

Local and Global Merchant Networks: Accounting Across Space and Time

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Abstract

Purpose: Our study has three main objectives. First, we build upon our earlier research of the *Guide du Commerce* (1773) and French trade to examine business networks emanating from eighteenth-century Nantes. Second, through the use of techniques drawn from social theory, we analyse these networks in terms of their linkages and their dominance across space and time. Third, by examining the accounting transactions themselves, we assess the importance of network structures on the financial as well as social dimension.

Design/methodology/approach: This study employs archival-based historical methods to examine the *Guide du Commerce* and merchant trading networks of the eighteenth century. We have adopted the methods of social network analysis to illustrate social and business networks, their inter-relation and their importance in fostering the growth of merchant capitalism.

Findings: Our approach underscores accounting's contributions to networks, their functioning and sustainability. Accounting mechanisms played a key role in accountability and contracting to mitigate inherent weaknesses in agency relationships. We investigate the role of network players in terms of facilitating information gathering, raising investment capital and knowledge transfer. By examining the accounting transactions themselves, we assess the importance of network structures on the financial as well as social dimension.

Practical implications: Our research approach bridges disciplinary divides by linking our study to current themes and debates in sister disciplines (history and economics). This interdisciplinary approach introduces valuable insights with which to explore our case study, to link our analyses to current themes and debates in sister disciplines, and to build upon the rich tradition in social and institutional theory.

Originality/value: The research method is relatively novel in accounting history. Our research points to the value of a combined qualitative-quantitative approach and demonstrates the potential contribution of social network analysis to historical studies of accounting.

Key words: merchant networks, accounting history, social network analysis

Categorisation: Research paper

Introduction

Networks, their development and operation remain topics of sustained interest across a number of research disciplines; the examination of business networks is seemingly ubiquitous. This prevalence provides accounting historians with an interesting opportunity to span disciplinary divides. It also encourages us to contribute our own insights into the functioning of these networks in terms of, for example, the circulation of capital, transaction costs, accountability, and knowledge transmission within these agency relationships.

Our primary focus is the merchant trading networks of the eighteenth century, the actors involved and, in particular, the accounting mechanisms that supported their activities. While our entry point is accounting, this theme has become commonplace in sister disciplines including history, organisation theory and economics (cf., Forestier 2009, Gervais 2008, Granovetter 1973, Greif 2005, Haggerty and Haggerty 2010, Marzagalli 2007, Richardson 2009). As noted by Jack (2005), the network concept has quickly gained the status of an ‘evocative metaphor’, or ‘catch-all umbrella’ which unites any number of theoretical and methodological perspectives (Jack, 2005, p.1234).

While our objective is not to add yet another (accounting) wrinkle to the extant literature, we note that studies that make use of business and accounting documents and texts rarely examine them from an accounting perspective. Moreover, engaging with other research domains allows us to link our analyses to current themes and debates in sister disciplines, and to draw upon the rich research tradition in social and institutional theory. Nonetheless our overarching goal is to enhance our understanding of network relationships by highlighting how accounting facilitated economic and social exchange.

At this juncture, we underscore that the research presented in this instance is both preliminary and exploratory. We begin by re-visiting research in other disciplines (i.e., economics, history, organisation theory, sociology) to take advantage of their findings and methodologies. This brief review enables us to conjoin our research to that of other scholars who explore similar themes from similar angles. While many of these studies rely on accounting records, their examination of accounting mechanisms and accounting’s contributions to business and commercial networks, their functioning and sustainability have received scant attention.

Thus, our study has three main objectives. First, we build upon our earlier research of the *Guide du Commerce* (1773) and French trade to examine commercial networks emanating from eighteenth-century Nantes. Second, through the use of techniques drawn from social theory, sociology, institutional economics and history, we analyse these networks in terms of their linkages and their dominance across space and time. In this vein, we analyse the role of network players in terms of facilitating information gathering, raising investment capital and knowledge transfer. Third, by examining the accounting transactions themselves, we are able to assess the importance of network structures on the financial as well as on the social dimension. Our accounting angle facilitates the examination of individual actors with respect to the circulation of capital and transaction costs, as well as accounting’s centrality in terms of accountability and contracting to mitigate inherent weaknesses in these agency relationships.

The paper proceeds as follows. We begin with a brief overview of pertinent research on networks and maritime trade. Then we outline our research methodology and sources. The next section presents our analysis. The study concludes with preliminary observations and further research directions.

1. Overview of Research Literature

In recent research, we have touched on social and business networks, their inter-relation and their importance in fostering the growth of merchant capitalism of the eighteenth century. In these studies, networks were a constitutive element in which trade took place, a taken-for-granted aspect

that we explore more directly in this study. As noted by Granovetter (1985, 1992), the pursuit of economic goals goes hand in hand with the pursuit of non-economic ones. This economic action is purposive action, socially situated in on-going systems of social exchange. The economic institutions of 'the market' are socially constructed. As such, Rauch (2001, p.1180) argues in his study of international business and social networks that "networks are sustained by the trade they are creating [rather] than to say that these networks were created by trade."

Rauch (pp.1280-83) notes that while networks provide means to mitigate opportunism through the use of collective punishment, as outlined by Greif (1994), or through the development of a moral community, as emphasised in the work of Cohen (1971) and of Curtin (1984), they also might reduce innovation in other areas. Interestingly, the development of bookkeeping mechanisms is presented as one important innovation that provided a way to enforce long-distance trade contracts. However, networks are viewed as distinct from these formal-legal mechanisms and hindered their development. This seeming contradiction intrigues us. We would argue instead that these accounting mechanisms were one integrated constituent of the network and that their means of control and accountability facilitated network operations.

Jack (2005) focusses on the work of Granovetter, in particular, the hypothesis of strong and weak ties and how these ties are utilised. Jack examines entrepreneurial activity and seeks to bring to light the important contextual features of this activity beyond the structural features that dominate social network analysis. Jack's qualitative approach encourages a greater understanding of how these networks develop, operate and evolve. Jack summarises her key findings as follows: The usefulness of a network is contingent upon the strong ties upon which it is founded but it is the function and not the frequency of the tie that is critical. Networks are dynamic, involving "a two way process of give and take, a degree of exchange, the trading of information and resources but only when trust is established through knowledge and experience (p.1251)." Strong ties arise initially from personal or family ties. They are characterised by respect, knowledge of the individual, familiarity, and trust developed over time through understanding and trust in the individual's knowledge or ability. Weak ties, alternatively, operate in a broader social context, 'friends of friends' who can provide resources, enhance reputations and generate business opportunities (p.1251).

Berry et al (2004) provide a valuable comparison of the various research traditions of network research. The authors caution about the tendency to characterise networks in purely instrumental terms. While 'structure matters', it is important to determine how the network operates, its participants and its boundaries. The authors also underscore the need to use a variety of research methods and theoretical orientations, especially to join quantitative methods, such as social network analysis, with more qualitative efforts and dynamic studies to tease out how network activities really take place and how networks evolve and sustain themselves. Context is not to be treated as 'noise' but instead the "everyday sources of meaning that guide and define the actions of the participants (p.549)." Comparative and case studies are promoted as ways to foster our understanding of network structures, their evolution and their consequences.

The study of networks is a prevalent theme in history and one which has seen the increasing adoption of tools such as network analysis and GIS methods to explore them. While it is not our intent to provide in this instance a comprehensive review of this literature, we briefly outline a number of studies that relate most closely to our own research in terms of thematic focus, time frame and methodology.

Gervais (2008) examines merchant practice, defined as a "thick web of relationships" characterised by the "free circulation of goods, people and ideas (p.465)." Merchant practice remains relatively neglected in historical inquiry, including the analysis of the "daily transactions reflected in ledgers and receipts (p.466)." However, Gervais demonstrates emphatically that the merchant world was a networked one. Networks played a series of roles in terms of information transmission, credit and capital access. Networks were spatially complex chains of interpersonal relationships. Gervais highlights, however, that the merchant process was one and the same regardless of the setting:

Each particular merchant relationship, be it local, regional, worldwide, or transatlantic, was the expression of the basic merchant act of forging a link in a commercial chain which would eventually make possible the opening of a conduit between two separate, segmented markets and the transportation of one or more goods from one to the other. In other words, the sets of relationships each merchant created were geographically diverse, but identical in nature and function wherever they came into being (p.472).

This view of the global *versus* the local and the role of networks therein have also been taken up in human geography. Smith (2003, p. 35) speaks of ‘skeins of networks’ and how these networks are mobilised and transported across the world. His analysis argues for closer attention to what Latour (1987) termed ‘immutable mobiles’ – texts, money, artefacts, human beings – that make up networks and can be transported and utilised without changing their form. Importantly, in our context, these immutable mobiles were vital mechanisms of long-distance control (cf. Smith, 2003, pp.35-37).

Marzagalli (2007) focusses on the role of merchant information within networks. This study highlights the role of information in economic exchange, its content in terms of prices, market supply and demand, market intelligence, credit sources, currency exchange, etc. Marzagalli also outlines the important role of discretion, what information was conveyed only in person, and the need for network actors to determine whether or not information was to be divulged to others. While information circulated across time and space, it did so subject to the risk and hazard of information conduits. The internal control mechanisms that enabled the merchant to place confidence in a series of correspondents and agents relied upon this circulation of information. Information cannot be divorced from the societal norms which influenced its content, production and means of transmission. For our purposes, accounting as part of this information system was versatile in that it provided a key control mechanism and rich source of trading information.

We next turn to the work of Haggerty and Haggerty (2010) which examines eighteenth-century trading networks. This research is important in terms of its time frame, which parallels our own, its focus on slave-trade operations, which also feature within our case study, and its use of an interdisciplinary approach. Haggerty and Haggerty use social network analysis to examine network relationships and their dynamic properties. The study uses a variety of sources including accounting records and correspondence to develop a variety of quantitative measures to identify network dynamics. These dynamics encompass the ability of merchant groups to mitigate risk within a network structure including the choice of partners, investors, agents and ship captains. Finally, this research points to the value of a combined qualitative-quantitative approach and demonstrates the potential contribution of social network analysis to historical studies of accounting. We outline social network theory and our research methodology in the following section.

2. Research Methodology and Sources

2.1. Social Network Theory¹

We have adopted in this study the tools and methods of social network theory. This theory has developed various methods and tools that provide quantitative measures and visual representation of network data.² These metrics are useful in terms of improving our understanding of network structure and dynamics, key players and places, but also as a means to quantify the qualitative.

Our qualitative evidence (both primary and secondary sources) contributes the thick description to our study. Our objective is to bring our networks to life across space and time: their geography, the products and merchandise, the circulation of capital and market finance, and the individuals who acted within and created these structures. Similar analysis has been offered by Daudin (2005, p.131) who examined exchange networks and the redistribution of merchandise across various axes: geographic, people, products and transactions. The qualitative and quantitative evidence support and

strengthen each other by ‘measuring the intangible’. As noted by Haggerty and Haggerty (2009), social network analysis provides benefits in terms of network modelling and prediction. Given the exploratory nature of our study, we introduce first some elementary definitions and features of this approach, beginning with graph theory.

A social network is defined by Wasserman and Faust (1994, p.20) as a “finite set of actors and the relations defined upon them.” We analyse network relations in terms of their structure, centrality and linkages. We develop our case study by using these measures as guideposts to support our qualitative analysis. The analysis of social networks is grounded in graph theory. Restating briefly, a graph is a set of points, some of which are connected to each other by links or ties. For example, a link between two points a and b which goes from a to b is directional. A link between a and b which goes either from a to b or to b from a is symmetrical, or non-directional. In simple terms, we are mapping the relation between points; the points are termed *nodes* or *vertices* and the links are called *edges* or *arcs* when it refers to a directional graph.

It is possible to represent a social network in this way, each node representing an actor (*ego*), an individual or legal entity, even an institution, with each edge indicating a relationship between the two actors. A social network requires not only the connections between actors but also information about these connections; otherwise we have no network to analyse (Kadushin 2004, p.7). To illustrate, let’s consider a group of four people A, B, C and D. If we assume that A is related to B and C, that B is related to C and C with D, we have the sociogram in figure 1. It is important to clarify at the outset that in a sociogram, whatever it may be, the lay-out of the points on the drawing is totally arbitrary³ and that the length of the lines does not necessarily have any particular significance.

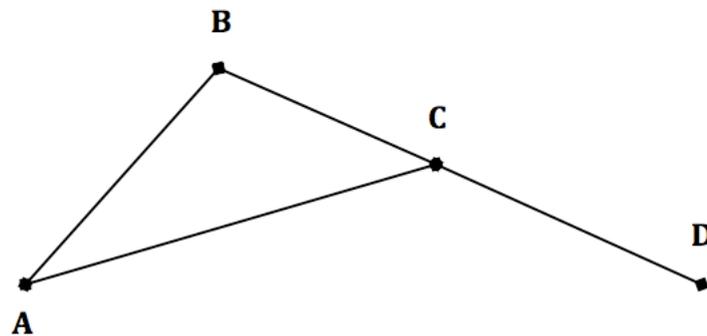


Figure 1: An example of a non-directional graph

Assuming non-symmetrical relations between these individuals would result in a directional graph. For example, let’s assume that in the hierarchy, A is the superior of B and of C; equally B is the superior of C and C of D. We now have the sociogram in figure 2.

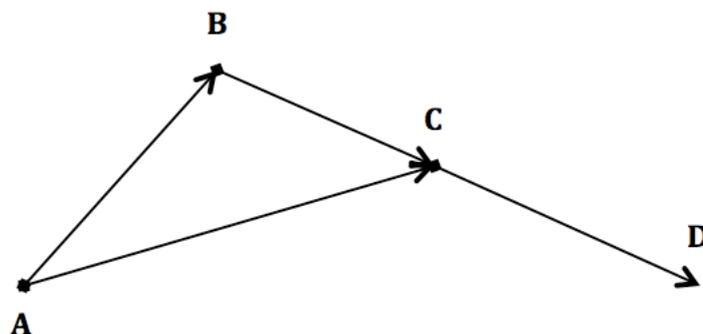


Figure 2. Example of a directional graph

The first important concept of graph theory is that of the *degree* of a point (vertex). It is defined as the number of arcs that pass through a point and indicates thereby a measure of the size of its neighbourhood. This measure is generally considered, depending on its value, as an indicator of the integration or alternatively, the isolation of, the actor within the entire network. It is the first indication of the actor's *centrality*. In the example above, Points A and B have degrees of two while Point C has a degree of three. In the case of directional graphs, one can further distinguish the out-degree of a point, measured by the number of arcs that begin or leave from that point, and the in-degree measured by the number of arcs that arrive or end at the point. In our case, the out-degree of Point C is equal to one, while the in-degree is equal to two.

A second fundamental concept is that of the *distance* between points. Two points are *adjacent* if an arc exists between them: in our case, A and B are adjacent; A being the *predecessor* of B and B the *successor* of A. If two points are adjacent, the *distance* between them is equal to one. If they are not, one needs to determine if a *path* exists between them, that is to say, if they are linked indirectly by a series of arcs making it possible to go from one point to the other. In our example, there are two paths from point A to point D: the first has a distance of three, passing through B and C; while the other is shorter with a distance of two. The shortest path is called the *geodesic distance* from B to D.

As one might suspect, this type of network, along with the calculation of the various measures which we can draw from it, quickly becomes cumbersome beyond a few dozen points without the use of specialised software for data manipulation and analysis. Every graph also can be represented effectively by a square matrix M, called the *adjacency matrix* "because it represents who is next to, or adjacent to whom in the 'social space' mapped by the relations that we have measured (Hanneman and Riddle 2005, p.55)." In this matrix, each line and each column correspond in the identical order to a point on the graph. Each element m_{ij} of this matrix has the value of 1 if the point i is the predecessor of point j , if not it assumes the value 0. In the case of a non-directional graph (Figure 1), we have a symmetrical matrix:

	A	B	C	D
A	0	1	1	0
B	1	0	1	0
C	1	1	0	1
D	0	0	1	0

A directional graph (Figure 2) is represented by a strictly triangular matrix:

	A	B	C	D
A	0	1	1	0
B	0	0	1	0
C	0	0	0	1
D	0	0	0	0

2.2. Centrality, Power and *Betweenness*

In our study, we have calculated four measures⁴ whose properties allow us to identify some of the key actors in the network of our *négociant nantais*⁵ as developed in the example by Gaignat (1773). The following section briefly outlines these measures and their calculation.

2.2.1 Degree centrality

Most of us would agree that the more ties that one individual has to other individuals can have potential advantage. In social network theory, the more ties that one actor has to other actors means

that the actor has more ways to satisfy individual needs and to reduce dependency on others. Additionally, more ties could indicate the ability to draw on more network resources and/or the ability to act as a deal maker or broker in exchange relationships. Therefore a first measure of actor centrality is *degree*. The *degree* of the actor of interest (referred to as *ego*) is the number of actors in the network with whom the individual has a direct link. *Degree centrality* is measured as the degree of the actor divided by the number of links possible (the number of actors less one). (cf., Hanneman and Riddle 2005, pp.147-149)

In the case of our non-directional graph, the degree of C is 3. The number of actors being 4 results in a measure of *degree centrality* of 1 [$3 \div (4-1)$]; all the other actors having a link with C. The *degree centrality* of A, B and D is 2/3, 2/3 and 1/3 respectively.

2.2.2 Bonacich's power measure

The centrality concept is linked to those of power, prestige and social influence (Freidkin 1991). We adopt the *Bonacich power measure* which has been one of the dominant measures in this regard. Based on a process model of social influence, Bonacich (1987) focusses on the connections within an actor's neighbourhood – the more connections the actor has, the more central she is. In contrast, power is inversely related to the number of neighbourhood connections – the fewer an actor has, the more powerful the actor is. This argument differs from those of others in which centrality equates with power and derives from connections across the entire network.

Bonacich emphasises the need to take 'the inherent ambiguity' of the centrality concept into account, including its transitory nature. One example that relates to our study is her view that local and global network structures require different weightings in different contexts, as in long-distance trade when global communication networks are likely more influential than local ones. Also, an actor's power might be increased or decreased by association with powerful others and power might even arise from linkages to weak others. In simple terms, "one's status is a function of those one is connected to (Bonacich 1987, p.1181)." The simultaneous nature of each actor's power and centrality makes it more difficult to build straightforward algorithms to model these concepts. Nonetheless, the *Bonacich power measure* extends the idea of degree centrality based on adjacencies considering both one's own connections and the connections of one's connections (Hanneman and Riddle 2005, p.153).⁶

2.2.3 Closeness centrality

A further criticism of degree centrality measures has been its failure to take into account indirect ties to all actors in the network, emphasising instead immediate ties or the ties of the actor's neighbours. For instance, one might be very centrally connected to many others but only in one's local neighbourhood. To mitigate this weakness, *closeness centrality* measures the actor's distance to all other actors in the network. A number of different measures have been defined in light of various interpretations of what being 'close' to others actually means. In our study, we adopt a common measure of *closeness centrality* by determining the proportion of actors that one *ego* can reach in two steps.

2.2.2 Betweenness

Betweenness broadly measures the strategic importance of an actor within a network by recognising the importance of the geodesic paths between all actors in the network. "Ego is 'between' two other actors if ego lies on the shortest directed path from one to the other. The *ego* betweenness measure indexes the percentage of all geodesic paths from neighbor to neighbor that pass through ego (Hanneman and Riddle 2005, p.135)."

In our study, we adopt Freeman's approach to binary relations. With binary data, we know that

an actor is in a favoured position and potentially one of control if the actor lies on geodesic paths between the other actors of the network (Haggerty and Haggerty 2009, p.5; Hanneman and Riddle 2005, p.163). In common parlance, the more people need to go through me to connect to other people, the more power I have. However, two actors might be connected by more than one geodesic path, and if I am not on all of these paths, my power decreases. Software packages simplify the determination of the geodesic paths between all pairs of actors within the network, and the frequency of which each actor falls in each path. The *betweenness* measure of actor centrality is the proportion of times that actors are ‘between’ other actors and is normalised “by expressing it as a percentage of the maximum possible betweenness that an actor could have had (Hanneman and Riddle 2005, p.163).”

2.3 Sources

Our study makes use of a wide variety of primary and secondary sources to recreate the network of interest and to analyse its operations and the actors therein.

The sample is composed of the individuals presented in the *Guide du Commerce* of Gaignat de l’Aulnais (1773). Gaignat’s volume has both a strategic and pedagogical dimension. In terms of pedagogy, he constructs his accounting story to present the methods of single- and double-entry bookkeeping to guide the reader in the conduct and control of his trade activities (cf. McWatters and Lemarchand, 2010). However, the volume also has an important strategic dimension. Gaignat demonstrates accounting and its mechanisms, but he also demonstrates how these accounting linkages support commercial and trade relations in terms of both accountability and control. Moreover, he provides the reader with strategic insights into this networked world. His choice of network actors, alliances, and their complexity of operation at various commercial levels are highlighted through the journal entries and accounting transactions which he develops in his accounting story.

Gaignat includes examples of the various facets of the network from insurance, charter parties, commission sales to financing, joint ventures and multi-investor associations. Along with rich detail into the complexities involved in a network that operates across space and time, and the various means to extend and support the network geographically, Gaignat outlines different ways to ensure that the circulation of goods and capital is undertaken within acceptable levels of risk. He gives us strategic insight into the choice of linkages, transaction costs and time factors, along with the importance of trust and social capital. It is a world that includes relations with both the small commercial trader and the major traders and banking houses. We outline briefly Gaignat and the *Guide du Commerce* as follows.⁷

2.3.1 Gaignat de l’Aulnais and the *Guide du Commerce*

Gaignat was born in Angers, France on April 11th, 1718, studied there with the Oratorian fathers, moved to Nantes as a young man where he pursued a number of occupations. Married in 1740, he and his first wife had several children. At some point after her death, he left Nantes and settled in the 1760s in Sceaux, south of Paris. He later re-married and lived there until his death in 1791.

The *Guide du Commerce* includes four sections. The first is an overview of currencies, weights and measures to conduct trade in China, Peru and America. The next section provides general models of commercial documents, with specific treatments of shipping operations. It first introduces single-entry bookkeeping and then double-entry. Gaignat presents his material through the creation of two hypothetical merchants and their business networks with entries and models covering the full scope of their business operations. The third section focusses on accounting for maritime trade, specifically the accounting by the vessel captain and other activities undertaken by this agent on behalf of the vessel owners/investors. Section Four deals with the slave trade, especially the managerial role of the vessel captain (cf. McWatters and Lemarchand, 2006). While written over a

period of approximately twenty years, the *Guide du Commerce* was eventually published in 1773 as a commercial guide for those involved in trade in major port cities, either as the traders or their bookkeepers whose activities supported their various operations.

2.3.2 Other Primary and Secondary Sources

To complement our understanding of the actors in *notre négociant's* (NN's) network, we have taken advantage of the rich availability of the following primary and secondary sources.

Primary Sources

- The industry tax rolls (*les registres du dixième et du vingtième d'industrie*) housed at the Archives départementales de la Loire-Atlantique in Nantes, France.
- The archives of the French Admiralty (les archives de l'Amirauté) also located at Nantes.
- Parish registers, in which are recorded baptisms, marriages and deaths. We made comprehensive use of the listings of Series GG (série GG) of the Archives municipales de Nantes which regroup the parish registers. These listings provide, in summary form a list of activities and individuals, notably the principal *négociants* of the city. The data base of marriages, baptisms and burials in the parishes of the Loire-Atlantique maintained by the Centre Généalogique de l'Ouest is more comprehensive in terms of coverage but offers less detail. We also have consulted individual parish records.
- Notarial archives

Secondary sources

The commercial and business world of Nantes has been the subject of in-depth research by many historians. To triangulate our sources, we have made use of this literature, including the work of Gaston-Martin (1931), Mettas (1984), Meyer (1969), Pétré-Grenouilleau (1996, 1997, 1998), Quénet (1973), Rinchon (1964), and the rich data sets provided by genealogical associations. The references section provides a more complete list of these materials.

2.4 Research Method

After the fashion of the majority of authors of bookkeeping manuals published up to the nineteenth century, Gaignat adopts the role of a merchant, or his bookkeeper, who records the operations of an entire year of activity. We thus have at our disposal a daybook, journal, and general ledger of a fictitious business, that of our *négociant*⁸ at the end of the first half of the eighteenth century. We believe that the material, which served as the basis for the construction of the examples in Gaignat's business, had been collected by him between 1735 and 1750 – a period for which almost no merchant archives of Nantes survive.

We have examined 114 double-entry journal entries, supposedly posted from January 1st to December 31st, 1755, corresponding to 171 elementary transactions. By elementary, we mean all real (of goods and/or services) or monetary flows which took place between our *négociant* and his environment (and those flows strictly within the firm), from the moment when these flows were the subject of a posting to the accounts. Above and beyond our *négociant*, 85 actors intervene in these transactions. Details of these 85 actors are presented in Table 1. To date, we have identified the existence of 75 per cent of these individuals, including more than 90 per cent of those located beyond Nantes.

We jointly coded each transaction to ensure agreement and to resolve any minor differences in our interpretation of them. We next constructed a square matrix (86 x 86) in which the value of each element m_{ij} , initially fixed at 0, was increased by increments of one at the moment when an accounting entry indicated the existence of a relation between the actor i and the actor j . Therefore the elements of this matrix are not binary variables but correspond to those of a valued graph. At this stage of our analysis, we have yet to exploit this property of our matrix and the calculations

presented here have been made on the basis of a matrix composed uniquely of 1 (a relation exists) and 0 (no relation exists).

Table 1. Actor Locations

Cities	Transaction Partners	Service Providers	Actors involved in settlements/payments	Total
Dinan	1			1
Morlaix	1			1
Nantes	36	18	9	63
Orléans	4	4		8
Paris	1		3	4
Saumur	1		1	2
Tours	1			1
Amsterdam	1			1
Hamburg	1			1
Léogane	2			2
Martinique	1			1
Total	50	22	13	85

3. Analysis – the role of network players

In this section, we outline the results of our analysis and discuss its implications.

3.1 The complete network

As shown in figure 3, the resulting sociogram resembles a star of which all branches converge on our fictitious *négociant* of Gaignat’s example.⁹ In and of itself, this result offers nothing of real interest. The inclusion of all actors in the network from NN’s perspective overstates the role of NN. This source-centric approach does not distinguish the dynamics of the network or identify patterns in terms of sub-groups and those who had direct links to other actors without ‘passing through’ NN. Finally we are not able to highlight those who worked more independently or, alternatively, those who may have held a privileged position in terms of network access.

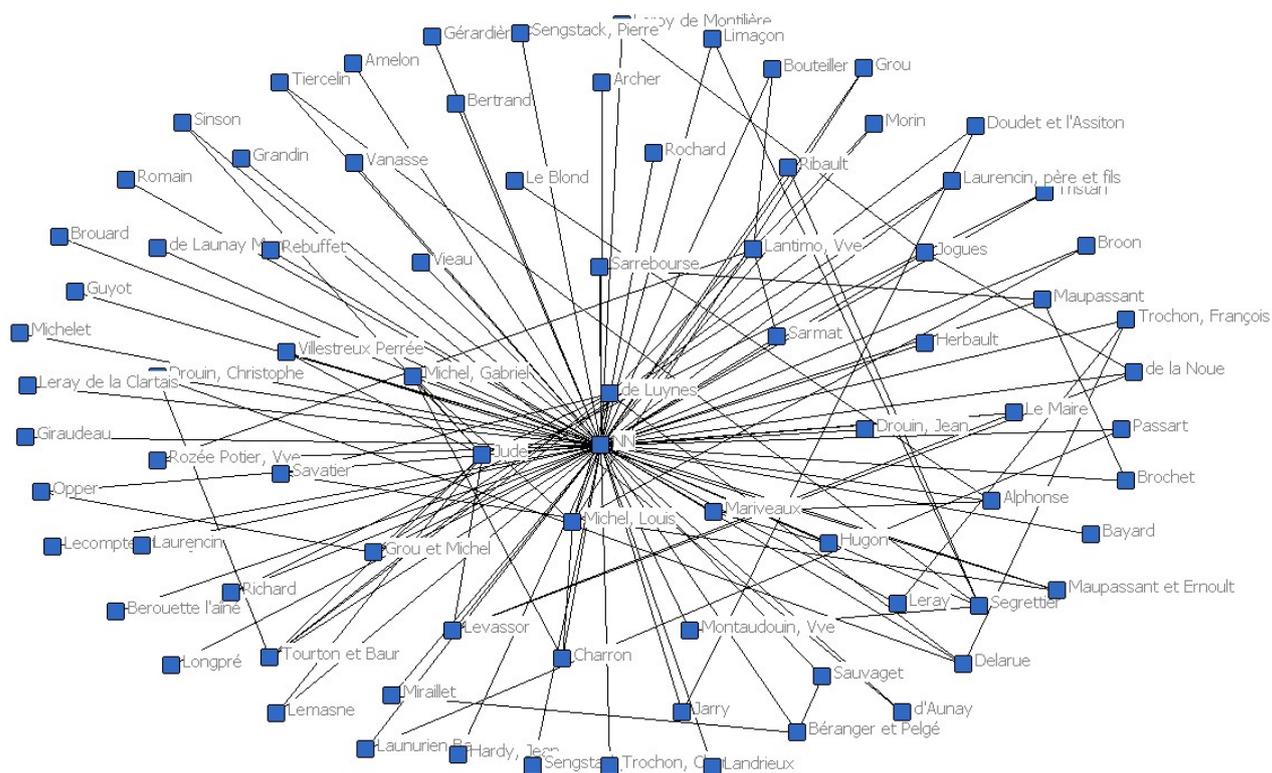


Figure 3. The Complete Network

Following upon an approach analogous to that of Haggerty and Haggerty (2010), we eliminated NN from the matrix, as well as all actors whose only links are with him alone. We are left with a set of 52 actors who were the subject of further analysis.

3.2 The (partial) sub-networks and centrality

Figure 4 indicates nine sub-networks. Two of these regroup only two individuals, two others include three, two other sub-networks bring together four actors, and one has five. Our sub-network of primary interest includes 29 actors.

The construction of partial networks mitigates to some extent a limitation of our case study and our use of social network methodology. As one can readily recognise, we are dealing with one set of accounting entries compiled by one actor, NN, as Gaignat elaborates his accounting story from the perspective of this one actor. In technical terms, we have an *ego*-centred network. Moreover, given that Gaignat constructed his example based on material gathered over a period of time and re-assembled for his project, we cannot determine the extent to which the network is the actual one of a merchant for whom Gaignat maintained the account books or one that Gaignat has re-created for his own purposes. It is entirely possible that Gaignat has presented us (and the aspiring merchants to whom his work was intended) with an ideal type to which he plans to deliver the keys to understanding.

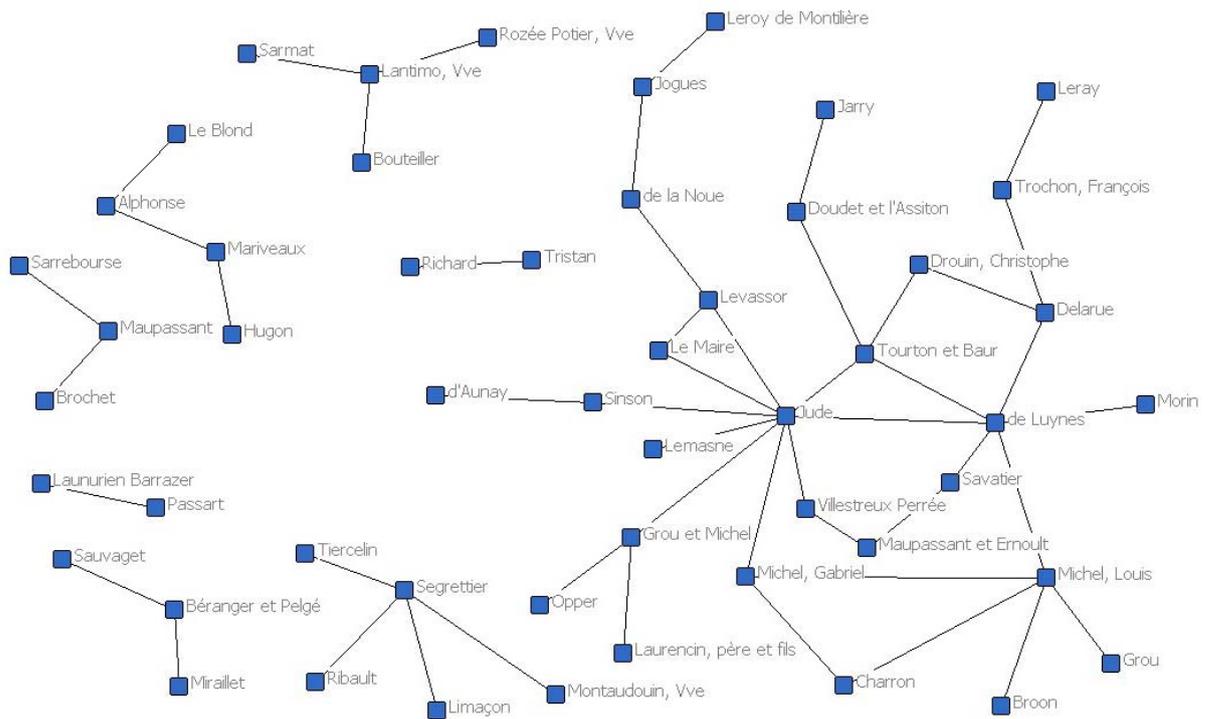


Figure 4. The (partial) sub-networks

Our visualisation of partial networks allows us to see how trade was organised. This initial glimpse of its dynamics, in terms of connections and the roles played by individuals within the network, both confirms results from other sources and highlights important facets of this networked world. However, we are also interested in who had access to whom, and which actors played the most central role. As discussed earlier, centrality has been variously defined – the actor with the most ties, those who possibly controlled information, players of influence. To examine aspects of centrality, we calculated the four measures discussed in section 2.2. Table 2 indicates comparatively the results of our analysis.¹⁰

Table 2. Measures of network centrality

Degree	Bonacich's power	Closeness 2-step	Betweenness
Jude	Jude	Jude	Jude
de Luines	de Luines	de Luines	de Luines
Michel, Louis	Tourton et Baur	Tourton et Baur	Levassor
Segrettier	Michel, Gabriel	Michel, Gabriel	Tourton et Baur
Tourton et Baur	Michel, Louis	Levassor	Michel, Louis
Michel, Gabriel	Levassor	Grou et Michel	Delarue
Grou et Michel	Le Maire	Villestreux Perrée	Grou et Michel
Delarue	Grou et Michel	Michel, Louis	de la Noue
Lantimo	Villestreux Perrée	Le Maire	Michel, Gabriel
Levassor	Sinson	Sinson	Sinson

By whatever indicator selected, two actors appear at the top of the rankings, Jude le Jeune first, followed by Augustin de Luines, one a Parisian, the other a *nantais*. Based on the rankings, the next three places are shared amongst five actors: first, a Parisian banking house, Tourton et Baur, next two *nantais*, Gabriel Michel and Louis Michel (however, the second was established in Amsterdam), then finally a commission agent of Orléans, Levassor, and finally a *négociant* of Léogane, Segrettier.

This distribution, both from a geographic as from a functional point of view, does not seem fortuitous and corresponds quite strikingly with well known, structural features of the trade emanating from Nantes.

The identification of sub-networks underscores the long established linkages that Nantes had developed with other centres in France, across Europe and internationally to maintain its role as a major port city (Pétre-Grenouilleau 1998). It had taken advantage of France's colonies in the Antilles and its mercantilist policy to mitigate other economic circumstances such as the decline in the salt trade. The links with other European centres also reflected the practice to establish branch operations in other cities, through family ties or social relations, to reduce the agency costs of these long-distance exchanges. As well, foreign traders had long been part of the Nantes commercial sector, especially as some sought contexts more receptive to their religious leanings. These various international links facilitated commerce across borders.

We note in our sub-networks the essential role of access to merchandise suppliers in Northern Europe and in the French part of Saint-Domingue (the future republic of Haiti), along with access to financing in Paris, an important centre for securing credit. Indeed our network illustrates the role of Paris on this financial dimension with the presence of several Parisian banking houses: Tourton et Baur, Jude, Morin, and de Larue. As well, these banks were linked to a number of major *négociants* of Nantes, including Augustin de Luines, Grou et Michel and Christophe Drouin.

The appearance of Grou, Grou et Michel, Gabriel Michel and Louis Michel highlights the tradition, previously mentioned, to rely on family members to represent trading houses in other countries – in partnership in Hamburg (Grou et Michel) and by the intermediary Louis Michel in Amsterdam. These linkages were a further means to spread network and market access geographically. These family links also were important information conduits. Another geographic aspect is indicated by the *betweenness* ranking of Levassor reflecting the significant ties of business interests in Nantes to those in Orléans as part of the Nantes-Paris commercial axis that followed the Loire River.

We distinguish more precisely the geographic scope of our partial networks in figure 5 where the location of each actor is colour-coded. This coding more clearly indicates the 'space' element of the network. It also enables us to visualise an important missing link. Eliminating NN from our analysis also eliminated links between some actors and between some sub-networks. However, it is also evident that certain links existed between sub-networks without the need to pass via NN.

The Nantes-Paris axis is indicated, for example, by the path from Leroy de Montilière in Nantes to Jude in Paris via other actors established along the Loire. The journal entries provide rich details on these ties and indicate that Jude operated as a banker, and as both a merchandise supplier and buyer. As reinforced by our measures of centrality, Jude was the critical access point for many other network players.

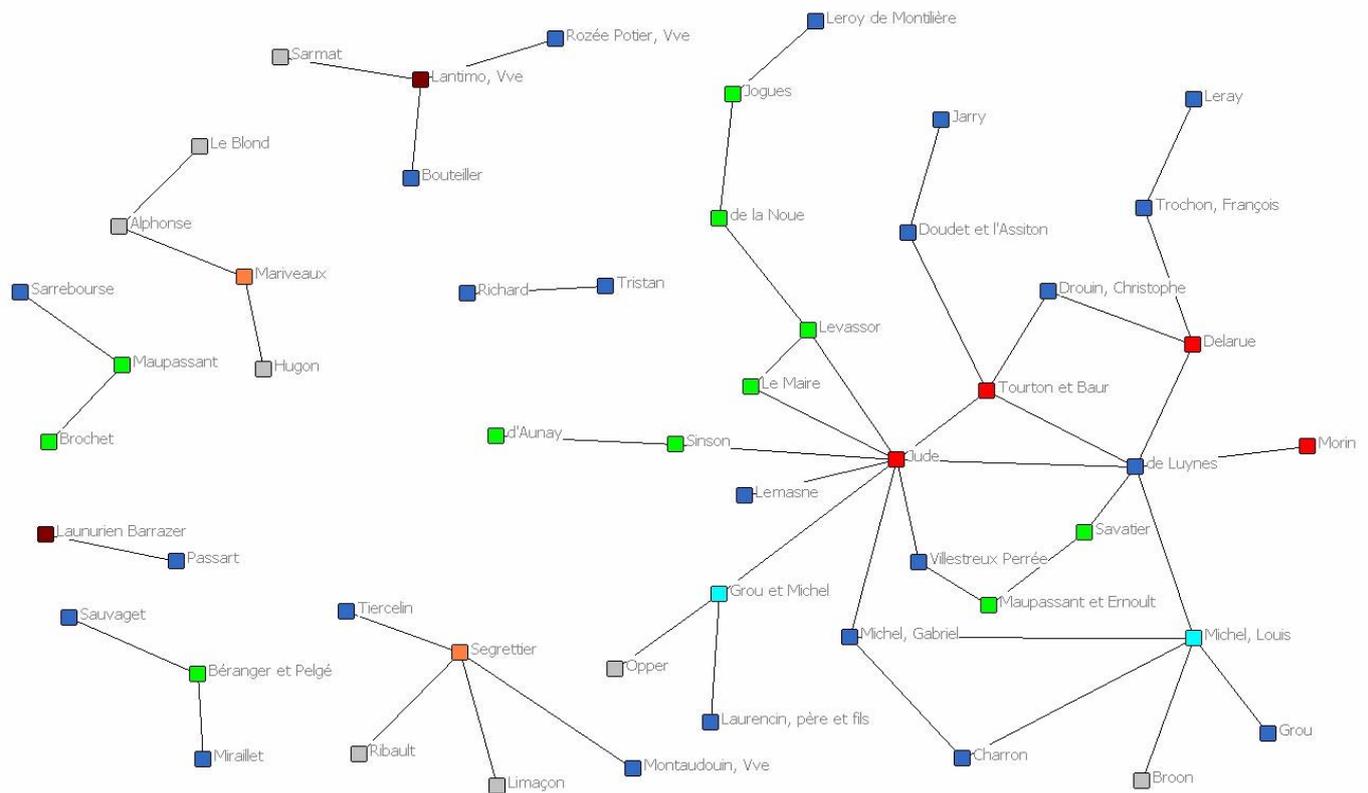


Figure 5. Sub-networks, location of actors

Key :
■ Nantes ■ Paris ■ Loire Valley ■ Brittany ■ Northern Europe ■ West Indies
■ Ship captains (non-localised)

3.3 Partial networks and key actors¹¹

3.3.1 Jude

Jude le Jeune plays a key role in this network as indicated by the measures of centrality where he ranks first across all four measures. This role is visualised effectively in figures 4 and 5 which isolate the sub-networks. To further distinguish his ties, we have constructed Jude's network in figure 6. Jude is now at the centre. We can see that he had direct ties with a number of major players in the business world of Nantes, as well as ties with Grou and Michel in Hamburg and Louis Michel in Amsterdam. By examining the specific journal entries, we note his ties with the Grou and Michel families and with Augustin de Luines. These ties indicate that he offered important financial backing to their commercial activities and facilitated operations across currencies. Of course, we only have Jude's network as developed from the entries made by NN in his accounts. It is probable that his actual role has been understated as these transactions would only be a sub-set of those undertaken. While not discussed at this stage, our next step is to explore this network by examining our archival sources as many of the actors in Jude's network are well known to us.

The reader, however, might be curious as to who exactly was Jude? From our research, we have determined that he is most likely Pierre-Louis Judde, a bourgeois merchant of Paris, whose family ranked amongst the most important merchant families in Rouen. According to Delobette (2005, p. 399, note 991), his father, Michel Judde (1668-1748), had four sons: Louis Judde, *négociant*, controller of the Maison du Roi; Jacques Judde, royal secretary and notary at Châtelet; Claude Robert Judde, *garde du corps de la Mercerie* (elected master of the Mercer's guild, the most

powerful merchant's guild); and Pierre-Louis Judde, merchant-bourgeois of Paris. As well in 1756, the *Almanach Royal* (p. 351) mentions Judde Robert, eldest son, amongst those involved in currency exchange and payments, in the 1760 edition, he appears simply as Judde l'aîné (the elder); thus it would not be at all surprising that his younger brother Pierre-Louis would have been referred to as Judde le jeune (the younger). His two other brothers appear in the almanacs in the lists corresponding to their duties.

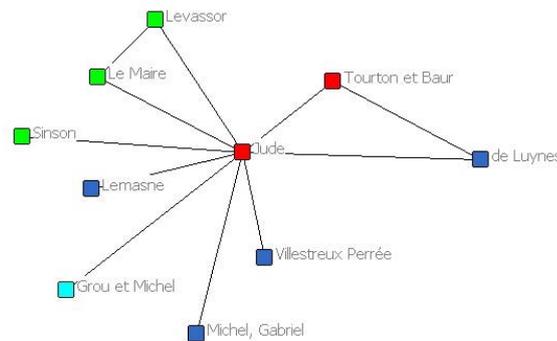


Figure 6. Network of Jude le Jeune

3.4 Partial Networks and Operations¹²

3.4.1 Segrettier (commission sales)

While the preceding analysis improves our understanding of network actors and their roles, it is important to link these roles in a more material fashion to the actual exchange of goods and services that these roles supported. To demonstrate this aspect, we examine the operations undertaken with the correspondent in Saint-Domingue, Segrettier. In figure 5, we see that Segrettier had links with actors in Nantes, la Veuve Montaudouin and Tiercelin, along with ship captains whose exact port of registration has not been established. In figure 6, we have captured those links that include NN and demonstrate how trade operations beginning in Saint-Domingue incorporated over time a number of actors linked together through NN.¹³

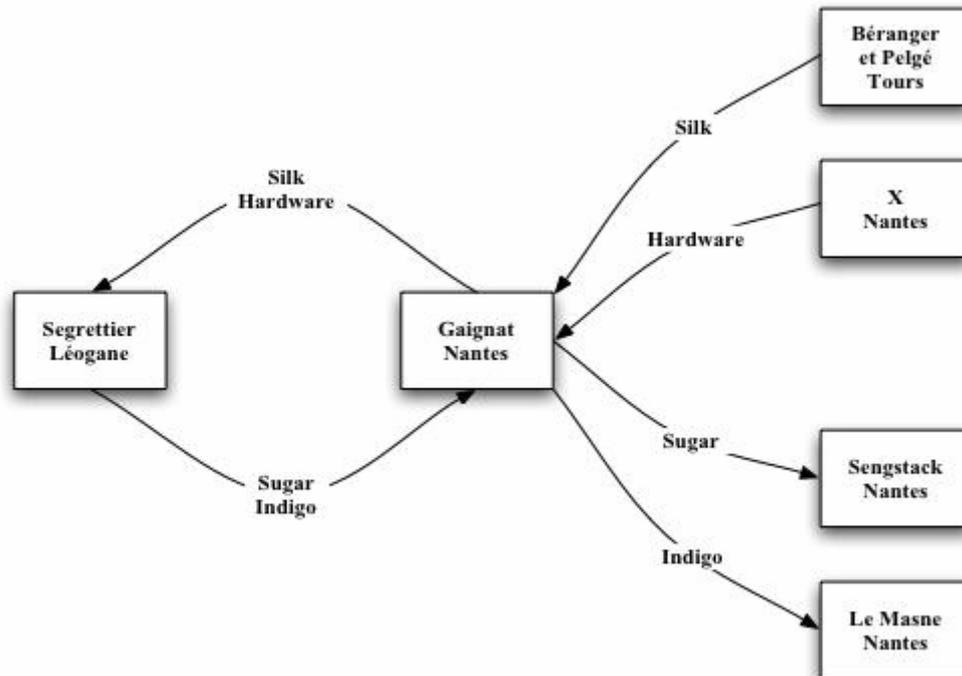


Figure 7. Operational view of the NN's network

Gaston Martin (1931, p.367) mentions a Segrettier in Saint-Domingue in 1746. Genealogical sources note that Jacques Michel Segrétier arrived from the diocese of Orléans in 1742 and settled in Saint-Domingue in the parish of Sainte Rose in Léogane.¹⁴ Thus, along with his connections to Orléans and, in our example, Nantes, he had relations in other French cities. We have found evidence of his links to the *négociant* Jean Pellet of Bordeaux.¹⁵

In May and August 1755, Segrettier sends indigo and sugar to NN via vessels, *le Saint Jean* and *la Généreuse*. In turn, NN sells these goods to two *négociants* in Nantes, Sengstack purchases the sugar and Le Masne acquires the indigo. To settle with Segrettier for the net produced from these sales, NN supplies him with silk fabric and hardware. NN acquires the silk from Béranger and Pelgé of Tours and the hardware in cash from an unnamed source (in Nantes as the records do not indicate otherwise).

This flow of goods, depicted in figure 7, is supported by another series of financial exchanges. Thus from this circulation of merchandise and capital, we have the development of a web of events and actors to ensure that goods received are accounted and paid for, credit secured and commissions and various fees paid to the respective parties. These exchanges implicate a number of other actors into the network, vessel captains (Limaçon, Tiercelin and Ribault), suppliers of credit to both NN and others in the network (Sauvaget and Miraillet), collectors of fees and custom duties (Bayard, la Veuve Montaudouin et fils, Drouin), and those involved in warehousing, freight and transshipment of goods (Drouin).

The role of NN in these exchanges could be interpreted as one of facilitator – knowing where to buy and sell these goods, arranging their shipment, settling accounts for customs and freight, etc. By examining more closely the journal entries recorded by NN, we also gain insight into the transaction costs involved in these exchanges and the ‘profit’ gained by NN as represented chiefly by his commissions. Table 3 summarises these exchanges.

Table 3. Summary of Segrettier Sales

Transaction Recorded	Indigo (£)	Sugar (£)
Cost (net produced)	13279.10	912.17
Commission to NN	293.5	29.18
Port Fee, Warehousing	9.6	----
Freight and Duties	1080.0	552.0
Sales Price	14662.10 (to Le Masne)	1494.17 (to Sengstack)

NN also settles his account with Segrettier by providing silks in the amount of £9322.16 and hardware in the amount of £4671.12. On these sales, NN earns a commission of £182.16 and £91.12 respectively. At year end, NN carries over the balance due to Segrettier of £198.10. These details demonstrate features of the network that we have seen in other settings: Commissions are a small percentage but act as a lubricant to the workings of the network. While these sums are not huge (often one or two per cent of the exchange value), their network role was important as value existed in being in the network and established as the go-to person. Second, exchanges required the ability to collect and pay various taxes and duties, which could be significant, as shown in the case of sugar. Capital circulated as well as goods and trade depended on trust in such operations as credit was extended over periods of time and involved actors with whom one was not in direct contact and known via reputation and/or repeat contracting. The network crossed social categories in that NN was involved with major players (*négociants*) and those who conducted barge operations and freighting.

While not strictly part of this example, we know that actors were linked in other ways and other transactions. Importantly, these actors also were linked socially and through family ties. For instance, the daughter of Segrettier married into the Le Masne family, considered to be amongst the important families and commercial interests in Nantes.¹⁶

4. Concluding comments

Given the provisional nature of our study, we offer here some *very* preliminary conclusions and some questions for further research and analysis. We began this study after much previous research into the commercial world of Nantes, its local and global reach, and the role of accounting in such structures in terms of both decision making and control. In this study, we emphasise the networks of actors who have been part of our earlier work but whose network roles have not been the primary focus. Our initial results have confirmed that our decision to put networks in the spotlight is a reasonable one. Our social network analyses provide more precise definition of the linkages and relationships that we have encountered in other ways in our archival data.

In the case of Gaignat, we are now even more convinced that his accounting story ‘makes sense’. We also have been able to shed further light on the roles of specific actors, their centrality in the network and the ability of these networks to operate across vast arrays of space and time. In this way, our analysis supports the view of Gervais (2008) that the merchant web and its processes operated in much the same manner regardless of the specific setting.

Social network analysis is another *entrée* into the networked world of eighteenth-century Nantes. We plan to return to our early results, combining them with our rich data on many of these actors, to determine more fully how this network operated in terms of information exchange, the raising of investment capital and credit, and knowledge transfer. Based on our ability to drill down into the accounting records, we know that accounting mechanisms played an important role in all three facets

of this network. Moreover, our initial analysis indicates the important role of trust, kinship and social capital within a commercial network.

Second, we have demonstrated the value of a joint qualitative-quantitative approach to historical studies. As noted by Haggerty and Haggerty (2010, p.20), social network analytics are not without limitations but measurements highlight key network actors who would not have been identified using traditional historical techniques. Building on the insights gained from our 'pilot study', we intend to apply this research methodology in a future study whose data base is significantly larger and more complex, thus offering increased possibilities to take advantage of these techniques.

Third, we are intrigued by the issue of reciprocal exchange in network relationships. For example, many researchers adopt a 'directional view' of these relationships which we consider problematic. Commercial relations, by definition or almost such, presume reciprocity. There is nothing to declare that in a buyer-seller relationship, one of these actors plays an ascendant role or that one will have power, always or in a transitory way, over the other actor. While equality is not required, exchange relationships depend on some measure of give and take, trust, and a belief in fair play. In our network, we see that networks crossed social contexts, minor merchants traded with major players. Yet they did so based on mutual understandings of the ground rules. Finally, we can see that some exchanges and transactions (such as commissions) were undertaken for reasons distinct from profit seeking, as many of these operations garnered little in monetary terms but were extremely important to facilitate the workings of the market and to maintain access to the network.

As noted earlier, this study has limitations. Our observations are not based on the account books of a merchant in Nantes but rather from the journal entries presented in terms of examples, and which, even if they may have been recopied directly from account books that Gaignat maintained, these entries were assembled to meet his own pedagogical objectives.

This *ego*-centred nature of our data set is not unique to our study and common to micro-history more generally. Our ability to triangulate sources and to utilise quantitative analysis in conjunction with qualitative sources enriches the study and paints a more complete picture than reliance on a qualitative approach alone. In some instances, the quantitative results pleasantly confirm our historian hunches or intuition based on long hours in the archive. Some aspects are more complete than others, such as our ability to trace our actors and their activities through notary filings of their business dealings, government registers of vessels, taxation records, along with personal and parish records. Yet the overall picture will always remain partial and open to further interpretation.

Our objective quite simply has been to highlight the characteristics of the social networks which a *négociant nantais* might have had access. At this stage we have only made use of the links revealed to us in the *Guide du Commerce*. This first step completed, we envisage further possibilities and the next steps to enlarge our data set through on-going archival research and examination of secondary sources. Whether it be family ties, business liaisons, such as the participation a joint venture or multi-investor enterprise, the addition of these attributes into our matrices will enable us to explore more fruitfully these rich sources.

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¹ Space constraints preclude the inclusion of an exhaustive review of social network analysis and of the graph theory approach that we have adopted. Wasserman and Faust (1994) is a recognised reference text in this domain and provides a comprehensive discussion of the various measures used in this study. We also draw upon Hanneman and Riddle (2005) which is an introduction to social network analysis and visualisation software. We are also grateful to Professors S. and J. Haggerty whose research has similarities to ours and who graciously have allowed us to reference their 2009 study.

² Notwithstanding the use of standard measures, some of them tend to be 'software-specific', while others more importantly reflect theoretical differences within sociology, social psychology and social theory (cf., Haggerty and

Haggerty 2009, Hanneman and Riddle 2005, Kadushin 2004, Scott 2000, Wasserman and Faust 1994). We comment briefly on theoretical differences in our discussion of centrality measures.

³ The graph lay-outs obtained from social network software can be completely random, just like it can depend on certain measures built into the software program. However, in all cases, the final lay-out results from the joint selections made by the user and the author of the software program.

⁴ These calculations were undertaken with the use of the software *Ucinet 6* and the sociograms were created using *DrawNet*, which comes with *Ucinet 6*. For further details on this software and the various measures that can be derived from it, see Hanneman and Riddle (2005).

⁵ We have adopted the term '*notre négociant*' – NN for short – to refer to the commercial trader in Gaignat's example and who is at the centre of the network that we analyse in this study. We discuss the implications of this anonymous actor later in the paper.

⁶ Bonacich (1987) provides a detailed exposition of this measure in terms of eigenvectors. The model allows for actor centrality – the sum of connections to others weighted by their centralities – and the degree and direction of the dependence of each actor's score on the scores of other actors to vary. It is measured in our case study using *Ucinet 6*.

⁷ An in-depth presentation of both Gaignat and the *Guide du Commerce* and of our other data sources is provided in McWatters and Lemarchand (2010).

⁸ As noted earlier, we have named our *négociant* "NN" as he has not been identified.

⁹ We have retained the spelling of names used by Gaignat, although it differs in some instances with that found in other sources such as parish records, for example, Jude or Judde. The *Guide* also has variations across journal entries for the same actor. From our own experience, these inconsistencies are not unusual, especially for the time period in question where spelling frequently varied depending on the source document. To avoid confusion, we wish to alert the reader to these minor variations.

¹⁰ We have focused on the first ten actors for each measure after which the ranking are of limited interest.

¹¹ Further research is in progress with respect to sub-networks. We anticipate the inclusion of two further examples to illustrate the role of partial networks and the key actors involved, specifically De Luynes and Villetteux Perrée.

¹² Research in progress examines operations in terms of commission sales (*Lecompte et Forget*), the role of insurance, international exchange (*Grou et Michel*), vessel share interests (*le Jupiter*). We also elaborate our presentation of networks across time and space.

¹³ Berangé et Pelgé of Tours also appears in figure 5 within their own sub-network with actors involved in credit operations.

¹⁴ *Généalogie et histoire de la Caraïbe*, numéro 70, avril 1995, p. 1313

¹⁵ Letter of 1742 addressed to Pellet from Segrétier of Léoganne (A.D. Gironde, 7 B 1798, Pellet Jean, négociant et armateur à Bordeaux).

¹⁶ *Généalogie et histoire de la Caraïbe*, numéro 70, avril 1995, p. 1313.