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Network structures of a centralized and a decentralized market. A direct comparison.

Sylvain Mignot¹ and Annick Vignes²

¹ Lille Catholic University, 51 rue du port, 59000, Lille, France
sylvain.mignot@univ-catholille.fr

² ENPC, LISIS-INRAE, CAMS-EHESS, 54 boulevard Raspail, 75006, Paris, France
annick.vignes@enpc.fr

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1 Introduction

A fundamental assumption in economics is that rational individuals act in their own self interest. One implication is that, when trading, buyers are supposed to seek for the lowest price and sellers for the highest one and social interactions are not considered. It is now largely accepted that social relationships affect the efficiency of a market structure (centralized or decentralized) (Babus et al. 2013, Opp & Glode 2016, Glode & Opp 2017).

The objectives of the current study is to examine the network structures of a very specific market : the Boulogne-sur-mer fish market. On this market two market structures coexist, each being used by the same buyers and sellers, exchanging similar goods. The two submarkets are a centralized one (Auctions) and a decentralized one (over-the-counter market). For each sub-market we examine (1) the global network structure, (2) the local network structure, and (3) we identify the traders characteristics that best explain the network structures. by comparing the results, we can compare the role of trust (bilateral market) and reputation (auction market) in the individual choices of trading partners.

Structural measures are used to characterize networks structures. Exponential random graph models are used to evaluate how trader characteristics explain purchasing patterns, and how the influence of these characteristics vary with the market mechanism.

We bring into the light that, when the transaction links on the auction market reflects the economic constraints of the partners, the relationships on the bilateral market depends on something more. Clearly, the prices of the bilateral transactions are the consequences of economics and non economics determinants. At first glance, the stable co-existence of two market structures looks like a paradox. Our results help to understand the distinctive characteristics and functioning of each sub-market. This discussion contributes to the debate about the efficiency of market structures.

2 The main market features and the data

We present here some particular features of the Boulogne s/mer fish market, through the analysis of a detailed database, consisting of 300 000 daily transactions on the period 2006-2007.

The market: The Boulogne s/mer fish market is located in the North of France near Belgium. It is considered as the most important fish market in France and one of the most important in Europe, in terms of quantity. On this market, the catch becomes scarce; this is due to the rarefaction of fish and a policy of quotas decided by the Common Fisheries Policy of the European Union, to protect the resource. This market uses a double mechanism where both auction and bilateral sub-markets coexist.

This market is a daily one, open 6 days a week. Transactions begin early in the morning. Agents are heterogeneous on both sides of the market. They are or sellers or buyers. There is no possibility of arbitrage. Buyers form an heterogeneous population, facing different budget and time constraints. They can freely buy on both sub-markets. Each day, sellers have the possibility to choose how to sell their fish (auctions or pairwise exchanges). Once the sub-market chosen, they cannot change their strategy until the next day for practical reasons (costs of bringing the merchandise from one part of the market to the other are very high). Mignot et al. (2012) show the existence of two behaviors: some agents purchase most of the time on the same sub-market, when others switch regularly. Loyal sellers, the ones who change rarely, are mainly present on the bilateral market.

On the auction sub-market sellers can't choose their buyers: the buyers are not supposed to interact with the auctioneer, apart from the prices formation mechanism. But, of course, they can decide not to bid when the catch of certain boats is being sold. Indirect trust can play a role, but not direct trust. The time constraint is high while all the transactions take place in a very short time. Important volumes of fish are traded and transactions occur at a fast rate.

On the bilateral market, the prices are not displayed and emerge from a bargaining process. Buyers, who are retailers are looking for specific species, that correspond to their expected demand. Here agents have different source of private information, depending on their past history, their ability to bargain and transact and the special links they can have with agents of the other type (buyers or sellers), here direct trust can exist and influence market outcome.

The data: 200 boats are registered in this market and designated as "sellers" in what follows. 100 buyers purchase regularly, most of them on both sub-markets. The database we use covers a year and a half (2006-2007) where both sub-markets coexist. For each transaction, the date, the species, the characteristics of the traded fish (size, presentation, quality), buyer's and seller's identities, the type of trade mechanism (auction or negotiated), the quantity exchanged and the transaction price are known. The analysis of the database tells a story of heterogeneity. First statistical results exhibit heterogeneous behaviors in terms of quality and quantities exchanged, on the both sides

of the market. On the period studied, the two sub-markets (auctions and negotiated) are of equal importance (45% of volume for the auctions market, 55% for the bilateral one): the same agents transact on the two "sub-markets" and the same types of fish are sold through both mechanisms (80 different species of fish are traded). Between 37% and 54% of each of the four main fish species (in term of quantities) are sold on the auction market which suggests an equivalent distribution of the production between the two market mechanisms.

3 Methodology and preliminary results

The first observation we can make is that the prices are higher on the negotiated market (average and median) and that the prices distributions behave differently on the two markets. The auction distribution, even if not following a normal law, is less asymmetric than the pairwise one (skewness of 0.87 vs. 3.00 and kurtosis of 1.71 vs. 16.74 on the bilateral market) and then exhibits relatively few high values. Clearly, pairwise exchanges are more risky and this result is in line with the literature.

When looking at the buyers strategy, we observe a propensity to exchange with a higher number of sellers on the negotiated market than on the auction one. We guess here that the trade network is more dense on the negotiated market than on the auction one. In the same way a simple correlation between the number of time a couple is present at the same time on a market and the number of times they transact together is higher on the negotiated market.

The matching between buyers and sellers seems to follow different rules on both sub market. We will analyse the behaviors of buyers and sellers by doing a network analysis of the trading network of both submarket.

We first analyze the structure of the two networks (centralized and decentralized), looking at the difference in density, clustering and centralisation. Our preliminary results show similar number of nodes (same traders go on both markets), relatively comparable densities but very different clustering coefficients. Clustering is much higher on the auction market than on the pairwise one. In the same way, distributions of centralities on the projected networks are quite different. The two networks are structurally different, even if buyers, sellers, and goods exchanged are the same on both submarkets.

We then turn to ERGM to evaluate which of our measures are associated with a tie between a buyer and a seller, in order to estimate the nature of linking on the two sub-markets. do pairs of people exchange because a kind of informal contract (we talk about trust) or do they exchange because of an economic specialization? We can then compare the influence of these parameters on linking, allowing us to compare the effect of reputation (indirect trust on an auction market) and direct trust (on a pairwise market).

Bibliography

- Babus, A., Kondor, P. et al. (2013), 'Trading and information diffusion in over-the-counter markets', *Manuscript (R&R Econometrica)*, *London School of Economics*.
- Glode, V. & Opp, C. (2017), 'Over-the-counter vs. limit-order markets: The role of traders' expertise', *Available at SSRN: <https://ssrn.com/abstract=2697281>*.
- Mignot, S., Tedeschi, G. & Vignes, A. (2012), 'An agent based model of switching: The case of boulogne s/mer fish market', *Journal of Artificial Societies and Social Simulation* 15 (2) 3 **15 (2)**, 3.
- Opp, C. & Glode, V. (2016), (de) centralizing trade, in '2016 Meeting Papers', number 1591, Society for Economic Dynamics.