promoted by “ethical” funds. She uses a network study to show that, even when there are no formal barriers to entering this market, social and informal barriers do exist for participating in its oligarchic regulatory process. Long-term social investments in this milieu (i.e., in personalized friendships) allow financiers to be at the right place at the right time

when important decisions about their industry are made. Other case studies illustrate collegial oligarchies using status inconsistencies in conflicts of interests to concentrate power and build/buy legitimacy in the regulation of the economy (e.g., Lazega, 2012c; Lazega, Quintane, & Casenaz, 2016, on the construction of a new transnational intellectual property regime). Network studies of courts specialized in business are also of particular interest here. NSS has looked, for example, at how public authorities and private business unlock, capture, and exploit each other's collective action capacities thanks to common relational infrastructures. It is a promising avenue of research on how powers (fail to) check each other in contemporary organizational societies.

**(p. 58)** The list of the social processes that are the social capital of the collective, the existence of which depends on a common and underlying relational infrastructure, is indefinite. Each of these processes can be compared in different organized settings. They are also linked in dynamic, recursive ways. They can energize or inhibit the evolution of their own relational infrastructures and thus steer collective action in new directions. New rules can lead to new solidarities and reconfigure a system of niches. Normative beliefs produced by regulation in controversies can influence, for example, choices of advisers and therefore collective learning (Lazega, Mounier, Snijders and Tubaro, 2012). Social control can encourage the emergence of new forms of social status and modify the principles of status consistency, which in turn can impact regulation. Systematic network research and modeling on the concatenation (Tilly, 2007) of these processes based on the fact that they draw on the same relational infrastructures is in its infancy. The evolution of relational infrastructures at each level will help understand how recursive social processes reinforce/feed back on/transform/undermine each other using the same or different relational infrastructures—when their dynamics are indeed based on relational infrastructures—to contribute to the emergence of new social orders.

## Challenges: Longitudinal and Multilevel Network Structures to Navigate Social Processes

All social processes in forms of organized collective action (in which personalized ties are crucial for coordination) are intrinsically dynamic even if social network analysts have often speculated about them based on static data. “Dynamic invariants” as a basis for organizational resilience can be identified, for example, in advice networks: centrality trajectories of members and analyses of relational turnover in longitudinal datasets show recursive cyclical dynamics in centralization-decentralization-recentralization of these networks as generated by a search for a balance between overload and conflict among super-central advisers (Lazega, Sapulete, & Mounier, 2011). Dynamic and multilevel perspectives can be developed, for example, showing when, in contexts of cooperation among competitors, access to advisers who are “big fish in big ponds” provides competitive advantages for the little fish (Lazega et al., 2008). Extension of opportunity structures by “network lift from dual alters” increases this advantage when members can close multilevel three-paths and when dual alters have complementary resources (Lazega, Jour-

da, & Mounier, 2013). This is the case for the social control of markets, as shown in neo-structural studies (using Snijders & Nowicki's [1997] stochastic blockmodeling) of formal judicial institutions exercising social control on the business world (Lazega, Sapulete, & Mounier, 2011)—institutions where a centuries-old capture is produced by structural stability regardless of membership turnover.

Sociological research increasingly takes into account these dynamic and multilevel dimensions of position, relational infrastructures, and social processes. How to model dynamics of multilevel networks is an important question, for example, in studies of institutional emergence at the transnational level or in studies of increasing digitalization/bureaucratization of exchanges and controls in the organizational society. Especially with studies of regulation, institutionalization, and concatenation of processes, demand for longitudinal and multilevel data increases. Given the complex structure and richness of contemporary big (p. 59) relational datasets (including information on production output, affiliations, careers and trajectories, performance outcomes, etc., in addition to behavior), often in comparative frameworks, new perspectives will emerge to take into account this complexity of multilevel network dynamics. One of the main issues for network analysts today is to design and use robust methods analytically disentangling causal effects to measure, model, and account for social phenomena in different real-life settings, across levels, and over time. Extending existing models, such as that of Snijders's (2016) approach of the dynamics of networks to the dynamics of multilevel networks, will allow studying the coevolution of multiple networks and multiple behaviors, where "behavior" is a shorthand for any changeable characteristic of the actors who are the nodes in the network.

Position in a dynamic structure is not simple to identify and track. Social dynamics are complex. Individual actors may follow different trajectories and change not only places and positions (see, e.g., Brandes, 2016; Moody et al., 2011; Quintane, 2013) but also behaviors, norms, and relationships. Collective actors in which individuals are affiliated emerge when their social capital (as defined earlier) is sufficient, but they can stabilize or unravel over time. The coevolution of all these dimensions of individual and collective action, especially from a relational perspective, is not well known. Models for longitudinal network analysis such as Snijders's *Siena* statistical actor-oriented approach for longitudinal network data (Snijders, 2001, 2005, 2017 for a recent synthesis; Snijders, Steglich & Schweinberger, 2006; Snijders, Lomi, & Torló, 2013) provide analytical tools and statistical tests for the relative weight of influence and selection effects describing the coevolution of networks and behavior. Empirical explorations can be found in research on institutional emergence and maintenance (see Moody, 2009; Lazega, Mounier, Snijders & Tubaro, 2016).

Position in multilevel network structures is also difficult to specify (Snijders & Bosker, 1999; Snijders, 2016; Lazega & Snijders, 2016). This often requires observing and modeling at least two systems of collective action that are superimposed and partially interlocked in terms of their interdependencies: for example, one interindividual, the other interorganizational. Building on Breiger's (1974) "dual" approach of bipartite or two-mode

networks that co-constitute each other, articulation of distinct levels of collective action can be partly accounted for using a structural linked design (Lazega et al., 2008, 2013; Breiger, 2015), where the unit of analysis is the individual-organization pair, or dual positioning as articulated with strategies of actors. Examples are node sets defined as a set of firms and a set of employees, with firm-firm ties, employee-employee ties, and firm-employee affiliations. Each level is represented with a complete network and examined separately, and then combined with that of the other level thanks to information about the affiliation of each individual in the first network to one of the organizations in the second network. Taking into account such within-level and cross-level effects over time provides a better understanding of processes in which individual effects translate into social effects, as in institutionalization processes. Statistical tests for hypotheses about the significance of specific multilevel effects have been developed (Zijlstra et al., 2006; Wang et al., 2013, 2016) and used in economic sociology.

For example, research exploring trade fairs and social processes taking place in them cross-level between networks of sales representatives and the networks of the companies that employ them (Brailly et al., 2015; Favre et al., 2016) explains the conditions under which small firms can resist and survive predatory practices of multinational corporations (Brailly, 2016) or the differences in strategies of collective learning between novices and experienced traders in new marketplaces bringing together regional and global players in (p. 60) the television industry (Favre, 2014). This approach works for all systems that organize themselves around several levels of decision making and power. These levels can be bureaucratic, collegial, or both: they are articulated but benefit also from autonomy (Lazega, 2020a, 2020b).

Neo-structural approaches to social processes have been developed employing mixed methods, both qualitative and interpretive (beginning with a sociology of work and ethnography) as well as quantitative and formalizing. Combining dynamic and multilevel network analysis without conflating the levels (in Archer's [1982] sense) is one of the next frontier of NSS. Indeed how do relational infrastructures from personalized relationships help navigate social processes in a bureaucratized, hierarchical world of routines, impersonal interactions and subordinations? To account for this apparent paradox, a more complex, multilevel, and dynamic understanding of the notion of position must be introduced. This is equivalent to saying that the complexity of articulations of bureaucracy and collegiality requires new theoretical approaches that benefit from the adoption of the dynamic multilevel perspectives and methodologies mentioned above. Sociological "stratigraphy" can identify superposed strata of bureaucracy and collegiality in social settings, stressing the vertical dimension of social phenomena in new organizational terms. In this stratigraphy, two such multilevel relational infrastructures at least account for the more complex notion of position. First, multilevel social niches, i.e. subsets of "pairs" of individuals/organizations that occupy a common position in the division of work of at least two strata of collective agency simultaneously (Žibera, 2014; Žibera & Lazega, 2016). One temporary kind of such a niche is the intermediary-level social niche, that is, a collegial pocket that is built in between strata to serve as a foothold for groups of actors who prepare for the reconfiguration of lower or upper levels with new projects, discourses, practices,

turnover, and relational rewiring, thus attempting to drive the coevolution of these strata by challenging incumbents, creating new collectives and redefining the division of work. Second, multilevel status, which qualifies individuals who play the role of vertical linchpins, driving this coevolution of strata by being present and active in collective agency at two or more superposed levels/strata simultaneously. In a stratified context, these multilevel relational infrastructures shed additional light on institutional entrepreneurship and joint regulation, whether in public service, business firms or cooperatives, political parties, or civil society associations.

For example, when vertical linchpins cluster together, they usually constitute a special kind of intermediary-level social niche, a “collegial oligarchy” (Lazega, Quintane and Casenaz, 2016). Building on established knowledge of status heterogeneity and inconsistency in collegial settings, we can understand how members of this collegial oligarchy dominate (but do not monopolize) the joint regulatory process. When actors join efforts to build intermediary-level social niches as stepping stones for the establishment of a collective presence at both levels simultaneously, they do so because establishing this presence at the other level requires a redefinition of the division of work at that level. This intermediary-level position is thus meant to eventually reach, beyond the mere function of collective foothold, the quality of second, cross-level social niche, to acquire a role in a redefined structure, i.e. in a new division of work at both levels simultaneously. The construction of such positions characterizes extremely competitive lower or upper levels in which mobility and relational turnover are intense and where new and challenging collective actors are not always welcome among incumbent individuals or organizations (Molina et al. 2018). Thus, (p. 61) anticipating the future development of NSS, we argue that these multilevel relational infrastructures make full sense when considered in their dynamic coevolution and environment. This also indicates that complex dynamics of “multilevel synchronization” could also be measured and modeled using longitudinal and multilevel network analyses (Lazega, 2016a).

Setting in motion the gears of such a multilevel synchronization is also socially costly in time and resources for members with multilevel forms of status who want to be part of the collegial oligarchy in their political system. Not only will such a synchronization prove intrinsically too expensive for many institutional entrepreneurs who cannot spare resources to share at both levels simultaneously, but also the cost of such synchronization could be dumped on lower-level constituencies, for example, first-level social niches. This can backfire in terms of regulation because the latter can also be internally competitive. For institutional entrepreneurship to work at several levels simultaneously, opportunity structures must be extended and mobilized efficiently—for example network lift from dual alters mentioned earlier (Lazega et al., 2013) and specific multilevel Matthew effects must be at work (Lazega & Jourda, 2016). Much remains to be done in NSS to further explore and enrich knowledge of such multilevel dynamics in terms of social inequalities.

Indeed, theorizing dual/multilevel opportunity structures, synchronization, and costs of synchronization of levels in such opportunity structures and in the construction / emergence of social systems can contribute more generally to more established bodies of soci-

ological knowledge. If different forms of adjustment and synchronization between levels take place, for example, in the relational turnover required by mobility and careers, costs—which are often invisible and poorly measured by contemporary sociology—generate still further social inequalities. These costs are almost always incurred by individuals, rarely by the organization and by the actors using them as “tools with a life of their own” in their “dynamic configuring fields” (Selznick, 1949). Therefore, dumping of costs of synchronization on the weakest in society must lead NSS to rethink the contribution of dynamic and multilevel network analyses to measurements of social inequalities in the organizational society as a class society (Lazega, 2012b). Social stratification itself can be better understood with dynamic and multilevel network approaches to phenomena such as opportunity hoarding (Tilly, 1998), which transforms organizations into pawls of ratcheted social stratification. Dynamics well known to the study of social mobility in society are also multilevel: the more open the bottom of social stratification is, the more closed and self-segregated it is at the top (Godechot, 2016; Godechot et al., 2019; Tomaskovic-Devey, 2013)—closure being strongly reinforced by personalized relationships and collegial coordination (Lazega, 2020b). Again, mobility in loops (White, 1970) and organizational rotations create status hierarchies promoting or demoting leaders (Lazega, Lemercier, & Mounier, 2006), but at the same time they can also exclude discreetly, as in giant musical chairs. Exploratory network analytical insights into such developments can be found, for example, in work on social mobility (see Breiger, 1990, to begin with) and schools (Moody, 2001; Vermeij, Van Duijn, & Baerveldt, 2009). Separate dynamics at different levels of analysis raise new research questions about reassessing the relationships between meso and macro levels of society, especially their co-constitution. The conditions under which the multilevel character of a system of interdependencies drives social processes, rigidifies or destabilizes social structure and inequalities remain to be further measured and modeled.

(p. 62) Understanding social phenomena involving participatory processes, i.e. not only polarizing processes, will directly benefit from these developments in social network analysis. For example, bottom-up versus top-down struggles to shape the institutionalization of new commons and forms of collective responsibility (Lazega, 2017) in bureaucratic societies dominated by digital platforms are an issue for democracies in which bureaucratic regulation meets with collegial self-regulation, and understanding them will require such modeling, as will any kind of “unified” (bringing together bottom-up and top-down dynamics, public and private actors, and multiple national structures and cultures) emergence of transnational institutions in areas such as judiciary, urban development, environmental policy, etc. Between individual responsibilities, state responsibilities, and transnational institutions, there are multiple and superposed bureaucratic and collegial strata of collective agency and responsibility, each with their own social processes changing at their own rhythm and influencing change at the other levels. Thus, accounting for social phenomena, over time and across boundaries and levels, using a neo-structural approach is a challenging and promising approach.

# Conclusion

NSS is largely concerned with how members manage their social resources to fulfill their commitment to broadly understood collective responsibilities, thus helping collective actors manage dilemmas generated by cooperation. It considers social capital as a set of relational infrastructures and generic social processes, that is, as a collective asset and capacity for collective action taking place at the meso level in the organizational society. This was made possible by new formalisms proposed by generations of social network analysts. As always in science, these new formalisms have helped develop new phenomenologies, intuitions, and hypotheses in sociology, especially about phenomena that are very difficult to observe empirically, such as the dynamics of multilevel forms of collective agency combining social and organizational networks over time.

Throughout this exploration, several issues come into view as critical concerns for contemporary organizational societies, and thus for further neo-structural research by the social sciences. Without any claim to completeness, it is possible to count among these concerns the following issues.

Making progress in the study of social networks requires awareness that we live in societies of organizations as class societies. Managerial thinking about combinations of bureaucracy and collegiality would tend to be short term and to favor solutions that can be safely implemented quickly, whereas innovation usually requires more time, a different temporality (Bruna, 2013). Synchronizing these temporalities by building dynamic multi-level relational infrastructures is costly in many ways, and thus an issue of social stratification and inequalities. Understanding how synchronization works requires measurements of sedimented vertical or horizontal differentiations of the social world at different levels and analyzing their costs. The issue of the relative costs of synchronizations and asynchronies between levels, as well as that of the allocation of these costs in the evolution of joint regulation and institutions, is important for the capacity to innovate technically, socially and politically for the many, not just to generate new cooperative institutions for the (p. 63) self-segregated few. If members cannot reshape to some extent their structures of opportunity and constraints, – for example, build intermediary-level relational infrastructures, become vertical linchpins – they cannot participate in the redefinition of a recognized schedule, and therefore in the redistribution of the costs and gains of synchronization between the superposed levels of collective agency. More work is thus needed to measure synchronization costs (as approximations of social (in)capacities) in institutional entrepreneurship and new ways of understanding social inequalities that are based on such costs. This characterizes increasingly situations where one level becomes entirely transparent to the other, as in the case of online microworkers (Tubaro, 2019; Tubaro & Casilli, 2019).

Modeling and understanding of this social discipline or social capital of the collective, both at the interorganizational and intraorganizational levels of agency, requires rich data and knowledge of the relational dimension of these processes. The study of social capital as a collective capacity is nevertheless confronted with the problem of the organized

scarcity of data on interdependences and social discipline that are accessible to public academic research. Indeed, the production of fundamental knowledge on the meso-social level is not the exclusive prerogative of academic organizations. Public administrations (police, military) and private companies (BRT as network data platforms for marketing, strategic consulting, personnel management, and labor markets) keep building and exploiting relational databases that allow them to acquire a sophisticated knowledge of the economic and social interdependences among individual and/or organizational actors. For example, contemporary social digitalization bureaucratizes social control by combining information from devices such as body sensors/captors with information from online relational profiles. This weakens control regimes based on concrete personal relationships—with possible societal consequences in terms of further limits to welfare protection or to political freedoms and institutional entrepreneurship (where they exist), both being likely to become conditional to acceptance of relational “intervention” (Valente, 2012; Lazega, 2015a). It is part of the responsibility of the public and open social sciences not to abandon to the private actors an increasingly systematic and closed knowledge of personal and organizational interdependences, social processes, and social capital as understood here.

NSS and models of the dynamics of multilevel networks could help in understanding the current creation of new institutions (or change in older ones) to manage the coming (demographic, migratory, ecological) transitions and survival of societies in terms of access to vital resources (such as energy, clean water, food, or new technology). But they are also at the heart of digitalization as the latest phase of Weberian bureaucratization of society. Digital network analytical routines fed with data collected from intrusive privacy-killing social media technology will soon allow computer scientists and artificial intelligence to identify collegial settings and pockets in ways that may lead to manipulation or neutralization of the social processes and the relational infrastructures listed previously. This raises the prospect of undermined democratic institutional entrepreneurship and politics altogether (Al Amoudi & Lazega, 2020; Archer 2014). NSS and models of dynamics of multilevel networks point to many open questions that need to be addressed and uncharted territories that need to be explored. Little progress will be made, even methodological, without a sound theoretical foundation. NSS attempts to provide this foundation by contextualizing these models. Models will remain misleading if the social sciences do not uphold a tradition of anthropological social network analyses, empirical research questioning and listening to actors on the ground, uncovering the relational infrastructures and social (p. 64) processes behind the phenomena in which they are interested. Whether it is about redefining commons, collective responsibility, cooptation, government, or even social stratification, exploring dynamic multilevel networks exposes social (in)capacities to build new laboratories for social change, including the issue of privatization of knowledge and the social (in)capacities to steer social change that come attached. For the worse not to be certain, much remains to be done to prevent social network analyses from becoming purely technocratic and bureaucratizing instruments of social engineering, including as a challenge for public sociology and its possible contribution to navigating future transitions.

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### **Emmanuel Lazega**

Emmanuel Lazega is Professor of Sociology at Sciences Po, Paris. He is a senior member of the Institut Universitaire de France and the author of several books, among which *The Collegial Phenomenon: The Social Mechanisms of Cooperation among Peers in a Corporate Law Partnership and Bureaucracy*, *Collegiality and Social Change: Redefining Organizations with Multilevel Relational Infrastructures*. His research brings together social theory, sociology of organizations, economic sociology, and social and organizational network analyses. He received the 2018 Simmel Award of the International Network of Social Network Analysts.