Formal network methods in history: why and how?

Claire Lemercier

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Claire Lemercier, CNRS, Center for the Sociology of Organizations, Paris, claire.lemercier@sciences-po.org

On 19 May 2008, *Nature News* discussed history[1]. Under the title "Social networking gets medieval", the first lines read as follows: "Researchers give a French province the 'Facebook' treatment. The popularity of Internet sites such as Facebook, Bebo and MySpace might make social networking seem relatively modern. But a team of French researchers has challenged this idea by trawling through medieval documents to create the oldest detailed social network ever constructed."[2]

Network research, be it explicitly historical or not, often relies on such modernization theories. Brumfiel's statement mixes the very existence of social ties with the type of awareness and representation of these ties provided by Facebook (did the researchers "create" or reconstruct the network?). Medieval "networking" obviously did not take the form of web-based "friends wheels"; but were medieval networks generally less wide, varied and consciously constructed than those of our contemporaries? And which methods–a "Facebook treatment"?–allow us to answer this question?

The computing power that is now available to all of us has allowed this research to get done[3], but it is the current fashion of the network vocabulary that led to its publication in *Nature*. As in this case, popular interest in social networking has recently led researchers in various sciences and social sciences to join "network studies" with no knowledge of–or interest in–the sociological and anthropological theories, methods and software developed on this topic during the last 35 years. They thus often reinvent old indicators; more worryingly, they tend to build an artifical "complexity" by mixing heterogeneous ties on long periods, thus adding to the mathematical interest of the study but obscuring its historical meaning. For example, in the medieval France research, the basic idea is "to rely on agrarian contracts as a source of information about social bounds between persons"[4]. There is nothing wrong with this source, that is indeed the only one available for many past society, but the choices made for its coding are questionable. Each "bound" was actually defined by the fact that two persons appeared, in any social role, in the same contract or in related contracts, be they about land hiring, sale or inheritance. It is difficult to get any meaningful historical results from such a simplistic definition of social ties: there is a high risk to only re-discover very general phenomena, such as the existence of dense parts in many networks, often described as "small worlds". In this case, assessing the fact that persons from the same family or village were often present in the same contract does not add much to our understanding of medieval social structure.

What I will try to show here is that, despite of the preventions of many historians, caused both by the fashionable character of "networks" and by the existence of such studies that sacrifice historical

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[1] Geoff Brumfiel, Social networking gets medieval, in:Nature News (19 May 2008).

[2] This is not fair for Michael C. Alexander and James A. Danowski, Analysis of Ancient Networks: Personal Communications and the Study of Social Structure in a Past Society, in:Social Networks, vol. 12 (1990), 313-335, who treated the much older social network appearing in Cicero's correspondence in an altogether more serious way.

[3] Presented on the website <http://graphcomp.univ-tlse2.fr>.

[4] Romain Boulet et al., Batch kernel SOM and related Laplacian methods for social network analysis, in: Neurocomputing, vol. 71, issue 1 (2008), 1257-1273.

interest for the sake of "complexity", there are indeed very interesting and even important things that historians can do if they add formal network analysis[5] to their toolbox. The fact that methodological sophistication, or the drawing of very complicated graphs, becomes the aim of research is a risk, but it can be controlled–especially if historians know enough about the techniques involved, so that they do not become pure data-providers for model-makers. Using formalization, while keeping it in its ancillary role, might allow us to go beyond the loose "relational turn" of the last decades, so that we not only change our vocabulary, but actually produce new results. The use of words like "network", "social capital", "sociability", "relational", "family", "friendship", "trust" or "cooperation" has been steadily increasing in social science research in the last 20 years. "The term "network" has invaded our system of references, largely in a metaphorical sense, and loosely evoking the existence of a world of connections that go beyond taken-for-granted borderlines."[6] The explanatory and/or descriptive power imparted to the underlying concepts has often been gained on the expense of "class", "institution" and/or "market". However, the number of papers or books showing network graphs, using specific network statistics or even only a precisely and collectively defined network vocabulary is much lower–certainly in history, and even in the research fields of social network pioneers, such as economic sociology. There, too, general, quasi-ritual references to "embeddedness" or "the strength of weak ties" generally are not accompanied by the use of any formal network method. In too many of these papers, the word "network(s)" could be replaced by any other (e.g. "group" or "social ties") without any change in substantive meaning. The network vocabulary is often used in a purely metaphorical way, without reference to any more or less systematic information on precise ties between specific individuals or organizations.

However, stating that social ties matter should be old news today, especially for historians or sociologists. Describing exactly how, and at which scale, they matter–which ties matter for what, which do not, and how different sorts of ties interact–is a more interesting, but also more difficult purpose. It can certainly be achieved, in many cases, without any use of formal network analysis. Knowing the principles of this method, however, helps to more precisely think about networks. While research using formal analysis is not immune, as we have already seen, to the perils of over- or under-interpretation, a balanced relationship with formal methods, neither ignoring them nor making methodology the aim of historical studies, might help us to go beyond a loose relational fashion and actually insert networks in serious historical explanations and narratives.

I will try to show this by discussing common assumptions on network research. From a theoretical point of view, does it aim at showing that everything can be explained by networks and/or by individual strategies of networking? From a practical point of view, is it unsuited to historical sources, either because of their non-systematic character or because applying sociological theories to them would be anachronistic? From a methodological point of view, does network analysis aim at producing graphical representations of "the network of an individual" or of a social situation?

"Networks matter": starting point or conclusion?

There has been much debate among network specialists themselves about the status of "social network analysis": is it a method (or even only a technique, an application of graph theory suited to some types of data), a theory[7], a paradigm, an "ontology"[8], or something looser, like an approach, a

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5   On the difference between "formal" and "quantitative", the former being more inclusive, and on the place of network analysis in the realm of formal methods, see Charles Tilly, Observations of Social Processes and Their Formal Representations, in:*Sociological Theory*, vol. 22, issue 4 (December 2004), 595-602

6   Eugenia Roldán Vera and Thomas Schupp, Network analysis in comparative social sciences, in: Comparative Education, vol. 42, issue 3 (August 2006), 405-429, 406.

7   e.g. in the variants promoted by Ronald S. Burt, Brokerage and Closure: An Introduction to Social Capital, Oxford 2005, or Harrison White, Identity and Control: How Social Formations Emerge, Princeton 2008, that have mostly been applied to economic sociology and do not in fact much rely on formal data handling.

8   Douglas R. White and Ulla C. Johansen, Network Analysis and Ethnographic Problems: Process Models of a

way to view things? Today, most researchers actually seem to share the last option, and historians can certainly adopt it.

Networks and sociological theories

Mark Granovetter has given the best presentation of what it implies. In his view, "network ideas" are only incompatible with two sorts of social theories, which at the same time makes them compatible with many others and gives them a role in questioning these two broad world views. On the one hand, an interest in networks is not compatible with "under-socialized" theories, such as the simplest perfect market models, where atomized actors may be influenced by the aggregate behavior of others, but never by specific ties. On the other hand, "over-socialized" theories, where people automatically follow widely agreed-upon norms, do not need either to bother with the precise shape of interactions[9].

Considering reality as relational thus helps to go beyond purely micro or macro, agency-based or structure-based visions of the world. This definition of network methodolgy as a kind of middling approach is shared by many other authors, e.g. Emmanuel Lazega (emphasizing the consideration of "meso-social" phenomena) or Alain Degenne and Michel Forsé (showing that networks are involved in complex feedbacks between agency and structure)[10]. There is thus a wide range of social theories that are compatible with this view. Granovetter himself did not plead for a well-defined, unified "network theory" of social life, but for a general use of network methods, as "there really is no way to remain faithful to the fundamental insights of sociology without paying attention to networks of social relationships." If there is not a unified network social theory, there is certainly a shared core of concepts that have been translated to indicators, implemented in software and presented in textbooks[11]. Most of them are not specifically related to any sociological theory: they are just tools, instruments allowing us to draw or to measure, the equivalent of a microscope or periscope. It implies that they are not neutral (they enable us to see the world from a specific perspective and thus to learn something new; this perspective is relational, stating that ties matter as well, or even more as individuals or institutions), but that they are not either confined to the task of

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Turkish Nomad Clan, Lanham 2004.

[9]   See e.g. Mark Granovetter, The Myth of Social Network Analysis as a Separate Method in the Social Sciences, in: Connections, vol. 13, issue 1-2 (1990), 13-16.

[10] Emmanuel Lazega, Rationalité, discipline sociale et structure, in: Revue française de sociologie, vol. 44, issue 2 (2003, 305-330; Alain Degenne and Michel Forsé, Les réseaux sociaux. Une approche structurale en sociologie, Paris 1994.

[11] The reader who would like to be introduced to network analytical methods should begin with short texts written for historians and surveying historical research, e.g. Bonnie H. Erickson, Social Networks and History. A Review Essay, in:Historical Methods, vol. 30, issue 3 (Summer 1997), 149-157 in English, Carola Lipp, Struktur, Interaktion, räumliche Muster. Netzwerkanalyse als analytische Methode und Darstellungsmittel sozialer Komplexität, in: Silke Göttsch, and Christel Köhle-Hezinger, eds., Komplexe Welt. Kulturelle Ordnungssysteme als Orientierung, Münster 2003, 49-63 in German, Claire Lemercier, Analyse de réseaux et histoire, in:Revue d'histoire moderne et contemporaine, vol. 52, issue 2 (April-June 2005), in French. Two surveys written by sociologists but discussing several historical studies are also of special interest: Mustafa Emirbayer and Jeff Goodwin, Network Analysis, Culture and the Problem of Agency, in: American Journal of Sociology, vol. 99 (1994), 1411-1454 and Roger V. Gould, Uses of network tools in comparative historical research, in: James Mahoney and Dietrich Rueschemeyer, eds., Comparative historical analysis in the social sciences, Cambridge 2003, 241-269. Accessible manuals, written for precise software but more generally applicable, are Robert A. Hanneman and Mark Riddle, Introduction to Social Network Methods, Riverside, CA. 2005 <http://www.faculty.ucr.edu/~hanneman/nettext/> and Wouter de Nooy et al., Exploratory Social Network Analysis with Pajek, Cambridge 2005. The most popular textbooks, including theoretical discussions, are Stanley Wasserman, and Katherine Faust, Social Network Analysis, Cambridge 1994 in English, Thomas Schweizer, Muster Sozialer Ordnung. Netzwerkanalyse als Fundament der Socialethnologie, Berlin 1996 in German, and Pierre Merckié, Sociologie des réseaux sociaux, rev. ed., Paris 2011 in French. Recent methodological developments, especially those involving testing and simulation, are covered by Peter Carrington et al., eds., Models and Methods in Social Network Analysis, Cambridge 2005 in English and Emmanuel Lazega, Réseaux sociaux et structures relationnelles, rev. ed., Paris 2007 in French. The International Network for Social Network Analysis provides various online resources (http://www.insna.org).

supporting a specific theory[12].

While a whole theory is not embedded in network analysis tools, then certainly produce graphs and measures that tend to be associated, because of often implicit reflexes of interpretation, to a certain view of the social word. Caution is especially needed against strategic over-interpretations of network patterns, the kind of interpretation that more or less assumes that actors are perfectly aware of their ties and those of their contacts and consciously manage these ties to get to a specific position in a network–a sort of "Facebook" view of social reality that in fact existed long before Facebook, including in many historical narratives, be they biographies or comments on genealogies. Network sociologists, and those who used a similar vocabulary in history, especially in microhistory, have often been accused of overestimating the strategic character of networking, and/or of hypothesizing collective strategies (of alliance, land management, etc.), especially at the level of the family, without any proof of their conscious and concerted character[13]. Network analysis itself does not allow to detect the existence of conscious strategies in network analysis: qualitative investigation remains necessary on this question, and assuming a strategy from a network pattttern can be considered as over-interpetation.

Conversely, carefully interpreted network data may allow to disprove strategic hypotheses. For example, in a study of social mobility in a village, Georg Fertig found important "network effects", but only a part of them could be interpreted as the effect of deliberate "networking", as captured by the (probably) strategic choice of godparents: other "networks", those acquired by birth or by the choice of others, were of a different nature[14]. In this case, while there could be a strategic use of available ties, the existence of a strategic network-building was much more questionable. Other network studies of long-term historical dynamics, be they about the Florentine elite of the late middle ages or a Turkish nomadic clan, were precisely used to show how long-lasting, "macro" social structures can emerge from local behaviors not intended to produce them (possibly strategic behaviors in other ways, but not driven by a "networking" strategy)[15]. Formal network analysis thus allows us to detect structures that might not be recognized by all actors involved in them, but whose shape still informs us about underlying social mechanisms.

A relational view of reality, not a separate part of reality called networks

Not only is there no specific, unified theory of social networks; there is no specific object of social network analysis. There is a fundamental ambiguity here, as the network analysis of sociologists is certainly born out of questions about social relationships and "sociometric" studies of, e.g., friendship in classrooms. Today, however, studying social relationships and using formal network analysis are too different, only partially overlapping tasks. There are many ways to study social relationships or "social capital", from the close scrutiny of love letters to regressions on the number of associations at the country scale; only those that are interested in the precise pattern created by one or a few sorts of ties between a set of individuals will profitably use formal network analysis. Conversely, it is sometimes interesting to describe in a relational way things that we would not spontaneously describe as social relationships, such as the routes of ships between ports or the fact of sharing the use of key words.

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[12] The complex relationships between theories of Pierre Bourdieu–one of the inventors of "social capital"–and formal network methods, that have long been rejected by his French followers, is a particularly good example of this relative, but only relative independence between theories and techniques. See e.g. Wouter de Nooy, Fields and Networks: Correspondence Analysis and Social Network Analysis in the Framework of Field Theory, in: Poetics, vol. 31 (2003), 305-327.

[13] Pier Paolo Viazzo and Katherine A. Lynch, Anthropology, Family History, and the Concept of Strategy, in: International Review of Social History, vol. 47 (2002), 423-452.

[14] Christine Fertig, Rural Society and Social Networks in Nineteenth-Century Westphalia: The Role of Godparenting in Social Mobility, in: Journal of Interdisciplinary History, vol. 39, issue 4 (2009), 497-522.

[15] White and Johansen, Network Analysis; John F. Padgett and Walter W. Powell, The Emergence of Organizations and Markets, forthcoming.

The point of formal network analysis is indeed not to get to the conclusion that networks exist or are important, but, taking their existence as a hypothesis, to describe their precise patterns, to understand how they were created and/or what their consequences are. "Networks" are nowhere and everywhere, as practically anything can be considered as a set of relationships (for example, as we now well know, concepts such as "gender" or "age" are relational in their very definition[16]). Using a network vocabulary–and, when data are available, methodology–is therefore only interesting if we are prepared to say something precise about our "network": not only that ties matter, but that they are organized in a significant way, that this or that individual has an interesting position in terms of his or her ties, that two people from the same family will be more likely to also have credit relationships, etc.

The fact that network analysis does not aim at showing that social relationships are important, but at more precisely understanding how they work is particularly obvious in the case of "trust", a more and more ubiquitous term in social science generally and more specifically in economic history. Those who use the term with most emphasis are often the same who also indistinctly talk about "social capital", with unilaterally positive connotations, and do not use precise empirical studies to confirm their assumptions. On the contrary, studies precisely focused on this question, sometimes using formal network analysis, produce more subtle results. It is in fact possible and, in my view, particularly useful, to play "networks" (network analysis of empirical data, taken as a method that does not pre-determine the conclusions) against "networks" (general, loose ideas about the importance of social ties). For examples, two different network studies have discussed cases where family ties had a very limited role in rural land and credit markets of the 18th and 19th centuries–because there was no market at all, because efficient institutions (laws, banks...) limited the advantages of transactions with kin, and/or because other forms of proximity played a more important role than family ties[17]. The virtue of systematic studies is here the fact that they take all cases, including negative ones, into account. In critical surveys of the concepts "trust" and "social capital", Timothy Guinnane pointed that trust only concerns specific individuals in specific contexts, while Alessandro Portes mentioned both the weight of "negative" ties and the possibly negative effect of an accumulation of strong ties, the "not-so-desirable consequences of sociability [...]: exclusion of outsiders, excess claims on group members, restrictions on individual freedom, and downward leveling norms"[18]. Hence the interest of precise empirical studies, and especially of historical ones, as popular views of "networks", "trust" and "social capital" also convey strong–and other contradictory–assumptions on their relationship with modernity[19].

One implicit narrative, based on the "Facebook" vision of "networking", considers social capital as an integral component of economy in the information age, while ancient societies would have been relatively deprived of networks, in that individual choices of relationships would have been more constrained by structures such as that of the family or the village. On the contrary, loose Polanyian views equate modernity with impersonal exchange, as opposed to the warmth provided by "traditional" strong ties. As Seilagh Ogilvie puts it, "Past societies are often portrayed as having enjoyed more trust than modern ones. History is mined for examples of the closely-knit and multi-stranded social networks thought to generate particularly rich stocks of social capital"[20]. The contradiction in fact vanishes if we concentrate on the precise characterization of ties, not on the

[16] On the relational character of identities, especially that of class, see Roger V. Gould, Insurgent Identities. Class, Community and Protest in Paris from 1848 to the Commune, Chicago and London 1995.

[17] Georg Fertig, Äcker, Wirte, Gaben. Ländlicher Bodenmarkt und liberale Eigentumsordnung im Westfalen des 19. Jahrhunderts, Berlin 2007; Fabrice Boudjaaba, Des paysans attachés à la terre ? Familles, marchés et patrimoines dans la région de Vernon (1750-1830), Paris 2008.

[18] Timothy Guinnane, Trust: A Concept Too Many, in: Jahrbuch für Wirtschaftsgeschichte, vol. 1 (2005), 77-92; Alessandro Portes, Social Capital: Its Origins and Applications in Modern Sociology, in: Annual Review of Sociology, vol. 24 (1998), 1-24.

[19] These questions on the characteristics of network "modernization" were already clearly framed in Barry Wellman et al., Networks as Personal Communities, in: Barry Wellman and Stanley D. Berkowitz, eds., Social Structures: A Network Approach, Cambridge 1988, 130-184.

[20] Sheilagh Ogilvie, The Use and Abuse of Trust: Social Capital and Its Deployment by Early Modern Guilds, in! Jahrbuch für Wirtschaftsgeschichte, vol. 1 (2005), 15-52.

"size" or "importance" of "networks", "trust" or "social capital" in general that would mix together all sorts of social relationships. Assessing long-term change in the patterns of ties is only possible and interesting if what we consider as a "tie" has been precisely defined. In this case, it might add something to our understanding of historical dynamics, as did the studies by pioneering microhistorians who, without using the then new formal network methods, put the interplay of class, kinship and other personal relationships on the research agenda[21].

Networks and historical sources

From what I have already said, it should be clear that I do not consider formal network methods to be impossible to use on historical cases because they would be too intrinsically tied to theories about the present society. For example, they are not based on the assumption that any individual is free to choose his or her friends, regardless of any social constraint; on the contrary, they provide robust tools to investigate homogamy (the tendency to link to people similar to oneself) or endogamy (the tendency to link to people previously already linked to oneself, e.g. the "matrimonial relinking" of family history). However, formal network analysis was actually developed to deal with "sociometric" data obtained by questionnaires (e.g. "who are your best friends in the class") or direction observation of interactions. It does not follow that it is not suited to historical sources. As long as we do not forget our professional habits of precisely defining what we are looking for and taking the point of view of historical themselves into account, we can use formal methods to investigate relationships not only between people, but also between organizations, places or even words.

Abstracting relational information from sources

Historians often seem to fear that their painfully discovered, often fragmentary sources are not suited to the data requirements of network analysis. This seems to be caused by an ambiguity in vocabulary, as a part of formal network analysis is often described as the study of "complete networks". This however does not imply that the aim is to describe, or map, all the ties that exist around one actor, or between a set of actors. Here lies a fundamental ambiguity of network studies, that has too often been maintained by network specialists themselves, commenting on graphs as if they were maps or photographs of "all the ties that exist here". In fact, the map of photograph metaphor holds if we remember that these other representations also are abstractions: a map concentrates on some patterns of reality (roads and/or altitude and/or location of restaurants, etc.) and even a photograph only captures one point of view. Similarly, network graphs and the databases that are used to build them concentrate on one or a few sort of ties between a limited set of actors, deliberately ignoring the fact that these actors necessarily have other relationships among themselves and with outsiders. Choices in "boundary specification" (whom do we observe? which ties among them? at what time(s)?) heavily constrain the sort of questions that can be analyzed by network analysis: "carelessness in system specification is probably a more serious issue for network analysis than for much survey analysis"[22]. This implies, on the one hand, that interpretations based on network data should be careful not to reify notions such as centrality or isolation, that are always relative to a choice of ties and actors observed; on the other hand, nothing prevents us to study some sorts of ties thanks to some historical sources, even if they generally do not systematically record all the sorts of ties that we would be interested in.

Even in the richest "community studies", making use of exceptional sources and research workforce, such as that by Darrett B. Rutman and Anita H. Rutman, who followed the growth of a

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[21]   Giovanni Levi, Inheriting power: the story of an exorcist, Chicago 1988 [1985]; David W. Sabean, Property
       production and family in Neckarhausen 1700-1870, Cambridge 1990.
[22]   Edward O. Laumann et al., The Boundary Specification Problem in Network Analysis, in: Linton C. Freeman et al.,
       eds., Research Methods in Social Network Analysis, Fairfax 1992, 61-87.

Virginian village from 1650 to 1750, trying to reconstruct all sorts of interaction[23], we do not find any complete representation of reality, as any representation is an abstraction: maps, tables and narratives use changing scales and successive focuses to build a composit–some would say cubistic–image. This is the sort of result that todays' network analysis can provide, computer power having made it easier to require and quickly obtain any possible view of a network or network indicator, but not magically removed the necessity and difficulty of, first, abstracting information from sources and, second, inventing partial representation of historical data suited to add to our understanding of past situations.

This abstraction task is common to historians and sociologists, but an important difference between them is that the latter have the possibility to ask actors about, e.g., their social relationships, whereas we historians generally have to rely on signs of past activity in our sources. This however is not necessarily a drawback for network studies. First, we should not overestimate the easiness of the task of asking people about their relationships: sociologists, as ourselves, although for different reasons, hardly ever get "complete information". Second, historical sources provide opportunities to observe traces of actual exchange and interaction of various sorts, not only consciously designed discourses on social relationships. For example, many associations record who recommended the approval of whom as a member–a kind of source that, to my knowledge, has never been investigated by network analysis–; notarial records offer information on various sorts of exchanges and family ties; judicial records show who testified on behalf of whom; scientific papers provide patterns of citation, etc. In all these cases, it is the very act of writing that either creates the tie or officially certify its existence for future reference. There is much value in such sources, that are often less easy to access for contemporaty situations, and it is probably why early network sociologists turned to historical sources for some of their most famous papers: the cost of finding information on one additional link or individual is often much smaller when reading archival material than in face-to-face interviews, which allowed them to go beyond very micro studies and/or to compare information on different sorts of ties. It is in fact generally easier to find a source suited for the reconstruction of a "complete" network in archival records, e.g. all the sales or marriages taking place between inhabitants of the same village during a decade, than to conduct interviews systematically asking e.g. 100 people about their ties with each of their 99 potential partners.

Defining ties

There are therefore possibilities for formal network analysis in history, as long as our aim is not to "map social reality" generally, but to understand the patterns of precisely defined ties, by deliberately abstracting them in order to carefully consider their effects, their origins (as they are e.g. sometimes dependent on legal constraints, sometimes freely or even strategically constructed), their changes in response to external events and their consequences. However, the construction of network data remains a complicated step of research, not to be overlooked–as it has too often been in formal network studies such as that discussed in the introduction. Aggregating all sorts of ties under general words such as "bound" or "relationship" is order to get a more complex picture, superficially looking more interesting, only leads to impoverish possible interpretations. On the contrary, any network study–and it is in fact also true for the most qualitative ones–should begin with a careful definition ot the tie(s) to be studied, especially taking into account three dimensions that have sadly, up to now, been scarcely discussed in the network literature and about which historians should have something to say: the difference between interaction and potential for interaction; the awareness of relational patterns among the actors; and the temporality of ties.

It would often be useful, in order to produce more meaningful interpretations of "network effects", to better distinguish between two senses of the words "tie", "link" or "relationship", referring either to an actually observed interaction at a given moment (e.g. a sale of land) or to

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[23]   Darrett B. Rutman and Anita H. Rutman, A Place in Time: Middlesex County, Virginia, 1650-1750, New York 1984.

potential for exchange (e.g. being akin). Potential for exchange can of course itself have been created by previous exchanges of the same type (as in the case of matrimonial relinking), of another type (a kinship tie making an economic association easier), or by a pure similarity (e.g. of religion) or a shared past experience (alumni, members of the same large association). However, the two idealtypes of "tie" have a different temporality and often cannot be interpreted in the same way: being considered as "tied" in the sense of, in fact, sharing some properties that might make interaction likely (e.g. alumni from the same university having studied there 5 years apart from each other) is not the same as being considered as "tied" because you have, e.g., managed a student association together for 5 years. Patterns of any of these ties among, for example, leading businessmen can be interesting to study, but the mechanisms involved if "alumni tend to be economic allies" is quite different in each of the cases. Thinking of these two idealtypes as, e.g., conduits and fluxes (using the metaphor of the river or of flows of digital information) might help to better analytically distinguish them.

As I have already mentioned, historical sources altogether tend to offer more opportunities to observe actual, precisely dated exchanges than fieldwork in contemporary societies. They however also offer discourses about social ties. We should of course neither ignore "subjective" ties as defined by the actors themselves nor "objective" ties that we can reconstruct from less intentional sources; but we should not either forget our professional skills when using formal methods: mixing or confusing "subjective" and "objective" ties can only impoverish interpretation. This has been mainly pointed out by specialists of family ties: our ability to reconstruct complex genealogies is such, for some periods and societies, that we can unearth family ties between people that almost certainly did not know that they existed. This does not in itself prevent any historical interpretation giving such ties an explanatory role, but we should take this into account in order not to interpret this role as the product of explicit "family strategies". More generally, it is always useful, and all the more so when part of the historical information is abstracted in order to be treated in a formal way, to learn as much as possible about how the actors themselves viewed and defined their ties and how they thought that ties were created and/or influenced behaviours. Mark Mizruchi made this point about historical and sociological studies of "interlocking directorates", i.e. bonds (supposedly) created between firms by having the same persons sitting on their boards: he pointed out that much more energy had been spent in reconstructing such bonds than in thinking about their meaning for actors, e.g. using more qualitative sources to understand who appointed members, with which legal restrictions, if some people refuse to be appointed, if board members actually met and what they did together, etc.[24] Vincent Gourdon similarly warned historians about the frequent use of data on witnesses (in marriage records or in notarial records generally) as approximating the notion of acquaintances, "weak ties" or even friends[25]. Although, when no other source is available and when the fragile character of this interpretation is taken into account, such information has proved useful in understanding, e.g., logics of migration[26] or differential local integration, the risks of over-interpretation should not be understated.

The case of family history is similar, but interactions between qualitative and formal studied should be all the more important there as there is always a temptation to reify the boundaries of "family" in order to e.g. count relationships "between families" or answer to the binary question "are they akin or not?", while in fact, in most societies, it is a question of degree more than of boundary. Sharing a common last name has too often been used as a proxy of "having a family tie" in historical studies, without considering what this approximation implied in terms of interpretation. In addition, the interest for family outside the household, much increased among historians by the

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[24] Mark S. Mizruchi, What Do Interlocks Do? An Analysis, Critique, and Assessment of Research on Interlocking Directorates, in: Annual Review of Sociology, vol. 22 (1996), 271-298.

[25] Vincent Gourdon, Réseaux des femmes, réseaux de femmes. Le cas du témoignage au mariage civil au XIXe siècle dans les pays héritiers du Code Napoléon (France, Pays-Bas, Belgique), in: Annales de Démographie Historique, issue 2 (2006), 33-55.

[26] Paul-André Rosental, Les sentiers invisibles. Espace, famille et migrations dans la France du XIXe siècle, Paris 1999.

early results of microhistory[27], has too often led to a simplistic, reified definition of wider "groups"[28]. We should at least always state which "kinship" we take into account: reconstructed, available, mobilized, united, legally defined kinship? Kinship acknowledged by the individual? The study by Peter Bearman on English 17th-century nobility provides an interesting limit case in this respect[29]. As genealogies made partly contradictory kinship claims (e.g. a nephew being recognized by the uncle as such, but not the other way around), Bearman decided to consider these claims themselves as a network, to study subjective, asymmetrical kinship claims, not objectively reconstructed blood ties, which gave new insights both on the meaning of kinship for the actors and on changes in the social structure of the elite.

Finally, defining a set of ties that can be entered in a database implies too often implicit decisions about the time boundaries of the observation and the temporality of ties themselves. These questions have scarcely been discussed in the network analysis literature, although its recent move to the study of network dynamics has opened a space for discussions: historians would certainly be able to provide important thoughts on this topic. Network methods, as they are based on graph theory, tend to be intrinsically static, although it is now possible to visualize network evolutions as films; but this in turn opens the complicated question of dating ties: not only their birth, that is often difficult to define, but also their end, which is a fundamental question, weighing on any interpretation of their importance. During which period does a satisfying sale experience with someone make you more likely to trade with them again? Do we consider that divorced people are still tied by a specific potential for interaction because of their having been married? Do ties die with the people who created them? We should certainly draw on some qualitative studies directly addressing such questions[30] in order to take them seriously, but any answer will depend on the society being investigated and on the availability of sources. Defining the time borders of a network always entails the risk to include long-forgotten ties that in fact do not influence anything, or to exclude central actors whose death or migration does not immediately invalidate all effects of their past structural position. Even simply avoiding to take future ties into account in calculations requires particularly well-constructed datasets[31]. While it is not too difficult to take into account the official dates of birth of formal structures such as associations in order to draw a time-oriented picture of their relationships[32], dating personal interactions between individuals often implies bold interpretative choices. Simply ignoring the question, however, is not a solution: it would, for example, lead to consider that social capital only increases during any individual's life, as each interaction would create an everlasting potential for future ties. This is intuitively not true, or not in all societies; however, the alternative of assigning a duration to ties has rarely been used in historical or sociological studies, with important, recent exceptions seriously discussing choices in this respect and their impact on research[33]. The fact that one of them is a biographical study taking place in the 10th century should free historians from their shyness about formal methods.

Ties that are not interpersonal social relationships

27 Levi, Inheriting.
28 Warnings have already been given in this respect by Andrejs Plakans and Charles Wetherell, Households and Kinship Networks: The Costs and Benefits of Contextualization, in: Continuity and Change, vol. 18 (2003), 49-76.
29 Peter S. Bearman, Relations into Rhetorics. Local Elite Structure in Norfolk, England, 1540-1640, New Brunswick 1993.
30 e.g. Claire Dolan, Le notaire, la famille et la ville. Aix-en-Provence à la fin du XVIe siècle, Toulouse 1998.
31 e.g. of the part of godparents who were not already kin at the time of the baptism, in Fertig, Rural Society.
32 Naomi Rosenthal et al., Social Movements and Network Analysis: A Case Study of Nineteenth-Century Women's Reform in New York State, in: American Journal of Sociology, vol. 90 (1985), 1022-1054.
33 Karim Hammou, Des raps en français au « rap français ». Une analyse structurale de l'émergence d'un monde social professionnel, in: Histoire & Mesure, vol. 24, issue 1 (2009), 73-108, Cristina Munno, Unsure land: an elite face of networks in the auction of a common land in 19th century Veneto, in: Georg Fertig, ed., Social Networks, Political Institutions, and Rural Societies, Turnhout forthcoming, and especially Isabelle Rosé, Reconstitution, représentation graphique et analyse des réseaux de pouvoir au haut Moyen Âge. Approche des pratiques sociales de l'aristocratie à partir de l'exemple d'Odon de Cluny († 942), in: Redes, forthcoming.

When we think of "social networks", we generally refer to ties between human beings. The interest of formal network methods in history is however not limited to inter-individual ties: what formal network methods do is basically allow to clarify complex patterns of relationships (of any sort) and to test hypotheses about their shapes, origins and consequences. None of this is intrinsically related to interpersonal social relationships. On the contrary, other sorts of networks have often proved easier to define, to reconstruct from historical sources and/or to date, so that many historical studies using formal network analysis actually deal with ties between places, organizations or parts of texts. The number of historians interested in associations, economic exchange, migration, networks of citations or of words is thus increasing; although the number of already published papers is more limited, they can provide inspiration to colleagues of various specialties.

The use of network as complements to maps is particularly suited to studies of exchanges, especially of goods, and studies involving historical geography more generally: formal network analysis can take the orientation, volume and type of ties into account to generate a synthetic but detailed image of a structure underlying the observed exchanges–and of its changes[34]. The same is true for migration: we often think of "networks and migration" at the individual level (e.g., do local dense kinship relationships prevent young people to leave?), but migration networks between villages are also particularly fit for formal studies[35]. Many other indicators of ties between places could be and have been constructed e.g. from the correspondence between town councils or from court records[36].

Networks between organizations, between words or texts, and between organizations and persons, or words/texts and persons[37] have been the object of much more studies, some of them using historical sources, and are currently on the agenda of many network sociologists. Formal studies of networks of organizations, often considering the fact of sharing members as a tie–but also sometimes considering taking part in the same demonstrations, sharing the same stated aims, etc.– have proved very useful for research on social and political movements, clarifying their structure, its evolution, and pointing to "central" or "intermediary" key persons or organizations, thus reassessing the role of, e.g., feminists in women's organizations of the early 20th century[38]. A rare illustration of the full potential of formal network techniques designed by a historian, not a sociologists is Carola Lipp's study of the political structures and mobilizations in the German town of Esslingen during the 19th century[39]. Among other indicators, she computed a level of "exposure" to political activism (based on ties between people defined by the fact of having signed the same petition) at different dates and confronted it with the network of organizations (based on shared

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[34] See e.g. David A. Smith and Douglas R. White, Structure and Dynamics of the Global Economy: Network Analysis of International Trade 1965-1980, in: Social Forces, vol. 70, issue 4 (June 1992), 857-893 and Emily Erikson and Peter Bearman, Malfeasance and the Foundations for Global Trade: The Structure of English Trade in the East Indies, 1601–1833, in: The American Journal of Sociology, vol. 112, issue 1 (July 2006), 195–230.

[35] Claire Lemercier and Paul-André Rosental, "Pays" ruraux et découpage de l'espace : les réseaux migratoires dans la région lilloise au milieu du XIXe siècle, in: Population, vol. 55, issue 4-5 (December 2000), 691-726; Lemercier and Paul-André Rosental, The Structure and Dynamics of Migration Patterns in 19th-century Northern France, working paper 2010, <http://halshs.archives-ouvertes.fr/halshs-00450035>.

[36] Laurence Buchholzer-Rémy, Une ville en ses réseaux : Nuremberg à la fin du Moyen Age, Paris 2006, not using formal methods, and Karen Barkey and Ronan van Rossem, Networks of Contention: Villages and Regional Structures in the Seventeenth-Century Ottoman Empire, in: American Journal of Sociology, vol. 102, issue 5 (March 1997), 1345-1382, using them.

[37] This is called a "2-mode" network, as it can be considered in two ways: common members create a tie between organizations; being members of one or several organizations together creates a tie between people. The use of the same keywords creates a tie between scientists, while being used by the same scientists can be considered as creating a tie between keywords.

[38] Rosenthal et al., Social Movements. See also Maryjane Osa, Solidarity and Contention. Networks of Polish Opposition, Minneapolis 2003.

[39] See especially Carola Lipp and Lothar Krempel, Petitions and the Social Context of Political Mobilization in the Revolution of 1848/49. A Microhistorical Actor Centered Network Analysis, in: International Review of Social History Supplement, issue 9 (2001), 151-170.

members) as well as with other individual data e.g. on occupations. Formal techniques here obviously add something to the study, and even to the narrative itself, of political mobilization.

Using texts themselves–be they personal letters, scientific papers or judicial decisions–to study connections between words, between authors or between words and authors has, up to now, remained a mostly qualitative task for historians, while a systematic, formal treatment of such data could often help to answer important questions e.g. about the "Republic of letters" (or science) and its transnational character. Citation studies, often used to "evaluate" contemporary research, can also, if the meaning of citing for actors is seriously taken into account, yield important insights for the history of science–and even of law; so do studied about the shared use of words or concepts by scientists or other authors. While correspondance networks themselves (who writes to whom) often are inaccessible to a systematic study, systematically researching patterns of mentions of persons in letters, or mentions of interaction in letters, is now on the agenda of several historians[40].

Limits on the use of historical sources for formal network studies thus do not follow from the fragmentary nature of our evidence. They depend on our imagination in thinking in a relational way (what would we learn from considering this or that as a tie? often nothing, of course, but it sometimes produces new insights) and on our caution in precisely defining "ties" and not forgetting our reflexes of source analysis because we aim at using formal methods.

Why formal methods?

Without of course providing here a technical course of network analysis, I would like this final part to give an idea of the sort of results that can be expected from formal methods. My aim here is twofold. I would first like to emphasize the fact that producing one barely readable graph of "the network" should not be the only or even the main aim of formal analysis–even if, sadly enough, many published papers give this impression. On the contrary, its value lies in its ability to provide many complementary views and indicators, especially helping the researchers to navigate between scales. Second, I would like to show some virtues often associated with a systematic and explicit treatment of data, even including the idea of testing hypotheses, often it is often dismissed by historians as scientist. My aim is however not at all to criticize qualitative methods: on the contrary, the best qualitative studies generally share the imperatives that I will develop, while many formal studies, often due to a lack of consideration of their sources, disregard these imperatives. What I have however discovered in the course of teaching formal methods to a few generation of doctoral students in history, is the fact that trying, even only for a while, to think in terms of systematic collection of data and/or explicit hypothesis testing has heuristic virtues, as it helps to discover some bias in the sources and prejudices in the interpretation that otherwise would have gone unnoticed. It is in this spirit that I would like to state what, if we are interested in "networks", we have to win from taking them seriously and studying them formally, as opposed to referring to them in a loose, metaphorical way. As already stated, this has much to do with accepting that research is

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[40] A pioneer was Thierry Rentet, Network Mapping: Ties of Fidelity and Dependency among the Major Domestic Officers of Anne de Montmorency, in: French History, vol. 17, issue 2 (June 2003), 109-126. Among other pioneering studies of networks of words or citations, see Peter Harris, Structural Change in the Communication of Precedent among State Supreme Courts, 1870-1970, in: Social Networks, vol. 4, 1982, 201-212; Douglas R. White and H. Gilman Mccann, "Cites and Fights: Material Entailment Analysis of the Eigtheenth-Century Chemical Revolution", in: Barry Wellman and Steven Berkowitz, eds., *Social Structures: A Network Approach*, Cambridge 1988, 380-399; Charles Tilly, Parliamentarization of Popular Contention in Great Britain, 1758-1834, in: Theory and Society, vol. 26, issue 2/3 (April-June 1997), 245-273; John W. Mohr and Vincent Duquenne, The Duality of Culture and Practice: Poverty Relief in New York City, 1888-1917, in: Theory and Society, vol. 26, issue 2/3 (April-June 1997), 305-356. For a transnational study of journals tied by shared authors, see Christophe Verbruggen, Literary Strategy during Flanders's Golden Decades (1880-1914): Combining Social Network Analysis And Prosopography, in Katherine S. B. Keats-Rohan, ed., Prosopography Approaches and Applications A Handbook, Oxford, 2007, 579-601. For an innovative study in history of science studying not citations, but ties between doctoral students and advisers, see René Sigrist and Eric D. Widmer, "Social networks and the making of botany as a discipline (1670-1830). An analysis of the master-disciple relationships", in: Redes, forthcoming.

about abstraction (defining a tie in order to study its patterns, not trying to reconstruct reality as a whole). If this premise is accepted, formal methods provide us on the one hand with a wide set of graphical and numerical partial descriptions of data, and on the other hand with incentives to specify and ways to test or causal hypotheses.

Navigating scales in networks

Network software allows researchers to produce two sorts of outputs that reduce the complexity of their data and allows their interpretation: graphs, on the one hand, and numerical indicators, on the other hand (and the latter can be used as parameters in the former). It is important to understand that graphs, as well as indicators, although they look more concrete, only provide one in billions of possible representations of the data, suited to answer some questions and not others. They are often useful in the exporatory step of research, as they can enhance intuition, thus providing new hypotheses to be tested; they also can help to communicate results, although the general abilitiy to read a graph sould not be over-estimated. It is especially important to take into account the fact that graphs generally tend to give an impression of density (as present ties are much more visible than absent ties, whereas "non-ties", be they forbidden or deliberately avoided, are often key to othe understanding of social structure), tend to make the reader think that people placed at the center of the page are "at the center of the network", which is not always true, and tend not to efficiently show the direction of ties (while it is sometimes the most important feature of the network). The most useful graphs, for communication purposes and even for heuristics, are thus probably the simplest, most abstracted and clearly constructed ones: the ones that do not convey the idea that they are photographs of "the social reality", but simply help to visualize properties that are difficult to describe with words, or to navigate scales, as a graph is particularly suited to both allow the identification of individual position, of meso-scale patterns and of a global shape.

In addition, it is often useful to experiment with graph instead of using them "direct from the computer". For instance, projecting observed networks on maps, i.e. confronting ties with distances, can be illuminating[41]. Another interesting confrontation is that of the network and the family tree–a conventional representation that deeply influence our views on family, thus making some historical questions difficult to answer or even to frame. As any representation, family trees have their implicit biases (they are centered on lineages, and often gender-biased) and practical drawbacks (such as not helping to identify relinking marriages or to represent successive marriages). Alternative versions, like the "p-graphs" applied by Douglas White in various historical cases[42], that counter-intuitively use lines to represent individuals and circles for marriages, try to overcome these problems. They especially aim at discovering endogamous "cores" in long-term, complex marriage networks. As for the abstraction of networks from sources, historical imagination should not be constrained by previous practices when it comes to the design of network graphs that flexible software allows to create.

In addition to graphs themselves, representing ties as lines between nodes, formal network analysis provides other, mathematically-founded ways to reduce the complexity of data and to find significant patterns in them. One of them, called "blockmodeling", has a particularly interesting potential in helping to navigate scales. It is essentially a way of clustering the set of actors studied (be they persons, words, places or organizations) according to their ties, so that actors with a similar structure of ties to others are clustered together. This helps both to understand the overall structure (e.g., is there a core and a periphery or are there separate, relatively independent cohesive subgroupes) and to investigate the precise place of each actor in the structure. For example, a famous study of family and economic ties in the Floretine elite of the 15th century showed first, at

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[41] Lemercier and Rosental, The Structure.
[42] Especially the long-term studies of the Austrian village of Feistritz (Lilyan A. Brudner and Douglas R. White, Class, Property and Structural Endogamy: Visualizing Networked Histories, in: Theory and Society, issue 2-3 (1997), 161-208.) and of a Turkish nomad clan (White and Johansen, Network Analysis).

the global level, that this elite was divided into two relatively isolated blocks in terms of these relationships (each of these blocks in addition being socially heterogeneous but politically homogeneous), second, at the meso level, that each of these blocks had a very different internal structure (one of them being more hierarchical than the other), and third, at the individual level, that the position of the Medici family in this structure, although not deliberately achieved by its members, could parly explain its accession to political power[43]. This technique of description generally emphasizes borders and hierarchies inside networks, thus complementing graphs that make reciprocity and cohesion more visible.

Blockmodels are however only one in many tools offered by formal network analysis both to describe and to test hypotheses. My aim here is not to review these techniques, that are in addition best understood when discovered as part of the results of a historical studies, like the ones that I already cited. I only want to make two additional points here. First, network analysis offers indicators for each scale of a network (e.g., its overall density, that of variously defined subgroups in it, and the "centrality" of individual, according to different substantial definitions): the idea of bridging the micro-macro link thus is not only an appealing slogan, but has a practical content. Second, at the individual level, formal network analysis has always payed special attention to the position of the "intermediary", the "broker" that "bridges" between otherwise quite closed communities. The indicator of "betweenness"–the degree of "intermediary character" of an actor, that does not depend as much of his or her number of ties as of the precise position of these ties in the network–has been one of the first to be created by sociologists, and the substantial role of "brokers" is still regularly discussed in formal historical network studies that often offer subtle interpretations of its advantages (from the person and/or for the bridged communities) and even of its drawbacks or dangers[44]. As the notion of broker, translator or intermediary seems to be more and more present in various specialties of history–studying cultural brokers, transnational figures, interdisciplinary scholars, etc.–, it seems important not to ignore the thoughts of network specialists on this topic, so that it does not become just another loose metaphor.

Testing hypotheses

There is no such thing as "purely descriptive" results: the techniques described above rely on assumptions on what could be interesting in the data (e.g. the existence of a core/periphery structure or the specific role of brokers). In many cases, making our research hypotheses explicit–be it in the context of qualitative or quantitative research–helps to refine them. For example, investigating a question such as "does family matter in 19th-century Parisian economic institutions?" implies not only to find data and ways to treat them, but also, and more importantly, to define "family" and to differentiate several hypotheses about the way it could "matter": Were new members chosen among kin of previous ones? Were even fathers systematically replaced by sons? Did family groups sometimes control an entire institution?[45] Answers to such questions will never be 100% "yes" or "no", but phrasing the questions and looking for empirically grounded answers, not only anecdotal evidence, is always helpful; in fact, a systematic treatment is not only the best way to get general answers, but also a step towards identifying meaningful exceptions that might in turn deserve qualitative investigation. This is true for studies on networks as well as for others, and perhaps all

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[43] John F. Padgett and Christopher K. Ansell, Robust Action and the Rise of the Medici, 1400-1434, in: American Journal of Sociology, vol. 98 (1993), 1259-1319. Other interesting cases of historical studies using blockmodels include e.g. Barkey and van Rossem, Networks, Smith and White, Structure, and Vincent Gourdon, Aux coeurs de la sociabilité villageoise : une analyse de réseau à partir du choix des conjoints et des témoins au mariage dans un village d'île-de-France au XIXe siècle, in: Annales de démographie historique, issue 1 (2005), 61-94.

[44] Among the most recent and subtle such discussions, see Henning Hillmann, Mediation in Multiple Networks: Elite Mobilization before the English Civil War, in: *American Sociological Review*, vol. 73, issue 3 (June 2008), 426–454 and Henning Hillmann, Localism and the Limits of Political Brokerage: Evidence from Revolutionary Vermont, in: American Journal of Sociology, vol. 114 (September 2008), 287-331.

[45] Claire Lemercier, Liens privés et régulation de l'économie : la famille et l'institution (Paris, XIXe siècle), Revue d'histoire du XIXe siècle, vol. 33, issue 2 (2006), 23-53.

the more so, because general statements about the "importance of networks" often disregard two important points. First, are networks important because they are supposed to be the cause or the consequence of other phenomena, or both? Second, when we discuss "important networks" or "useful social capital", are we sure that we have not overlooked contrary, negative cases and/or patterns created by pure chance?

Early network studies, especially those dealing with historical data, have been criticized for either being too deterministic (seeing *the* cause of everything in the network structure, forgetting both individual agency and cultural norms) or lacking any coherent causal model[46]. The radical, deterministic view was actually shared by some early promoters of network studies, who more or less clearly stated that "attributes" (classe, age, sex...) did not matter, as social structures only relied on relationships. For example, the 1980s network software Structure, created by sociologist Ronald Burt, did not allow the researche to to include any data on individual attributes. As a result, network models have often been regarded "as graphs of relationships taken out of context and out of time, a mere dried skeleton of social life. Network models are often misunderstood as something divorced from the social context that lends a more proper interpretation"[47]. Fortunately, software as welll as the ideas of most network specialists have evolved since the 1980s, so that the causal hypotheses about networks that can be tested of course can and should include interactions with attributes, behaviors, culture, historical events, etc. This however makes their precise specification all the more necessary. Is the network supposed to be the cause of what we are interested in, is it the consequence (we are interested in what gave birth to it), or both? Are we interested in alliances between families because their pattern seems to reveal generating strategies, such as repeated marriages between lineages that would aim to reconstruct fragmented pieces of land, in the context of a given inheritance system? Are we trying to spot the effects on the network of an event such as an institutional change, a war or a plague? Or do we want to know how "embeddedness" influences individual behaviors, e.g. on a market?

The most difficult, but also the most interesting step of formal network analysis is the definition of such hypotheses. Once they have been phrased, currently available techniques (often based on simulation, which offers a sort of counterfactual history: "how would the network look like if...") offer wide possibilities to test even the most subtle among them. For example, in a study of migration between villages during three successive time periods, it was possible to assess which parts of the change in the patterns of migration could be attributed to economic and demographic changes, to a growing preference for moving to places similar to that of departure (in terms e.g. of language spoken or similar economic activities) and to more "structural" phenomena such as the–surprising–tendency for migrations between two places to become reciprocal (people moving in both directions)[48].

Many sources and question are not suited to such explicit testing of multicausal models, or do not require a formal treatment of this sort, even if explicitly formulating the model is useful. However, there are more general rationale behind hypothesis-testing, namely the will to check that our impression that networks matter is not biased by only considering positive cases or by mistaking something that could have happened by pure chance for a significant pattern. These should be considered by any historian when talking about "networks" or "social capital", even if he or she does not afterwards use network software.

Historical texts about "networks" that only rely on genealogies or narratives too often only tell the story of one or a handful of "successes with networks". For example, after having selected politicians with a particularly impressive career, the author looks for ties that could explain it. And he or she finds some, all the more easier if what could constitute a "tie" has not been defined beforehand: an alliance, a friendship, a common acquaintance, an involvement in social events at the same time as powerful persons... Hence the importance of "social capital" in what too often borders tautology. Comparison, be it qualitative or more systematic, is needed to avoid such over-

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46 Emirbayer and Goodwin, Network Analysis.
47 White and Johansen, Network Analysis.
48 Lemercier and Rosental, The Structure.

interpretations. Three theoretical cases should be taken into account and looked for in the sources: success without network, network without success, and neither. For example, one should not only consider *ex post* a set of persons who have adopted an innovation and look for ties that might have helped the innovation to circulate among them, but also consider non-adopters: were they not included in similar ties? In the same way, the literature on social networks and mobilization often focuses on how different sorts of ties increase the probability to mobilize. Actors with less network incitations are also taken into account in the most careful studies, while few take into account another possible case, that of ties hindering mobilization, or conflicting ties–e.g. a conservative family and liberal friends[49]. It is not always possible to decide between explanations only by comparison, but it helps; in addition, alternative possible interpretations should always be recognized: for example: does the observation of frequent economic exchange between family members prove the existence of trust and it enhancement by kinship ties, or did exchange occur *despite of* mistrust or indifference[50]? Even if it is not technically easily to include negative (as opposed to positive on non-existent) ties in formal network study, we should not disregard the fact that conflict, both internal and external, is often an integral part of the daily life of densely knit communities[51].

The question of exchange happened despite of distrust sheds light on the fact that ties can be created not because of a conscious preference, but because of the fear of sanctions or, even more simply, of the lack of alternatives. Is homogamy or endogamy the product of choice or only of the availability of partners that happen to be similar or akin to the individual? This question, too often disregarded in descriptive studies, is particulary suited to a formal treatment based on simulation[52]. It is not a technical question, as the "closeness" or "openness" of various communities often has important historical meaning: its assessment should not be biased by the omission of chance factors. In small communities, marrying a parent or selling him or her land often might have been a likely option, even with no specific preference, trust or strategy involved.

<p style="text-align:center">*</p>

Do networks matter? If we want this to become a meaningful historical question, we do not necessarily have to adopt formal methods, although those are not as naturally foreign to historians as many would think. We should, however, accept the idea that being interested in relationships does not imply that we will always prove that they have positive effects or even that they weigh more than classes, culture or institutions. Such premises should allow us not only to borrow some interesting ideas from sociologists but, more importantly, to teach them many things about the temporality and historicality of networks.

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[49] Doug McAdam and Ronnelle Paulsen, Specifying the Relationship between Social Ties and Activism, in: American Journal of Sociology, vol. 99, issue 3 (November 1993), 640-667.
[50] Georg Fertig, Zwischen Xenophobie und Freundschaftspreis: Landmarkt und familiäre Beziehungen in Westfalen, 1830-1866, in: Jahrbuch für Wirtschaftsgeschichte, vol. 1 (2005), 53-76.
[51] As demonstrated, in the case of family, in the classical book by Sabean, Property.
[52] White and Johansen, Network Analysis, took into account chances to observe various sorts of endogamous alliances and Fertig, Zwischen, chances to find land sales between kin.