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Social Network Analysis and Informal Trade

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Abstract

The objective of this article is to show how a formal approach to social networks can be applied to better understand informal trade in developing countries, with a particular focus on Africa. The paper starts by discussing some of the fundamental concepts developed by social network analysis. Through a number of case studies, we show how social network analysis can illuminate the relevant causes of social patterns, the impact of social ties on economic performance, the diffusion of resources and information, and the exercise of power. The paper then examines some of the methodological challenges of social network analysis and how it can be combined with other approaches. The paper finally highlights some of the applications of social network analysis and their implications for trade policies.

Keywords: social networks; informal trade; development; centrality; brokerage; embeddedness; social capital

JEL Classification Codes: D85, F14, L14, R11

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1. Introduction

Social network analysis has not joined “the dodo and Neanderthal man as an extinct species” as might have been feared some thirty five ago (Boissevain 1979: 394). Rather it is a burgeoning field of analysis. The enthusiasm for a relational approach to social interactions has spread across academic disciplines, bolstered by the recent explosion of digital data and progress in computational science, not to mention the popularity of social media such as Twitter or Facebook. Over the last decades, social network analysis has evolved from a relatively peripheral area of research to a formalized body of theories, concepts, and methods related to the social ties among people and the ways in which their interactions produce network structure.

Thus far, the vast majority of studies using a formal approach to social networks have been conducted in developed countries, particularly in Western Europe and North America, where social network analysis originated and has achieved its greatest conceptual and methodological developments. In the rest of the world, the use of social network approaches to describe and model contemporary societal structure is much less widespread, even in the domains of social life that are the most relational by nature, such as trade. In Africa, for example, network approaches examining the consequences of social relations for economic action still constitute a marginal field of research compared with those who look at trade using markets and prices as general principles of organization, and as devices of coordination, of economic activities.

Given that social interactions are constitutive of all societies, the objective of this article is to show how a formal approach to social networks can be applied to better understand informal trade in the developing world. To do so, we start by discussing some of the fundamental concepts developed by social network analysis over the last decades, including centrality, embeddedness, and brokerage. Through a number of case studies, the paper shows how social network analysis can illuminate the relevant causes of social patterns, the impact of social ties on economic performance, the diffusion of resources and information, and the exercise of power. The third part examines some of the methodological challenges of social network analysis and how it can be combined with other approaches. Before concluding, the fourth part highlights some of the applications of social network analysis and their implications for trade policies.

2. What is social network analysis?

In contrast to other related social sciences, social network analysis is primarily interested in studying how the ties between actors serve as channels for flows of material and immaterial resources, such as capital, information, advice, or trust.

2.1. A relational approach

The formal study of social networks can be employed to understand the social, economic, and political interactions between discreet individuals, groups, or organizations. Unlike other social theories that assume a predefined social structure, social network analysis seeks for the origins, evolution, and impact of structure on social outcomes. The perspective adopted by formal network analysis also allows for the integration of structure and agency. A structural perspective, social network analysis considers that the structure underpinning social relationships provides

opportunities for or constraints on individual action. In a trade network, for example, the power of central actors to control information flows, give advice and orders, and influence economic outcomes is supposed to come from their structural position rather than from innate leadership capacities. Quite different is the autonomy of structurally peripheral actors who must necessarily go through several peers to disseminate their ideas or reach customers and distant markets. In extreme situations, actors only attached to the network by a single link – known as pendants – are totally dependent on other actors to access resources.

Because networks are dynamic, it is assumed by social network analysis that social actors will develop tactics and strategies that aim at altering the structure, rather than the behavior of alters, to their advantage (Brass and Krackhardt 2012, Friedkin 2011). Network tactics are often based on the general principle that it is easier to influence someone that is close and present at the same time. Because the probability of forming a tie is inversely proportional to the distance, *propinquity* is a fundamental principle of network strategies. Actors are also more likely to influence people that have similar attributes or behaviors, a principle known as *homophily* and summarized by the popular expression “Birds of a feather flock together” (McPherson et al. 2001). Influence over other actors is also better exerted in a stable relationship, where all actors have had the time to build confidence in one another than in a conflicting configuration where uncertainty prevails. Finally, people are also influenced by social perceptions and tend to value people associated with well-connected people. Asked for a loan by an acquaintance, the financier Baron de Rothschild is alleged to have replied: “I won’t give you one myself; but I will walk arm-in-arm with you across the floor of the Stock Exchange, and you soon shall have willing lenders to spare” (Cialdini 2013: 45).

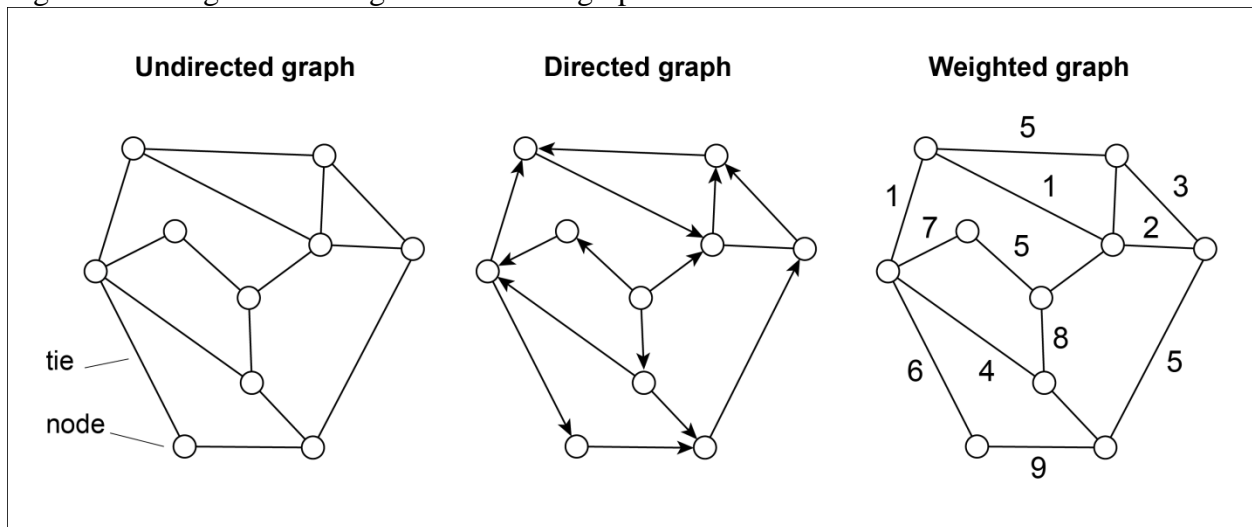
2.2. Fundamentals in social networks theory

Over the last decades, the study of social interactions has progressively been formalized by Social Network Analysis (SNA). Being both a paradigm of social interactions based on graph theory and a methodology, SNA has consequently developed a rapidly increasing number of statistical tools to formally describe, represent, and model social structures (Newman 2010). This approach regards social networks as a finite set or sets of actors linked to one another by social ties. The smallest social network, composed of only two actors, is known as a *dyad*, whereas a subset of three actors is called a *triad*. Actors between which ties can be measured form a *group* and can be visually represented with a *graph* (or *sociogram*) where the distance between the nodes is a function of their social proximity. Ties between actors can be *directed* – when each link had a direction pointing from one node to another – or *undirected*. Networks can be *weighted* when the ties connecting actors have a value, or *unweighted* when only the existence of ties is represented (Figure 1).

In a dyad, one of the most fundamental measures is *reciprocity*, which refers to the fact that two actors acknowledge that they are engaged in a mutual interaction (Bonacich and Bienenstock 2009). In the developing world, reciprocity constitutes a major concern for informal traders who, in the absence of contracts enforced by formal institutions, rely heavily on interpersonal relationships and mutual trust to conduct their business (Fafchamps 2004, Berrou and Combarrous 2012). The introduction of a third actor in a dyadic relation renders it possible to explore *transitivity*, a principle that assumes that two actors connected to a third actor are likely

to be strongly tied to each other. According to the ‘balance hypothesis’, a balanced state exists between three actors if they all appreciate each other or if two parties share a common enemy. In the first case, it is assumed that “the friends of my friends are my friends” and in the second case that “the enemies of my enemies are my friends”. Over time, unstable triads tend to evolve toward stable triads insofar as instability produces tensions that lead players to seek other forms of relationships.

Figure 1. Sociogram showing three kinds of graphs



Source: Walther 2014.

The importance of social actors is often deduced from their centrality. Because the notion of centrality varies according to the structural context in which actors are connected, numerous measures have been developed since the late 1970s (Freeman 1979, Freeman et al. 1991, Borgatti 2005, Everett and Borgatti 2010). Among the most commonly used are:

- *Degree centrality* is a local measure that refers to the number of ties each node has. Actors with a high degree centrality are often regarded as powerful because they are surrounded with many other nodes. In the developing world, for example, wholesalers usually have a high degree centrality, because they are the center of a large network of family, ethnic, and business ties within the local community;
- *Betweenness centrality* refers to the importance of bridging disconnected nodes. It is a global centrality measure calculated on the entire network and based on the number of shortest paths between nodes. Rather than being connected to a large number of alters, actors with high betweenness centrality usually bridge actors or groups that otherwise would be disconnected. The network literature argues that these actors bridge “structural holes”, i.e. areas of relative low density of ties (Burt 1992). Local traders connected to business partners in distant markets can play such brokerage role between their own community and the outside world;

- *Closeness centrality* is another global measure which refers to how close a node is to all other nodes. Actors with high closeness centrality are often found among high-ranking civil servants or counselors who have the ability to influence the choice of leaders without being officially in charge. In Northern Nigeria, for example, a committee of kingmakers is responsible for presenting a list of candidates to the state governor, who ultimately appoints new religious leaders. In trade networks, actors with high closeness centrality will typically be the second in charge who act on behalf on large wholesalers or international importers;
- *Eigenvector centrality* (also known as *Bonacich power centrality*) indicates whether actors are central because they have ties to other central actors. Actors with high eigenvector centrality are well connected to the parts of the network that have the greatest connectivity. CEOs and elite members of state bureaucracies in developing countries are examples of such actors. Large traders well connected to political leaders or involved in national politics are likely to have high eigenvector centrality scores as well.

2.3. Embeddedness and brokerage

Recent research conducted in a variety of disciplinary and geographical contexts has shown that social capital resulted from the combination of embeddedness and brokerage (Burt 2005, Fleming et al., 2007, Uzzi 1996, Everton 2012). Studying a sample of entrepreneurial households in Uganda, Rooks et al. (2012) show for example that the relationship between the degree of constraint of a network and innovative performance follows an inverted U-shape curve: the most innovative entrepreneurs are simultaneously embedded in a cohesive group while being able to create diverse external contacts between actors that are not themselves connected. As shown in Table 1, maximum economic performance is attained when actors are strongly embedded in a closed network and well connected beyond their own group.

Table 1. Combining embeddedness and brokerage

	<i>Low degree of embeddedness</i>	<i>High degree of embeddedness</i>
<i>High brokerage beyond group</i>	Divisive group with diverse external contacts	Cohesive group with diverse external contacts (maximum performance)
<i>Low brokerage beyond group</i>	Divisive group with homogeneous external contacts (minimum performance)	Cohesive group with homogeneous external contacts

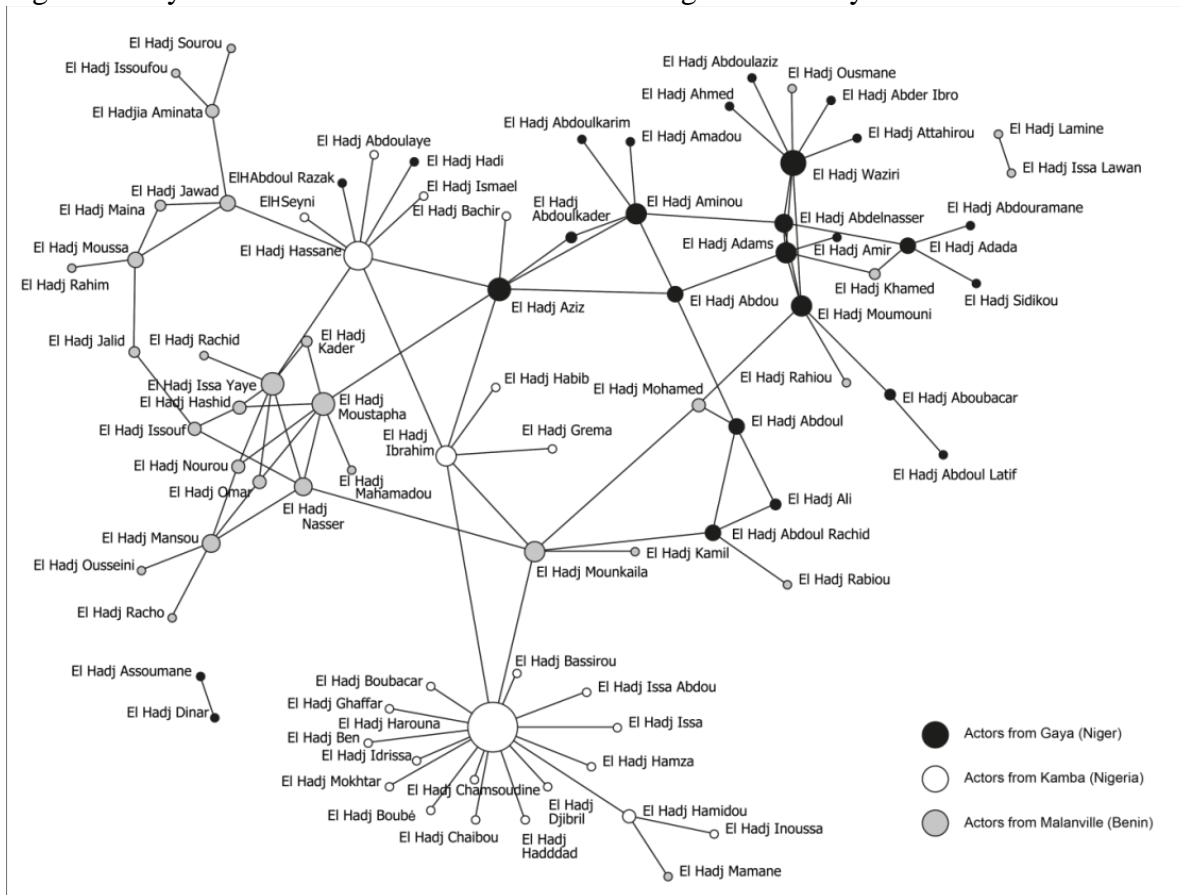
Source: Burt (2005: 139).

A strong degree of embeddedness provides trust between peers and reduces the risks associated with social, political and economic activities. Strongly embedded actors are therefore regarded as very central, in the sense that they are surrounded by a large number of other actors with whom they frequently interact to exchange information, draw resources or communicate orders. This structural position is, however, not without disadvantages, because strongly embedded actors lack brokerage ties that would allow them to reach external resources, such as new ideas or non-redundant information. As Spiro et al. (2013) demonstrate, brokerage can generate value in three different ways. Firstly, brokers can transfer resources between two disconnected parties, a

situation known as *tertius gaudens* or “rejoicing third”. This structural position is routinely used by traders in the developing world, who act as a bridge between importers and final consumers along transnational routes. Secondly, brokers can facilitate matchmaking between two actors to the benefit of each, a situation known as *tertius iungens*, or “the third who joins”. Banks brokering between investors and investees can play such a brokerage role. Finally, the structural advantage of a broker can come from his ability to coordinate the activities of third parties without creating a direct relationship between them, which reinforces their dependence on the broker. Free-lance negotiators involved in the release of hostages are used to playing this role, by mediating between government and rebel groups. One should note that in social network analysis, the definition of a broker derives from his structural position and is not, as in the anthropological literature, defined by his professional occupation.

To illustrate the difference between embeddedness and brokerage, we examine the network organization of 136 large traders on the Nigeria-Niger-Benin borders for which we collected data in 2012 (see Walther 2015). In a business environment characterized by an imperfect removal of barriers to trade and unfinished harmonization of external tariffs, trade relies on a combination of trust and reputation shared among local traders, and distant ties developed with foreign partners. Figure 2 maps the business relations between traders located in Niger, Benin and Nigeria.

Figure 2. Gaya-Malanville-Kamba trade network: degree centrality

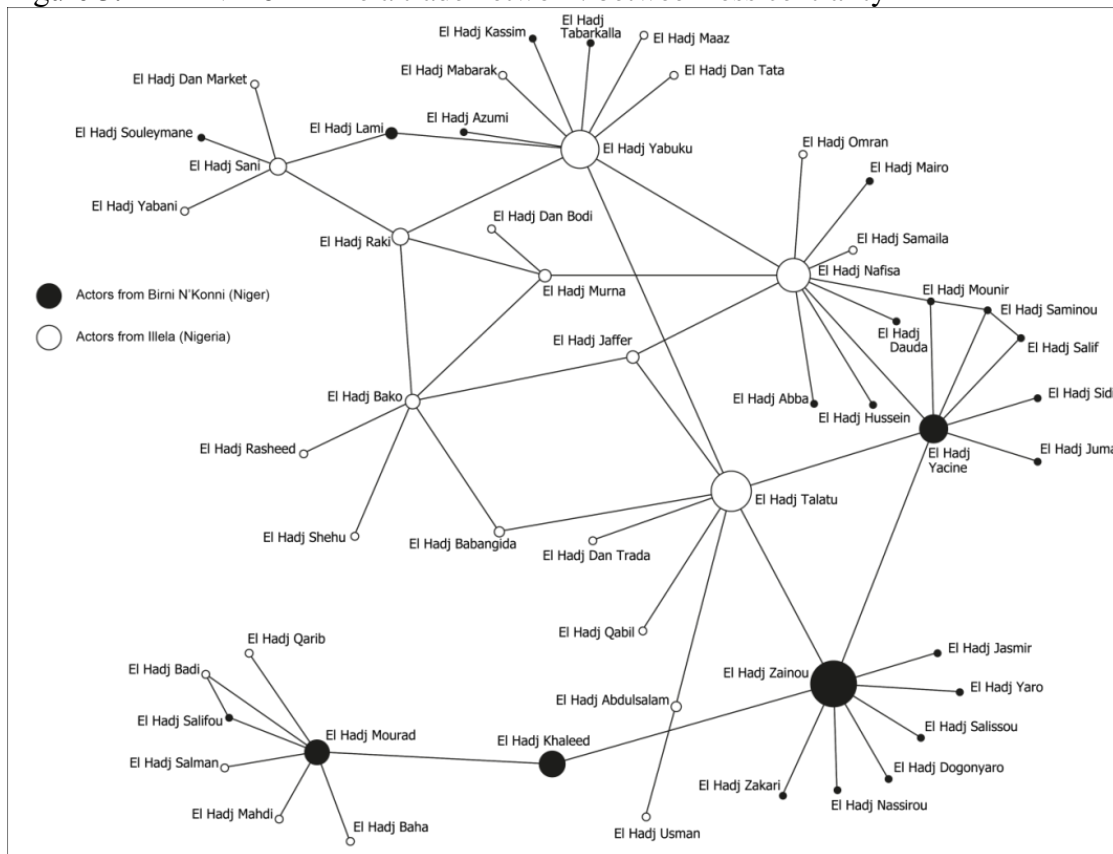


Source: Walther 2014.

The size of the nodes reflects the number of ties developed by each actor and the color refers to each of the border markets: black for the market of Gaya in Niger, white for Kamba in Nigeria, and gray for Malanville in Benin. The sociogram shows that there is a relative absence of very central actors in the region. Most of the large traders develop business ties with a limited number of partners with whom they repeatedly engage in business transactions. In a region where there is no formal trade institution to enforce contracts and where cross-border relations can be suddenly disrupted by border controls or boycotts, this particular configuration makes the network less sensitive to fragmentation.

The fact that none of the large traders working on the Niger-Nigeria-Benin border is particularly prominent in terms of degree centrality does not mean that they cannot occupy brokerage positions. Figure 3 provides a visual representation of the betweenness centrality scores in another border region between Niger and Nigeria. Each actor is represented according to his market, with traders from Birni N’Konni in Niger in black and traders from Illela in Nigeria in white. The size of the nodes is proportional to their relative importance in terms of brokerage: Brokers are characterized by larger nodes. The sociogram shows that business relations between large traders are mediated through a limited number of prominent brokers, whose activities strongly contribute to the spatial integration of regional markets in this part of West Africa. Instead of ignoring borders or treating them as artificial, cross-border traders have developed business ties that make use of the colonial partition.

Figure 3. Birni N’Konni-Illela trade network: betweenness centrality

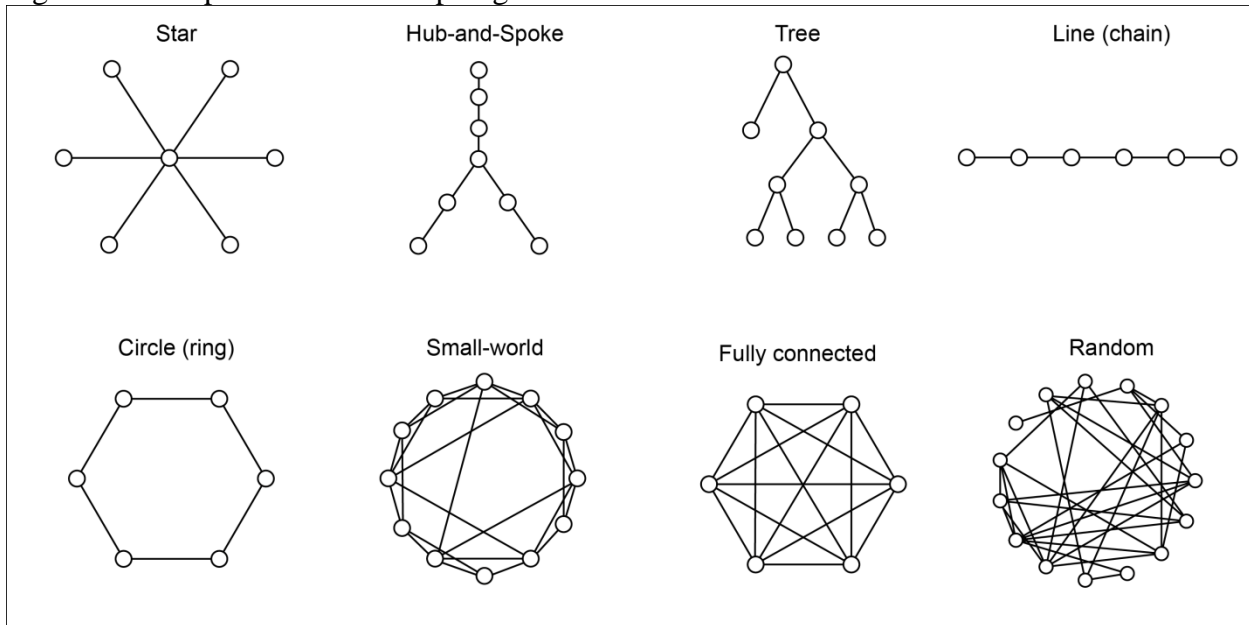


Source: Walther 2014.

2.4. Centralization and network topology

In order to understand the shape of a network (also known as its *topology*), centralization is a crucial measure, which indicates how much variation in centrality there is among nodes. The measure can range from 0, if no node is atypical in terms of centrality, to 1 if the centrality of one node exceeds all nodes. Centralized networks are composed of a small number of actors with many ties and tend to be more efficient in terms of coordination, because information, orders and resources can be more easily transferred from central nodes to the rest of the network. The star network – represented in Figure 4 – in which peripheral actors have no ties between each other is the most extreme example of a centralized network. Its opposite is the fully connected network, a decentralized structure where every node is connected to every other node, which proves resilient to threats because of its redundancy of ties. Other network topologies include the hub-and-spoke network, a centralized network in which information and resources move along spokes towards a central node, and towards the tree network, a hierarchical structure commonly found in military organizations.

Figure 4. Examples of network topologies



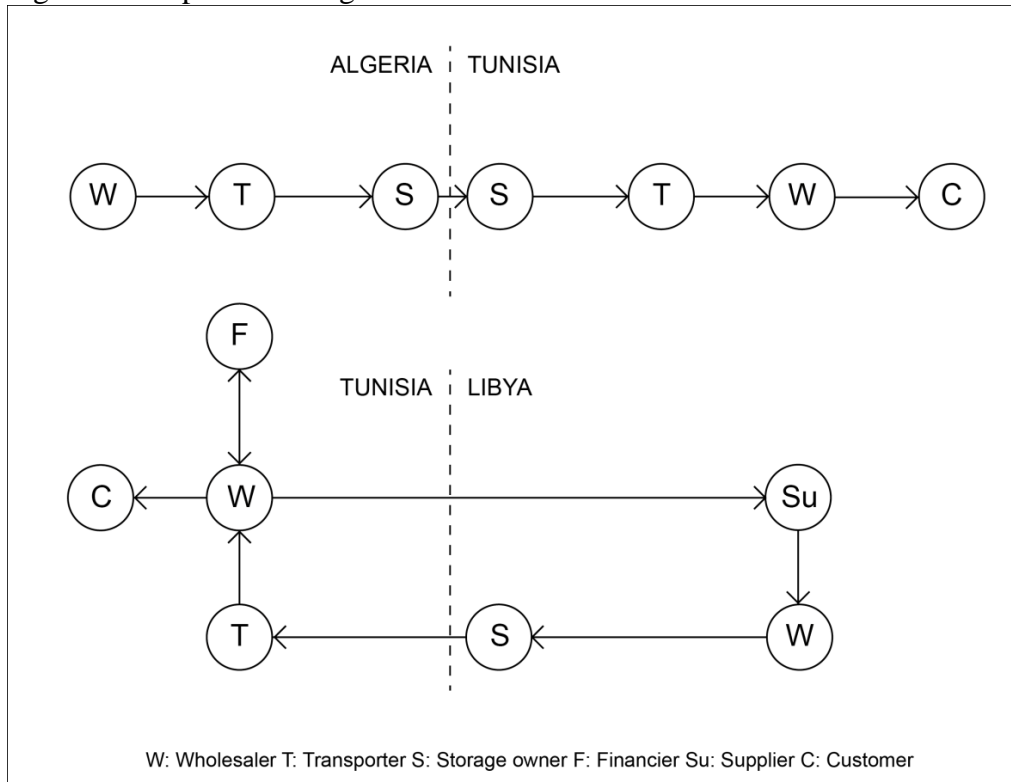
Sources: Baker and Faulkner (1993); Watts and Strogatz (1998); Newman et al. (2002).

Decentralized networks are structured in such a way that no single node can achieve a prominent position. The line network, where each node is organized in a chain of actors, is a decentralized structure, as is the circle network formed when each node is only connected to the adjacent one. The two trade networks presented earlier are good examples of decentralized structures: Both networks have low values for degree centralization (0.185 in the region between Gaya, Malanville and Kamba and 0.172 in the region between Birni N’Konni and Illela), which makes them less sensitive to fragmentation, since no node seems to be particularly highly connected. The relatively higher measures found for betweenness centralization – 0.320 between Gaya, Malanville and Kamba, and 0.403 between Birni N’Konni and Illela – confirm however the existence of prominent brokers, which is relevant in a region where much profit can be expected from bridging partners from various countries. Circle networks can become more complex when

numerous ties are added and evolve towards small-world networks, where most nodes can be reached from every other by a small number of steps even if they are not neighbors of one another, or random networks if no regularity is observed.

Many social networks are functionally differentiated, in the sense that their structure is a function of their overall purpose. For example, social networks that aim at recruiting people are often fully connected and do not rely on brokers because their main objective is to reach the largest number of potential recruits, whereas fund-raising networks rely much more on brokers who can connect distant investors (Leuprecht and Hall 2014). An illustration of how the topology of networks can vary depending on the specific roles of the actors is provided by Ayadi et al.'s (2013) study of informal trade across Tunisia's borders. Building on field interviews with border authorities and local informants, the authors show that the structural organization of trade differs significantly whether trade takes place across the Algerian or Libyan borders. On Figure 5, we have represented the connections between the main actors on Tunisia's land borders. The graph on top of the figure shows that trade with Algeria is mainly organized through a linear chain of actors. The chain starts with a wholesaler (W) on the Algerian side, who hires a transporter (T) to bring the goods ordered by his Tunisian counterpart to a storage owner (S) on the Algerian side of the border, indicated here with a dotted line. Close family and cultural ties on both sides of the border then facilitate the crossing of goods to another storage owner in Tunisia. The merchandise remains in the house of a Tunisian storage owner until a transporter picks it up and delivers it to a wholesaler within 50 km of the border, or, if the goods have to be delivered further afield, to another transporter, until they reach the final consumer (C).

Figure 5. Simplified configuration of the Tunisian border trade network



Source: Walther 2014, based on Ayadi et al. (2013).

In contrast, the organization of trade on the Eastern border of Tunisia is more circular than linear. The supply chain starts when Tunisian wholesalers order a certain quantity of goods from Chinese, Turkish, or Libyan suppliers (Su), possibly with the help of a financier (F). Once the goods arrive in Libya, they are received by Libyan agents (W), who arrange for the goods to be transported to border entrepôt and stored (S) until a Tunisian transporter (T) comes to pick them up. The merchandise is then stored in a Tunisian entrepot and delivered to a Tunisian wholesaler, who will finally reimburse his financier (F), if needed, and sell the goods to the final customers (C). These two examples show the variety of structure and the diversity of roles of social networks. Capturing their complexity requires the development of specific methodological tools adapted to the relational nature of network data.

3. Collecting and analyzing network data

Collecting and analyzing relational data poses a certain number of methodological challenges (Borgatti et al. 2013, McCulloh et al. 2013). In what follows, we briefly discuss the various sources of data that can be mobilized to examine social networks, the difficulty of identifying the boundaries of a network, and how social network analysis can be combined with other approaches to study informal trade.

3.1. Data and network boundaries

Social network analysis can be conducted on a large variety of written and oral sources including existing lists of actors, newspaper articles, archives, administrative, communication or criminal records, key informants, or stakeholders directly engaged in social networks (Marsden 2012). When the size and composition of a population is known, the existence of social ties between actors is more easily investigated, through questionnaires, interviews and participant observation, than when the researcher does not know who belongs to the network. In the latter case, one of the main issues when dealing with interdependent actors is to draw the boundaries of the surveyed network because, as been popularized by the “small world” literature (Barabási 2003), everyone is virtually connected to everyone at a certain number of degrees of separation.

Sampling a population in which the connections between actors are unknown isn't pertinent as, by randomly selecting some of the actors, a large number of relevant connections would be ignored. In order to address this issue, snow-balling techniques are used as an alternative that allow identifying new economic agents from among the subjects' existing acquaintances (Frank 2012). Snowball sampling doesn't presume that the network is consciously experienced by the actors or that the investigator can impose preconceived boundaries. It is particularly adapted to the study of actors such as informal traders, who don't necessarily belong to a formal professional institution in which insiders could easily be distinguished from outsiders, and whose number and activities are difficult to evaluate from the investigator's perspective.

A snowballing survey will typically start with identifying a first wave of interviewees, who will be asked to name people they are related to in particular ways (family, friends, neighbor, colleagues, organization member), people they can trust or rely on, or people they feel close to (Kadushin 2012). A number of related attribute data, such as age, gender, or education, can be

collected simultaneously. In the case of the cross-border trade networks presented earlier, we started to identify all the traders whose annual turnover was over 100 FCFA million (€152,000) in 2010 in the region. This threshold is used by local freight agents to distinguish between small traders whose activity is predominantly limited to petty business, and large traders who can conduct more ambitious trade activities. Several waves of interviews can then be conducted with the actors mentioned during the first wave, until the same names start to appear again and again, meaning that the boundaries of the network have been reached. A very high response rate – of more than 80% – ensures that the data is not negatively affected by missing data (Kossinets 2006, Koskinen et al. 2013). If a survey among the whole population of a network can't be achieved, an alternative is to focus on individual networks, known as ego networks, which consist of a focal node (ego) and the actors to whom he is directly connected plus the indirect ties among his connections (called alters). Ego network analysis is particularly adapted to understand whether ego is surrounded by a dense cluster of alters, whether he can benefit from structural holes that separate sub-groups of actors, and whether his alters share similar characteristics (Everett and Borgatti 2005).

Because structural analysis considers the ties, rather than the attributes of the actors, as its main unit of analysis, it violates basic assumptions of independence, non-random sampling, and unknown distribution of variables. In order to deal with the fact that actors engaged in social networks are, by definition, not statistically independent, a set of statistical tools has been developed for constructing tests of significance that contrasts with traditional econometric tools (Contractor et al. 2006). The most popular probability models that take into consideration dependencies are known as Exponential Random Graph Models (ERGMs). They permit the construction of a statistical model based on specifiable dependence assumptions and estimated from observed network data (Robins et al. 2007).

3.2. Combining social network analysis and other approaches

Social network analysis can be employed alongside other qualitative or quantitative approaches. For example, the degree to which an individual is connected to others can become an independent variable exploited through econometrics. In Africa, research investigating the impact of the social structure on economic outcome has shown that social connections enhance employment opportunities by helping match workers and firms in countries where informal recruitment procedures are based on word-of-mouth (Schöer et al. 2012, Mano et al. 2011).

Social networks can also enhance manufacturing and trade (Barr 2002). Studying the networks of informal entrepreneurs in the second-largest city of Burkina Faso, Berrou and Combarous (2011) found that being connected to many alters enjoying an intermediate social status had a stronger impact on economic outcomes than being connected to individuals with high social status. Connections to other entrepreneurs with an intermediate social status, the authors argue, are easier to establish and provide suppliers and financial support. In Kenya, the social connections between micro-manufacturers and traders favor the adoption of new technologies and the production of higher quality products (Akoten and Otsuka 2007) whereas in Ethiopia the density of ties between micro-enterprises positively affect the sales and the skills of the manufacturers (Ishiwata et al. 2014). In Madagascar, research shows that social networks enhance trader's productivity by helping them to obtain information about prices and market

conditions, negotiating and enforcing contracts, and access loans (Fafchamps and Minten 2002). Having numerous social ties with others traders, suppliers and clients, positively influences the economic performances of the traders, due to better information on prices, the trustfulness of clients and suppliers, and potential access to commercial credit. Business-state relations also prove crucial for the economic performance of small traders. In West Africa, small traders are particularly successful in transforming their social ties into profits when they are connected to state representatives, politicians, and security officers, who can significantly facilitate the conduct of domestic and cross-border business (Kuepié et al. 2014). Social ties with local religious leaders seem, however, to have a negative effect on business profit due to the expenses caused by social obligations, which illustrate some of the negative economic consequences of being too much embedded in a closed network.

Social network analysis can also be combined with more qualitative approaches that look at the locally situated ethnographic, historical, geographical and institutional context in which social networks are embedded as well as of the meanings that the actors give to their relations. A formal approach to networks has everything to gain from integrating qualitative information that explain why certain ties have been created between actors, how these connections have evolved over time, what exactly is the nature of the ties, and how they are perceived by the actors. Trader biographies, for example, are particularly useful to understand the success or decline of market places. New graphical tools have been developed to interactively collect qualitative network data and analyze them quantitatively (Gamper et al. 2012).

4. Applications of social network analysis

One of the most obvious applications of social network analysis to trade is that it allows researchers to precisely identify, map, and analyze the structural position of individual traders, informal business groups, or formal business organizations. Because social network analysis is a relational approach, the identification of the actors and their importance is necessarily related to their mutual interactions. The ability to highlight both the components and the links of a social group can help to distinguish between the traders that are particularly well connected and those who are not. As the debate on social capital initiated in the 1990s has shown (Narayan 1999, Woolcok and Narayan 2000, Grootaert and van Bastelaer 2001), the combination of intracommunity and extracommunity ties explains variations in economic outcomes at the community level. Well-connected traders are often strongly embedded in their group and have developed diverse external contacts. Their leadership results from their ability to transfer information and resources efficiently, communicate their opinions, and influence political, economic and religious outcomes. At the opposite end, traders who are only marginally embedded in their own group and have developed homogeneous external contacts have little social capital to draw upon, resulting in a potential lower economic performance, social marginalization, and greater risk of falling into poverty.

Social network analysis can contribute to the empowerment of marginalized actors by illuminating the structural causes of their peripheral situation. In Sub-Saharan Africa and Asia, participatory approaches have been used by several international organizations, including the World Bank, the International Fund for Agricultural Development and the International Food Policy Research Institute of the United Nations, with the objective of empowerment of

marginalized actors. A large majority of these initiatives have targeted the fields of agriculture, natural resource management, and health, rather than trade (see Schiffer 2012 for a synthesis). In the White Volta River Basin in Ghana, for example, a dedicated network mapping tool was used to understand and improve water governance among representatives from several public agencies, NGOs and traditional authorities (Schiffer et al. 2010). This approach led actors to better understand what their conflicting or cooperative goals were, how they influenced each other, and, after group discussions, how the network could evolve with an aim to increase water governance in the region. The study found that exchanging information and providing advice was crucial in developing influence among stakeholders, and that several governance systems overlaps reduced the efficiency of fisheries management and led to poor enforcement of rules.

A network approach can also be used to improve the coordination between aid donors and local organizations (Nascimbeni 2014). Pact, an international NGO working in community building in Africa, Asia and Latin America has used organizational network analysis to redesign the original hub-and-spoke structure which connected its African offices to local partners and wasn't particularly supportive of collaborative activities among them. This initiative led to the creation of new ties between peripheral organizations, and collaboration with actors with high betweenness that could disseminate information and ideas. The NGO also encouraged the creation of ties between its own country offices to facilitate idea and resource exchange (Bloom et al. 2008).

Social network analysis is finally increasingly recognized as a useful approach to understanding how development interventions affect local communities. The World Bank (2012), for example, used network tools to evaluate the impact of some of its activities on agricultural productivity in India and China. Network analysis can help identify relevant issues that hinder community development, visualize the complexity of actors engaged in the resolution of the issues, and represent the relations between the issues themselves. Boutilier (2011) shows that a formal approach to social networks can be used to visualize the consequential links between the positive and negative impacts expected from the construction of a dam in a very arid region. Using a participatory method for mapping social networks in Northern Nigeria, Schiffer et al. (2012) found a gap between policy design and implementation of maternal health and newborn survival activities, resulting in high number of normally preventable deaths. The network approach highlighted that the gap resulted from conflicting power strategies between two groups of influencers. While representatives of the health ministry were responsible for writing the budget, politicians outside of the health field were in charge of the actual disbursement of funds. Each group of influencers would necessitate a specific advocacy strategy.

5. Conclusion and policy implications

Social network analysis is a fast growing field of research based on graph theory, whose main interest is in the links between actors. By examining social actors through their effective relational contacts, social network analysis provides a realistic view of the flows of capital, information, and resources that potentially cut across social groups or categories, such as tribes, villages, or social classes. Applied to the field of informal trade, social network analysis can be seen as an analysis tool for researchers in the economic and social sciences, as an empowerment

tool for local communities and NGOs, and as an intervention tool for governmental and international organizations.

Over the last decades, the fundamental concepts developed by social network analysis, such as centrality, embeddedness or brokerage, have been increasingly used to map, describe and model social, economic or political structures. It is only recently that the application of these concepts has reached the field of development and, as a result, social interactions in developing countries are poorly understood and are generally unmanaged. This is particularly true for informal trade activities, which remains a *terra incognita* of social network analysis, despite their key importance for the development of both rural and urban societies (Walther 2014). As highlighted by the OECD (2009: 43), much remain to be done to achieve a “better understanding of the magnitude and characteristics of informal cross-border trade and the motivations behind it”.

The objective of this paper has been to contribute to address this situation, by discussing how social network analysis could potentially contribute to a better understanding of the network positions and strategies developed by social actors involved in informal trade. In complement with other quantitative and qualitative approaches, we have argued that social network analysis was well adapted to capture both the complexity of social ties that bind traders and the spatiality of informal trade, i.e. how traders are spatially connected, possibly across national borders. As the example of the West Africa cross-border trade networks presented earlier has shown, a network approach can highlight how traders are related to each other, which traders are prominent and which are not, and what make some traders different from others in terms of degree or betweenness centrality. Social network analysis is also particularly well adapted to study the general architecture of a network, which has direct effects on individual behaviour. Decentralized structures, for example, are particularly well adapted to cope with the uncertainties that many informal traders face on a daily basis.

The ability to study both the individual autonomy of social actors and their structural constraints makes social network analysis a useful empowerment tool for local communities and NGOs to address current developmental issues. Very few people are able to apprehend their own structural position in a social network without a proper visualization of the entire network. Therefore, people tend to behave according to what they suppose their social network is, and not according to an objective representation of the network. Because perceptions strongly determine power, the actors with the best perception of the networks are likely to be more powerful than those who only have a partial overview of the connections that exist beyond their immediate friends, allies or business partners. Formal approaches that map social ties provide a visualization of the structural position of marginalized actors, groups or organizations which can be partially hidden and is often difficult to ascertain when numerous actors are involved. This is particularly true of informal trade networks.

A formal approach to networks can finally contribute to support the recent revival of interest in informal trade expressed by numerous international financial institutions, regional bodies, and aid organizations in Africa. Now regarded as “the most efficient, organized and deep-rooted system of trade in the region” (African Development Bank 2012a: 9), informal trade is increasingly considered as a crucial sector for alleviating poverty, due to its ability to allocate supplies during food crises, respond to the needs of new city dwellers, and provide employment

opportunities. Recognizing that informal trade represents a significant portion of trade in many developing countries and that its complete elimination is unlikely (OECD 2009), most aid agencies are now trying to promote growth-enhancing and network-enhancing policies that target trade networks (McLinden et al. 2010, African Development Bank 2012b, World Bank 2013).

Growth-enhancing policies aim at improving the qualifications of the local workforce, supporting existing entrepreneurs, and creating the conditions for the development of new economic activities. A crucial aspect of such policies is the improvement of the body of rules and regulations governing regional trade, which are currently seen as an obstacle to regional integration. *Network-enhancing policies*, for their part, aim at improving both the internal connectivity of economic actors at the local level, and their external connectivity with the rest of the world. The extension and rehabilitation of road, rail, and maritime infrastructure is a crucial aspect of such policies.

A formal approach to trade networks could contribute to both growth-enhancing and network-enhancing policies. It could first help identify the strong ties between economic actors within the region and the relatively weaker ties between these local actors and the rest of the world. As our paper shows, the most successful traders are those who can achieve a high level of internal and external ties, whereas those deprived of both dimensions of social capital are disadvantaged. Development initiatives would have a higher impact on trade if they enhance the positive aspects of intracommunity ties in business communities, which are synonymous with solidarity and protection against uncertainty, while simultaneously supporting the creation of external ties between traders and governments, NGOs, and aid agencies.

Combined with qualitative approaches that provide information on the historical and social nature of the ties, formal approaches to trade could also contribute to the development of trade policies that take into account the local economic, social, political and institutional conditions in which economic actors are embedded. Despite the proximity to the border, regional integration occurs either through a multitude of cross-border ties, or through a limited number of key brokers depending on the historical roots of the networks. Because of the local variety in the structure of trade networks, policies that aim at facilitating cross-border trade would be more successful if they are place-specific rather than spatially blind. Unlike spatially-blind policies that are applied without explicit consideration to space, place-based policies acknowledge that the local actors and institutions shape the development potential of cross-border trade. They appear crucial for the local development of traders, for which the existence of national borders constitutes a resource and who rely heavily on their social networks.

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