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Where do electronic markets come from? Regulation and the transformation of financial exchanges

Michael Castelle, Yuval Millo, Daniel Beunza and David C. Lubin

Michael Castelle, University of Chicago, Department of Sociology, 1126 E 59th St Chicago, IL 60637, United States. E-mail: mcc@uchicago.edu

Yuval Millo, Warwick Business School, University of Warwick, Scarman Rd, Coventry, CV4 7AL, United Kingdom. E-mail: yuval.millo@wbs.ac.uk

Daniel Beunza, London School of Economics and Political Science, Department of Management, Houghton Street, London WC2A 2AE, United Kingdom. E-mail: d.beunza@lse.ac.uk

David C. Lubin, University of Chicago, Department of Sociology, 1126 E 59th St, Chicago, IL 60637, United States. E-mail: dlubin@uchicago.edu

Abstract

The practices of high-frequency trading (HFT) are dependent on automated financial markets, especially those produced by securities exchanges electronically interconnected with competing exchanges. How did this infrastructural and organizational state of affairs come to be? Employing the conceptual distinction between fixed-role and switch-role markets, we analyse the discourse surrounding the design and eventual approval of the Securities and Exchange Commission's Regulation of Exchanges and Alternative Trading Systems (Reg ATS). We find that the disruption of the exchange industry at the hands of automated markets was produced through an interweaving of both technological and political change. This processual redefinition of the 'exchange', in addition, may provide a suggestive precedent for understanding contemporary regulatory crises generated by other digital marketplace platforms.

Keywords: financial markets; production markets; regulation; stock exchanges; technology; marketplace platforms.

Introduction: from a sociology of markets to a sociology of the exchange

The sociological study of markets is often characterized as a project intending to problematize the assumptions of neoclassical economic theory, with its efficient equilibria of rational actors (Fourcade, 2007; Fligstein & Dauter, 2007). This has, perhaps unintentionally, led down a path that emphasizes the analysis of *financial* markets—those paradigmatic sites that (at least in theory) realize particular notions of competition and information. But financial markets do not emerge spontaneously: they instead most often develop as a trade facilitation service, provided by particular institutions—namely, *exchanges*.

In the nineteenth and most of the twentieth century, exchanges tended to be member-owned cooperatives. But the last two decades of the twentieth century saw a significant transformation as these institutions became threatened by firms that provided automated platforms matching buyers and sellers. In this paper we highlight the importance of understanding and theorizing the transformation of exchanges for the sociology of financial markets. We detail the development and regulation of technologically-centralized and electronically-interlinked trading venues in the US securities exchange industry, and show how the role of the traditional stock exchange became blurred—a form of market 'disruption' leading to the demutualization of exchanges, the fragmentation of financial market venues, and the potential for pathological high-frequency trading (HFT) practices.[1]

Our story is about the ontological and discursive transformation of the exchange—what it is; what its legal definition is; and the historical relation between the two. The case at hand will demonstrate that the political transformation of markets on the part of state regulators—while sometimes considerably removed from technological developments (in terms of direct action)—is inextricably informed and interwoven with technological processes. At the same time, we show that the necessary and critical material and legal infrastructure for cultures of HFT emerges as an

[1] We study the US case because it is an early instance of the regulated interlinking and routing of orders for securities exchanges, which later facilitated HFT activities. For a comparison of US regulations and those of the Market in Financial Instruments Directive (MiFID), see (Boskovic *et al*., 2010); and for the relationship of algorithmic trading and MiFID, see (Lenglet, 2011).

unintended consequence of an intertwining of technological innovation and regulatory debates regarding the very nature of competition and fairness in financial markets.

Exchanges as fixed-role markets that produce switch-role markets

We distinguish between *fixed-role markets* and *switch-role markets*, as described by Patrik Aspers (Aspers, 2007, 2011).[2] This distinction categorizes markets according to the extent to which actors are strictly assigned the roles of either buyers or sellers ('fixed-role'), or can switch between acting as a buyer or seller ('switch-role') (see Figure 1.)[3] Examples of fixed-role markets—where buyers and sellers are not interchangeable—include production markets (with firms competing to sell comparable products to a disjunct community of buyers) and labour markets; the canonical examples of a switch-role market—where buyers and sellers are interchangeable—are financial markets or other auctions (one can purchase a stock as a buyer, and then turn around to 'flip' it as a seller); see Figure 1 for a diagrammatic illustration of this distinction. In our case, as we will see below, we want to consider 'the exchange' as a site which both has aspects of fixed-role markets—i.e., multiple exchanges may compete to provide trading services for brokers and dealers—*and* switch-role markets: i.e., the familiar, furious 'trading floor'-style buying and selling of shares.

[2]This distinction may be seen as in the tradition of the 'multiple market' critique of the economic conception of markets described by Zelizer (1988).

[3] The differing size of the diamonds in the fixed-role market represents the differing status of the sellers in typical production markets, in contrast with the standardization of buyers and sellers found in switch-role financial markets; see Aspers (2011).

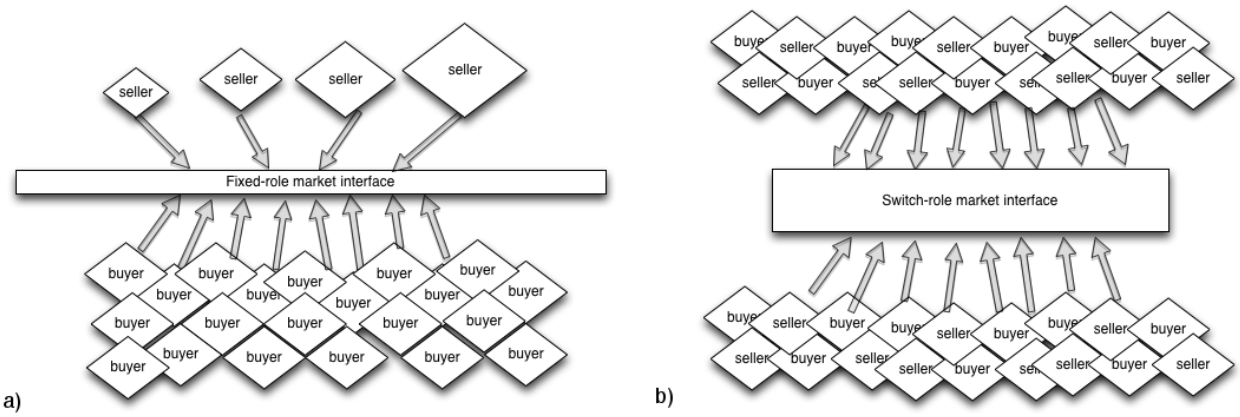

Figure 1 a) A fixed-role market b) A switch-role market.

Source: Compiled by authors.

Following Aspers' distinction between fixed-role and switch-role markets, we enrich the notion of a traditional securities exchange. In Figure 2, we illustrate how two exchanges, a dominant exchange (the New York Stock Exchange, NYSE) and a regional exchange (the Philadelphia Stock Exchange, PHLX) act as members of a *fixed-role* production market for trading services in a given stock (in this case, IBM stock).

The trading facilitation services that these exchanges produce, in turn, take the form of multiple (switch-role) financial markets for individual securities. The exchange 'industry' is thus a fixed-role market which produces switch-role markets.[4] Until now, the social studies of finance (SSF) literature has focused on largely these latter switch-role markets—as in the ethnographies of trading floors (Baker, 1984), trading screens (Knorr Cetina & Bruegger, 2002) and investment-bank trading desks (Beunza & Stark, 2012)—but paid little attention to the institutional conditions that create and maintain them.[5]

[4]In this formulation, the products of an exchange are services - specifically, 'trading services', a term not infrequently used in more specialized literature to describe what exchanges produce; for example, Schwartz & Francioni (2004, pp. 133–135).

[5]The subdomain within economics focusing on fixed-role markets is that of *industrial organization* (IO) (Schmalensee & Willig, 1989). Some of the notions from contemporary industrial organization, such as *multi-sided*

Missing from these accounts is the (fixed) role of exchanges as institutions which can compete to attract these trading agents. This focus on switch-role markets in SSF is in contrast to Harrison White's emphatic focus on fixed-role production markets in his economic-sociological theory. White's view, put succinctly, is: 'A producer's market organizes producers into an array of parallel roles whose primary focus is each other' (White & Eccles, 1987); this asymmetric logic is quite different from the structural similarity of buyers and sellers in a financial market.[6]

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markets (Rochet & Tirole, 2006) are quite suggestive and can permit a good degree of theoretical complexity (despite their canonical examples including somewhat imaginary entities, like now-nonexistent 'singles bars').

[6]White has outlined and elaborated on this idea in many articles, beginning with White (1981a) and White (1981b) and culminating with the monograph *Markets from networks: Socioeconomic models of production* (White, 2002). Intermediary presentations on similar material include White & Leifer, (1988), White (1988) and (White, 1992). White's explicit influences from economics are manifestly not neoclassical theorists like Walras, but instead include Chamberlin on monopolistic competition (Chamberlin, 1933) and the signaling theory of Michael Spence; On Chamberlin, see Swedberg (2003, pp. 113–114).

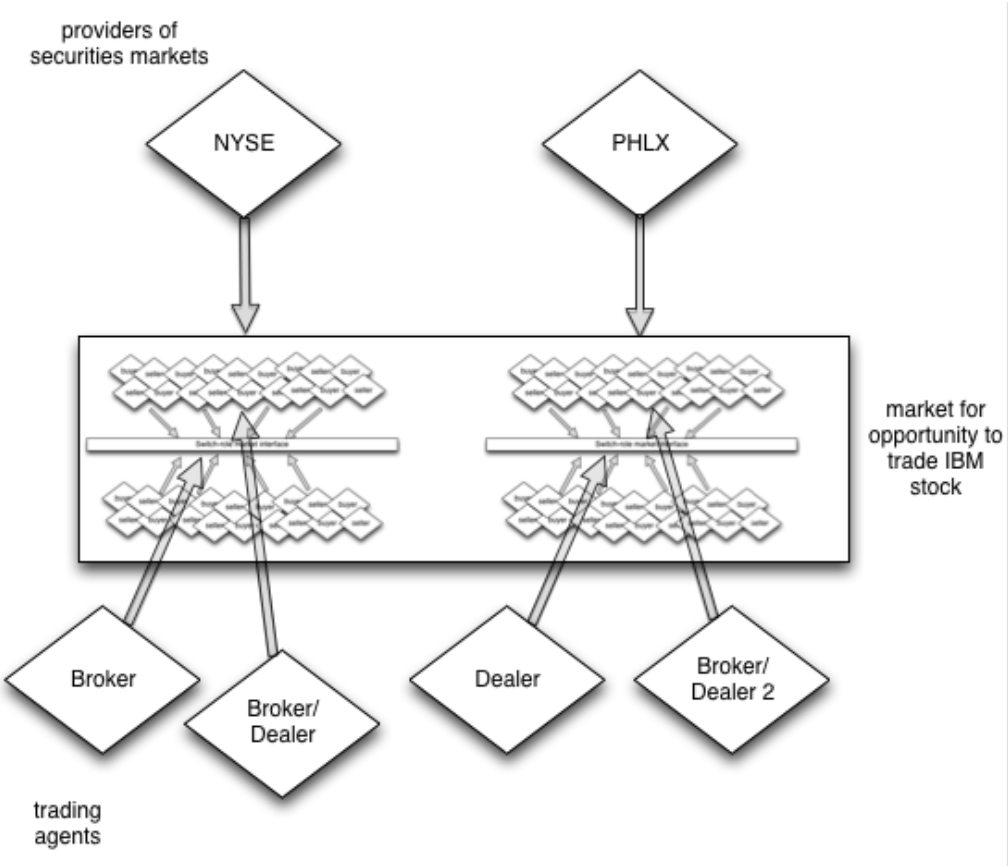

Figure 2 In this historically-inspired example, producers of trading services for IBM stock include the NYSE and the regional Philadelphia Stock Exchange (PHLX). Brokers and dealers are 'in the market' for the exchanges' services, which consist of switch-role markets in which they can alternately buy and sell IBM stock.

Source: Compiled by authors.

In part, this lack of recognition might be attributed to an assumption that White's theory of production markets should only be applied to goods, and not services. The classical distinction between goods and services, which goes back to Adam Smith, is worthy of continued consideration in economic sociology.[7] Callon, Méadel and Rabeharisoa (2002), for example, forcefully suggest that we should see in discussions of the rise of the service economy a

[7] For Smith's distinction between goods and services, see (Smith, 1776).

'profound transformation of the rules by which markets function'.[8] In our case, in one 'market' (a financial market for a given security) we have the furious turnover of symbolic property rights and a form of competition which is (theoretically) solely a function of price; in the other 'market' (the exchange industry) we have, among competing exchanges, the much less cleanly demarcated competition for the provision of trading services—a 'product' which is hardly uniform. Because examples of production markets in economics lean toward straightforward examples using standardized goods, it may be less obvious that exchanges also form a production market, albeit a semiotically and interactionally complex one: namely, their product is the facilitation of the continuous exchange of goods which—in the case of securities—are so standardized as to be represented by certificates in a centralized clearinghouse, or indeed nothing more than symbols in a computerized database (Callon & Muniesa, 2005).

In the next two sections, we shall examine the fixed-role and switch-role aspects of exchanges in turn, emphasizing the sociotechnical and technopolitical aspects of each. By *sociotechnical* we aim to highlight a greater sensitivity to issues of technologies and techniques with respect to phenomena largely understood with technological factors *in absentia* (such as the notion of *embeddedness*).[9] By *technopolitical*, we want to fuse the sense of technology as *volition* (Mitcham, 1994) with a definition of politics as *intentional institutional change* (Glaeser, 2010) to suggest that there can be no politics absent of sociotechnics, and vice versa.[10]

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[8]Callon, Méadel & Rabeharisoa (2002, p. 196). Gadrey (2000) describes theoretical progress in the goods/services dichotomy, including those of Peter Hill, who points out the traditional weaknesses of neoclassical economics in the study of services: 'Because services cannot be transferred from one economic unit to another, models of pure exchange economics of a Walrasian type in which existing goods are traded between economic units are quite inapplicable and irrelevant to services' (Hill, 1977, p. 318).

[9]The term 'sociotechnical' is analogous to the sense of *sociomateriality* in Orlikowski & Scott (2008) but we intend to not privilege any of the senses of technology-as-tool, technology-as-technique, technology-as-social, and technology-as-volition, as in Mitcham (1994).

[10]Gabrielle Hecht and Paul Edwards use the term 'technopolitics' to refer precisely to such a "hybrid form of power" with "cultural, institutional, and technological dimensions" (Hecht & Edwards, 2010).

Fixed-role markets in exchanges: the provision of trading services

In the consideration of the exchange as part of a production market we take as our unit of analysis the exchange as firm, as in the tradition deriving from Coase (1937). We see producer firms as intrinsically involved in multiple markets—the *upstream* markets of which they are buyers, and the *downstream* markets of which they are sellers. Since in our case the exchange is a producer of trading services, the immediate downstream consumers of these trading services are brokerage firms, who in turn can be seen as providing those trading services further 'downstream' to institutional and retail investors.[11] The crucial role of the state in affecting the arrangements of firms in a production market goes unmentioned by White (1981b), but is asserted forcefully by Fligstein (1996). Indeed, for Fligstein, stable production markets are something that occurs not despite, but because of, explicit intervention on the part of the state.[12] In our case, however, we can consider neither production markets nor the state regulation thereof as occurring independently of their sociotechnical arrangements. Competition in the provision of trading services, as we shall see, is dependent on the technological relations between exchanges; and regulatory change can be enacted both in response to these technical relations, and to intentionally induce these technical relations.

While there are sociologists (Muniesa, (2000), Pardo-Guerra (2011)) who have focused on the history of particular exchanges (the Paris Bourse and the London Stock Exchange, respectively) as technological institutions, we argue that there is a great degree of opportunity for the field of economic sociology to address topics which, for economists—and its subsequent market microstructure literature—are considered 'puzzles' in the context of financial exchanges. Economic depictions of the history of stock exchanges, for example, often provoke the phrase

[11] Some studies in finance research that see the exchange industry in this way, taking an industrial-organization perspective, include Macey & Kanda (1989), Domowitz & Steil (1999) and Cantillon & Yin (2011).

[12] Dobbin (1994) and Fourcade (2009, pp. 36–37) argue that the regulatory tradition in the United States (going back to the 1891 Sherman Antitrust Act) normalised oligopolies as inherently 'competitive' within legal discourse. It should also be noted that Aspers criticises Fligstein for only considering the role of the state in production as opposed to financial markets (Aspers, 2009).

'liquidity attracts liquidity',[13] which is to say that whichever exchange at any given time has attracted the most customers for a given security may remain incumbent due to a 'network externality'.[14] This fact highlights why notions of 'embeddedness' (Granovetter, 1985) were so eagerly applied to finance. For example, take the 'network externality puzzle' discussed in the survey of Madhavan (2000), which asks why financial markets remain 'fragmented' (as in, multiple exchanges compete to provide markets in the same security). How, indeed, do financial markets become fragmented in this way?

Switch-role markets in exchanges: the trading of securities

In contrast to the fixed-role markets in which exchanges compete with each other, exchanges themselves *produce* switch-role markets: an investor interacts (directly or indirectly) with an exchange in order to gain access to arenas of buying and selling of securities. These markets use the 'continuous double auction' system of financial markets, which today dominates securities and derivatives exchanges worldwide: in between the 'call auctions' which open and close an exchange, orders to buy and sell may be posted at any time in a continuous fashion.[15] Because each market for a given stock is switch-role, a buyer of a stock can become the seller of that stock immediately afterwards (and vice-versa, in the case of short-selling). (Today, this temporal window within which a trader—or trading *agencement*, as per Çalıskan & Callon (2010)—may buy and sell a quantity of stock that has today been reduced to a matter of microseconds.) Because the goods being bought and sold in a market for a given stock are homogenous and strictly delimited, they have historically posed as an exemplary representative system for the general equilibrium theory of the 19th century French economist Léon Walras, which modelled buyers and sellers' continuous interests (mediated by an auctioneer in a so-called

[13] 'Markets consolidate because traders attract traders. Trading is easiest and cheapest where most traders of an instrument or similar instruments trade. Liquidity attracts liquidity' (Harris, 2003, p. 539).

[14] 'As the value to one trader of transacting on a given trading system increases when another trader chooses to transact there as well, such a system is said to exhibit network effects or network externalities' (Domowitz & Steil, 1999).

[15] See Friedman (1993). The term *continuous auction* can thus be contrasted to the *call auction*, in which orders are aggregated and then later matched at periodic, pre-arranged times. For a classification of exchange trading systems based on empirical observation in the mid-1980s, see Cohen *et al.*, (1986, pp. 16–37).

tâtonnement process with zero transaction costs) to uncover an (presumed) underlying price.[16] And because the assumptions of the general equilibrium theory happen to be isomorphic to an idealized version of financial markets devoid of (in the economists' nomenclature) 'network effects', 'imperfect information' and 'trader heterogeneity', these situations are obvious grounds for empirical disputation of microeconomic assumptions.

By contrast with the example of fixed-role markets, the sociotechnical dimension of financial markets has been carefully examined by a number of researchers, including Knorr Cetina & Bruegger (2002) and Zwick & Dholakia (2006). However, only recently has the SSFfield directly considered the technological and computational implementation of financial markets, as in the discussion of the Island exchange platform in MacKenzie & Pardo-Guerra (2014). Electronic exchanges of any sort, at their core, automatically perform the matching of orders to exchange some symbolic entity. With sufficient hardware (disk space, networking and communications, memory) backing up such a functioning order-matching system, they can be relatively trivially extended to perform simultaneous matching in multiple contracts; and electronic derivatives exchanges, with (for example) a variety of expiration dates and strike prices, benefit strongly from this digitized facility for increased scope. In the late 1990s, observers noted the broad significance of these affordances:

> Automated systems can now be tailored quickly and inexpensively to accommodate trading in a growing number of securitized products, such as equities, bonds, currencies, financial derivatives, pooled mortgages, agricultural commodities, electricity, pollution emission permits, and hospital bed allocations. (Domowitz & Steil, 1999, p. 46)

And while the role of the state has not gone unaddressed in discussions of financialization processes (as in, for example Krippner (2012) and Pacewicz (2013)), the specifically

[16]It is sometimes stated that Walras' original model was designed on the actual call auction process of the late-19th century Paris Bourse (Walras states: 'let us go into the stock exchange of a large investment centre like Paris or London' (Walras, 1954 [1892]). That the Paris Bourse ever functioned in a manner similar to Walrasian *tâtonnement* is disputed by Walker (2001).

technological aspects of the politics of financial markets are currently a developing field (Pardo-Guerra & MacKenzie, 2014).

Table 1: Comparison of studies on fixed-role markets and switch-role financial markets

	FIXED-ROLE/ PRODUCTION MARKETS	SWITCH-ROLE/FINANCIAL MARKETS
Microeconomics	Coase (1937), Chamberlin (1933), Schumpeter (1942), Schmalensee & Willig (1989)	Walras (1954 [1892]), Demsetz (1968), Madhavan (2000), Hasbrouck (2007)
Embeddedness	White (1981), Granovetter (1985), Uzzi (1997)	Baker (1984)
Politics	Fligstein (1996)	Carruthers (1996)
Sociotechnics/ Technopolitics	-	Knorr Cetina & Bruegger (2002), Beunza & Stark (2012); Pardo-Guerra & MacKenzie (2014)

Source: Compiled by authors.

Setting the stage: the last days of the club

Let us consider the NYSE in the early 1960s, then a member-owned, non-profit cooperative,[17] As correctly noted in the Securities and Exchange Commission's (SEC) *Report of Special Studies of the Securities Markets*, the term 'securities markets'—both at that time, and today – 'encompasses both the markets for distribution of securities into public hands and the markets for continuous trading in outstanding securities' (SEC, 1963, p. 9); the former refers to the issuing (via an underwriting investment bank) of an initial public offering (IPO) of stock for a

[17]The period of transition before the end of fixed commissions in 1975 is well-documented in Welles (1975).

newly public firm; and the latter refers to the financial markets of which this paper is explicitly concerned.[18]

'The NYSE' was thus in actuality a surfeit of separate switch-role markets, one for each listed security, with a variety of intermediating actors (in this case, the primary intermediates were the 600+ brokerage firms which were then members of the NYSE).[19] The custom at the time between the NYSE and the next largest exchange, the American Stock Exchange (AMEX), would be for the latter to list smaller companies; once they were 'battle-tested', they could de-list from Amex and list on the NYSE.[20] Meanwhile, because NYSE-listed stocks were not traded on any other major (non-regional) exchange, what we might now consider 'competition' in these securities markets was less present; each exchange thus had an effective monopoly in providing trading services for a given stock.[21]

The SEC 1963 *Special Study* was also significant in its early discussion of the possibility for automation; while the discussion of the automation of order matching and trade execution was highly speculative, but there was more interest in integrating various reports (including the exchange tape) to provide 'a continuing, comprehensive market picture' (SEC, 1963b, pp.354-355). As part of the study, the SEC also commissioned a study by the Univac computer-manufacturing division of Sperry Rand, which concluded that 'one centrally located computer would have sufficient capacity, speed, and capability to accommodate the reporting of the listed markets as well as the over-the-counter market'.[22]

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[18] These are referred to as 'primary' and 'secondary' markets in securities, respectively (Harris, 2003, pp. 209–210).

[19]These intermediating firms are called the *sell-side*; one can think of them as intermediating between traders and/or their representatives (that is, the *buy-side*) and the exchange itself. This is to say, it is the *trading services* that the buy-side is buying and the sell-side is selling, *not* the securities themselves. Also note that this perspective of the exchange's products as a set of independent markets is a simplification; various factors (including prohibitions and fees) may encourage investor diversification within an exchange's markets as opposed to across them.

[20]Seligman (1985, p. 7) describes the AMEX as a 'minor league' to the 'major league' NYSE.

[21]Coffee (2002, pp. 1769–1770). There were also an array of independent dealer markets for trading securities; these 'over-the-counter' (OTC) markets were also known (in aggregate) as the 'third market'. Additionally, Rule 394 (later Rule 390) prevented NYSE members from effecting trades in the over-the-counter market (the dealer markets regulated by NASD) (Seligman, 1995, pp. 505–516).

[22]"Listed" markets refers to financial markets hosted by the exchange (for example, NYSE, Amex) on which a stock first made its IPO. "Over-the-counter" refers to the trading of these and other stocks in settings not hosted by a

The transition away from floor-based trading was also sown by the Paperwork Crisis of the late 1960s, when a steady rise in trading volume—led by increased trading on the part of institutional investors for mutual funds and pension funds—crippled the clearing and settlement 'back offices' of NYSE member brokerages, leading to waves of mergers and departures of over a hundred firms from the exchange.[23] A subsequent investigation by the SEC (1971) led to a deliberate centralization of securities and the formation of the Depository Trust Company (DTC) in 1973, and the centralization of clearing and settlement services in the form of the Securities Industry Automation Corporation (SIAC) (Keith & Grody, 1988).

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formal exchange. (SEC, 1963, p. 657). Sperry Rand was then one of the 'seven dwarves' of computer manufacturing in competition with IBM.

[23]Wells (2000); NYSE (1971).

Centralized quotations and automated execution: NASDAQ and Instinet

By 1971, NASDAQ—the automated quotation system of the National Association of Securities Dealers—was operational, linking hundreds of market-makers to a pair of Univac 1108 mainframes in Trumbull, CT.[24] NASDAQ did not provide for automated trade execution, but it did provide a centralized, electronic repository of extant dealer quotations. Institutional Networks (later Instinet), by contrast, was a registered broker-dealer with institutional investor subscribers (for example, pension funds and mutual funds) with dedicated lines to another Univac system in Watertown, MA. Unlike other electronic systems of the early 1970s, Instinet provided the facility for automated execution of anonymous block trades.[25]

In hearings before the House Subcommittee on Commerce and Finance (Study of the Securities Industry, 1972) and a subsequent Senate report (Securities Industry Study, 1973), the electronically centralized quotations of NASDAQ were taken in part as an inspiration for a proposed 'central market system' (later 'national market system' or NMS)[26]:

> While the various formulations of the concept [of a central market system] differ in important respects, they have all contemplated the existence of a communication system through which (1) all orders and quotations in a particular security would have an opportunity to meet, and (2) all transactions would be reported. (Securities Industry Study, 1973, p. 89)

In 1975, Congress passed the Securities Acts Amendments (Securities Acts Amendments, 1975). The acts, among other changes, ended the fixed commissions of NYSE members and

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[24]NASD was the self-regulatory organization (SRO) for OTC broker-dealers (Smith *et al.,* 1998).

[25]A 'block trade' is simply a large transaction - at least 10,000 shares, but often much more. On the founding of Instinet, see (Pardo-Guerra, 2014).

[26]'We.. note our satisfaction with the manner in which the NASDAQ communications system has been operating and intend to continue to monitor its operations and development in order to determine whether any modifications may be necessary as the evolution of a central market system progresses' (Study of the Securities Industry, 1972, pp. 3447–3448).

directed the SEC to establish a National Market System, although details on how such a system was to be implemented were vague (Macey & Haddock, 1985). It called for 'fair competition among brokers and dealers, among exchange markets, and between exchange markets and markets other than exchange markets'.[27]

The existing centralized quotation systems—albeit only used on over-the-counter (OTC) stocks—thus made it possible to imagine a National Market System as a centralized limit order book (CLOB) (Pardo-Guerra & MacKenzie, 2014). The National Market System amendment introduced rules to facilitate the construction of an NMS, including the 'Last Sale Rule'[28], 'Quote Rule' (or 'Firm Quote Rule'),[29] and 'Display Rule'.[30] Technological developments subsequent to the 1975 Securities Acts Amendments include the establishment of the Consolidated Tape Association (CTA) (to implement the Last Sale Rule)[31], the Consolidated Quote System (CQS) (to implement the Quote Rule[32]; and the Intermarket Trading System (ITS), which allowed orders placed on the NYSE to be executed on a regional exchange (via networked 'chat room'-style terminals).

Electronic trading platforms in the 1990s

An exchange had been defined in the Securities Exchange Act of 1934 in the following way:

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[27]The amendment relating to the National Market System is section 11A (Securities Acts Amendments, 1975, pp. 111–112).

[28]The Last Sale Rule (originally rule 17a-15 in SEC Release 34-9850 in 1972) required the dissemination of trade execution information in exchange-listed and NASDAQ stocks on some real-time reporting system. (The 'last sale' is the last transaction price for a security, on any market.)

[29]The Quote Rule is 240.11Ac1-1, 'Dissemination of Quotations. It required brokers/dealers to send its quotes to exchanges, and for those exchanges to make those quotes available.

[30](Lee 1998, pp. 124-126). The Display Rule is 240.11Ac1-2.

[31]Before the Consolidated Tape, information on the last-sale price was provided by NYSE or Amex ticker tapes or electronic displays (Seligman, 1984, p. 86).

[32](Lee, 1998, p. 126).

> The term 'exchange' means any organization, association, or group of persons, whether incorporated or unincorporated, which constitutes, maintains, or provides a market place or facilities for *bringing together purchasers and sellers of securities* or for otherwise performing with respect to securities *the functions commonly performed by a stock exchange as that term is generally understood*, and includes the market place and the market facilities maintained by such exchange. [emphasis added] (Securities Exchange Act, 1934, sec. 3.(a)(1))

Institutions registered as exchanges are classified as *self-regulatory organizations* (SROs), which are obliged, by the 1975 amendments to the Securities Exchange Act, to enforce a variety of conditions, to 'prevent fraudulent and manipulative acts and practices', to 'promote just and equitable principles of trade'.[33]

By contrast, a *broker* and *dealer* were defined as:

> The term 'broker' means *any person engaged in the business of effecting transactions in securities for the account of others*, but does not include a bank. [emphasis added] (Securities Exchange Act, 1934, sec. 3.(a)(4))

> The term 'dealer' means *any person engaged in the business of buying and selling securities for his own account*, through a broker or otherwise, but does not include a bank, or any person insofar as he buys or sells securities for his own account, either individually or in some fiduciary capacity, but not as a part of a regular business. [emphasis added] (Securities Exchange Act, 1934, sec. 3.(a)(5))

The distinction between the 'exchange' and the 'broker' were established in a world where the latter was strictly subjugated to the former. That is to say, brokers needed the exchange to provide them with opportunities for finding counterparties to their trades. Additionally, brokers

[33]Securities Acts Amendments (1975, pp. 105–106); Lee (1998, pp. 118-120).

were subject to the rules and regulations of the exchange. Thus, when these terms were defined, there was never an assumption that any individual broker or broker-dealer might be providing 'the functions commonly performed by a stock exchange as that term is generally understood'. But by the late 1980s, this was precisely what Instinet had been doing for decades (see Figure. 3.)

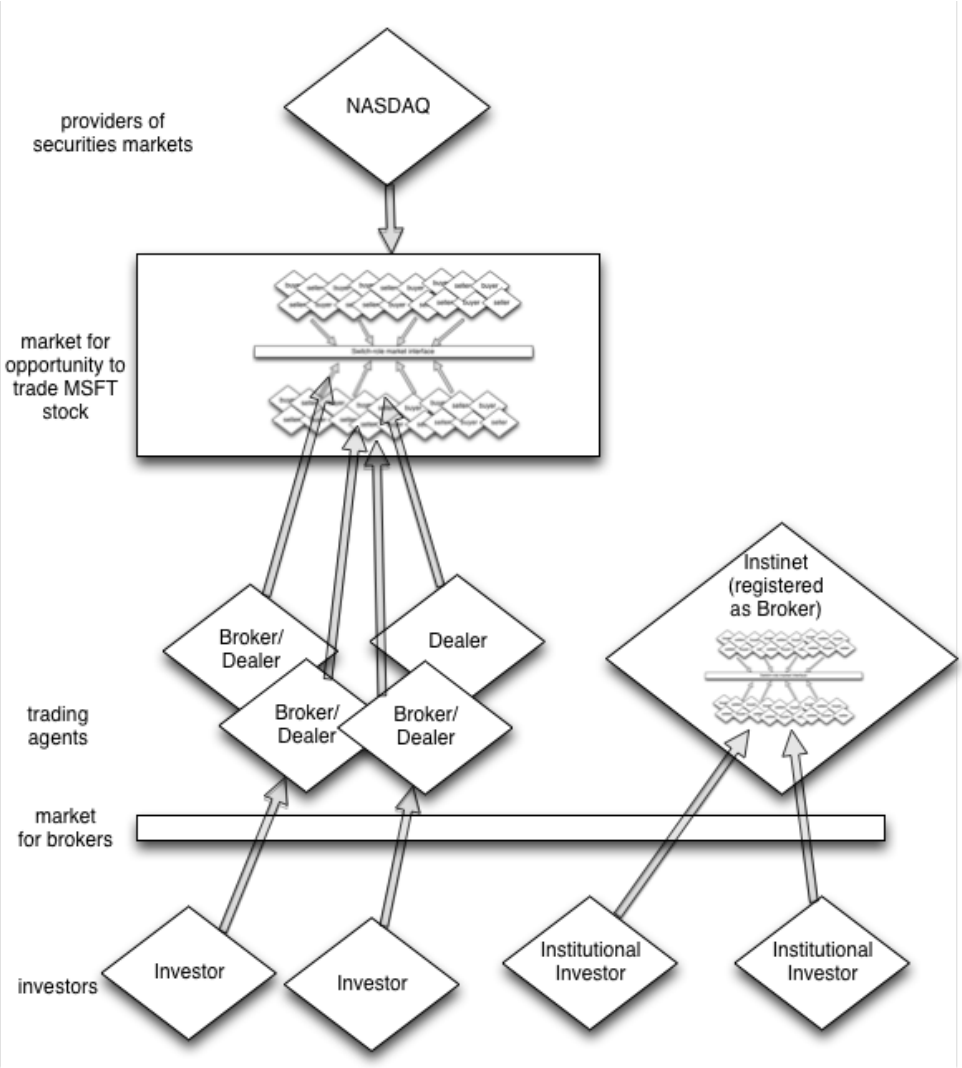

Figure 3 Instinet disrupts the market for financial markets by being registered as a broker, but functioning as an exchange.

Source: Compiled by authors.

In the section to follow, we shall examine—via a combination of SEC pronouncements, congressional hearing transcripts, and comment letters by institutional actors—how the dissolution in the distinction between an exchange and a broker-dealer was, in part, the outcome of technological changes. But automated trade execution platforms had made only a limited impact on the exchange landscape, until a distinct political development—the NASDAQ odd-eighths scandal, described below—motivated the further elaboration of NMS-related regulations (the 1996 Order Handling Rules); these regulations in turn legitimated a variety of competing broker-dealer systems, known as *electronic communication networks* (ECNs). In response to the emergence of the ECNs, the SEC ultimately passed a resolution in 1998, Regulation ATS (for 'Automated Trading Systems'), which finally permitted ECNs the choice to be regulated as either exchanges or as broker-dealers, and thereby redrawing the demarcation lines between broker and exchange.

Our sources include four major SEC proposals and subsequent sets of comment letters: 'Proprietary Trading Systems' (1989);[34] 'US Equity Market Structure Study' (1992);[35] 'Order Execution Obligations' (1995)'[36] and 'Regulation of Exchanges and Alternative Trading Systems' (1998)[37]. A schematic diagram summarizing the period under discussion here, including each of these four major SEC proposals, is provided in Table 2. We coded 107 comment letters from institutionally-affiliated actors and individuals across the four proposals, ranging from incumbent or traditional exchanges, new alternative exchanges, academics, government agencies, investors and investment institutions, and other financial services firms; noting their support for the proposal in question (where stated), as well as references to particular categories of arguments described below (fair competition, fragmentation, investor protection, and transparency). We also examined the proceedings of a 1993 set of hearings before the US House Subcommittee on Commerce and Finance along similar lines.

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[34] Release No. 34-26708; File No. S7-13-89 (SEC, 1989).

[35] Release No. 34-30920; File No. S7-18-92 (SEC, 1992).

[36] Release No. 34-36310 (proposal), Release No. 34-37619A (final); File No. S7–30–95.

[37] Release No. 34-39884 (proposal), Release No. 34-40760 (final); File No. S7–12–98.

During the first stage of data analysis, we surveyed the existing secondary literature on regulatory change in US securities law from the late 1980s to late 2000s, and compiled a chronological event history database (Van de Ven & Poole, 1990), observing the dialectical relationships between structures (regulatory pronouncements and proposals) and communicative events (including available comment letters and testimonials) (Fairclough, 1992) of interest. In the second stage of data analysis, we identified the four structures—SEC proposal releases (and corresponding enacted rules, when available) in 1989, 1992, 1995, and 1998—most crucial to the technical and regulatory transition of the nature and definition of the exchange. Using an inductive, interpretive approach, the comment letters submitted in response to each of these releases were read and categorized by at least two researchers familiar with the entire dataset (Campbell *et al.*, 2013).[38] As shown later in Table 4, letter writers were categorized by entity type (incumbent exchange, new exchange, investor, etc.) The letters were also broadly categorized by their support or opposition to the proposal. We then analysed the content of each letter as compared to the others in the aggregated letter corpus and identified recurring themes and key vocabularies. Each letter was then coded with these themes and key vocabularies in mind. Table 4 shows the distribution of comment letters with respect to these codes over time, and these categories, shifts, and representative insights assisted in developing the analysis to follow.

Table 2: Timeline of events and the different actors

New Exchanges For example, Instinet, Madoff Securities	Develop platforms to match security trades; registered	Strongly oppose narrow definitions /tight rules; claim it would stifle	Advocate the ability to continue matching orders citing the benefits	Seek to broaden definition of 'exchange'; seek 'no-action' with	Express support of the proposal; begin discussing the import of

[38] Only partial online coverage was available for the SEC comment letters for these proposals; the majority of the comment letters were scanned from the National Archives II in College Park, Maryland (Accession No. 266-07-0121), converted to plain text (when possible) via OCR software, and manually cleaned during reading for various conversion errors.

	as broker, but increasingly function as exchanges	competition	of exchange fragmentation and transparency of pricing data (essential to their business model)	respect to their activities; customers and business partners join the lobbying effort	investor protection
Incumbent Exchanges For example, NYSE (as member-owned, non-profit cooperative), AMEX	Express concerns regarding 'renegade' exchanges	Strongly support; advocate tight definitions and uniform application of regulations (to hinder competition)	Discuss the perils of unregulated fragmentation and need for investor protection	Focus on the role of regulation to ensure 'investor protection'	Express (reluctant) support so long as 'investor protection' is ensured; express concern over unfair regulatory burden; begin operating new exchanges
State SEC (primarily), Congress		Proposes strict definitions and regulation of trading systems	Expresses concern between the balance of investor protection and innovation; conducts hearings and research; solicits opinions	Rules buttress incumbent exchanges while not outlawing the activities of new exchanges; begin issuing no-action letters shortly thereafter	Creates lenient, bifurcated regulatory definitions/ apparatus

Source: Compiled by authors.

The regulation of a disrupted production market

In 1991, SEC Chairman Richard C. Breeden announced the commencement of a 'thorough and comprehensive study of the current market structure', entitled 'Market 2000' (Breeden, 1991). The subsequent SEC request for comments stated that the SEC believed that 'computerized trading systems, whether operated by securities markets or by broker-dealers, are generally consistent with the objective of linking all securities markets through communication

and data processing facilities' (SEC, 1992, p. 32601). Another document, co-written by members of the SEC's Division of Market Regulation, admitted the inevitability of such systems, but raised concern:

> ..the rate of technological change has become so great that other, equally revolutionary developments seem to follow in almost stupefying rapidity. Thus, we find ourselves attempting to make difficult choices concerning what time and place limitations we will choose to retain, if any, in the absence of any lingering physical or technological necessity, all the while being bombarded by continuing automation advances that sometimes make even our most recent market structure and regulatory decisions seem already archaic. (Becker *et al*., 1992, p.328)

It is important to explain why the SEC seems to be ambivalent about a transformation which might be considered consistent with an NMS initiative that, at that point, was over 16 years old. We can do so by simultaneously emphasizing sociotechnical and technopolitical perspectives.

A *sociotechnical* understanding would emphasize the presence of actors and their associated technologies and techniques as asymmetric prostheses. For example, the innovations by Instinet and other ECNs were definitively interconnected to practitioners and technologies from outside the financial industry. The founders of Instinet (Weeden & Co.) did so not because of an internally developed matching system, but because they had also funded Keydata Corporation in Watertown, MA, which provided time-sharing computing services (founded by Charles Adams, a member of MIT's real-time Project Whirlwind) (Pardo-Guerra, 2014).

A *technopolitical* perspective would recognize the (currently understudied) role of relevant patents on the part of Charles Adams and others.[39] But it would also account for the relative ignorance towards technology on the part of the SEC as an organization and institution,

[39]Adams' 1969 patent is 'Instinet communication system for effectuating the sale or exchange of fungible properties between subscribers', US3573747 A.

historically primarily composed, as it is, of securities lawyers without formal training in engineering or computer science fields (Khademian, 1992). These 1991 and 1992 discussions followed in the wake of an earlier SEC proposal in 1989—on which the SEC ultimately did not take action—which floated the concept of regulating 'proprietary trading systems' like those of Instinet (SEC, 1989). The comment letters reveal a strong preference on the part of incumbent exchanges for regulation, and an equally strong preference on the part of the firms running the proprietary systems to remain registered as, for example, broker-dealers. While these discussions remain at a theoretical and legalistic level and do not actively discuss the materiality of their systems, their positions emphatically indicate the role of these technological systems in the debates to come.[40]

Market 2000: study of US equity market structure

Noting the technological challenge to their existing regulatory definitions, in July 1992 the SEC released a request for comments on the ongoing study to US equity market structure (SEC, 1992). In order to frame the parameters of the transformation of the exchange, we will enumerate the most important—and, perhaps, problematic—concepts mentioned in this document release, including:

- *Best execution*: There is an assumption that greater transparency (see below) and a 'linked market' will lead to better trade execution.
- *Transparency*: This involves the 'real-time' dissemination of quotations and trade information.
- *Market fragmentation*: The idea that markets are 'two-tiered'—one for institutional investors and one for individual investors—is raised.

[40] By contrast with the above perspectives, it is worth noting the relative weakness of the concept of *performativity of economics* in the case of the transformation of the exchange industry. In the construction of automated quotation and trade execution systems there is little neoclassical economitc theory to be found, despite the (incorrect) possibility of imagining these systems as physical manifestations of a hypothetical Walrasian-equilibrium generator (this is to say that, in practice, continuous order matching via a CLOB does not correspond with Walras' depiction). In fact, Frederick Nymeyer, who submitted a CLOB-style patent around the same time as Smith, was inspired by Austrian economics, which denied the existence of a single market-clearing price (Pardo-Guerra, 2014, p. 22). Moreover, one finds little theory of industrial organization cited in the regulatory debates, besides the abstract invocation of notions of competition and fairness.

- *Competition*: The document explicitly asks, 'is ‘fragmentation’ simply another word for ‘competition’?' (SEC, 1992, p. 32595)
- *Liquidity*: It is also held that the dispersal of order flow in the situation of fragmentation may 'impair liquidity'.

Each of these concepts can be considered in turn. 'Best execution' is defined most generally as traders receiving favourable outcomes for their trades; in securities law discussions, brokerages are obliged to execute a customer’s order at the best available price, though there is no existing definitive statement of what constitutes best execution (Macey & O’Hara, 1997, p. 190). However, when multiple trading venues are available with different bid-ask spreads, parameters and commissions for trade execution, it is not always clear what constitutes the most favourable trade. For example, one reason held for the moderate success of Instinet and POSIT in an era dominated by the incumbent NYSE is that institutional investors could execute large trades while reducing the 'price impact' or 'market impact'- i.e. the financial market’s dynamic response to the elements of *phatic* communication in the act of trading[41]—that such trades would have on the public exchanges. As Larry Harris (1996) put it, 'Best execution means different things for different people' (Harris, 1996, p. 1).

Transparency is a word that often indicates a philosophical tendency towards a single, accessible consolidated limit order book (CLOB). As such it represents a comparable paradox to that of 'best execution', which is that some traders will be discouraged from the 'transparent' exposure of their limit orders. However, it is clear that a lack of transparency on the part of market-makers has led to excess spreads and high commissions in some exchanges.[42] One can imagine the sociologically appropriate position to take with respect to transparency is one of ontological heterogeneity, not just of traders (as in the case of 'best execution') but of firms in competition with one another. With complete order book transparency, there is little one can do to distinguish oneself as an exchange except to compete on execution speed. But the success of

[41] On phatic communication, see Jakobson (1960). In the 2000s, the competitive proliferation of 'maker-taker' pricing - which grants various rebates to either 'liquidity suppliers' (those 'makers' posting marketable limit orders) or, alternatively, to those 'takers' submitting the orders which match them - further complicated this notion of best execution (Foucault, 2012).

[42] The exemplary case of this was, of course, the NASDAQ odd-eighths scandal (Christie & Schultz, 1994).

contemporary 'dark pools' helps show that transparency is not always a positive feature for traders and exchanges, and that the population of trading services firms in a 'fragmented' environment is likely to always include producers of both ‘lit’ and ‘dark’ financial markets.

Market fragmentation is an especially slippery phrase, with an inherent pejorative sense for many, and for which our introductory distinction between fixed-role and switch-role markets can be applied. Fragmentation at the level of the exchange industry would seem to be a good thing for those who want to improve competition (as opposed to the monopolistic qualities of the NYSE in the 20th century, for example.) The market microstructure literature refers to the basic fragmentation of 'upstairs' trading (executing large blocks in a dealer market as opposed to the NYSE floor) as 'rational fragmentation', as it is used to reduce the price impact of large trades (Madhavan, 2000, p. 227). But fragmentation at the level of the switch-role financial market—where the confluence of more buyers and traders results in the 'positive externality' of the best prices—it would seem that fragmentation is problematic at best.

Competition is a concept which is unavoidable with respect to switch-role markets but, according to (White (1981a), somewhat different for fixed-role markets, as one rarely finds a state of 'pure competition' in the analysis of production markets. Some commentators are, indeed, thoroughly aware that competition in switch-role and fixed-role markets must be keenly distinguished:

> The competition among traders to obtain the best price and the competition among exchange service providers to provide exchange services often are incompatible with each other. Policies that would improve one competition typically harm the other. The pro-competitive position on any issue affecting both competitions—which includes most issues—therefore is rarely unambiguous. (Harris, 2010, p. 106)

Finally, *liquidity*—referring to the presence of sufficient market interest to be able to transact large amounts of a given security at reasonable prices in a short time frame— is a fascinating category, especially in the context of HFT, where debates emerge over whether HFTs

are 'providing/offering liquidity' or whether they are 'taking liquidity'.[43] An important aspect here is the facility for high-frequency algorithms to post and then quickly retract limit orders as they became unfavourable due to market conditions elsewhere (Dolgopolov, 2014).

National Market Hearings (1993)

Subsequent to the 1992 request for comments, in the spring and summer of 1993, the House Committee on Telecommunications and Finance held a series of hearings (National Market System, 1993) focusing on the 'Market 2000' initiative, inviting representatives from many exchanges and other industry institutions to give remarks and respond to Congressional questions; this included the Presidents and Chairmen of the NYSE, AMEX, the National Association of Securities Dealers (NASD), various regional exchanges, and various firms engaged in proprietary trading systems (including Instinet, Lattice, ITG, Madoff, and the Arizona Stock Exchange (AZX)[44]).

The published Market 2000 document (27 January 1994) provides a snapshot of the US securities exchange industry circa 1994. At that time, 97per cent of the market value for listed companies was at the NYSE, with the AMEX and regionals at 3 per cent. Half of NYSE volume were block transactions. Regional exchanges accounted for 20 per cent of NYSE stock trades. The 'third market' (OTC trading of NYSE-listed securities) accounted for 9.3 per cent of trade volume; and proprietary trading systems had only 1.4 per cent of NYSE share volume and 13 per cent of NASDAQ share volume. [45]

While many of the actors speaking in the National Market Hearings were of high rank and though (testifying as they were before Congress) one cannot take their comments at face value, the discussions are particularly interesting, especially on contentious issues, and have helped us categorize the main classes of competitors in the market for trading services. Three of the issues

[43]Harris (1991) is an excellent discussion of liquidity.

[44]Steven Wunsch's Arizona Stock Exchange was, at the time, the only proprietary trade execution system actually registered as an exchange.

[45] SEC (1994, pp. 7–9).

are highlighted in Table 3: *fragmentation*, *payment for order flow* and *regulatory burden*. The provided quotes intend to highlight the extent to which each category of dispute reveals the interests of the institutional actors in question.

Table 3: Arguments regarding fragmentation, payment for order flow, and regulatory burden in 1993 'National Market System' Hearings (National Market System, 1993)

	SPEAKER	EXCHANGE TYPE	QUOTE FROM NATIONAL MARKET HEARINGS (1993)
FRAGMENTATION	James R. Jones (Chairman, AMEX)	Incumbent	'..because SelectNet and other proprietary trading systems do not allow for widespread dissemination of trading interest, they result in increased fragmentation and reduced market transparency'.
	Joseph Hardiman (President, NASDAQ)	Over-the-counter (OTC)	'..opponents of competition for order flow.. must demonstrate that competition for order flow has led to palpable harm and that a monopolistic approach would lead to palpable improvement. We believe neither is possible'.
	Bernie Madoff (Chairman, Madoff Securities)	Broker-dealer / 'Third market'	'By definition, any time more than one participant marketplace is involved in trading a particular security that could trade elsewhere, there is fragmentation..'.
PAYMENT FOR ORDER FLOW	William H. Donaldson (Chairman, NYSE)	Incumbent	'I think cash payments should be outlawed'.
	Joseph Hardiman (President, NASDAQ)	Over-the-counter (OTC)	'..the [discount/regional] firms that are receiving the payment for order flow are, indeed, charging lower commissions to their customers'.
	Bernie Madoff (Chairman, Madoff Securities)	Broker-dealer / 'Third market'	'[T]he exchanges had offered numerous noncash inducements such as reciprocal order routing arrangements, clearing discounts, credits, and other free services... We found that one of the most effective ways of overcoming the primary exchange monopolies was payment for order flow'.
REGULATORY BURDEN	Leopold Korins (Chairman, Pacific Stock Exchange (PSE))	Regional	'..The systems that have been developed... should have to conform to the same type of SRO [self-regulatory organization] requirements that we as exchanges guard very jealously. And to establish entities that appear to be exchanges and operate like exchanges but don't have any of the obligations of exchanges, we think is an unfair burden upon us'.
	Edward A. Kwal-wasser, (Executive	Incumbent	'Before any trading system initially begins operation, there should be a thorough review of all aspects of the system and the system should meet

	Vice President, NYSE)		certain investor protection standards'.
	Michael O. Sanderson (President, Instinet Corp.)	Alternative Trading System (ATS)	'Regulation of Instinet as a broker is reasonable and appropriate. Regulation of Instinet's activities other than as a broker would discourage innovation in the securities industry'.

Source: Compiled by authors; quotes from National Market System (1993).

The Order Handling Rules (1996): the Limit Order Display Rule and amended Quote Rule

Characteristic of the distinction between dealer-based markets (like NASDAQ) and those based on order matching (for example, the NYSE) was the absence, in dealer markets, of public limit orders (Cohen *et al*., 1986, p. 19), even if there existed limit orders better than the current market-maker's quote for a security. A well-publicized study in 1994 (Christie & Schultz, 1994) revealed the possibility of collusion on the part of NASDAQ dealers to keep quote spreads artificially wide (revealed in their data because the dealers' convention was to stick to even-eighths quotes and avoid odd-eighths quotes). A subsequent release proposed that quotes be published openly whenever an exchange or market-maker trades more than 1 per cent of a security's aggregate volume (SEC, 1995).

Up until the adoption of these 'Order Handling Rules' in September 1996, a NASDAQ broker-dealer would have no obligation to alter their quote in the system to reflect an incoming customer limit order.[46] The SEC had found the existence of a 'two-tiered market' where market-makers would 'routinely trade at one price with retail customers and at better prices with ECN subscribers', and insisted that '*all* investors' should be able to fill orders at the best offered price (SEC, 1996, p. 48308). The Limit Order Display Rule required that customer limit orders better than a market-maker's quotes must be reflected in those quotes (or forwarded to another [entity] that will display the order) (Smith *et al.*, 1998). The amendment to the Quote Rule includes the

[46]The proposed rules are SEC (1995); The final rules are in SEC (1996). The Limit Order Display Rule is Rule 11Ac1-4; the amended Quote Rule ('ECN Alternative' to 'Dissemination of Quotations') is Rule 11Ac1-1.

'ECN Amendment' which requires market-makers to publicly post any limit orders sent to ECNs which are better than the extant public quote (Odders-White, 2004, pp. 280–281).

Interestingly, very few of the public comment letters supported this proposal without reservation, and even the ECNs (or the firms investing in future ECNs) had reservations about the new rules. One future ECN investor, Bear Stearns, instead proposed their own limit order book technology (which would make that technology the valuable centre of calculation instead of the quote-broadcasting complexities of the SEC proposal). Other ECNs, like Instinet, appear to have met only in private, with only brief summary memorandums available in the SEC's archives. Unsurprisingly, broker/dealers, looking forward to better prices for their customers, widely supported the proposal (see Table 5.)

The order handling rules, once finalized, 'brought the order-driven market into the quoted market' (Schwartz *et al*., 2013, p. 20). It allowed ECNs to post orders in the NASDAQ quote montage, and potentially, fill it themselves (at a lower cost).[47] With this situation in place, ECNs were effectively no less powerful than NASDAQ dealers, and potentially more inexpensive for traders. (See Figure. 4.) The industry had changed overnight, and when anyone can run their own exchange with electronic access to the same buyers and sellers, one might ask: just what *did* it mean to be an exchange versus an ECN?[48]

[47]Angel *et al*., (2011, pp. 33–34). (The NYSE had a higher latency of placing and canceling orders.)

[48]For more on the effect of the Order Handling Rules, see Schwartz & Francioni (2004, pp. 229–230). According to Schwartz & Francioni (2004, p. 241), 'A market maker could use a Nasdaq system (SelectNet) to send an order it has received to another market maker or to broadcast the order to all market makers. As quote providers, an ECN could also connect directly into SelectNet. SelectNet included a negotiation feature that allows a participant (market maker or ECN) to accept, reject, or counter a received order'.

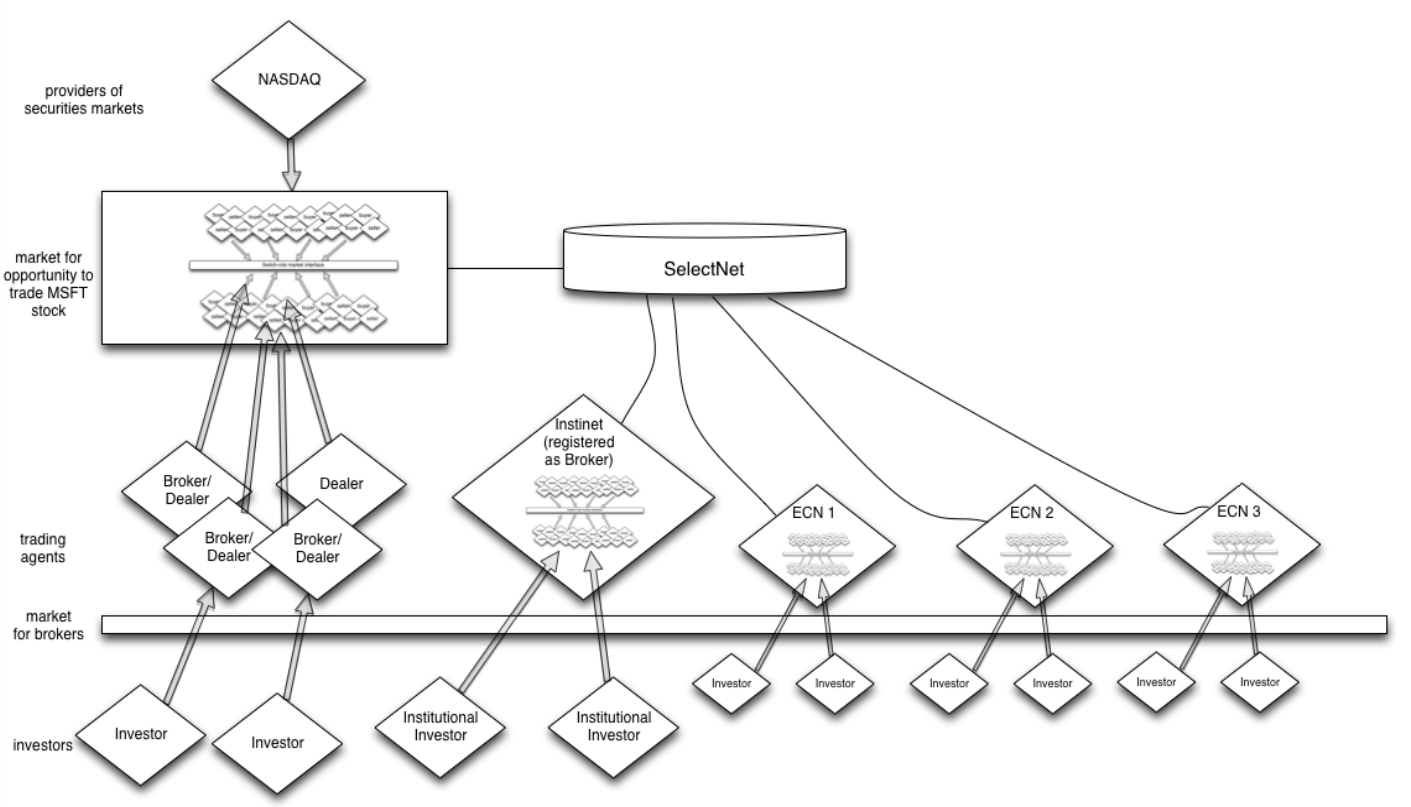

Figure 4 ECN disruption via direct access to NASDAQ quote montage.

Source: Compiled by authors.

Table 4 (a, b, c, d): Analysis of SEC comment letters for relevant releases in 1989, 1992, 1995 and 1998

1989: **Proprietary Trading Systems (SEC S7-13-89)**					
Entity Type	**Support**	**Fair Competition**	**Fragmentation**	**Investor Protection**	**Transparency**
Incumbent	4/4	3/4	1/4	0/4	0/4
New Exchange	0/4	2/4	0/4	1/4	0/4
Investor	-	-	-	-	-
Academic	-	-	-	-	-
Financial Institution	1/1	1/1	0/1	0/1	0/1
Industry Association	-	-	-	-	-
Broker/Dealer	-	-	-	-	-
Government	-	-	-	-	-
Service Provider	0/1	0/1	0/1	0/1	0/1

1992: **US Equity Market Structure Study (SEC S7-18-92)**					
Entity Type	**Stated opposition to no-action**	**Fair Competition**	**Fragmentation**	**Investor Protection**	**Transparency**
Incumbent	1/10	5/10	8/10	6/10	6/10
New Exchange	0/6	2/6	5/6	1/6	4/6
Investor	0/8	1/8	5/8	3/8	5/8
Academic	0/7	0/7	1/7	1/7	0/7
Financial Institution	0/2	0/2	2/2	0/2	0/2
Industry Association	0/2	1/2	0/2	1/2	1/2
Broker/Dealer	0/2	0/2	2/2	0/2	2/2
Government	0/2	0/2	2/2	0/2	2/2
Service Provider	0/1	0/1	0/1	0/1	0/1

1995: **Order Execution Obligations (SEC S7-30-95)**					
Entity Type	**Support**	**Fair Competition**	**Fragmentation**	**Investor Protection**	**Transparency**
Incumbent	3*/4	1/4	0/4	3/4	2/4
New Exchange	0**/3	0/3	1/3	0/3	1/3
Investor	4/7	1/7	1/7	1/7	5/7
Academic	0/2	0/2	1/2	0/2	1/2
Financial Institution	2/7	0/7	2/7	0/7	6/7
Industry Association	-	-	-	-	-
Broker/Dealer	6/8	0/8	1/8	0/8	4/8
Government	1***	0/1	1/1	0/1	1/1
Service Provider	-	-	-	-	-

* with various caveats and reservations

**Some existing ECNs absent; Instinet meeting in private only

*** supports parts

1998: **Regulation of Exchanges and Alternative Trading Systems (SEC S7-12-98)**					
Entity Type	**Support**	**Fair Competition**	**Fragmentation**	**Investor Protection**	**Transparency**
Incumbent	7*/8	3/8	2/8	4/8	4/8
New Exchange	5/5	1/5	2/5	4/5	3/5
Investor	2/7	0/7	1/7	0/7	4/7
Academic	-	-	-	-	-
Financial Institution	0/1	0/1	0/1	1/1	1/1
Industry	1/2	0/2	0/2	1/2	1/2

Association					
Broker/Dealer	-	-	-	-	-
Government	-	-	-	-	-
Service Provider	1/2	1/2	0/2	0/2	-
* with caveats: if implemented a certain way, wanted assurance of equal treatment of exchanges and non-exchanges					

Source: SEC Comment Letters from National Archives II in College Park, Maryland (Accession No. 266-07-0121).

Regulation ATS (1998) and the semantics of the exchange

In 1997 the SEC issued a Concept Release for what came to be known as *Regulation ATS* ('Regulation of Exchanges' (SEC, 1997)); after a comment period, the final rules were released in 1998 (SEC, 1998). It provided a new definition of 'exchange':

> The statutory definition of 'exchange' includes a 'market place or facilities for bringing together purchasers and sellers of securities or for otherwise performing with respect to securities the functions commonly performed by a stock exchange'. The new rule interprets these terms to include *any organization, association, or group of persons that: (1) Brings together the orders of multiple buyers and sellers; and (2) uses established, non-discretionary methods (whether by providing a trading facility or by setting rules) under which such orders interact with each other, and the buyers and sellers entering such orders agree to the terms of a trade.* (SEC, 1998, p. 70848)

The primary discursive difference here is from a focus on bringing together *purchasers* over bringing together *orders*. This is not precisely a transformation in the *ontology* of the exchange, because floor-based trading is also characterized by a flow of such orders. However, it is a transformation in the (legal) *semantics* of the exchange: a move from seeing an exchange as a place where buyers and sellers of securities (or, more specifically, their agent intermediaries) are brought together to a place where orders (which may have a variety of origins) are brought together.[49]

Ultimately, as Karmel (2002, p. 89) describes, although the SEC did manage to redefine the 'exchange' from its previous interpretations, the goal of Regulation ATS appears to be 'to force ATSs with substantial volume in [National Market System] quotation and transaction reporting rules, [and] not to change the way in which exchanges operate or are governed'. The

[49] The phrasing 'non-discretionary methods', it is explained, is meant to distinguish matching algorithms from the activity at traditional block trading desks which would 'shop around' and break up a customer order (SEC, 1998, 70851). For general remarks on Reg ATS, see Domowitz & Lee (2001).

transformation of the exchange was thus a legal construction which legally sanctioned a technological shift which had already occurred.

Table 5: Outcomes for ECNs in the 2000s

ECN	FOUNDED	ORIGINAL OWNERSHIP	OUTCOME
Instinet	1967	Institutional Networks	Sold to Reuters (1985), Merged with Island ECN (2002), Acquired by NASDAQ (2005)
Redibook	1992	Spear, Leeds & Kellog, others	Merged into Archipelago, 2002
Tradebook	1996	Bloomberg	Still operating
Island	1997	Datek Online Holdings (majority)	Acquired by Instinet in 2002
Archipelago	1997	Terra Nova Trading	Sold to investors in 2000; Sold to Instinet in 2002, rewrote Instinet's matching engine
BRUT (Brass Utility)	1998	Multiple firms, later Sungard Data Systems	Sold to NASDAQ (2004)
Strike	1998	Bear Stearns	Merged with BRUT (1999)

Source: Some data from (Liebenberg, 2002, p. 77).

Conclusion: the customer as competitor, and the valuation of marketplace platforms

> Over time, exchanges have been behaving more like intermediaries, and intermediaries have been behaving more like traditional exchanges. (Cybo-Ottone, Noia, & Murgia, 2000, p. 224)
>
> 'All natural economic distinctions between stock exchanges and broker dealers have broken down... Exchanges and brokers are now doing exactly the same thing'—Benn Steil. (Alpert, 1999, p. 22)

The above quotes indicate the situation at the end of the century: in an exchange industry which now obliged the exposure of orders and quotes, the very foundations of the former production market—in which exchanges would sell the facility to trade downstream to traders via intermediating brokers—had collapsed. The subsequent decade in the exchange industry was dramatic, including the rapid demutualization of major exchanges and waves of mergers (see Table 5 for an enumeration of the acquisitions and mergers of the ECNs of the late 1990s) (Domowitz, 1995). In 2002, another analysis by Benn Steil concluded:

> The inexorable trend toward securities exchanges operated as for-profit public companies with nonmember ownership is a direct product of the automation of trading systems. (Steil, 2002, p. 80)

Such a statement, *prima facie*, represents perhaps the quintessence of technopolitics. In this case a major industrial transformation has as its primary causal factor the implementation (and clones thereof) of an electronic version of a trading floor specialist's limit order book. While our work here does not examine the twenty first-century exchange landscape, it is difficult to ignore the essential conceptual tension here between a unified, single (monopoly) network and the chaos that ensues when (as with the 'National Market System' concept) a regulatory agency

attempts to unify (fixed-role) providers of (switch-role) financial markets which, effectively, become fast-paced clones of each other.

The exchange industry scholar Ruben Lee in 2002 predicted, given the many sources of income of an exchange (i.e., the multiple production markets for which the firm takes the role of a seller)—including 'fees for listing, trading, clearing, and settlement, and charges for the provision of company news and for quote and trade data' —that the exchange industry had found itself in a similar position to the media industry (via digital distribution of content and increasingly online advertising marketplaces):

> In the language of the media industry, which they will effectively have joined, exchanges will be content providers. As such, they are likely to mimic the activities of other similar media companies. (Lee, 2002, p. 2)

Lee points out that as the marginal cost of executing a transaction gets close to zero, competition between exchanges will lead to increased *payment for order flow*, or 'paying for the privilege of executing orders on their trading systems'. This had indeed already begun, with Island's introduction of so-called 'maker-taker' payments/fees, which gave a rebate to those 'makers' submitting standing limit orders, and added a fee to 'takers' executing market orders or marketable limit orders. Lee argued, correctly, that this would become the norm (Lee, 2002, pp. 1-2). His use of a media industry analogy is appropriate here, as so-called 'two-sided platforms' like newspaper firms subsidize readers (by providing free or inexpensive news) at the expense of advertisers (Evans, 2003). Another important remaining source of income, he suggests, would be quotation and sale data; and indeed, the income from these data feeds (as partially revealed in the newly demutualized firms' annual reports) became a prominent source of income for exchanges in today's fragmented, high-frequency markets.

Following the analysis and findings in this paper, we suggest that a first step can be made towards a new way of thinking about the sociological study of markets. Specifically, by explicitly distinguishing the specialized, distinctive properties of switch-role financial markets from those of fixed-role markets, we identify a potentially new field of economic processes worthy of

investigation; one which is as intriguingly and processually intermingled with economic theory as before, but corresponding with the differing jargon of *multi-sided markets* and *two-sided platforms* from twenty first-century industrial organization.

More generally, our study points to an impending theoretical and policy-oriented dilemma. On the one hand, various industries are already confronting the rise of marketplace-platform startups like Uber and Airbnb—which, like electronic exchanges, bring together buyers and sellers without any of the logistical concerns of materially-mediated supply-chain management. On the other hand, there exists the equally problematic alternative of intensive legal enforcement—in the name of competition and of securing some unified 'national market system'—which would oblige competing firms to expose their customers' bids and offers, thus potentially leading to a fragmented production market of various services where firms ruthlessly compete for flows of orders without ever being able to maintain even temporary network dominance. Furthermore, what, in such a technopolitical environment, such as the one which developed in financial exchanges and is only now being realized elsewhere, may stop any customer from implementing their own matching engine, and thus becoming themselves a competitor? This, we suggest, can be an agenda-setting question for economic sociology in the near future.

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