From Block Lords to Blockchain: How Securities Dealers Make Markets

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Technology is currently bringing a decisive wave of innovation and disruption to the financial industry. There are many promises and predictions of where this will go, but the best source of information for projecting the future's trajectory is history. History shows us that markets began decentralized, centralized from the 18th century around trading venues, and then gravitated again toward decentralization thanks to data transmission. The "gravity" that has shaped this process is broker-dealer choice. The medium in which the process has occurred is technology. Law has occasionally—but not always—played an important role.

Merchant firms of varying size and specialization have traded securities largely through private networks at least from 1200, and then since about 1800 in clubs and quasi-public organizations called "exchanges." Around 2000, major broker-dealers began to re-internalize trading into proprietary matching platforms, a return to private networks. The move to decentralization accelerated around 2015 with an intense interest in blockchain or other forms of distributed ledger technology.

Securities trading has thus migrated from private networks to public forums and appears to be returning to private networks again. This evolution has been shaped by law and technology, but is driven by the interests of the broker-dealers that both design and operate the markets. As trading concentrated in exchange venues slips into history, it is important to understand what is happening. The disintegration of securities trading, commonly understood as stimulating innovation and lowering trading costs through competition among matching platforms, is arguably reducing market quality for all other constituents, such as issuers, investors, regulators and the taxpayers who support them, while increasing control of the largest institutions over access to the market.

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I. INTRODUCTION: MAKING MARKETS

A. The Likely Return to Private Networks

As trading concentrated on major securities exchanges disintegrates, trading is returning to direct (now electronic) networks between major broker-dealers. For most of the roughly 1000 years during which there is historical evidence of debt instruments or shares of stock being exchanged, trades were executed over informal networks among merchants or other debtholders,[1] who met in market squares, designated city blocks, or their own offices.[2] With the notable exception of The Netherlands, concentrated trading on securities exchanges became the rule only from the 19th century.[3] Trading floors provided

1. *See* FERNAND BRAUDEL, CIVILIZATION AND CAPITALISM, 15TH–18TH CENTURY, VOL. 1, THE STRUCTURES OF EVERYDAY LIFE 472 (1992) [hereinafter BRAUDEL, EVERYDAY LIFE]; BAS VAN BAVEL, MANORS AND MARKETS: ECONOMY AND SOCIETY IN THE LOW COUNTRIES 500-1600 27 (2010); *see infra* Part II.B (discussing the history of broker-dealers).

2. Raymond de Roover, *Money, Banking, and Credit in Mediaeval Bruges*, 2 J. ECON. HIST. 52, 53 (1942).

3. The direct predecessor of the New York Stock Exchange was formed in 1792. *See, e.g.*, CHARLES R GEISST, WALL STREET: A HISTORY: FROM ITS BEGINNINGS TO THE FALL OF ENRON 13 (1997). The direct predecessor of the London Stock Exchange was formed in 1801. *See, e.g.*, RANALD MICHIE, THE LONDON STOCK EXCHANGE: A HISTORY 26 (2001).

an environment that allowed exclusion of non-members and control of information, and in which real-time, multilateral communication of offers and acceptances was possible, but electronic communication permits the same, with even higher efficiency. Market structure changes made at the outset of the 21st century began a trend that currently projects a return to decentralized networks among major broker-dealers.[4] This change has been advanced by the largest broker-dealers,[5] and it is unlikely that their initiatives are contrary to their own interests, but serious thought has not been given to how a full return to disintegrated trading would affect the interests of savers, issuers, regulators, and other concerned constituencies. The history of markets offers insight on this.

A return of trading to private networks affects "market quality," both in a narrow and in a broad sense. Although it is not customary in the literature to distinguish between narrow and broad concepts of market quality, such a distinction can be drawn by reference to the set of affected constituencies included in an analysis. A narrow (indeed the customary) examination of market quality focuses on how the market affects the interests of direct market participants, the broker-dealers licensed to trade in the market, assessing primarily trading costs and speed. Using this measure, it would be unusual for market structure innovations not to have a positive effect on market quality, for as Francioni and Schwartz remind us, broker-dealer members of exchanges find "investors and the listed companies . . . important primarily because they are critical for the profitability of the members. Nevertheless . . . the interests of the intermediaries come first."[6]

B. How We Measure the Quality of Securities Markets

Securities markets are built by the broker-dealers for the broker-dealers, but are not solely of the broker-dealers. Many of the securities traded are linked to returns from activity in the real economy, and many investors based in the real economy buy interests in traded securities. Nevertheless, regulators measure the quality of a market on the basis of benefit to its owners, not in connection with the broader economy. As Lee observes, though "mounting anxiety about the presence of conflicts of interests at market infrastructure institutions, and about whether governance mechanisms should be put in place to minimize the occurrence of such conflicts" has been the subject of detailed examinations and proposals,[7] little or no attention is given to the fact that broker-dealers and the institutions they own control the design of key infrastructure for national economies.[8] When a regulator is guided by a narrow concept of market quality, it essentially asks: have the

4. *See infra* Part IV (describing the development of market structures changing to decentralized networks). Essentially, it is a result of the Regulation National Market System in the U.S. and of the Market in Financial Instruments Directive in the E.U., interacting with changes in communications and computation technology. *Id.*

5. *See infra* Part IV.A (discussing data provided by the US Financial Industry Regulatory Authority (FINRA)).

6. ROBERT A. SCHWARTZ & RETO FRANCIONI, EQUITY MARKETS IN ACTION: THE FUNDAMENTALS OF LIQUIDITY, MARKET STRUCTURE & TRADING 93 (2004).

7. RUBEN LEE, RUNNING THE WORLD'S MARKETS: THE GOVERNANCE OF FINANCIAL INFRASTRUCTURE 2 (2011) [hereinafter LEE, RUNNING THE WORLD'S MARKETS].

8. The financial industry's choice and design of a settlement system for transfers of securities created the widespread use of the distinction between "registered" and "beneficial" ownership of a security and a very significant disruption of corporate governance. The SEC did not consider this to affect market quality when approving or revisiting the arrangement over a 30-year period. *See* David C. Donald, *Heart of Darkness: The Problem at the Core of the U.S. Proxy System and Its Solution*, 6 VA. L. & BUS. REV. 41, 43–46 (2011).

broker-dealers constructed a market for themselves from which they can extract maximum profits at minimum transaction cost?[9] While this may well include an assumption that the savings of broker-dealers will be passed on to the real economy, nothing in applicable theory or practice supports such an assumption.[10]

In contrast, a broad concept of market quality places the assessed market within the overall economy and evaluates its structure and performance in connection with that economy.[11] Broad market quality includes the effects of market design on investors and listed companies, regulatory budgets, and those broker-dealers who might be excluded from the market under a given structural arrangement.

How do leading regulators assess markets? On its website, the US Securities and Exchange Commission (SEC) declares a broad concept of market quality: "The mission of the US Securities and Exchange Commission is to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation."[12] However, it is very difficult to find evidence of this broad view in actual SEC assessments of market structure and behavior.[13] During the early 2010s, when the effects of market fragmentation and high-frequency trading were hotly debated, the SEC published two reviews it conducted of the relevant literature addressing those questions. It observed that in the papers on fragmentation it saw as important enough to be collected, "the metrics chosen to measure market quality . . . [were] quoted, effective, and realized spreads, quoted depth, short-term volatility, variance ratios of volatility of various durations, and autocorrelation in returns."[14] Although these metrics could arguably have an indirect impact on any aspect of society, they only directly affect the cost and ease of trading. No analysis of broader impact

9. Here is an example of such reasoning: "Is market fragmentation harming market quality? Our results suggest the answer is no. From a transactions cost perspective, fragmentation appears to reduce effective spreads and increase execution speeds . . . Moreover, while short-term volatility appears to have increased particularly for NYSE-listed stocks, overall efficiency seems to be enhanced in that stocks with more fragmented trading exhibit price behavior closer to being a random walk." Maureen O'Hara & Mao Ye, *Is Market Fragmentation Harming Market Quality?*, 100 J. FIN. ECON. 459, 471–72 (2011).

10. First, it is well known that volumes of proprietary trading far exceed brokerage trading, so that there is no one to pass cost savings on to for the majority of trades. *See* DAVID SKEEL, THE NEW FINANCIAL DEAL: UNDERSTANDING THE DODD-FRANK ACT AND ITS (UNINTENDED) CONSEQUENCES 87 (2011). Second, the price of a product or service is not determined by the cost of its component factors, but by what the market will bear. ISRAEL M KIRZNER, MARKET THEORY AND THE PRICE SYSTEM 41, 183–84 (1963). Third, while trading costs have decreased, the fees paid to the financial industry by savers have not. *See, e.g.*, Noah Smith, *Americans Savings Make Wealth Managers Rich: Advisers charge fees that are opaque or hidden, depriving investors of information needed to avoid excessive costs*, BLOOMBERG (May 16, 2017), www.bloomberg.com/view/articles/2017-05-16/americans-savings-make-wealth-managers-rich.

11. *See, e.g.*, JOHN KAY, DEPT. BUS. INNOVATION & SKILLS, THE KAY REVIEW OF UK EQUITY MARKETS AND LONG-TERM DECISION MAKING: FINAL REPORT (July 2012), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/253454/bis-12-917-kay-review-of-equity-markets-final-report.pdf. Kay considers the relationship between the U.K. equity markets and the U.K. real economy, concluding: "In the long run, the outcome has benefitted market participants more than market users." *Id.* at 86.

12. *What We Do*, SEC, https://www.sec.gov/Article/whatwedo.html (last visited Aug. 27, 2018).

13. *See, e.g.*, Donald, *supra* note 8, at 82–88 (discussing SEC regulatory failures in the design of market infrastructure).

14. DIV. OF TRADING & MKTS., SEC EQUITY MARKET STRUCTURE LITERATURE REVIEW PART I: MARKET FRAGMENTATION 5 (2013), www.sec.gov/marketstructure/research/fragmentation-lit-review-100713.pdf. [hereinafter SEC Review Part I].

is mentioned.[15]

In a similar collection addressing the effects of high-frequency trading, the SEC casts its net somewhat broader, but stays close to the costs of trading.[16] It includes papers addressing "general aspects of market quality, particularly spreads, price discovery, volatility, and liquidity," as well as "papers that focus on the transaction costs of retail and institutional investors," and "papers that address . . . order anticipation and momentum ignition, and . . . on HFT during a severe market disruption."[17] Nevertheless, the examined "transaction costs" of retail and institutional investors were limited almost exclusively to trading costs,[18] perhaps presuming without demonstrating that savings to brokers would automatically be passed on to retail investors. In its review of papers examining potential market manipulation, the SEC again focused on the cost of trading (here in terms of facing an informed trader),[19] and when examining papers on severe disruptions, the SEC again highlighted trading and price behavior rather than broader effects.[20] There is clearly a difference between a website mission statement and the concrete factors that the SEC thinks important enough to be included within a collection of knowledge for regulatory policy-making. This difference is one between broad and narrow concepts of market quality.

Aitken and his Capital Markets Collaborative Research Centre (CMCRC) undertake what are probably the most sophisticated attempts to measure market quality.[21] In 2014, Aitken and co-authors took the extraordinary step of writing about market structure in the *Journal of Business Ethics* so as to emphasize that market structure has an ethical dimension.[22] The paper, while broader than most studies, nevertheless restricts itself to the relationship between market *efficiency* (cost, speed and price accuracy for traders) and market *integrity* (absence of price manipulation).[23] The Kay study of the UK markets, cited above, is one of the very few expert analyses to weigh benefits to market participants against impact on the overall economy. It finds that neither issuers (seeking efficient capital allocation) nor investors (seeking good information and fair returns) are being served by the UK equity markets:

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15. *Id.*

16. DIV. OF TRADING & MKTS., SEC, EQUITY MKT. STRUCTURE LITERATURE REVIEW PART II: HIGH FREQUENCY TRADING 23 (2014), www.sec.gov/marketstructure/research/hft_lit_review_march_2014.pdf [hereinafter SEC Review Part II].

17. *Id.*

18. *Id.* at 29–30.

19. *Id.* at 31–33.

20. *Id.* at 33–34.

21. CMCRC has developed a "Market Quality Dashboard" receiving key data flows from most of the world's securities exchanges. This dashboard, allows, for example, a user to undertake analyses of trading volumes and costs in relation to incidents of market manipulation and actual historical events for most securities exchanges in a matter of minutes. CAPITAL MKTS. COOP. RES. CTR., https:www.mqdashboard.com/details (last visited Mar. 3, 2018).

22. Michael J. Aitken et al., *A Worldwide Examination of Exchange Market Quality: Greater Integrity Increases Market Efficiency*, 132 J. BUS. ETHICS 147 (2015).

23. *Id.* at 148–49. The author of this paper, together with Michael Aitken and Vito Mollica, have undertaken a study of the Hong Kong-Shanghai Stock Connect and the ASEAN Trading Link, the results of which are consistent with a finding that general infrastructural connections between stock exchanges facilitate international activity by smaller broker-dealers that do not have proprietary international networks. David C. Donald et al., Liquidity Effects from Asian Market Linkages: Structural Improvement or Liberalization?, (unpublished manuscript) (on file with author).

> In equity markets today we observe high volumes of trading between individuals – or computers – who deal anonymously with each other, and know little or nothing about the activities of the companies whose shares they trade. It is hard to see how this activity could contribute much to well judged capital allocation between corporate activities or to good governance in the corporate sector, and we found no reason to think that it has done so. Nor can such a trading environment generate the information needed either to make good long-term decisions in companies or to assess whether good long-term decisions have been made.[24]

Although advancing technology has made market structure change one of the major concerns of regulators since 2000, regulatory actions have largely been limited to responding to the requests of broker-dealers and the problems presented by meeting those requests. Thus, when new communication technology enabled trade matching to be taken out of exchanges and placed in proprietary platforms and broker-dealers backed such a move,[25] regulators shortly thereafter issued the Regulation National Market System[26] in the United States and the Market in Financial Instruments Directive[27] in Europe. When the growing fragmentation, which was celebrated for lowering trading costs,[28] threatened the integrity of market price discovery, regulators pushed for a Consolidated Audit Trail (U.S.)[29] and a Consolidated Tape (E.U.)[30] to tie together the pricing data that had been dispersed over a wide assortment of trade matching entities by their earlier initiatives. Thus, regardless of website mission statements promising protection of market quality broadly conceived, regulators' actions evidence a focus restricted to efficiency of the market for traders—cost, speed, and information quality—only later considering costs for the overall economy.

When looking forward to the next phase of technology-driven change affecting securities markets, it is therefore likely that the major players within markets will seek their own benefit in choice of structure and that the regulators will measure societal benefit by cost savings to traders, rather than overall cost. In order to make a truly informed decision about the shape of future markets, we need instead to move beyond a focus on trading costs to understand the full spectrum of market quality differences between such venues and private networks among broker-dealers. This perspective can be gained by examining the history of securities trading against a broad set of market quality indicators.

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24. KAY, *supra* note 11, at 87.

25. *See infra* Part IV.B.

26. 17 C.F.R. § 242.600 (2012).

27. Council Directive 2004/39/EC, 2004 O.J. (L 145) [hereinafter MiFID I]. There are important, technical differences between the NMS and MiFID projects that must not be ignored. However, when seen as a move from consolidated to private network securities trade matching, the two projects can be considered fungible. On the important regulatory differences, see, for example, Giovanni Petrella, *MiFID, Reg NMS and Competition Across Trading Venues in Europe and the USA*, 18 J. FIN. REG. & COMPLIANCE 257, 260–62 (2010).

28. *See, e.g.*, James Angel et al., *Equity Trading in the 21st Century* 2 (USC Marshall Sch. Of Bus., Working Paper No. FBE 09-10, 2010), www.sec.gov/spotlight/emsac/equity-trading-in-the-21st-century.pdf.

29. 17 C.F.R. § 242.613 (2012).

30. Commission Regulation 2017/571 of June 2, 2016, supplementing Directive 2014/65/EU of the European Parliament and of the Council with regard to regulatory technical standards on the authorisation, organisational requirements and the publication of transactions for data reporting services providers, 2016 O.J. (L 87).

C. What Are Securities Exchanges For?

More than one analytical frame for assessing market structure can be found in foundational economic analyses of markets. In his study of firm and market, Coase brings out the transaction cost incentives that lead economic actors to choose between a coordinated and an uncoordinated mode of exchange.[31] Commenting on his own earlier article, *The Nature of the Firm*, Coase draws out the structural similarity between moving a market's pricing activity into the coordinating decisions of a firm and concentrating decentralized trading activity within the governance of a managed securities exchange:

> In the medieval period in England, fairs and markets were organized by individuals under a franchise from the King. They not only provided the physical facilities for the fair or market but were also responsible for security . . . of comparable importance in our modern economy . . . [are] commodity exchanges and stock exchanges. These are normally organized by a group of traders (the members of the exchange) which owns (or rents) the physical facility within which transactions take place.[32]

Such closed markets allowed vetting of participants and products and monitoring of trading activity, as well as transfer of property under controlled circumstances. Coase distinguishes his transaction cost analysis of organized exchanges from the political-economic criticism offered by Adam Smith and economists following the latter, who understood such organizations primarily as attempts to "exercise monopoly power" and "restrain competition,"[33] a view embraced by modern advocates of creating private matching platforms to compete with stock exchanges. Coase observes that these economists, "ignore or, at any rate, fail to emphasize an alternative explanation for these regulations: that they exist in order to reduce transaction costs and therefore to increase the volume of trade."[34]

Coase in this way brings to light two of the dominant themes found in modern market regulation. Securities exchanges do very significantly reduce transaction costs,[35] yet all historical evidence shows that exchanges were indeed set up as cartels to restrain competition.[36] As will be shown in this Article, regulatory discourse tends to combine the two poles of transaction cost analysis and monitoring for anti-competitive behavior in such

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31. RONALD H. COASE, THE FIRM, THE MARKET, AND THE LAW 35–39 (1988).

32. *Id.* at 8–9. The creation of the firm supersedes markets, so that the firm is "an organization . . . allowing some authority (an 'entrepreneur') to direct the resources." *Id.* at 40. Concentrated exchanges reduce transaction costs, but do not replace the essential market mechanism with executive decision on price.

33. *Id.* at 9.

34. *Id.* It is undisputed that securities exchanges significantly reduce transaction costs. *See generally, e.g.*, J. Harold Mulherin et al., *Prices Are Property: The Organization of Financial Exchanges from a Transaction Cost Perspective*, 34 J.L. & ECON. 591 (1991) (discussing how securities exchanges reduce transaction costs).

35. *See* SEC Review Part I & II, *supra* notes 14, 16.

36. As an example, the "Buttonwood Agreement" creating the predecessor of the New York Stock Exchange in 1792, consists in its entirety as a promise of exclusive dealing at a fixed commission: "We the Subscribers, Brokers for the Purchase and Sale of the Public Stock, do hereby solemnly promise and pledge ourselves to each other, that *we will not buy or sell from this day for any person* whatsoever, any kind of Public Stock, *at a less rate than one quarter percent Commission* on the Specie value and that *we will give preference to each other* in our Negotiations." (emphasis added). *Trading on the Street*, MUSEUM OF AM. FIN., https://www.moaf.org/exhibits/trading_street (click on "Buttonwood Agreement on display" icon) (last visited Aug. 27, 2018).

a way that the *interests* behind structuring a market generally to gain advantage are neglected. That is, as shown in Part I.B., provided that the cost of trading is kept low, regulators usually take the position that anti-competitive behavior is not an issue. This overlooks the fact that market participants would not have engaged in anti-competitive behavior as an end in itself, but rather to extract rents, and the history of securities exchanges attests to this. The first exchanges were created to *both* exclude competition *and* reduce transaction costs. For the regulator, the key insight should therefore not be to remain vigilant about higher costs to broker-dealers, but to understand that these broker-dealers have their own interests in mind when building their marketplaces.[37]

As is the case with all other forms of infrastructure, from highways to airports, the major users of such facilities do not always have the public good in mind. Profitable trading occurs at the most favorable price for the *trader*, not necessarily at the most fundamentally accurate price of the issued securities.[38] Keynes famously captured the essence of a broker-dealer's activity when he concluded that they must "devote [their] intelligences to anticipating what average opinion expects the average opinion to be."[39] To achieve this, a trader needs information about both securities (including their issuer) and trading activity, the capacity to process this information, and speed when reacting to it. When designing market infrastructure, such competitive advantages will undoubtedly play a role at least as important as overall management of transaction costs.[40] An optimal level of expected volatility (in light of a given broker-dealer's trading style) may also be important. As Lee reminds us, "the market for exchanges and trading systems on the one hand, and the market for securities on the other . . . are not identical. Structural aspects in one market may affect structural aspects in the other."[41] If advantages for the highly competitive securities market could be hardwired into the oligarchic market for large infrastructure, why would leading traders eschew building such amenities into their markets?[42] Ensuring the absence of built-in advantages is clearly a matter of duty for market regulators, yet this is rarely discussed. Both narrow and broad measures of market quality must be used when assessing market

37. A tacit assumption often found in U.S. scholarship against mandatory regulation is that market participants will seek to build only the fairest, most neutral playing field because they are rational actors that take into account all potentially negative impacts of their actions. *See generally, e.g.*, Frank H. Easterbrook & Daniel R. Fischel, *Mandatory Disclosure and the Protection of Investors*, 70 VA. L. REV., 669 (1984) (discussing for and against regulation); Stavros Gadinisa & Howell E. Jackson, *Markets as Regulators: A Survey*, 80 S. CAL. L. REV. 1239 (2007) (debating whether securities exchanges should be self-regulating).

38. *See, e.g.*, Gill North & Ross P. Buckley, *A Fundamental Re-Examination of Efficiency in Capital Markets in Light of the Global Financial Crisis*, 33 U. NEW S. WALES L.J. 714, 737 (2010), citing among others, Ronald J. Gilson & Reinier Kraakman, *The Mechanisms of Market Efficiency Twenty Years Later: The Hindsight Bias*, 28 J. CORP. L. 715, 736–37 (2003).

39. JOHN MAYNARD KEYNES, THE COLLECTED WRITINGS OF JOHN MAYNARD KEYNES: VOL. VII: THE GENERAL THEORY OF EMPLOYMENT, INTEREST AND MONEY 156 (Elizabeth Johnson & Donald Moggridge eds., 2d ed. 1973).

40. This is the issue surrounding the 2016 creation of the Investors' Exchange (IEX), an extremely hard-fought battle to create a securities exchange that uses market structure to negate the advantage of high-speed traders. *See* Application of Inv'rs Exch., LLC, Exchange Act Release No. 78101 (June 17, 2016) [hereinafter IEX Application].

41. RUBEN LEE, WHAT IS AN EXCHANGE?: THE AUTOMATION, MANAGEMENT, AND REGULATION OF FINANCIAL MARKETS 254 (1998) [hereinafter LEE, WHAT IS AN EXCHANGE?].

42. The exploitation of latency arbitrage and the responding investor-sponsored creation of the IEX, cited in IEX Application, *supra* note 40, presents a very good example of how market structure can lead to advantages other than efficiency through minimized transaction costs.

structure in order to decide whether a structure that is cost-saving for broker-dealers has the anticompetitive impact of shifting costs to the broader economy.

The review of market history presented in this Article allows us to see why and how markets have been made. At this moment technology is bringing enormous changes to all areas of endeavor, but particularly to the financial industry—where money is plentiful, the rewards for first-starters are high, and financial activity itself consists primarily of data transfer and processing.[43] Index arbitrage, high frequency trading, big data market analysis, and distributed ledger technology are a few of the techniques that have arisen since 2000, and at the core of each one is that computers have enabled innovation. Networked transmission of data obviates the need for a central physical venue, but the absence of a focal point also makes oversight much more complex. Once regulators lose such point of contact, its reconstitution would face an enormous uphill battle against a cost-benefit argument, and so the process of dis-integration should be understood in a broad context today, while the existing regulatory model remains at least partially in place.

The following Parts of this Article examine how securities markets have been made over the years, highlighting the strategic choices of those in control and the impact of these choices on market quality, as well as the reactions of regulators. Following this introduction, Part II will examine the beginnings of securities trading, from disparate networks of merchants and traders, to clubs built and managed by these groups. This Part will be primarily historical in its analysis. Part III will then examine the mature operation of exchanges under private ordering and their transition to quasi-public, self-regulatory entities operating under government supervision. This Part will focus on changes in the regulation of exchanges and the strategic gains and losses to the broker-dealers who owned them. Part IV will then turn to the present moment, which began toward the end of the last century, as information technology made it possible for securities trading to be taken out of exchanges. That Part will highlight, in particular, the actions of the larger broker-dealers to decentralize trading into their own networks and the actual and potential effects of such a return on the other constituencies concerned, particularly regulators and smaller broker-dealers. Part V will offer conclusions on the projected change in market quality from concentrated exchanges to private networks by analyzing the expected use of distributed ledger technology (blockchain).

II. PRIVATE NETWORKS INFORMALLY MAINTAINED

A. The Concept of Market

Markets take shape at the intersection of multiple institutional forms,[44] and Hodgson provides a useful definition gathering together their various institutional functions: "Where they exist, markets help to structure, organize and legitimize numerous exchange

43. "[F]inancialization is . . . one of the ramifications of accelerating information technology." MARTIN FORD, RISE OF THE ROBOTS: TECHNOLOGY AND THE THREAT OF A JOBLESS FUTURE 56–57 (2015). Barrat reports that in the financial industry, "in fact there is—anecdotally, more money than anyone else is spending on machine intelligence, perhaps even more than DARPA, IBM, and Google can throw at AGI [artificial general intelligence]. That translates into more and better supercomputers and smarter quants . . . Every new AI tool gets tested in the crucible of finance." JAMES BARRAT, OUR FINAL INVENTION: ARTIFICIAL INTELLIGENCE AND THE END OF THE HUMAN ERA 126–27 (2013).

44. *See, e.g.*, ROBIN CANTOR ET AL., MAKING MARKETS: AN INTERDISCIPLINARY PERSPECTIVE ON ECONOMIC EXCHANGE 2–8 (1992) (displaying the various viewpoints).

transactions. Pricing and trading procedures within markets help to establish a consensus over prices, and communicate information regarding products, prices, quantities, potential buyers or possible sellers."[45] This legitimizing organization that allows price consensus results from the framing by varying degrees of physical, social and legal institutions.[46] The physical, social and legal aspects of markets work to buttress each other, so that when one is strengthened, others might relax. A purely physical market like a vending machine requires no social support, and a highly restrictive social institution like a tribal community may obviate the need for formal law in a market.

Different mixes of institutional support are found at different points in history and for different types of commodities traded. In early European trading, the social institution of reputation is used by the "Maghribi traders, a group of Jewish traders in the Mediterranean in the eleventh century,"[47] while a reciprocity enforcing "community responsibility system" was used to govern "exchange between English merchants and merchants in Germany, Italy, France, Poland, and Flanders (whose cities were England's largest trade partners)" in 14th century Europe.[48] The trend found in European history is of markets in which pervasive social institutions are progressively replaced by more abstract and automatic systems—from norm, to rule, to law and to automated protocol—so that today "algorithmic trading" between computers or "smart contracts" in simple commercial dealings can regulate commercial dealings "mechanically" following pre-designed algorithms, without further human intervention.[49]

Each type of market has its own structural requirements, so that a market for fresh fish will have a time sensitivity not present in a market for stone blocks, and a market for fine art will have a different set of concerns altogether. Markets for instruments evidencing debt or ownership claims against companies, what here will be referred to as "securities," also have their own special requirements. Securities have value because they evidence a right to something or against someone[50] almost never present at the time of transfer.[51] Value thus depends not only on the authenticity of the instrument itself, but also on the ability to collect full value from a third party pursuant to the terms stated in the instrument, and the latter risk can be defined as "credit risk."[52] This risk can be addressed by many different

45. Geoffrey M. Hodgson, *Market*, THE NEW PALGRAVE DICTIONARY OF ECONOMICS (Steven N. Durlauf & Lawrence E. Blume eds., 2d ed. 2008).

46. In his classic analysis of markets and the shift of transactions toward internal organizations, Williamson categorizes the determinative elements as "human attributes" and "transactional factors" because he brackets out technological factors, which will prove central to my own analysis. *See* Oliver E. Williamson, *Markets and Hierarchies: Some Elementary Considerations*, 63 AM. ECON. REV. 316, 316–19 (1973).

47. AVNER GREIF, INSTITUTIONS AND THE PATH TO THE MODERN ECONOMY: LESSONS FROM MEDIEVAL TRADE 58 (Randall Calvert & Thráinn Eggertsson eds., 2006).

48. *Id.* at 329.

49. IRENE ALDRIDGE, HIGH-FREQUENCY TRADING: A PRACTICAL GUIDE TO ALGORITHMIC STRATEGIES AND TRADING SYSTEMS 9–10 (2d ed. 2013). As Aldrige explains, a key part of the transition to automated markets was that, "algorithms were designed to mimic established execution strategies of traditional traders."

50. The obligor can be a physical or legal person. For example, the U.S. Uniform Commercial Code defines "security" as "an obligation of an issuer or a share, participation, or other interest in an issuer or in property or an enterprise of an issuer." U.C.C. § 8-102(a)(15) (AM. LAW INST. & UNIF. LAW COMM'N.2017).

51. The absence of the thing distinguishes a commodities market from a securities market and the absence of the issuer distinguishes a "primary" market, in which the issuer of the security sells the security to third parties, from a "secondary" market, in which third parties sell the security among each other, without the issuer being present on the market. This paper focuses on secondary markets.

52. In this context, "credit risk" can be understood as "the potential that a . . . counterparty will fail to meet

types of market institutions, the most important of which is law's invention of the concept of "negotiability", which allows the transferor "to confer to the transferee a better title than that of the transferor . . . [so that] a 'negotiable instrument' is a document of title to a sum of money . . . capable of conferring on the transferee title to it free of a third party's adverse claims and prior parties' defences." [53] Negotiability allows trading to continue uninterrupted by concerns about whether an instrument has been stolen by the transferor, or whether the payor himself has raised claims against the obligation expressed in the instrument. Instruments circulated in secondary markets began to enjoy negotiability in the 17th century,[54] about the time the Amsterdam Stock Exchange and the Dutch secondary market became prominent in Europe, though no causal link appears to connect these events.

Beyond the enforceability of an instrument transferred, a security's value will also depend on the solvency of the ultimate payor and the market's perception of the same based on available information.[55] Private ordering within securities markets offered the first requirements to disclose such information. The special types of risk characteristic of the securities market may be why the world has seen the development of a rather specific social caste of traders, jobbers and broker-dealers,[56] even if among this group significant differences of wealth, size and prestige have always been present.[57]

B. Initial Informal Networks for Trading Securities

Early securities trading was governed by various kinds of networks among merchants and informal institutions. Braudel examines the networks and infrastructure used for trade in goods—ranging from wandering peddlers to specialized markets, shops, fairs and exchanges—and shows how connected trading in claims arises in these different institutional contexts.[58] As observed above, Greif shows how both cultural networks

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its obligations in accordance with agreed terms." BANK INT'L SETTLEMENTS, BASEL COMM. ON BANKING SUPERVISION, PRINCIPLES FOR THE MANAGEMENT OF CREDIT RISK (2000), www.bis.org/publ/bcbs75.pdf.

53. BENJAMIN GEVA, THE PAYMENT ORDER OF ANTIQUITY AND THE MIDDLE AGES 529 (Craig Scott, ed., vol. 6 2011).

54. *Id.* at 452–53; de Roover, *supra* note 2, at 56 ("medieval bills of exchange . . . did not circulate by way of endorsement").

55. The current view of information's role in securities markets seems to include both a firm belief in rational impounding of information and a deep skepticism of such rationality. *See generally* Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383 (1970) (supporting the rationales of market actors); Robert J. Shiller, *Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends?*, 71 AM. ECON. REV. 421 (1981) (questioning the rationales of market actors). The indecision on this point was evidenced by the joint award of the 2013 Nobel Prize in Economics to both these two opposing theorists. Steven Rattner, *Who's Right on the Stock Market?*, N.Y. TIMES (Nov. 14, 2013), https://www.nytimes.com/2013/11/15/opinion/rattner-whos-right-on-the-stock-market.html.

56. STUART BANNER, ANGLO-AMERICAN SECURITIES REGULATION: CULTURAL AND POLITICAL ROOTS, 1690-1860 25–28 (1998).

57. In his historical examination of the Amsterdam Stock Exchange, Braudel remarks that

> speculation . . . reached a degree of sophistication and abstraction which made it for many years a very special trading-centre . . . a place where . . . one could by means of various ingenious combinations speculate without having any money or shares at all . . . small capital-holders . . . did not have the right to step inside the inner sanctum of the Exchange, which was confined to merchants and brokers.

FERNAND BRAUDEL, CIVILIZATION AND CAPITALISM, 15TH–18TH CENTURY, VOL. 2, THE WHEELS OF COMMERCE 101–04 (1992) [hereinafter BRAUDEL, WHEELS OF COMMERCE].

58. *Id.* at 26–113.

among traders of homogeneous religion, in the case of the Maghribi, and agreements of community responsibility, in the case of charters creating broad liability for debt collection in medieval Europe, established networks over which debt claims could be collected.[59] Van Bavel focuses on the primary market for mortgages and annuities in The Netherlands of the late middle ages, explaining how the needs of public finance eventually created a pool of these instruments which led to the development of a secondary market.[60] Zuijderduijn's analysis of the rise of capital markets in The Netherlands finds that both state and church regularly bought and sold debt claims in the 15th and 16th centuries through intermediaries—resembling today's broker-dealers—whose status at that time is not perfectly clear and included government officials.[61]

Ample evidence of trading in debt claims therefore exists, and all of it shows that inchoate secondary markets consisted of informal networks before concentrated trading commences in Antwerp[62] (later moved to Amsterdam).[63] Braudel finds that, similarly to that of the Maghribi, during the 10th century, trade in debt instruments like "bills of exchange, promissory notes, [and] letters of credit" existed among "the merchants of Islam . . . as can be seen from the *geniza* documents."[64] Van Bavel shows how, with a basic level of government power, control over the production and registration of mortgage claims was used to channel the secondary market in such claims.[65] Braudel examines how European merchants developed the informal networks, rules and law applicable to trading in goods for use on dealing in claims.[66] Such rules, created by the merchants themselves, came to be called the *lex mercatoria*, which is a prime example of early, private ordering. As North observes, "[m]erchants carried with them in long-distance trade codes of conduct, so that Pisan laws passed into the sea codes of Marseilles."[67]

The coding of these behavioral norms arose from various informal sources, but nevertheless allowed a decentralized network of trade to exist in an orderly fashion. De Roover describes one example:

> In Bruges it was not only possible to transfer credit when the debtor and the creditor were both clients of the same money-changer, but also when the debtor was the client of one money-changer, and the creditor, the client of another money-changer. It is false to contend that a book-transfer system could not operate effectively without a centralized clearing system. On the contrary, such a system did operate effectively in medieval Bruges because all the money-

59. GREIF, *supra* note 47, at 58–60.

60. VAN BAVEL, *supra* note 1, at 185–88.

61. C.J. ZUIJDERDUIJN, MEDIEVAL CAPITAL MARKETS: MARKETS FOR RENTEN: STATE FORMATION AND PRIVATE INVESTMENT IN HOLLAND (1300 – 1550) 213–14 (2009) ("Who these people were is not wholly clear, but it is likely private persons turned to the same intermediaries as public bodies . . . Another possibility is that members of local governments functioned as intermediaries: in England *scribents* acted as brokers.").

62. VAN BAVEL, *supra* note 1, at 189–90.

63. For a chronology of the rise of the Amsterdam market, see L.O. PETRAM, THE WORLD'S FIRST STOCK EXCHANGE: HOW THE AMSTERDAM MARKET FOR DUTCH EAST INDIA COMPANY SHARES BECAME A MODERN SECURITIES MARKET, 1602-1700 1–6 (2011).

64. BRAUDEL, EVERYDAY LIFE, *supra* note 1, at 472.

65. VAN BAVEL, *supra* note 1, at 168–69.

66. BRAUDEL, WHEELS OF COMMERCE, *supra* note 57, at 148–53.

67. DOUGLASS C. NORTH, INSTITUTIONS, INSTITUTIONAL CHANGE AND ECONOMIC PERFORMANCE 127 (1990).

changers were in account with one another.[68]

This 14th century networked system for the exchange of credit claims existed absent both central institutions and government support. As described, it resembles the foreseeable system of mutually trusting financial institutions that may well employ a distributed ledger system to achieve an efficient market through a private network among leading banks, as will be discussed in Part IV.

III. CONCENTRATING TRADING WITHIN DESIGNATED VENUES

A. Bringing Trades Within a Private Club

As private networks began to concentrate their activity geographically, their structure began to prefigure the stock exchange in its early form as a privately ordered club. Many historians refer to the "famous Champagne fairs,"[69] as "arguably the most important interregional trading fair in Europe during the twelfth and thirteenth centuries."[70] "These fairs and their participants were under the protection of the territorial lord, who proclaimed a market peace and offered safe conducts to local and foreign merchants travelling to and from the fairs."[71] The fairs also "closely controlled entry and exit. A merchant could not enter the fair without being in good standing with those who controlled entry, and any merchant caught cheating at the fair would be incarcerated and brought to justice under the rules of the fair."[72] When the bundling of such protections and restrictions migrated into an inchoate financial industry, such ordered network transacting became available on a permanent basis, controlling membership, listing and disclosure. Given the state of technology and law available in late medieval Europe, closed spaces like clubhouses were a rational next step for merchants dealing in financial claims.

North argues that merchants moved beyond private networks of extended family, clan and religion in connection with the increasing scope of their activities, seeking on the one hand to manage risk through better accounting, writing specialized insurance contracts, and use of the company form, and on the other hand to improve enforcement through more effective private ordering increasingly recognized by public authorities.[73] As discussed above, such choices were both generally efficient for their trading *and* self-serving. As North observes, in formulating a core insight of his institutional economic analysis: "Institutions are not necessarily or even usually created to be socially efficient; rather they . . . are created to serve the interests of those with the bargaining power to devise new rules."[74] Twenty years later, fellow institutional economists Mahoney and Thelen reaffirmed this thought, reminding us that we should understand "institutions above all else as *distributional instruments* laden with power implications."[75]

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68. de Roover, *supra* note 2, at 63.

69. VAN BAVEL, *supra* note 1, at 221.

70. GREIF, *supra* note 47, at 315.

71. VAN BAVEL, *supra* note 1, at 221.

72. GREIF, *supra* note 47, at 317 (citing Paul R. Milgrom et al., *The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs*, 2 ECON. & POL. 1, 20 (1990)).

73. NORTH, *supra* note 67, at 16.

74. *Id.*

75. James Mahoney & Kathleen Thelen, *A Theory of Gradual Institutional Change*, *in* EXPLAINING INSTITUTIONAL CHANGE 7–8 (James Mahoney & Kathleen Thelen eds., 2010) (emphasis in original). *See also* Peter A. Hall, *Historical Institutionalism in Rationalist and Sociological Perspective*, *in* EXPLAINING

As trading moves into closed venues during the modern period, the crossover between interest and efficiency is prominently visible. In the case of broker-dealers, "interest" meant to secure advantages by blocking competition, fixing prices, and controlling information, while "efficiency" meant reducing transaction costs through enhanced liquidity and reduced risk. Braudel understands a significant force to be at play as the warehouse and the stock exchange replaced the open market square: "the market was faced with the *anti-market*."[76] Braudel finds that within the private venue founded in 1608 (the "new" Amsterdam Stock Exchange) the sophisticated practices of short selling, market manipulation and insider dealing that enriched the top broker-dealers were "made possible (1) because there was not at the time . . . any official quotation of prices to help people follow the rise and fall of the markets; and (2) because the broker . . . addressed himself to small capital-holders who did not have the right to step inside the inner sanctum of the Exchange."[77] In distinguishing the Amsterdam Stock Exchange from the earlier exchanges established for wholesale trading in commodities as well as for securities, Braudel argues that "what was new . . . was the volume . . . and the speculative freedom of transactions . . . gaming for gaming's sake . . . [with] a degree of sophistication and abstraction . . . where one could by means of various ingenious combinations speculate without having any money or shares at all."[78] Braudel then dryly observes that this "was where brokers came into their own,"[79] and it indeed appears that closed venues helped the inchoate financial industry focus on profit-generating activity that was unique to itself.

In the United States, the "Buttonwood Agreement" that founded the New York Stock & Exchange Board, predecessor of the New York Stock Exchange (NYSE), set out the group's two main goals of price fixing and cartel:

> [W]e the Subscribers, Brokers for the Purchase and Sale of the Public Stock, do hereby solemnly promise and pledge ourselves to each other, that we will not buy or sell from this day for any person whatsoever, any kind of Public Stock, at a less rate than one quarter percent Commission on the Specie value and that we will give preference to each other in our Negotiations.[80]

Welles presents the history behind this Agreement as a struggle by the Buttonwood group against "the most powerful men in the street [who] were a group of auctioneers," which set up a trading arrangement that "threatened to force the group of brokers who traded under the buttonwood tree out of business."[81] The promise of exclusive dealing at a fixed price eventually had its intended competitive effect, leading the new exchange created by the buttonwood group to dominance. In its own history, the NYSE does not refer to the competitive struggle, but only to the buttonwood group as "twenty-four prominent brokers and merchants" of New York.[82]

In the United Kingdom, the genesis of the London Stock Exchange (LSE) exhibits

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INSTITUTIONAL CHANGE 204, 217 (Mahoney & Thelen eds., 2010) ("The persistence of institutions is . . . the outcome of exercises of power and interpretation, whose result is at best a contested stability.").

76. BRAUDEL, WHEELS OF COMMERCE, *supra* note 57, at 135–36.

77. *Id.* at 103–04.

78. *Id.* at 101.

79. *Id.*

80. *See* COASE, *supra* note 31.

81. CHRIS WELLES, THE LAST DAYS OF THE CLUB 9 (1975).

82. THE NEW YORK STOCK EXCHANGE: THE FIRST 200 YEARS 14 (James E. Buck, ed., 1992).

both similarities and differences to Amsterdam and New York. A first attempt at excluding other traders was made in 1761 through an exclusive arrangement with Jonathan's Coffee House, but this was ruled illegal because a custom had been established that the coffee house was an open market.[83] This can be understood as a small victory for the flexibility of common law. In response, however, leading traders then created a new "stock exchange" with its own building (thus having no customary use) in 1772 under a similar rule of exclusivity with payment for trading privileges.[84] The new venue struggled at first. Then, as has occurred repeatedly throughout history,[85] wars on the Continent shaped capital flows and, at the end of the 18th century, closed exchanges in Amsterdam and Paris, which brought refugee talent and funds across the channel to London.[86] As a result, by 1802, demand pushed the London Exchange into being established at a greater size than previously thought possible.[87] Whether from an enduring memory of the experience with Jonathan's Coffee House or out of a special aspect of UK business culture, the LSE was very generous in accepting members, later rejecting only 39 applicants out of 3854 submitted between 1886 and 1903.[88] In their detailed history of the LSE's early governance, Neal and Davis show that the "proprietors" that owned the LSE earned very good returns on their investments.[89] As other exchanges, the LSE served defensive purposes, but dramatic changes in the environment altered the needs of its principals. Attesting a continued effort at gaining competitive advantage, Attard reports that the LSE changed its rules in 1908 and 1912 when members felt pressure from off-exchange trading, reasserting the control of member broker-dealers over trading revenues through the exclusivity of the market.[90]

Although each of these three stock exchanges allowed their controllers to earn profit from advantages over nonmember traders, they were established rather gradually in various stages at different historical junctures and as a result of nonidentical causes. The Amsterdam market gradually evolved during the 17th century, becoming larger and more sophisticated, whilst the New York market was founded during the early years of the United States as a reaction to an existential threat from local competition, and the London market existed informally in multiple places within a mature global economy until it was pushed into definitive existence by war and the closing of exchanges in Continental Europe. Thus, although each of these exchanges was created for the benefit of its leading broker-dealers, the concrete motives were divergent. Nevertheless, they all introduced a simple, available technology—creating a specified place where trading took place at a specified time among specified people—to increase the efficiency of the market.

As Coase reminds us, no serious analysis of securities exchanges should "ignore or, at any rate, fail to emphasize" the enormous transaction costs savings generated through

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83. MICHIE, *supra* note 3, at 31.

84. *Id.*

85. *See* Ann M. Carlos & Larry Neal, *Amsterdam and London as Financial Centers in the Eighteenth Century*, 18 FIN. HIS. REV. 21, 37 (2011) (discussing disruption of financial ties between London and Amsterdam due to war).

86. *Id.* at 33.

87. *Id.* at 38.

88. MICHIE, *supra* note 3, at 84.

89. Larry Neal & Lance Davis, *The Evolution of the Structure and Performance of the London Stock Exchange in the First Global Financial Market, 1812-1914*, 10 EUR. REV. ECON. HIST. 279, 289–92 (2006).

90. Bernard Attard, *Making a Market. The Jobbers of the London Stock Exchange, 1800–1986*, 7 FIN. HIS. REV. 5, 9 (2000).

the use of a closed concentration of traders meeting at specified times and contracting according to mutually agreed rules.[91]

Exchange trading increases the likelihood a potential buyer or seller will find a counterparty for a trade, a feature referred to as "network externalities" and directly related to liquidity.[92] Liquidity may be more important for trading in securities because securities trading by its nature is more speculative and thus trade volume is higher than trading found in other commodities at a wholesale exchange.[93] With regard to transaction costs and structure, the concentration of activity into a specified time and place with defined contracting formalities reduces transaction costs and augments both operational efficiency and the efficiency of price discovery. From a social perspective, concentrating trading on an exchange allows the clear demarcation of a caste- or guild-type community with certain characteristics regarding creditworthiness and honest dealing, which has both legal and economic benefits. As Braudel observes, "[s]olidarity between merchants was in some ways solidarity within a class."[94] Once market participants accept the regulatory authority of the assembly of exchange members, the set of securities traded can be screened during selection and a form of ongoing regulation for listed companies and securities can arise via private ordering.[95] This selective demarcation within an exchange also enables members to create monopolies on both contracting and pre- and post-trade information, as well as to create a brokerage fee cartel.[96] Regulatory and rent-seeking opportunities thus come hand-in-hand.

B. Private Ordering in the Clubs

For the 300-year period from 1600 to 1900, the available technology and dominant philosophy converged to make the clubroom for concentrated trading an effective mechanism to achieve both a reduction of transaction costs and strategic advantages over competitors. The club could also function as a united front against government attempts at regulation. As early as the 1830s, the New York Stock & Exchange Board "succeeded in fending off regulation proposed in the New York legislature."[97] The success of this lobbying was to continue for over 100 years. "Unlike other American cartels which have risen from time to time, members of the NYSE have never been forced to conspire

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91. COASE, *supra* note 31, at 9.

92. *See* Hans R. Stoll, *Future of Securities Markets: Competition or Consolidation?*, 64 FIN. ANALYSTS J. 15, 16 (2008); THIERRY FOUCAULT, ET AL., MARKET LIQUIDITY: THEORY, EVIDENCE, AND POLICY 239 (2013) ("Fragmentation prevents investors from taking full advantage of the 'thick market externalities' (also called 'liquidity externalities') that arise from the fact that each additional market participant reduces the trading fees or increases the liquidity of all other traders . . . Another positive externality of market participation is that it makes it more likely to find a trading partner quickly enough: this is easier if the market attracts many traders."); COASE, *supra* note 31, at 9.

93. When examining the historical development of exchanges, this is the primary difference that Braudel finds between a commodity exchange and a stock exchange. *See* BRAUDEL, WHEELS OF COMMERCE, *supra* note 57, at 101.

94. *Id.* at 153.

95. BANNER, *supra* note 56, at 259–63. This is discussed in Part II.B.

96. Braudel notes the information monopoly present in the early Amsterdam Stock Exchange. *See* BRAUDEL, WHEELS OF COMMERCE, *supra* note 57, at 135–36. The New York Stock Exchange takes shape first as a trading cartel—*see* BANNER, *supra* note 56, at 251—which continues for over 200 years—*see* WELLES, *supra* note 81, at 8–12.

97. BANNER, *supra* note 56, at 267–68.

furtively . . . the Exchange regarded itself, and was regarded by the courts, as a private business club, with complete authority to set its own rules."[98] Seligman's history of the SEC shows NYSE members and management regularly lobbying U.S. Congress to countervail regulatory powers of the SEC.[99] While pushing back against government, excluding non-members, and imposing cartel prices on securities trading, the NYSE also developed the modern framework of securities regulation, and this regulatory framework helped defend securities regulation from government intervention.

Banner explains that the NYSE developed a listing application procedure according to which prospective listed companies needed "to submit a 'full statement of the capital, number of shares, recourses & certified to' by a representative of the corporation."[100] All NYSE members (i.e., all prospective counterparties) were vetted for creditworthiness and were provided with a list of non-members who had breached contracts with members, creating a significant tool to enforce reputational sanction.[101] Exchange members took on additional importance for the economy because the Exchange provided them exclusively with current market price information and they were forbidden from leaking it to outsiders.[102] Lastly, the Exchange offered standardized protocols for contracting trades, set mechanisms for transferring the securities purchased and communally accepted means for enforcing contracts that might otherwise be deemed unenforceable under law.[103] From the sum of these techniques, it is easy to understand why Coase saw a need to shift focus toward the transaction cost saving functions of securities exchanges.[104] Seligman argues that when the 1929 financial crisis broke, the NYSE listing standards offered a system of securities regulation that was "far more precise than any found in the blue sky laws."[105] Although the clubs were originally created to block competition and sequester information, securities exchanges developed into efficient cornerstones of market infrastructure, and a great deal of the impetus for the last stages of this transformation was the injection of public law into their private ordering.

Seligman explains that in 1933, on the cusp of the new regulatory paradigm of the Self-Regulatory Organizations (SRO) model, the NYSE had 1375 members, but decisions were taken by "three hundred or so specialists," or market-making dealers, and another "approximately 170 members who traded solely for their own accounts."[106] The remaining 900 or so brokers would thus be subject to the policies and arrangements supported by the more powerful members.

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98. WELLES, *supra* note 81, at 12.

99. For example, in 1940, the NYSE collaborated with the Investment Bankers Association and other organizations in a three-year effort to have Congress roll back parts of the regulatory legislation enacted in 1933 and 1934, so that the House Interstate Commerce Committee called NYSE officials to "testify about the extent to which the securities laws had caused a 'partial stagnation of capital investment.'" JOEL SELIGMAN, THE TRANSFORMATION OF WALL STREET: A HISTORY OF THE SECURITIES AND EXCHANGE COMMISSION AND MODERN CORPORATE FINANCE 235 (3rd ed. 2003); *see also id.* at 97–100 (further detailing NYSE members and management efforts to weaken SEC regulatory powers).

100. BANNER, *supra* note 56, at 265.

101. *Id.* at 259–61.

102. *Id.* at 261–62. Geisst also observes that "prices were not uniformly available in the New York newspapers for years." GEISST, *supra* note 3, at 20–21.

103. BANNER, *supra* note 56, at 258, 263.

104. *See supra* Part I.C; COASE, *supra* note 31, at 43 n.32.

105. SELIGMAN, *supra* note 99, at 46.

106. *Id.* at 73–74.

C. Public Regulation Boxes in Private Ordering

1. The United States

In the United States, the era of the private clubs came to an end in the aftermath of the 1929 market crash. The Securities Act of 1933[107] and the Securities Exchange Act of 1934[108] brought the heavy hand of government down on the private ordering that the NYSE and other exchanges had always practiced. A statement by Franklin D. Roosevelt to Adolf A. Berle captures the public mood about securities dealers at the time: "The fundamental trouble with this whole Stock Exchange crowd is their . . . inability to understand the country or the public or their obligation to their fellow men."[109] By creating the SEC and placing the NYSE and other exchanges under its jurisdiction, the Exchange Act closed the long period of freedom securities trading had known since its medieval origins.

The financial industry well understood what was happening and the legislative changes occurred only after "one of the most bruising lobbying struggles ever waged in Washington."[110] The Securities Act essentially adopted the framework of the NYSE listing standards,[111] but strengthened liability provisions while effectively shifting power to approve listings from the Exchange to the SEC. This led the financial community to immediately demand its rollback through amendment, particularly through removal of prospectus liability provisions.[112] The Exchange Act was even more hotly contested, as it established a government regulator, the SEC,[113] and placed the securities exchanges under it as a new category of Self-Regulatory Organizations, so that the NYSE would have to meet Exchange Act and SEC requirements to retain its license.[114] The Exchange Act also transferred power over NYSE rulemaking to the SEC.[115] In congressional hearings on the draft bill and its proposed regulation of margin accounts,[116] the president of the NYSE, Richard Whitney, argued that the bill would work to "destroy the free and open market for securities," "impairing" "liquidity" and thus damaging the "entire investing public."[117] Similar arguments have been periodically raised until today with regard to most regulatory

107. Securities Act of 1933, 15 U.S.C. §§ 77a –77mm (2016).

108. Securities Exchange Act of 1934, 15 U.S.C. §§ 78a–78q (2016).

109. Letter from President Franklin D. Roosevelt to Adolf A. Berle, Jr. (Aug. 15, 1934) (on file with the Securities and Exchange Commission Historical Society), http://www.sechistorical.org/museum/papers/1930/page-2.php (scroll to bottom of page and click on letter hyperlink) (last visited Mar. 3, 2018)

110. SELIGMAN, *supra* note 99, at 73; *See also* GEISST, *supra* note 3, at 227–51.

111. SELIGMAN, *supra note* 99, at 46.

112. *Id.* at 80.

113. 15 U.S.C. § 77d (2016).

114. 15 U.S.C. § 78s (2016). Another SRO, the National Association of Securities Dealers—now FINRA—was placed in authority over broker-dealers, but the SEC remained (and remains) the ultimate supervisor of this second SRO.

115. 15 U.S.C. § 78s(b)(1) (2016). "No proposed rule change shall take effect unless approved by the Commission."

116. A fixed margin limit was eventually replaced with delegated authority to the Federal Reserve Board to regulate the amount of credit a broker may grant a client. 15 U.S.C. § 78g(a)(2016).

117. Richard Whitney, President of New York Stock Exchange, Statement in regards to H.R. 7852 National Securities Act of 1934, www.sechistorical.org/museum/papers/1930/page-2.php (follow the hyperlink listed as "Parts I and II of Statement of Richard Whitney on H.R. 7852, National Securities Act of 1934") (last visited March 3, 2018) (last visited March 3, 2018).

initiatives.[118] This debate was about who is the best custodian of the free market, and should be juxtaposed to Braudel's observation on how merchants' creation of their first proprietary trading venues represented the open "market . . . faced with the *anti-market*."[119]

Following amendments promoted by the NYSE to protect the existing positions and trading practices of its powerful "specialists" and floor brokers,[120] the Exchange Act became law. It also brought the exchange members into its framework as regulated broker-dealers,[121] introducing the SEC as the body ultimately responsible for deciding whether an exchange member may engage in regulated activity.[122] Under the 1934 Act, a national securities exchange would be required to ensure fair governance of and between its members,[123] the prevention of "fraudulent and manipulative acts and practices," and the promotion of "just and equitable principles of trade."[124] The result of the Exchange Act and accompanying New Deal legislation was to bring under government control the club devised by leading broker-dealers as a tool to fight competitors, prop up commission earnings, achieve transactional efficiency, and lobby against government regulation. The club became a confined space in which the power of the members' private activities would be monitored, evaluated for fairness and sometimes punished.[125] The publicly regulated securities exchange became a venue in which all broker-dealers received a measured dose of equal treatment under the spotlight of regulatory oversight.

It should be remembered that the Exchange Act and the Securities Act are remaining elements of Roosevelt's New Deal, and that the financial industry has fought the New Deal from its beginning to its end. The insiders achieved a major victory with the effective repeal of the Glass-Steagall Act, [126] spearheaded by Citibank and Travelers Insurance and achieved with the Gramm-Leach-Bliley Act of 1999.[127]

2. The United Kingdom

The London Stock Exchange was not suddenly encased in law that turned private ordering into public control, but was rather embraced and deputized by the Bank of England, and this embrace is the likely origin of the "relationship" regulation famously practiced in the U.K.[128] The overall causal context included not only financial crisis, but

118. Perhaps the most prevalent arguments in favor of high frequency trading are those maintaining it promotes liquidity. *See, e.g.*, Audacity Capital, *Reflecting on the Benefits of HFT Liquidity*, TABB F. (Nov. 30, 2015), http://tabbforum.com/opinions/audacity-capital-on-the-benefits-of-liquidity-providing.

119. BRAUDEL, WHEELS OF COMMERCE, *supra* note 57. *See also supra* Part III.A (discussing the anti-market).

120. See the discussion in SELIGMAN, *supra* note *9*99, at 100.

121. Securities Exchange Act of 1934, 15 U.S.C. § 78o (2016).

122. Securities Exchange Act, 15 U.S.C. § 78f(b)(2). Broker-dealers were ultimately under the jurisdiction of the SEC, but directly under the National Association of Securities Dealers (NASD) pursuant to the Maloney Act. GEISST, *supra* note 3, at 250.

123. Securities Exchange Act, 15 U.S.C. § 78f(b)(3) provides: "The rules of the exchange assure a fair representation of its members in the selection of its directors and administration of its affairs."

124. Securities Exchange Act, 15 U.S.C. § 78f(b)(5).

125. *See* GEISST, *supra* note 3, at 233–43.

126. Effectively repealed by the Gramm–Leach–Bliley Act, Pub. L. No. 106-102, 113 Stat. 1338 (1999).

127. This is discussed in GEISST, *supra* note 3, at 384–86, comparing it to the fall of the Berlin Wall.

128. *See* Howell E. Jackson, & Mark J. Roe, *Public and Private Enforcement of Securities Laws: Resource-Based Evidence*, 93 J. FIN. ECON. 207, 235 (2009) (explaining the difference between US and UK regulatory

also the economic strictures of two world wars, during which a close and captive relationship between the government and the LSE ultimately turned the latter into a staid commercial entity that could be trusted to supervise the markets. This worked to freeze the LSE's competitive development in place as the international financial markets evolved around it, eventually requiring a "Big Bang" to break up the logjam. When, in Part IV, we examine the respective introductions of NMS and MiFID, the different histories of the NYSE and the LSE greatly explain the different points of departure.

The divergence in UK regulatory history from that of the US began early, with the Bubble Act of 1720, which ostensibly outlawed trade of joint stock company shares while supporting Crown trading companies,[129] and the Barnard's Act of 1733, which prohibited time bargains in public securities between stockjobbers.[130] These acts served to retard the development of the company limited by shares in the UK and brought the Amsterdam Exchange and Dutch stockjobbers more London business,[131] but also arguably forestalled later regulation. Michie reports that although calls for regulating the LSE had been made in 1860 and a committee to study regulatory options had been set up in 1878, it was not until 1914 that the UK government became actively involved with the LSE.[132]

This involvement, as mentioned above, was not through regulatory legislation, but by pressing the LSE into government service to help address the economic shocks of World War I. Measures included vetting and eventually preventing foreign access to the LSE,[133] limiting new securities issues to those necessary for war efforts,[134] declaring a moratorium of loans to protect LSE members trading on margin when cash trading was mandated,[135] and by war's end, increasing the minimum fixed commission on trades in government debt, given the increased volumes of such trade.[136] A close relationship between the LSE, Her Majesty's Treasury, and the Bank of England became the new normal for the market while international transactions migrated into other institutions, significantly reducing the LSE's centrality to the City of London's money market.[137]

There were some elements that resembled the regulatory revolution in the U.S. Following World War I, the LSE did introduce firmer controls on initial listings, which Michie describes as "sufficient in the immediate aftermath of the frauds, and the Wall Street crash."[138] At the outbreak of World War II, an "intensification of the cooperation that had been in existence since 1931," led the LSE to cede power over approving all new issues to Treasury.[139] In 1944, the Prevention of Fraud (Investors) Act returned greater

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cultures).

129. *See* BANNER, *supra* note 56, at 75–78.

130. Carlos & Neal, *supra* note *86*85, at 21, 36.

131. Larry Neal, *The Disintegration and Re-integration of International Capital Markets in the 19th Century*, 21 BUS. & ECON. HIS. 84, 87–90 (1992) ("After the South Sea Bubble of 1720, a large stock of English securities were held by Dutch investors and traded among them on the Amsterdam Beurs.").

132. MICHIE, *supra* note 3, at 122–23.

133. *Id.* at 150.

134. *Id.* at 149.

135. *Id.* at 146.

136. *Id.* at 153.

137. MICHIE, *supra* note 3, at 165–69. "As a result of these extensive contacts with the government and the Bank of England the Stock Exchange had come to regard itself as a national institution by the 1930s." *Id.* at 183–84.

138. *Id.* at 267.

139. *Id.* at 292.

control over trading in listed securities to LSE members.[140] Michie concludes that the relationship with Treasury "meant that the Stock Exchange was acquiring a degree of power over the securities market which it had never possessed in the past."[141] Following the War, this cozy relationship continued, with a slight relaxation of rules against speculation, but parallel developments lead to merchant banks overtaking LSE member firms in the business of new issues, so that the LSE became even more of a policing body and less a participant in the primary market.[142] A static LSE resisted the growing forces of international finance until enough pressure built up to demand removal of monopoly powers and rules impeding LSE members from effectively competing on the global market.[143]

Although the "Big Bang" did have some similarities to 1934—such as the introduction of regulation through SRO status[144]—the main change was removal of the LSE from its semi-official and protected position on the edge of public institutions. Tooze describes the severity of the transition:

> The City of London was thrown open to outside investment, sacrificing guildlike structures that dated back centuries to the imperative of creating a genuinely global financial center. Within a decade the UK's own investment banks had been swallowed by their American and European competitors. American, Asian and European capital flooded in.[145]

This meant the elimination of fixed commissions, the introduction of electronic trading, and the admission of multinational financial firms to LSE membership.[146] As Michie explains, "after Big Bang . . . power [within the LSE] had now been placed in the hands of the major players in the global market place."[147] This considerably trimmed the field of market participants. By 1999, "out of the Stock Exchange's 298 members some 20 per cent were responsible for 80 per cent of the value of business done, and these largely comprised a small number of American and European firms operating internationally."[148] The Big Bang took the LSE out of its protected position and brought large, globally active financial institutions into the LSE so that the momentum of their business plans would drag the LSE in tow and reshape the U.K. securities market. This route to dis-integration under MiFID shared with NMS the backing of the largest market participants, but the U.S. broker-dealers had been embedded in the market for the long haul since 1934, while the largest U.K. players were often joining the LSE from the outside.

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140. *Id.* at 293.

141. MICHIE, *supra* note 3, at 293.

142. *Id.* at 356.

143. Michie places great stress on the exchange controls, which permitted UK residents from buying securities denominated in a foreign currency, other than through an authorized depository. He argues that the removal of these controls began a seismic shift in the UK securities market. *Id.* at 526–27.

144. *Id.* at 586.

145. ADAM TOOZE, CRASHED: HOW A DECADE OF FINANCIAL CRISES CHANGED THE WORLD 80 (2018).

146. MICHIE, *supra* note 3, at 559–61.

147. *Id.* at 594.

148. *Id.* at 645–46.

IV. AN IT-ENABLED RETURN TO PRIVATE NETWORKS

A. Technology Obviating Clubroom Walls

The history of securities market structure is one of broker-dealers engaging with technology within the limits of law to create environments best suited to their business. Both changes in technology (e.g. telegraph, data transmission, distributed ledgers) and historical events (e.g. treaties reducing restrictions on capital flows or wars triggering capital flight) create business opportunities that law can enhance or limit.[149] Within this context, industry competition among securities exchange members can also lead to change (as it did at the LSE during the Big Bang). As information technology progressed to allow the creation of networks operating without a physical location, the antique tool of using a common room to focus liquidity among a crowd of physically present traders decreased in value for those broker-dealers who could afford their own virtual networks.[150]

Many exchange members also maintained and cultivated their own networks beyond exchanges even during the heyday of exchanges, both for private investments in public equity (PIPEs) and for the over-the-counter (OTC) markets. When the concentrated exchanges came to dominate trading in the 19th century, they did not eradicate trading through private networks. The form of trading found during the preliminary stage of development in New York—informal trading on the "curb"—continued among some traders as OTC, still sometimes referred to as the "curb" market long after the signing of the agreement leading to the NYSE.[151] Indeed, a major decentralized network for OTC trading was brought into existence at the dawn of the digital age by the launch of the electronic NASDAQ system of market makers in 1971,[152] eventually leading to scandal as its major dealers extracted rents from outside brokers.[153] Thus, OTC markets have coexisted with concentrated venue trading throughout the history of organized trading. In the case of OTC derivatives trading, the main argument raised for avoiding containment within an institutional framework is the desire to retain heterogeneous products, which do not lend themselves to the standardized transaction processes of exchanges and their clearinghouses.[154] For major broker-dealers, it is therefore a relatively simple matter to evaluate whether they would like to step out of concentrated trading altogether.

In the 1990s, as exchanges were created and operated under the leadership of the largest broker-dealers, a point was reached where available technology allowed those same large institutions to create private systems with network externalities as broad as securities

149. The institutional dynamics among law, technology, and the political-economic environment are highly complex and deserve a study of their own in the context of securities exchange development. On the problems of this analysis generally, see ELINOR OSTROM, GOVERNING THE COMMONS: THE EVOLUTION OF INSTITUTIONS FOR COLLECTIVE ACTION 50 (1990).

150. Indeed, the obsolescence of the securities exchange was proclaimed as soon as such networks were commercially feasible. *See generally, e.g.*, RICHARD O'BRIEN, GLOBAL FINANCIAL INTEGRATION: THE END OF GEOGRAPHY (1992).

151. *See, e.g.*, GEISST, *supra* note 3, at 9–13, 21; BANNER, *supra* note 56, at 250–51.

152. SELIGMAN, *supra* note 99, at 490.

153. *See* William G. Christie & Paul H. Schultz, *Why do NASDAQ Market Makers Avoid Odd-Eighth Quotes?* 49 J. FIN. 1813 (1994); SELIGMAN, *supra* note 99, at 698–99.

154. *See, e.g.*, CRAIG PIRRONG, INT'L. SWAPS AND DERIVATIVES ASS'N, THE ECONOMICS OF CENTRAL CLEARING: THEORY AND PRACTICE 27–28 1 (2011), https://www.isda.org/a/yiEDE/isdadiscussion-cap-pirrand.pdf.

exchanges,[155] the market model was ripe for disruption. Initially, this took the form of new entrants in the market established as Electronic Communication Networks (ECNs), which acted as market makers and disrupted the business models of leading market participants. However, the ECNs rapidly consolidated and were eventually purchased by better-endowed financial institutions.[156] By 2014, the world's largest broker-dealer banks controlled the market for such alternative trading platforms.[157] Technology offered leading market participants perhaps the simplest way to remove most of the strictures that the Exchange Act had imposed upon them for decades: take trading out of exchanges. The move rebooted private ordering in market structure, allowing those broker-dealers capable of making their own markets to take trading volume into private, wholly-owned networks.

When technology allowed large broker-dealers to establish their own trade-matching facilities, this then set up a conflict of interests between those broker-dealers and the exchanges. As Lee explains, there is a problem of perception when studying securities exchange development:

> A complex rivalry may exist between exchanges and intermediaries. Interpretations of the creation of exchanges, prior to the evolution of cheap information technology, tend to portray their development as the formalization of informal associations of brokers. The primary aim of an exchange has thus traditionally been seen to further interests of its broker members. The possibility of rivalry between an exchange and the financial intermediaries who both trade on and are members of the exchange, is therefore at first sight implausible. Such a rudimentary notion of an exchange does not, however, capture the conflicts that inevitably obtain between an exchange and its members.[158]

As technology has increasingly allowed broker-dealers themselves to arrange and match significant volumes of securities trades,[159] these conflicts became unavoidable. Within the

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155. The history of this development is provided in LEE, RUNNING THE WORLD'S MARKETS, *supra* note 7, at 49–55.

156. *See* Dale A. Oesterle, *Regulation NMS: Has the SEC Exceeded its Congressional Mandate to Facilitate a "National Market System" in Securities Trading?*, 1 NYU J.L. & BUS. 613, 661 (2005). One of the largest ECNs, Archipelago Holdings, Inc., was purchased by the NYSE. *Id.* at 671. The most prominent ECN, Instinet, now belongs to Nomura Securities. *See About Instinet*, INSTINET, http://www.instinet.com/about-instinet/history.html (last visited Mar. 3, 2018).

157. FINRA provides data on such platforms (alternative trading systems) for a number of years, showing that initially the largest banks owned the largest seven platforms by trading volume. This has changed slightly, with more opaque ownership structure being used, perhaps for liability purposes. *See Terms of USP*, FINRA, https://otctransparency.finra.org/Agreement (last visited Mar. 5, 2018). Note that at any given time FINRA retains only about two years of data on the website. By June 2015, the largest ATS were owned by Credit Suisse, UBS, Deutsche Bank, Citibank, Bank of America, Morgan Stanley, and Goldman Sachs. *See* David C. Donald, *Bridging Finance Without Fragmentation: A Comparative Look at Market Connectivity in the US, Europe and Asia*, 16 EUR. BUS. ORG. L. REV. 173, 185 (2015) [hereinafter Donald, *Bridging Finance*].

158. LEE, WHAT IS AN EXCHANGE?, *supra* note 41, at 57.

159. For own-account matching, the EU employs the highly descriptive term "systematic internaliser" in the MiFID. *See* Council Directive 2014/65/EU, art. 4, 2014 O.J. (L 173) 382 [hereinafter MiFID II]. The term "internalisation" captures the fact that key elements of connecting buyer and seller, matching buy and sell orders, and delivery of security and cash can also be undertaken within a firm rather than within the framework of an organized exchange. *Id.* This reverses the migration of institutional support from private firms to common

exchange, technology also exacerbates the rivalry between large and small broker-dealers, which have different sized markets, customers, networks and budgets to buy technology.

The availability of public infrastructure is always a factor in the competition between participants in an industry,[160] and this has been particularly true for the history of the securities exchange, which allowed network externalities at a scale unachievable by small firms acting independently. As markets have become more automated, regulated, and international, the number of registered broker-dealers has decreased dramatically—despite an increase in the volume of securities trading and the overall size of the financial industry.[161] The largest institutions, which could afford partnering in large, private networks and building significant computing power, increased their lead as data transfer systems and the ability to access international markets became a standard part of trading operations and broker-dealers could rely less on the common infrastructure of securities exchanges.[162] It was estimated in mid-2017, that "'fundamental discretionary traders' account[ed] for only about 10 percent of trading volume in stocks," while "quantitative investing account[ed] for about 60 percent," and "high-frequency trading accounted for 52 percent."[163] One example of industry consolidation can be seen in the number of prime dealers listed by the Federal Reserve Bank of New York, which halved from an average of 40.5 for the decade between 1985 and 1994 to an average of 20.2 for the decade between 2005 and 2014.[164] As revenue consolidated in the largest broker-dealers, such institutions became more able to create the private trade matching venues integral to the dis-integration and internationalization of securities trading.[165]

This competition, which exists both among broker-dealers and between the latter and securities exchanges, cannot be simplified into an enlightened drive toward lower transaction costs and greater market efficiency for all. The history of securities trading reviewed above shows that a broker-dealer capable of shaping market structure will do so

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securities exchange, as technology allows some market participants to replace the operational capabilities of the common infrastructure with their own systems.

160. The provision of infrastructure (roads, airports, phone lines) will assist those without the means to accomplish a task or provide a service without such public infrastructure. The introduction of infrastructure and technology does not affect all competitors equally. *See* A. ALLAN SCHMID, CONFLICT AND COOPERATION: INSTITUTIONAL AND BEHAVIORAL ECONOMICS 207–08 (2004).

161. In the United States, SEC Annual Reports and current data show that over the 19-year period from 1990 until 2018, the number of registered broker-dealers more than halved from 8437 to 3839. *See Company Information About Active Broker-Dealers*, SEC, https://www.sec.gov/help/foiadocsbdfoiahtm.html (last modified Oct. 1, 2018). Michie tells with regard to the LSE that "by the mid-1980s the business transacted on the Stock Exchange was increasingly dominated by a small number of large firms, both among the brokers and jobbers. These firms found it most economical to operate from their offices, using computer screens and telephones." MICHIE, *supra* note 3, at 577.

162. "Today only 5 giant wire house firms [Merrill Lynch, Morgan Stanley, UBS, Wells Fargo, Edward Jones] dominate the business. There are still a few regional brokerage firms, which probably will consolidate further." Andre Cappon, *The Brokerage World Is Changing, Who Will Survive*?, FORBES (Apr. 16, 2014), www.forbes.com/sites/advisor/2014/04/16/the-brokerage-world-is-changing-who-will-survive.

163. Evelyn Cheng, *Just 10% of Trading is Regular Stock Picking, JPMorgan Estimates*, CNBC (June 14, 2017), https://www.cnbc.com/2017/06/13/death-of-the-human-investor-just-10-percent-of-trading-is-regular-stock-picking-jpmorgan-estimates.html.

164. *See* Primary *Dealers*, FED. RES. BANK N.Y., www.newyorkfed.org/markets/primarydealers (click on "Historicla Primary Dealer Lists) (last visited Aug. 27, 2018).

165. As discussed above, the largest alternative trading venues are owned by the largest broker-dealer banks. *See OTC Transparency Data*, FINRA, https://otctransparency.finra.org/TradingParticipants (last visited Aug. 27, 2018).

rationally to gain any meaningful advantage over competitors (ultimately limited by law). Although the drive to create exclusive clubs did bring with it private ordering that led to transaction cost savings and overall gains in market efficiency, such gains were not the industry's main goals. The goal was competitive advantage. Moreover, when traditional exchange venues were created, they did not benefit the leading institutions alone, but were advantageous for all broker-dealer members, particularly the small firms with limited networks. Encasing these clubs in public law and public notions of fairness among broker-dealers was much less desirable for the builders of the clubs than for smaller members. As technology can now offer most of the network externalities and operational benefits of an exchange without the centralized venue in which all broker-dealers, small and large, participate on an equal footing under government surveillance, it is reasonable that the leading broker-dealers seek to migrate markets outward, dis-integrating them into a constellation of proprietary platforms.

B. The National Market System

The US Congress notionally launched the breakup of concentrated exchange trading in 1975 by adding Section 11A to the Exchange Act,[166] as it provided the legal basis for trading off-exchange. The purpose of this amendment was to create a "national market system" [167] through breaking down the monopoly of the old clubs of the stock exchanges.[168] Congress sought to achieve a national market system by allowing trades in securities to be matched on any eligible venue, and not just the one on which they were listed. According to this model, exchanges of listing were treated like manufacturing plants of listed securities and alternative matching venues became something like retail outlets for the listed securities, so that trade activity could disperse on a chain of retail matching outlets throughout the national territory, thereby rendering the securities market national. No thought was given (or at least publicly expressed) about the consequences of severing the natural link between the costs of regulating companies listed on the exchange and revenue earned from matching trades in the securities of those companies.[169]

As alternative trading venues do list securities, they need not pay for the type of regulation that creates liquid, listed securities, and this reduces their operating costs. For alternative matching business to be profitable, however, the cost of operating such venues

166. Securities Acts Amendments of 1975, Pub. L. No. 94-29, 89 Stat. 97 (1975) (codified as amended in scattered sections of 15 U.S.C. § 78).

167. *See* 15 U.S.C. § 78q (2006). The 1975 amendments sought to introduce "fair competition . . . between exchange markets and markets other than exchange markets . . . availability to brokers, dealers, and investors of information with respect to quotations for and transactions in securities . . . [and] the practicability of brokers executing investors' orders in the best market." 15 U.S.C. § 78k-1(a)(1)(C)(ii)–(iv) (2016).

168. *See* S. REP. No. 94-75, at 180 (1975) ("[A] number of causes for the securities industry's languor in the face of great change and great opportunity: price fixing with respect to commission rates, artificial restrictions on market making activities, unjustified barriers to access to markets and market makers, opposition to market integration from powerful vested interests, monopoly control of essential mechanisms for dissemination of market information.").

169. If exchanges list securities and monitor the governance and disclosure of listed companies, while any licensed platform is permitted to match trades in these listed securities, the cost burdens of exchanges and competing platforms will be unequal. Moreover, securities exchanges will no longer receive full benefit from the costs they incur when turning an unknown security of a privately funded company into a publicly listed corporation. For further discussion of and data on this problem, see generally Donald, *Bridging Finance*, *supra* note 157.

must fall below revenues from trade matching, which was achieved only in the 1990s through progress in data processing and communication technology. If the 1975 provisions had come immediately into effect, the disruption could well have damaged the market positions of leading broker-dealers, which were tightly ensconced within the NYSE.[170] Seligman reports that in 1978, when the SEC had a draft rule to implement the law by prohibiting the NYSE's restrictions of off-exchange broker execution, "the NYSE orchestrated a lobbying campaign . . . [with] nineteen of the twenty-two largest securities firms" and a number of New York politicians backing it up.[171] The SEC succumbed to this pressure by shelving the rule.[172] Some House members criticized the SEC in 1980 for its failure to implement the 1975 measures,[173] but with the support of the Reagan administration and later administrations, the financial industry was able to delay work on realizing off-exchange trading of listed securities until 2000.[174] Between 1975 and 2000, digitalization and increased dematerialization of securities together with low latency data processing and transmission, dramatically transformed the financial industry.[175] In preparation for infrastructural changes ahead, exchange members cashed out their positions by reorganizing member-owned exchanges into for-profit stock corporations and then self-listing, which began in Sweden in 1993[176] and reached New York in 2005,[177] the same year that Regulation NMS entered into effect and one year after the EU Market in Financial Instruments Directive was adopted.

By 2014, SEC Chairwoman Mary Jo White could estimate that in the US there were more than 250 broker-dealers matching trades on their own books.[178] By early 2018, the SEC named a total of 21 national securities exchanges on its website.[179] These exchanges differentiate themselves through distinct models of pricing and processing, so that they have come to resemble specialized venues. As discussed above, the largest specialized matching venues are now directly owned by major broker-dealers. On Aug. 6, 2018, FINRA listed 32 alternative trading systems on its website, with the top venues by trades executed owned by UBS, Credit Suisse, J P Morgan, Level Alternative Trading System,

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170. WELLES, *supra* note 81, at 9.

171. SELIGMAN, *supra* note 99, at 518 n. *. It should also be remembered that the executive officers of the NYSE at that time would have been "seconded" officers of large broker-dealer NYSE members. LEE, WHAT IS AN EXCHANGE?, *supra* note 41, at 58.

172. SELIGMAN, *supra* note 99, at 519.

173. *Id.* at 520.

174. Self-Regulatory Organizations; New York Stock Exchange, Order Approving Proposed Change To Rescind Exchange Rule 390, 65 Fed. Reg. 30,175 (May 10, 2000).

175. *See*, *e.g.*, Douglas W. Arner et al., *The Evolution of FinTech: A New Post-Crisis Paradigm?*, 47 GEO. J. INT'L L. 1271, 1279 (2016).

176. Bengt Ryden, *Demutualization and Self-listing*, *in* REGULATED EXCHANGES: DYNAMIC AGENTS OF ECONOMIC GROWTH 237, 241 (Larry Harris ed., 2010).

177. *See* Order Granting Approval of Proposed Rule Change and Amendment Nos. 1, 3, and 5 Thereto and Notice of Filing and Order Granting Accelerated Approval to Amendment Nos. 6 and 8 Relating to the NYSE's Business Combination with Archipelago Holdings, Inc., 71 Fed. Reg. 11,252 (Feb. 27, 2006), Self-Regulatory Organizations; Pacific Exchange, Inc.; Order Approving Proposed Rule Change and Amendment No. 1 and Notice of Filing and Order Granting Accelerated Approval to Amendment No. 2 Relating to the Certificate of Incorporation and Bylaws of Archipelago Holdings, Inc. 71 Fed. Reg. 11,271 (Mar. 6, 2006).

178. Mary-Jo White, Chairwoman, SEC, Enhancing Our Equity Market Structure (June 5, 2014) www.sec.gov/News/Speech/Detail/Speech/1370542004312#.VF22AvmUdMA.

179. *See, e.g.*, *Self-Regulatory Organization Rulemaking*, SEC, www.sec.gov/rules/sro.shtml (last visited Mar. 5, 2018).

Deutsche Bank, Morgan Stanley, Barclays, Merrill Lynch.[180]

In a market where trades can be matched on any one of about 300 platforms, networks have clearly supplanted a concentrated exchange. This is normally presented as creating more choice, more competition, and lower costs of executing trades.[181] This is probably not viewed in the same manner as, say, splitting John F. Kennedy International Airport into 11 smaller airports scattered around the New York Metropolitan Area would be viewed. Indeed, like the fragmentation of any other publicly important infrastructure, the fragmentation of the securities market has created notable regulatory problems. The Tabb Group estimated that in 2014 dark pools constituted over 43% of market volume in the US.[182] At the same time, numerous abuses were reported in connection with the operation of these dark pools, and a number of regulatory actions were filed against them.[183] Given their lack of transparency dark pools perhaps present the most extreme case of a general decrease in regulatory oversight due to fragmented markets.

The main problem of fragmentation, however, is that price discovery (liquidity) is broken into pieces and pre- and post-trade price information on one platform is not necessarily available for trading on another. This led directly to a monumental project for linking together the archipelago to counteract the damage to transparency caused by the NMS. It is referred to as the Consolidated Audit Trail (CAT), and had an initial estimated cost of $4 billion,[184] but the estimate provided in the actual fee schedule published in 2017 is (using median figures) approximately $3.4 billion for "building and implementing the CAT," about $2.6 billion "to retire existing systems," and approximately $3.1 billion for "annual aggregate costs for the maintenance and enhancement."[185] This initial outlay of approximately $9 billion should be understood against the primary perceived benefit of the fragmentation—to lower trading costs.

Moreover, even if successful, the CAT will only accumulate and combine post-trade information for regulatory purposes. There are no plans to create a consolidated view of pre-trade data from the various platforms on which trades are matched.

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180. *See OTC Transparency Data*, FINRA, https://otctrasparency.finra.org/Agreement (follow hyperlink; then follow "ATS Data") (last visited Aug. 26, 2018).

181. *See, e.g.*, Angel et al., *supra* note 28, at 2–5 (noting increased competition and lower cost).

182. *US Equity Market Structure: Q1-2014 Market Metrics*, TABB F. (July 15, 2014), http://tabbforum.com/researches/us-equity-market-structure-q1-2014-market-metrics (last visited Aug. 27, 2018).

183. *See,* e.g., Complaint at 1–2, New York v. Barclays Capital, Inc., No. 451391 1–2 (N.Y. Sup. Ct. June 25, 2014) https://data.bloomberglp.com/assets/sites/2/Schneiderman-Barclays-complaint.pdf ("Barclays . . . operated its dark pool to favor high frequency traders. Barclays . . . actively sought to attract such traders to its dark pool, and it has given them advantages over others trading in the pool."); Letter from Goldman Sachs Execution & Clearing, L.P., to Department of Market Regulation (FINRA) (July 24, 2015), http://www.finra.org/sites/default/files/GSEC_AWC_072715.pdf (charging Goldman Sachs with 395,000 instances of "trade-through" violation, offering its customers inferior prices); John D'Antona Jr., *UBS Pays Record $14 Million Fine for Dark Pool Violations*, TRADERS MAG. ONLINE NEWS (Jan. 15, 2015) (noting that UBS secretly marketed sub-increment order types to HFT traders for use in its dark pool); MICHAEL LEWIS, FLASH BOYS: A WALL STREET REVOLT 115–16 (2014) (detailing a scheme involving dark pool of Chipotle Mexican Grill stock).

184. 17 C.F.R. § 242.613 (2012).

185. CAT NMS, LIMITED LIABILITY COMPANY AGREEMENT OF CAT NMS, LLC (draft of May 22, 2017) App'x C-82, www.catnmsplan.com/wp-content/uploads/2017/03/CAT-NMS-Plan-Current-as-of-5.22.17.pdf.

C. The Market in Financial Instruments Directive

A similar process took place in the European Union about the same time. The first and second versions of the Market in Financial Instruments Directive (MiFID I and II)[186] achieve in Europe at the treaty area level what the NMS framework achieves at the US national level. The combination of MiFID I and II provides the same basic elements of opening registered exchanges to competition from alternative matching platforms. This has been achieved by directing member states to make three changes in their law. First, they were directed to expand the set of permitted "trading venues" beyond that of regulated markets,[187] so as to include multilateral trading facilities (MTFs)[188] and organized trading facilities (OTFs).[189] Second, they were to open up access to information by requiring "[m]arket operators and investment firms operating a trading venue [to] . . . make public current bid and offer prices and the depth of trading interests at those prices."[190] Third, member states were to introduce a best execution rule to force brokers out of set relationships in a given exchange, so that they must take sufficient steps to achieve "the best possible result for their clients taking into account price, costs, speed, likelihood of execution and settlement, size, nature or any other consideration relevant to the execution of the order," unless there is a specific client instruction to the contrary.[191]

MiFID I entered into force in 2007. By June 2017, the European Securities and Markets Authority (ESMA) reported (using data that still included the UK) 106 regulated markets, 153 multilateral trading facilities, and 11 registered systematic internalisers.[192] To put this in perspective, it is useful to restrict the data to the UK alone, where up to the 1990s, securities trading was dominated by the LSE and the London International Financial Futures and Options Exchanges (LIFFE). As at June 2017, ESMA showed registrations in the UK for 13 regulated markets, 75 multilateral trading facilities, and seven of the EU's 11 systematic internalisers.[193] As from 2018, data no longer includes UK entities, and the applicable legislation in the UK will likely change when the country completes its exit from the EU. This exit itself will also have a significant effect on market structure and quality.

Although there is currently no history of the adoption of MiFID I comparable to Seligman's detailed study of the SEC in its creation of the NMS rules,[194] Michie's history of the LSE shows that around the time of the Big Bang the developing shape of business pursued by multinational financial institutions strongly influenced the regulatory

186. MiFID I was replaced, effective January 2018, by a combination of a directive and regulation. MiFID II, *supra* note 159, and Regulation 600/2014, of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Regulation 648/2012, 2014 O.J. (L 173) [hereinafter MiFIR].

187. MiFID II, *supra* note 159, at 382.

188. An MTF is a matching venue "operated by an investment firm or a market operator." *Id.*

189. OTFs are matching venues other than regulated markets or MTFs that match trades in "bonds, structured finance products, emission allowances or derivatives . . . in a way that results in a contract." *Id.*

190. MiFIR, *supra* note 186, at 101.

191. MiFID II, *supra* note 159, at 412.

192. *See Registers and Data*, ESMA, www.esma.europa.eu/databases-library/registers-and-data (last visited Aug. 27, 2018).

193. *Id.*

194. While an excellent piece by Ferrarini and Moloney does examine interest group politics behind the adoption of MiFID I, the analysis takes securities exchanges as a constituency in itself without questioning the ownership of exchanges and the differing interests of their various members and owners. *See* Guido Ferrarini & Niamh Moloney, *Reshaping Order Execution in the EU and the Role of Interest Groups: From MiFID I to MiFID II*, 13 EUR. BUS. ORG. L. REV. 557, 564 (2012).

framework the UK government adopted for the LSE. That European securities markets after introduction of MiFID I display fragmentation similar to that arising after introduction of NMS indicates that the two projects served similar purposes. Both initiatives were launched under the general economic justification of stimulating competition and innovation,[195] and for neither project is there official analysis of deeper industry motivation among firms of different size and market quality for the broader economy.[196]

While the specific interests backing the genesis of MiFID's fragmentation project remain largely unstudied, there are good analyses of its effects. Lagneau-Ymonet and Riva report that industry groups whose representation includes "smaller brokers and asset managers which mainly operate locally and on behalf of their clients," complained following MiFID I of "the general deterioration of market quality and organization, especially for small and medium-sized intermediaries."[197] Petrella expresses the broadly held position that large broker-dealers incidentally benefited from the general push toward competition and innovation:

> The new regulatory environment has in fact spurred a number of initiatives by market participants, particularly to create new trading venues competing with established incumbent exchanges. Broker and dealers have actually a strong incentive to divert order flow from incumbent exchanges and to channel business towards trading platforms where they hold a stake in order to catch part of the incumbent exchange's profits.[198]

Although the self-interest of leading broker-dealers coincided with market quality when building clubs to protect their privileges, this is no longer the case when they divert trade matching from the exchanges to their own platforms. If we focus on trading costs alone, a picture of efficiency arises, but as discussed at length above, there is much more to market quality than (temporarily) lower costs to match trades. Market regulation under MiFID allows leading broker-dealers to consolidate their market positions and reduce competition from smaller brokers, which had benefited from the government-supervised concentration of trading in securities exchanges.

As in the US, fragmentation of information is now a major problem in Europe,[199] and the main response is to tie information back together again with an expensive network. The European version is called a "Consolidated Tape," which will be built by a private contractor or contractors.[200] Although the project of a Consolidated Tape for equity has been in the law for a decade,[201] at least at the aspirational level, no Consolidated Tape provider has stepped up to the plate to take on this difficult project. Moreover, the link is

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195. See *supra* note 167 and accompanying text; MiFID I, *supra* note 27, at Recitals 5 and 34.

196. See the discussion of competition versus fragmentation in Carole Gresse, *Market Fragmentation and Market Quality: The European Experience*, *in* MARKET MICROSTRUCTURE AND NONLINEAR DYNAMICS: KEEPING FINANCIAL CRISIS IN CONTEXT (Gilles Dufrénot et al. eds., 2014).

197. Paul Lagneau-Ymonet & Angelo Riva, *Market Information as a Public Good: The Political Economy of the Revision of the Markets in Financial Instruments Directive (MiFID)*, *in* FINANCE: THE DISCREET REGULATOR 134, 150 (Isabelle Huault & Chrystelle Richard eds., 2012).

198. Petrella, *supra* note 27, at 267.

199. William Canny & Viren Vaghela, *The MiFID-Driven Boom Seen in Europe ETFs Has One Major Flaw*, BLOOMBERG (Jan. 4, 2018), https://www.bloomberg.com/news/articles/2018-01-04/the-mifid-driven-boom-seen-in-europe-etfs-has-one-major-flaw.

200. MiFID II, *supra* note 159, at 367, 450–52

201. *See* MiFID I, *supra* note 27, at 4.

expressly limited to post-trade data,[202] which will not directly permit a broker's efforts to achieve "best execution" of an order for its clients. No cost estimates for the Consolidated Tape have been published as of this writing, but there is no reason—other than the absence of pre-trade data—to assume it will be substantially cheaper than the CAT, particularly if it is meant to tie together price information generated by different types of venues in various member states using different languages and somewhat different practices.

D. A Private Network Through Distributed Ledger Technology

As the foregoing sections make evident, in the second decade after the introductions of NMS and MiFID, market structure is highly unsettled. Fragmentation is the dominant trend, coupled with the appearance of boutique trading venues opened by leading broker-dealers. Simultaneously, smaller firms find themselves unable to compete and are either closed or absorbed. This consolidation of the industry has not yet been matched by a consolidation of (even post-trade) market information, so that the US CAT remains an unfinished and extremely expensive project and the EU Consolidated Tape remains little more than a hope. It is safe to assume that leading broker-dealers have been following their own best counsel and seeking a market structure that provides their firms with the most benefits, but the lack of transparency, thinning competition and high costs of repairing the market for long run efficiency indicate that market quality narrowly understood (as benefit to leading brokers) is diverging significantly from market quality broadly understood (as benefit for all market participants, issuers and investors).

Into this context enters blockchain, on which many are pinning their hopes for indelible, decentralized transacting. Since 2015, media has reported that leading banks are investing heavily in applications for distributed ledger technology (DLT),[203] one type of which is blockchain, the booking system that allows Bitcoin to function.[204] As its name suggests, DLT consists of a network of ledgers distributed along a network, and these ledgers are linked in such a way that they must remain exact copies of each other, so that each decentralized copy of the ledger presents an exact reflection of every other such ledger.[205] While this is sometimes referred to as a system in which no controller is

202. MiFID II, *supra* note 159, at 475.

203. *See, e.g.*, Jonathan Shieber, *Blockchain consortium R3 raises $107 million*, TECHCRUNCH (May 23, 2017), https://techcrunch.com/2017/05/23/blockchain-consortium-r3-raises-107-million/, the consortium and parties committing to it included "SBI Group, Bank of America Merrill Lynch, HSBC, Intel and Temasek . . . ING, Banco Bradesco, Itaü Unibanco, Natixis, Barclays, UBS and Wells Fargo." Some of the earliest activity is reported in Philip Stafford. *Banks and exchanges turn to blockchain*, FIN. TIMES (June 30, 2015), https://www.ft.com/content/764aed26-198a-11e5-8201-cbdb03d71480; Edward Robinson and Matthew Leising, *Blythe Masters Tells Banks the Blockchain Changes Everything*, BLOOMBERG MKTS. (Sept. 1, 2015), https://www.bloomberg.com/news/features/2015-09-01/blythe-masters-tells-banks-the-blockchain-changes-everything; John D'Antona Jr.*, Goldman Sachs Files Patent to Settle Securities in Bitcoin*, TRADERS NEWS (Dec. 3, 2015), http://www.tradersmagazine.com/news/brokerage/goldman-sachs-files-patent-to-settle-securities-in-bitcoin-114721-1html.

204. MELANIE SWAN, BLOCKCHAIN: BLUEPRINT FOR A NEW ECONOMY 105–10 (2015). ("The blockchain is seen as the main technological innovation of Bitcoin because it stands as a 'trustless' proof mechanism of all the transactions on the network . . . The blockchain allows the disintermediation and decentralization of all transactions of any type between all parties on a global basis.")

205. *See* Joseph Lee, Distributed Ledger Technologies (Blockchain) in Capital Markets: Risk and Governance (May 18, 2018) (unpublished article), available at https://ssrn.com/abstract=3180553; Benito Arruñada, *Blockchain's Struggle to Deliver Impersonal Exchange*, 19 MINN. J. L. SCI. & TECH. 55, 58–60 (2018);

necessary, its structure actually means that the controller designs a largely automatic system, like the maker of a music box. Once the algorithms of the chain's "genesis block" have been written and the system is operational, its design protects against unauthorized alteration in three, interlocking ways.[206] First, a block can only be created by calculating a complex mathematical problem ("proof of work" problem) or applying a private key (in a closed circle arrangement). Second, because each new block contains the history of all previous blocks (embedded in a "hash" formula that links blocks together), falsifying one block requires changing all blocks to alter their "hash" historical record, a task requiring enormous computing power if the chain has a long history. Third, ledger holders not conspiring with someone attempting to falsify the chain could provide proof of the actual history, and the system members would not alter their copies of the ledger unless the pre-defined ratio of ledgers make the alteration ("proof of stake" authority).

As the three locks on the content of the ledger arise from the nature of the ledger itself, the traditional institutional safeguards on transactional certainty can (theoretically) be moved back to the preparatory stage when the system is designed. That means no central authority monitors and enforces behavior on an ongoing basis and a need for enforcement arises only when the automated processes are ineffective. If securities transfers were to be recorded on such distributed ledgers, there would be no need for central clearing and settlement facilities, no need for anything more than the broker-dealers owning and maintaining each manifestation of the ledger. The hope of many is that blockchain or another ledger format would actually work like some sort of utopia element, eliminating the need for law, authority and supervision—it is all in the magic of the ledger itself. Few, if any, discuss the possibility of built-in biases through design. Like Enlightenment views of the Newtonian universe, the maker will have built with wondrous order and then departed, but in this case the Divine Maker is swapped for a team of unnamed coders.

Currently, securities transfers in most markets are booked on the accounts of a Central Securities Depository (CSD) to which all market participants are linked in an account relationship.[207] The CSD, like a stock exchange itself, provides a central infrastructure service for every clearing participant, and some participants act as intermediaries (often referred to as global custodians) for the smaller broker-dealers that cannot afford or do not want to carry the obligations of being a clearing participant.[208] Just as NMS and MiFID dis-integrated trade matching from the exchange of listing to any number of private platforms, so too would DLT eliminate or dramatically de-emphasize the CSD node for settling transactions, moving records of transfer to the ledgers maintained by the broker-dealers able to do so.

Likely candidates for a global DLT network are the largest broker-dealers (which now maintain the largest private trading platforms) and any other institutions now serving as leading global custodians.[209] It is unlikely that copies of a ledger on which trades for a

David C. Donald & Mahdi H. Miraz, Can Distributed Ledger Technology Return Securities Settlement to Direct Holdings? (unpublished manuscript) (on file with author) (explaining the make-up of DLT networks).

206. The following is taken from Donald & Miraz, *supra* note 205, pt. II.

207. The author examines this system closely in Donald, *supra* note 8, at 59–61.

208. *See* DEP'T FOR BUS., INNOVATION & SKILLS, EXPLORING THE INTERMEDIATED SHAREHOLDING MODEL: BIS RESEARCH PAPER NO. 261 93 (2016) http://www.uksa.org.uk/sites/default/files/BIS_RP261.pdf.

209. Two leading global custodians that do not act as broker-dealers are Bank of New York Mellon and State Street. However, others in the top ten do trade in securities. These are JP Morgan Chase, Citigroup, BNP Paribas, HSBC, Mitsubishi UFJ Financial Group, Société Générale Securities Services, and UBS AG. *See* data provided

given securities market are recorded would be held by just any securities trader. The size and volume would require extensive IT facilities—expensive to maintain and well beyond the financial means of smaller firms. The blockchain used to record trades in bitcoin exists in numerous ledgers potentially open to all participants, but manages only one asset. A ledger used to trade shares listed on the NYSE would, as in December 2017, record transactions in 2,286 different shares with an average daily turnover rate on the electronic order book of nearly 59 million shares.[210] At a record high transaction volume on December 14, 2017, bitcoin's blockchain recorded 490,644 transactions for that day, well over two orders of magnitude less than the average NYSE volume.

A private, permissioned network, which can transact significantly faster than the Bitcoin blockchain, could potentially achieve the required minimization of latency. As the candidates for a permissioned DLT network for clearing and settling stock market trades would be the same group of institutions discussed above as currently operating the largest alternative trading venues, securities trading would likely be absorbed into an oligarchy of the largest financial institutions. Thus, similar to the dis-integration of the securities exchanges, a dis-integration of the CSDs would mean that broker-dealers already receiving a part of the revenues from the CSD would receive a greater portion of clearing and settlement revenue by shifting those services out of the common infrastructure and into their own, wholly owned system. Together with what has begun under NMS and MiFID, the result would be a closed, private network of trading, matching and settlement that would no longer require securities exchanges. Open networks designed to shuttle trades among a network of public matching platforms already exist,[211] but such decentralized network would then constitute the entire market.

The only motivation large broker-dealers would have to move away from the current arrangement for securities settlement, which (for them) is cheap and very efficient, would be to gain more control of the market and extract a larger segment of settlement fees. Structurally, a system of ledgers used to transfer securities that remain closed to a handful of leading banks would be a club as private network, not unlike the technique of 15th century Bruges money changers discussed in Part II.B. A closed-system DLT would be protected by the trust among a group of globally significant institutions, but public regulation of the market would also hang from trust that information provided by the institutions is accurate and complete.[212] This would be an entirely different arrangement

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by the DEP'T FOR BUS., INNOVATION & SKILLS, *supra* note 208; *Custodians by Assets Under Custody (AUC)*, THE ASIAN BANKER, http://financialmarkets.theasianbanker.com/custodians-by-assets-under-custody (last visited Mar. 5, 2018). Nasdaq reports that the five largest global custodians hold about $100 trillion in assets, constituting about 60% of the world market. Trefis Team, *What is the Market Share of the 5 Largest Custody Banks in The Global Custody Banking Industry?*, NASDAQ, (June 14, 2016) www.nasdaq.com/article/what-is-the-market-share-of-the-5-largest-custody-banks-in-the-global-custody-banking-industry-cm635397. This makes it easy to see how a group of the 20 largest banks using DLT could collaborate to constitute a global securities exchange within a "Group of 20" exclusive network.

210. *Monthly Reports*, WORLD FED'N. OF EXCHANGES (Aug. 27, 2018, 8:28PM), https://www.world-exchanges.org/home/index.php/statistics/monthly-reports.

211. For example: "Liquidnet is the global institutional trading network that more than 930 of the world's top asset managers trust to execute their trades in size. Our scale of liquidity and investment opportunities span 45 markets and 5 continents." *On a Different Scale*, LIQUIDNET (Aug. 27, 2018, 8:30PM), www.liquidnet.com/#/about-us/.

212. While members of the closed-system DLT club could offer to place a copy of the ledger within a regulator's control, the necessary servers and maintenance would be expensive, and it would be difficult to

than has existed in a world of trading concentrated in regulated stock exchanges.

The only substantial disadvantage of the current arrangement for securities settlement built around a CSD is that listed companies lose control of information regarding their shareholders, which is transferred to the CSD and its broker-dealer members so securities can be held "indirectly" for faster transfer.[213] It may be possible to correct this lack of transparency through application of DLT,[214] but it is unlikely that such an alternative would be pursued by system owners because correcting the transparency deficit offers the financial industry no advantages (all benefits would go to listed corporations, their investors and the regulators) and the financial industry controls system design options. Nevertheless, it is useful to sketch the rough outline of such a system here.

In 1971, before regulators decided that securities settlement should be shifted to an indirect holding system centered on a CSD, the primary competing model was referred to as a "transfer agent depository" (TAD) system.[215] This system was conceived as a network of electronic registers connected to the stock exchange, with the aggregate of registers serving as the locus to record securities settlement. Thus, when shares were traded on the exchange, the new owner of the shares would be recorded as such on the listed company's register of members the moment the uncertificated security was transferred to her. The TAD system was rejected because paper certificates were still required by law and the 1970s data transfer networks were deemed inadequate.[216] Today, those obstacles no longer exist, and it may well be possible to create a TAD settlement system through use of DLT.

A blockchain system designed to record the actual economic purchaser of a share or that person's coded identity (as is currently done with bitcoin purchases, and proposed in Australia), rather than the CSD's nominee or a broker-dealer holding a direct account with it, would be an enormous improvement over the current indirect holding system. It would dramatically improve corporate communications, reduce administrative costs connected with shareholding, and perhaps also encourage longer term investing. However, it would force the financial industry to return to investors and listed companies the relationship they received by windfall in the 1970s and now control exclusively. This goes beyond information about the identity of shareholders in a listed firm, and includes the actual legal status of shareholder,[217] making them essential middlemen for passing on proxy statements, exercising votes, and making decisions on takeover offers and other "corporate

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ascertain on a continuing basis that the other ledgers were in fact fully reflected in the regulatory copy. Regulation would depend completely upon trusting the DLT technology and the broker-dealers that apply it.

213. For an explanation of how the "indirect holding system" implemented through CSDs causes listed company to cede their shareholder information to broker-dealers and the CSD, see Donald, *supra* note 8, at 59–63.

214. The Australian Securities Exchange has stated that a DLT solution being introduced to replace their current Clearing House Electronic Subregister System (CHESS) would allow complete transparency of ultimate investor, albeit filtered through use of a Common Investor Number (CIN) used to identify these persons. AUSTRALIAN SECURITIES EXCHANGE, CHESS REPLACEMENT: NEW SCOPE AND IMPLEMENTATION PLAN, AUSTRALIAN, SEC. EXCH. 16–18 (Apr. 2018), www.asx.com.au/documents/public-consultations/chess-replacement-new-scope-and-implementation-plan.pdf. However, their current CHESS system also allows such transparency through "issuer sponsored sub-registers," but 81% of holdings have been shifted into broker-nominee holding rather than investor transparent holding. *Id.* at 10.

215. *See* SEC, STUDY OF UNSAFE AND UNSOUND PRACTICES OF BROKERS AND DEALERS, H.R. DOC. NO. 92–231, at 179–80 (1st Sess. 1970).

216. *See* Donald, *supra* note 8, at 56.

217. *See id.* at 49 (discussing depository rights as legal owners of securities).

actions." Seen against the 400-year history of market structure, it is virtually inconceivable that the financial industry would voluntarily take such an altruistic step, and in light of that same history, it is highly unlikely that a regulator would advocate a design as "inefficient" as full transparency, given that "market efficiency" is customarily defined with reference to the costs and comfort of the leading broker-dealers.

V. CONCLUSION

The history of market structure presented in this paper shows broker-dealers arranging trading infrastructure according to their needs and preferences in response to available technology, political and economic developments, and law. The general evolutionary pattern moves from decentralized private networks, to clubs which were eventually made largely public, and back toward private networks. The staggered nature of the development (the Amsterdam Exchange appears 200 years before the NYSE and LSE) and the incompleteness of concentrated trading (OTC trading in various types of securities continuously persisted) does not significantly detract from the general pattern of development. Although each market structure was selected for the specific benefits it brought the leading broker-dealers, concentrated trading lowered transaction costs and generally improved market efficiency. Because any general market quality offered the economy is likely an accidental result of decisions made for private benefit, regulators should exercise influence on behalf of the public, and they should measure the decisions of broker-dealers affecting market structure against a broad understanding of market quality.

Because arrangements for securities trading are made in almost every case by market participant broker-dealers with very little input from other constituencies, regulation is important to ensure broad market quality. During the middle of the 20th century when the United States government encased the private clubs in public law and the government of the United Kingdom pressed the LSE into service as a quasi-governmental body, markets were quiet but generally served capital formation and allocation without major crisis. This state of affairs was achieved only when leading broker-dealers ceded a significant amount of autonomy to regulators. However, since the implementation of NMS and MiFID, broker-dealers with sufficient resources have been able to extract themselves from regulated securities exchanges by launching private platforms.

The industry seems to hope that use of DLT could allow broker-dealers to bring both trade matching and the settlement of trades into networks that are under full private control.

As broker-dealers design and operate markets for themselves, they naturally are in the best position to advise regulators on narrow market quality. The more complex the system, the more regulators must rely on these broker-dealers as the primary source of information about how market structure works and whether its quality is high. If a narrow view of market quality is used, it is legitimate for regulators to be guided by the views of broker-dealers, as narrow market quality predominantly asks whether market structure makes trading efficient for traders. Regulators investigate trading costs, trading speed, operational safety, and the flow of information (which is a component of both cost and speed). They test for market quality, narrowly understood.

This narrow view of market quality makes naïve assumptions about broker-dealers and ignores the real costs and functions of markets. First, it assumes that the self-interest of broker-dealers is limited to efficiently reducing transaction costs rather than achieving

other strategic advantages at the cost of efficiency. Second, it incorrectly assumes both that most trading is for clients (rather than proprietary) and that savings will be passed on to customers and the broader economy. Third, it seems to forget that the real costs of market structure include regulatory costs, overall quality of regulation, and competitive access to markets for all broker-dealers. Since the launch of NMS and MiFID, the market structure divisions of US and European regulators have expanded from a handful of experts to large teams charged with monitoring complex problems like market fragmentation and technical initiatives like the Consolidated Audit Trail and the Consolidated Tape. Periodic operational failures and abuses in proprietary trading venues like dark pools have also attracted significant regulatory resources. While the market may well have become cheaper for broker-dealers on a daily basis, it has necessitated a roughly $9 billion patch in the form of the CAT. Since the late 1990s, the population of broker-dealers has dropped significantly as the market has consolidated into the hands of a relatively few leaders.

The costs to broader market quality listed in the foregoing paragraph do not usually appear in official studies of securities market infrastructure. They should, and they must be taken into account as the approaching feasibility of DLT could allow a complete return of the securities markets to private networks, or on the other hand a complete return to direct and transparent shareholding. The publicly regulated securities exchange has provided an easy focal point for the regulation of securities markets. It has also provided a simple piece of infrastructure through which broker-dealers small and large can access significant network externalities. The regulatory benefits of concentrating trading on an exchange can be seen in the 2009 Group of 20 decision on OTC trading of derivative instruments, which following the near collapse of American International Group (AIG) in 2008, were brought into organized clearing systems to allow full information about trades to be included.[218] While concentrated trading can discourage some forms of competition, the advantages it brings far outweigh that cost.

The concentrated stock exchange, which for nearly 400 years existed as a robust and useful way to enhance liquidity and lower transaction costs, has been dramatically reduced in importance over about two decades, thanks to new technology and changes in law. Even better technology will soon make choices available that will obviate central markets altogether. Regulators should take note of how and why market structure has been shaped over the centuries and fulfill their responsibility to the broader economy and society by advocating public interest in the face of choices by leading broker-dealers to return the securities markets to proprietary networks fully under their own control.

218. Memorandum from Group of 20 (G20), G20 Leaders Statement: The Pittsburgh Summit (Sept. 24–25, 2009), www.g20.utoronto.ca/2009/2009communique0925.html.