Exchanges: The Quintessential Manufactured Markets

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I. Introduction

Financial exchanges such as the Chicago Mercantile Exchange or the New York Stock Exchange are often identified as the epitome of a free market: "Free Markets for Free Men," in the words of a lapel button once fashionable among floor traders on the Chicago exchanges. The price competition on the floor of a traditional exchange, or on the screens of a modern computerized one, is indeed intense and superficially resembles the Walrasian market of neoclassical textbooks. But this competition takes place within a dense web of deliberately chosen rules, and a superstructure of similarly deliberately chosen organizational and governance structures. What's more, these formal rules and structures are supplemented by, and are sometimes in tension with, intricate informal norms and beliefs that also constrain and guide the actions of the agents who trade on exchanges.

Thus, although the process of buying and selling that takes place on exchanges appears to approximate closely the neo-classical economist's ideal of a competitive market, a focus on the transaction process itself results in an entirely misleading conception of the economics of exchanges. When one examines them in their totality, it is apparent that exchanges are, in fact, the epitome of a manufactured market. Almost unremarked, the economic agents who own and control exchanges manufacture a complex institutional infrastructure that shapes and constrains the more visible trading process. The seen—the vibrant trading

process on the floor, or nowadays, on a computer, distracts our attention from the unseen—the dense set of rules, organizational forms, and mode of governance that determine the appearance of the visible trading process.

This immediately suggests the question: What economic forces determine the organizational and governance structures; the formal rules; and the informal norms of financial exchanges? Or: Why are these markets manufactured in the particular ways that we observe?

Answering these questions requires a detailed analysis of the microfoundations of the process of supplying transactional services to those who wish to buy and sell financial instruments such as stocks or futures contracts. Such an analysis demonstrates that both efficiency and distributive considerations affect the organization and governance of exchanges, and the content of their rules.

In an Arrow-Debreu-Walras world, all relevant attributes of commodities and securities are completely and costlessly specified; information is costless and uniformly distributed; and contracts are costlessly self-enforced. In reality, however, there are measurement costs; information is costly and distributed asymmetrically; and parties have incentives to renege on contractual commitments, or the inability to fulfill them. To the extent that it is possible to economize on measurement, information, and contract enforcement costs, transactions costs are reduced and more mutually beneficial trades can occur. Exchanges have historically been at the forefront of devising ways to economize on such transactions costs. By creating rules and enforcing them, exchanges make anonymous trade over time and space possible. They provide an infrastructure that supports trade.

Although such transactions-cost reducing considerations explain some exchange rules, they cannot explain all of them. Nor can they explain exchange organization or modes of governance. Understanding these features requires a detailed understanding of the trading process and the agents who participate.

This analysis demonstrates that: (a) the consummation of even a simple financial transaction requires the performance of several complementary tasks that are consumed in (nearly) fixed proportions; (b) there are advantages to specialization in the performance of these tasks, those specializing in these tasks have specific capital, and even agents within a particular specialization are heterogeneous due to different endowments of human and financial capital; (c) there are extensive economies of scale and scope in several of these tasks; and (d) due to these strong scale and scope economies, there are strong natural monopoly tendencies in exchange trading, and that exchanges possess market power.

These ubiquitous features of financial trading have important implications that largely determine the salient features of exchange organization, governance, rules, and norms. In particular, exchange market power generates economic rents. Moreover, specialization and task-specific skills and capital give rise to rents and quasi-rents. These rents and quasi-rents create incentives to engage in wasteful rent-seeking behavior—which in turn, provides an incentive to devise organizational and governance structures, and to create rules and norms, that economize on this rent seeking. Moreover, the existence of rents provides a motive to craft rules and structures to share these rents among market participants, and to

protect the agreed upon division from ex post attempts to undermine the sharing arrangement.

Thus, exchanges are the product of a complex variety of efficiency and rent-seeking considerations. In this chapter, I illustrate this conclusion by examining a several salient features of exchange organization, including exchange organizational form, vertical integration in the provision of complementary functions, the committee dominated governance of traditional exchanges, the content of exchange rules and the difficulties that exchanges have faced in addressing inefficient conduct that has profound distributive consequences, such as enforcing rules against manipulative conduct.

The analysis of exchange organizational form is particularly illuminating, because it illustrates how a technological shock that affected the distribution of rents among the suppliers of complementary transactional services, namely, the move to electronic trading, led to a complete and rapid change in organizational form from not-for-profit to for-profit form at exchanges throughout the world.

The remainder of this chapter is organized as follows. Section II discusses measurement, information, and enforcement cost issues, and how exchanges have, or have not, addressed them. This analysis demonstrates that although efficiency considerations are clearly important in explaining exchange efforts to reduce transactions costs, distributive effects are important as well. In particular, exchanges have not been notably successful in implementing efficiency enhancing rules when those rules have had large effects on the distribution of rents. This section provides historical examples that illustrate how distributive considerations

have impeded the ability of exchanges to combat some forms of opportunistic behavior, such as manipulation and fraud. This motivates a discussion of how such failures have shaped government regulation of exchanges, and how governments have become an important part of the market manufacturing process.

Section III presents an overview of the process of executing the purchase or sale of a financial instrument, such as a stock or a futures contract. This analysis identifies the numerous complementary components that are required to consummate a financial transaction, and identifies the sources of extensive scale and scope economies inherent in supplying them.

Section IV analyzes the technology for performing these complementary functions in a traditional "open outcry" trading environment; shows how this technology gave rise to rents and quasi-rents, which in turn created a need to devise institutional protections to mitigate rent seeking; and then demonstrates that not-for-profit organizational form and committee dominated, political governance structures were well-adapted to provide these institutional protections. The section concludes by examining how technological change affected the distribution of rents and quasi-rents, and how organizational form changed in response.

Section V examines how transactions cost, and technological and competitive considerations determine the extent of vertical integration on exchanges.

Section VI provides a brief summary.

II. Exchanges as Transactions Cost-Reducing Institutions

Economic agents incur costs to make trades. Consider the case of an apparently simple commodity, such as wheat. Wheat comes in many varieties. Moreover, even a given variety of wheat can vary in crucial qualities, such as protein content or foreign matter. Given such heterogeneity, it is insufficient for a buyer to say to a seller "I want to buy some wheat." The buyer and the seller need to come to an understanding about the qualities of the wheat actually being bought and sold. They need a language to describe wheat, and a means of assessing the attributes of the actual wheat that is sold. Creation of a language, and measurement of actual wheat, are costly activities. Moreover, to the extent that there are myriad buyers and sellers, there are often benefits to creating a standard language, and a standard measurement technology.

The buyer and the seller also need to arrive at a price. The value of the wheat depends, in part, on information about supply and demand. To the extent that information is imperfect and incomplete, and importantly, that it is not necessarily uniformly distributed among all buyers and sellers gives rise to costs. Asymmetric information about supply and demand tends to impede trade, and can cause a breakdown of trade altogether.

The buyer and the seller need also take care to ensure that the agreements that they make are adhered to. Some transactions, such as a spot sale in which performance is simultaneous with the striking of a bargain, pose little risk of non-performance. However, for reasons related to risk or logistics, it is often desirable

to negotiate today transactions that will be completed at some future date, or which involve some future contingency. The separation in time of agreement and performance creates the possibility of non-performance. For instance, a buyer may want to renege if the price of wheat falls subsequent to his agreement to buy wheat at a fixed price for delivery at some future date. Moreover, even if agents do not want to renege opportunistically, they may be unable to perform due to some event, such as bankruptcy.

It is possible for parties to negotiate bilaterally terms related to commodity definition and measurement, information disclosure, and contract enforcement. However, since (a) transactions are often repeated over time, (b) many agents engage in these transactions, and (c) certain activities (such as information disclosure and the creation of a language to describe what is being traded) have public goods attributes, there are reasons to engage in collective action to reduce transactions costs; it is efficient to do so if the costs of collective action are lower than the alternatives (e.g., bilateral interaction). These features create scale and scope economies that a group of traders can exploit to reduce transactions costs.

Indeed, the genesis of most commodity and securities markets is traceable directly to the efforts of market participants to reduce measurement, information, and enforcement costs through collective action.

For instance, many famous commodity exchanges, such as the Chicago Board of Trade or the Liverpool Corn Exchange, were created in large part to economize on the costs of commodity measurement. Prior to their establishment, there were no standards, even for things as prosaic as the definition of the term "bushel." Virtually

every transaction in physical grain required the buyer and the seller to inspect the grain physically. Since the same grain was often bought and sold repeatedly, agents repeatedly incurred measurement costs. To economize on these costs, market participants came together and formed exchanges that defined the attributes of commodities; created a standard language for describing them; and operated inspection systems to economize on measurement costs.

Pirrong (1995a) demonstrates that these systems were often quite elaborate, and exhibited variations that reflected differences in the quality-control technologies. For instance, bulk storage was feasible in the United States, and economized on handling and storage costs by exploiting economies of scale. Moreover, the operators of bulk storage facilities had the ability to maintain grain quality through careful operation of their facilities. To provide incentives of those supplying storage services to take adequate measures to control the quality of grain (e.g., to control insects, or the rotting of grain), it was efficient to inspect grain on load-out from a bulk storage elevator. This provided an incentive for the storer to maintain quality, but required only a single inspection. In contrast, handling technology in Australia and the Argentine during the early 20th century was rudimentary, and as a result handlers in the exporting country made it prohibitively costly to control quality at the point of export. Therefore, inspection at the point of export (as in the United States) would have had little effect on the incentive to maintain grain quality up to the export point, but would have entailed an additional measurement cost. Thus, it was economical to measure only at the point of import; which gave ship operators (who could exert some control over quality) the incentive

to take measures to maintain quality. This comparison provides an example of how exchanges chose grading systems in a discriminating way that reflected variations in the cost of quality control across producing and exporting regions.

Exchanges also mediated quality disputes between traders. The exchanges created standard contracts that included language that specified that quality disputes be submitted to exchange arbitration bodies. For instance, in the late-19th and early-20th centuries virtually all cotton traded internationally was bought and sold under contracts specifying the resolution of disputes through Liverpool Cotton Exchange arbitration, rather than the courts (Simpson, 1991; Bernstein, 2001).

Historically, exchanges also implemented measures to mitigate information costs and asymmetries. Exchanges often collected and distributed information about production, prices, imports, exports, and supplies. The central collection and dissemination of this information economized on information production costs, and also reduced information asymmetries, thereby reducing transactions costs arising from adverse selection. Similarly, in the years starting in 1869, the New York Stock Exchange imposed increasingly strict disclosure requirements on the companies that listed their stock to trade on the exchange (Pirrong, 1995a).

Arguably the most important exchange initiatives to reduce transactions costs related to contract enforcement. In volatile commodity futures markets in particular, both trader insolvency, and opportunistic efforts by traders to escape losing trades, were serious problems. The earliest rules (adopted in 1867) of the Chicago Board of Trade, the premier American agricultural futures exchange included provisions regarding the posting of performance bonds ("margins"). Over

time, rules regarding contract performance became progressively more elaborate and nuanced. Moreover, the CBT, and other exchanges as well, suspended the membership of non-performing firms, which effectively precluded them from trading further (as remaining members were prohibited by rule from trading with those under suspension). Futures exchanges also pioneered the collective sharing of performance risk via the innovation of the clearinghouse, first developed in its full modern form by the Minneapolis Chamber of Commerce (a grain exchange) in 1891.

In brief, exchanges have historically implemented a variety of rules, policies, and practices to reduce a variety of transactions costs, including measurement and contract enforcement costs. But not all exchange efforts met with success. An examination of the failures sheds light on the types of issues that make it difficult for exchanges and their members to consummate mutually beneficial Coasean bargains. In particular, these episodes illustrate how distributive conflicts over rents can interfere with the negotiation of such exchanges.

The most salient example is the conflict over the regulation of grain elevators ("warehousemen") by the Chicago Board of Trade in the 1860s. Warehousemen were essential to the efficient handling of grain in bulk. Merchandisers of grain would purchase it in the country and ship it to Chicago to be stored until it was efficient to market it to consumers in markets in the eastern US. In performing their functions, warehousemen could affect the quality of grain through the care they took in handling and storing it. Moreover, they could influence the process of measurement, and engaged in process like the "mixing" of grain that allowed them

to exploit the discreteness of grain grades. [1] This practice was in part wasteful rent seeking. Finally, warehousemen had an information advantage arising from their ability to monitor the quantity and quality of grain in store that they could use to trade profitably. The resulting "lemons problem" impaired market liquidity and created additional deadweight losses.

The merchandisers and futures traders on the Chicago Board of Trade attempted to use the rules of the exchange to compel the warehousemen to implement improved grading systems, and to disclose information about the quality and quantity of grain in store. The Board also attempted to negotiate with the warehousemen in an attempt to craft mutually acceptable rules and enforcement mechanisms. The attempts to compel and the negotiations both failed. Compulsion failed because the only sanction available to the exchange was expulsion, but the rents warehousemen captured from their exploitation of the grading system and information advantages exceeded the benefits of exchange membership. Negotiations failed in large part because side payments were impractical, and the difficulty of enforcing any bargain.

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[1] Grain quality varies continuously along several dimensions, in terms of moisture content, foreign matter, and other economically relevant features. Trading in bulk, however, made it uneconomical to preserve the unique identity of each consignment of grain, and thereby to ensure that the unique bundle of characteristics of each such consignment was value. Instead, grain was sorted into broad categories—"grades"—that could be satisfied by individual consignments of varying qualities. In Barzel's (1982) terminology, certain attributes of each consignment were placed in the public domain. The grain elevators exploited this fact, by mixing low quality grain with high quality grain. Those whose grain was of above average quality for a given grade lost some of the value associated with that value to the warehousemen. Inasmuch as mixing used real resources, this practice was a form of rent seeking. Moreover, by reducing the ability of those providing high value grain to capture this additional value, it attenuated the incentive to care for grain prior to shipment to the elevator. This induced a further welfare loss.

In the end, the Board turned from negotiations with the warehousemen to appeals to the Illinois legislature. In response, the legislature passed rules regulating the warehousemen. The warehousemen's lawsuit resulted in a landmark legal decision in the case Munn v. Illinois, which granted states broad powers in regulating private economic activity, and is often considered the genesis of the regulatory state.

This episode illustrates that large distributive effects can interfere with the ability of exchanges to implement transaction cost reducing rules. Many exchange rules improved welfare without imposing large distributive effects. For instance, operating behind the veil of ignorance of the future, traders do not know whether they will be the bankrupt, or the counterparty of a bankrupt. They anticipate that they will capture a proportionate share of the reduction in transactions costs associated with more efficient rules regarding contract performance, and hence all benefit from the adoption of such rules. No side payments are required. In contrast, in the elevator battle, the efficient rules redistributed wealth from warehousemen to merchandisers and futures traders, and hence achieving a Coasean bargain required the payment of compensation to the warehousemen. The available technology for manufacturing rules did not permit the production of enforceable deals to provide such compensation in exchange for performance.

This problem is not a relic of the distant past. I have personally been involved in work for several exchanges on the re-design of futures contracts delivery mechanisms. I have learned that seemingly small changes—adding a particular city as a delivery point on a futures contract, for instance, or changing

from delivery "in store" to delivery FOB—can have major distributive effects. Firms that operate in the newly designated delivery point have information advantages that they can exploit in their trading; the information advantages of traders at the old delivery points are reduced, or eliminated if their points are eliminated from the delivery mechanism. As a result of these considerations, and other distributive effects, negotiations over adjustments to delivery design are typically rancorous and protracted, and frequently lead to the persistence of clearly inefficient incumbent delivery systems.

Exchange difficulties in controlling the exercise of market power by large traders—market manipulation—provide another example of the challenges posed by distributive conflicts.

Since the birth of futures trading in the United States around the time of the Civil War, periodically traders have accumulated positions that allow them to demand delivery of larger quantities than are available at the competitive price; it is said that such traders have "cornered" the market, which allows them to "squeeze" sellers of futures contracts. Due to the costs of enhancing deliverable supplies, sellers of futures contracts ("shorts" who have an obligation to make delivery) are willing to pay a supercompetitive price to liquidate their futures positions, and thereby extinguish their delivery obligations. The large buyer can reap a monopoly rent by selling at these supercompetitive prices.

Manipulation is inefficient not only because of the welfare losses associated with the exercise of market power, but because the unpredictability of their occurrence and their large effects on prices undermines the roles of futures

contracts as hedging instruments, and beacons for price discovery (Pirrong, 1995b). Nonetheless, exchanges around the world in many different markets for many different instruments were almost uniformly unsuccessful in creating and enforcing rules to reduce the frequency of corners and squeezes. Pirrong (1995c) shows that this was in large part due to the distributive effects of manipulation. Any exchange action would have led to large transfers of wealth among traders. Furthermore, exchange members were fearful that delegating the power to intervene selectively to abrogate or alter contractual obligations, or to adjust prices on contracts, during a corner could be misused. That is, the exchange could abuse its powers by intervening to overturn market outcomes to benefit a group of influential traders. This would strike at the exchange's reliability as an impartial enforcer of contracts. Exchange members evidently concluded that it was better to live with the inefficiencies associated with periodic corners, than to undermine contract enforcement. This focus on contract enforcement was reinforced by the fact that many of the welfare costs of manipulation were borne by non-members.

The influence of efficiency and distributive effects is not limited to their effect on the design of rules relating to commodity measurement or contract enforcement or contract design or market manipulation. As I show, these competing considerations influence virtually every aspect of exchange rules, organization and governance. I next turn to a detailed examination of the technology of trading. This examination helps highlight a series of other possible efficiency and distributive effects which I will demonstrate help explain other salient aspects of the manufacture of financial markets.

III. The Technology of Trading of Financial Instruments

The completion of a financial transaction typically involves a variety of complementary activities.

The first function is the execution of a transaction; that is, the consummation of an agreement between a buyer and a seller. This can be done in a variety of ways. In over-the-counter markets, buyer and seller typically complete deals over the phone. In exchange markets, orders to buy and sell are directed to a central marketplace--the exchange. In a traditional floor-based, open outcry exchange, orders to buy or sell are represented by agents (floor brokers) on the exchange floor, or by exchange members physically present on the exchange dealing on their own account. Buyers and sellers (or their agents) on the exchange floor agree to the terms of a transaction through a negotiation or auction process. In newer, computerized exchanges, orders are routed electronically to a central computer that matches buy and sell orders based on priority algorithms.

Once the buyer and seller agree to terms, a transaction must be cleared. The clearer first establishes that the buyer and seller indeed transacted by verifying that all terms submitted by the buyer and seller match. In most centralized markets, the clearing entity is then substituted as a principal to the transaction, becoming the buyer to the seller, and the seller to the buyer. That is, the clearer becomes the

central counterparty (``CCP") that bears the risk of default by those with whom it transacts. [2] That is, CCPs bear performance risk.

In their role as CCP, clearers--typically referred to as "clearinghouses"--engage in a variety of activities, including: calculation and collection of collateral (margin); determination of settlement obligations (that is, the determination of what each party owes or is owed in money and delivery obligations); determination of default; collection from defaulting parties; and remuneration of participants in the event of a default. The CCP usually nets the obligations of those for whom it clears. That is, it determines the net amount each part owes or is owed; since a party may owe money on some transactions, and be owed money on others, netting typically reduces the flows of cash (and securities) between transacting parties. As will be seen, this netting function is economically very important.

Clearers service the financial intermediaries who broker customer orders, and who sometimes trade on their own account. That is, clearinghouses serve as a central counterparty only to so-called "clearing brokers," and collect margins, collect and disburse variation payments, and charge fees from/to these brokers. They typically do not deal directly with the ultimate buyers or sellers for whom the brokerage firms serve as agents.

Settlement is the process whereby transactors complete their obligations to pay cash or deliver securities. At one time, settlement agents facilitated the physical

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[2] This process is somewhat intricate. See Edwards (1983), or Pirrong (2006) for detailed descriptions of this ``novation" process. Not all organized exchanges have CCPs. CCPs have been widespread in derivatives markets since the late-19th and early-20th centuries, but have been introduced in equity markets only more recently.

delivery of stock certificates, bonds, or other delivery instruments. Presently, delivery is performed by debiting or crediting the securities and cash accounts of the counterparties to transactions. This typically involves the maintenance of a central register that records ultimate ownership of securities.

A securities or derivatives transaction involves all three functions. Thus, these functions are complementary, and the demand for each service is a derived demand. This has important implications for the organization of financial markets.

It should also be noted that there is an exquisite division of labor within the various complementary activities just described. An exhaustive discussion of this division in each of these functions is impractical, but the point can be illustrated by considering specialization in the function of executing transactions in a traditional floor-based exchange.

On a floor-based exchange, a customer's order to buy and sell is typically directed to a brokerage firm (sometimes referred to as a "commission merchant"). This firm: evaluates the creditworthiness and performance risk of the customer; manages the customer's position by keeping records of trades and positions and receiving cash due and paying cash owed; and provides the customer with advice and information. The brokerage firm, in turn, directs the order to a floor broker for execution. The floor broker is typically an independent contractor whom the brokerage firm pays a commission, although sometimes the brokerage firm employs the floor broker. The broker represents the order to the trading crowd. Members of the trading crowd may include other floor brokers representing customers, but independent traders buying or selling on the own accounts ("locals" in

American/Chicago trade jargon) also participate. These locals provide liquidity by absorbing temporary order imbalances, buying (selling) when more customer sell orders than buy orders (buy orders than sell orders) flow to the floor.

Again, all of these activities within the execution function are highly complementary. A customer consumes a bundle of brokerage firm, floor brokerage, and local trader services; each is essential to the completion of a trade.

What's more, even within a particular specialization (e.g., floor brokerage) practitioners are heterogeneous. They differ in skill—their human capital—and in their financial capital as well. Due to these skill differences, inframarginal members earn rents.

Furthermore, human capital in these functions tends to be highly specialized, and non-redeployable. As a result, floor traders tend to earn far more in this activity than they could in their next best alternatives. Some floor traders' skills are so specialized that they have had a very difficult time transitioning to what would seem to be a closely related activity, computerized trading. Moreover, a floor-based exchange is a dense social network in which reputation and social capital are quite important. These assets are specialized to trading on the floor of a particular exchange.

The physical capital of a floor-based exchange is also highly specialized. As an example, the new trading building at the Chicago Board of Trade (which opened in 1996) sits on expensive real estate in the heart of downtown Chicago, and encloses a vast open space big enough to hold a dirigible: and dirigible hangar is probably the next best use of the space. The trading floor is specially designed to

facilitate floor trading. To accommodate computers and communications equipment, under the floor runs enough wiring to girdle twice the globe at the equator.

There is another aspect of financial trading that exerts an influence on the organization of exchanges: market power arising from extensive scale (and sometimes scope) economies in each of the three major functions. First consider the execution of transactions. Liquidity effects make trading of a particular financial instrument a natural monopoly. Due to informational considerations, the cost of liquidity is lower when all trading in a particular instrument is concentrated on a single exchange. Some traders possess superior information about the value of a particular security or futures contract, and can earn a profit at the expense of the less informed. The less informed can minimize their losses to the better informed by sticking together. The more uninformed traders there in a particular market, the more attractive it is to other uninformed traders.[3] That is, liquidity costs (of which losses to the informed are a major component) in a particular market are lower, the larger the number of uninformed traders in that market.

Put differently, informational and liquidity considerations create a network effect. The prospect of achieving lower trading costs by trading on the biggest market for a particular instrument creates a centripetal force that tends to "tip" all trading activity in that instrument to a single exchange. Moreover, the difficulty of coordinating the simultaneous defection of traders from an incumbent exchange creates a switching cost that provides the incumbent exchange with market power.

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[3] Admati and Pfleiderer (1990), Pirrong (1999, 2002).

An exchange contemplating entry in competition with an incumbent incurs a cost—the cost of coordinating the switching of traders—that the incumbent does not. This entry barrier creates market power, and the potential for market power rents.

The other functions also exhibit scale and scope economies, though for different reasons. Consider clearing. Basic diversification considerations imply that the risks a clearinghouse bears per trader in a particular instrument are decreasing with the number of traders (Pirrong, 2008). This creates a scale economy in bearing default risk. Similarly, diversification across different instruments reduces risk, and generates a scope economy. Due to these considerations, clearing exhibits strong natural monopoly characteristics.

The specialization and heterogeneity of those involved in floor trading creates economic rents. Moreover, the extensive economies of scale in various aspects of the trading of financial instruments can create market power that also generates rents. The specialization and limited redeployability of physical and human capital creates quasi rents. The extensive complementarity of the various activities involved in floor trading, and the heterogeneity of the participants, creates opportunities to redistribute these rents and quasi rents through exchange rules, policies, and norms. Moreover, these rules, policies and norms can have efficiency effects. Furthermore, even the efficient rules can affect the distribution of rents and quasi rents.

Thus, exchange members face a complex challenge in choosing forms of organization, modes of governance, rules, policies, and norms that diminish wasteful rent seeking and encourage wealth-enhancing bargains. The next sections examine

in some detail the institutional implications of market power and the extensive complementarity and division of labor inherent in the technology of trading financial instruments.

IV. Trading Technology and Exchange Organization and Governance

The consequences of trading technology discussed above decisively affect the organization and governance of exchanges.

First consider the effects of scale economies, entry barriers, and the resultant market power. Exchanges have an incentive to exploit this market power, and have several ways of doing so. In particular, exchanges can exercise market power by limiting membership. Pirrong (2002) demonstrates that due to the liquidity cost advantage that a larger exchange possesses, a group of traders that supplies just more than half of the total available capacity to execute transactions is immune from competition from other exchanges. This occurs because when a particular exchange *X*'s members have more than half the transactional capacity, due to the network effect all those using this market incur lower trading costs if all trading activity takes place there, than if all activity takes place on some other exchange *Y*, which necessarily has lower capacity to execute trades. This occurs because trading costs are declining in the capacity of exchange members to execute transactions. Since trading tends to tip to the cheapest exchange, *X* need fear no competition from *Y* even though its membership is inefficiently small; the efficient outcome would require the exchange to accept all those seeking membership, rather than to limit

entry.[4] An exchange has no incentive to undertake this efficient action, however, because increasing membership reduces rents.

Thus, network effects imply that exchanges will limit entry to extract a monopoly rent. The historical record is consistent with this implication. With the primary exception of the London Stock Exchange, which was prohibited from limiting entry by an Act of Parliament, exchanges have limited entry. Pirrong (1999, 2000) presents evidence that these entry restrictions generate rents for members.

Exchanges have employed other means to exploit the market power arising from network effects. For instance, prior to the 1970s and 1980s, when regulatory pressure stopped the practice, exchanges around the world operated and enforced brokerage cartels (Pirrong, 2000). Moreover, they used inflated price increments, and restrictions on the ability of members to trade off-exchange to reduce competition, to reduce price competition among members.

Network effects, entry restrictions, cartels and other measures create rents. As noted previously, rents and quasi rents also arise from heterogeneity among exchange members. The existence of such rents, of course, creates the incentive to engage in inefficient rent seeking behaviors. Exchanges and their members have incentives to mitigate these wasteful activities. They can do so through a variety of

[4] Put differently, due to liquidity-driven scale economies, any exchange achieves its minimum liquidity cost when all buyers and sellers congregate there. Moreover, given the number of buyers and sellers, the costs of executing transactions are decreasing in the risk bearing capacity of the exchange members who supply liquidity. Liquidity suppliers put their capital at risk to bear the risk of price fluctuations that they take on when they trade with customers. The more capital (risk bearing capacity) they have, the lower the cost of bearing this risk (Pirrong, 2002). Thus, an exchange with 50 percent plus epsilon of total risk bearing capacity can offer lower trading costs than any competing exchange; the tipping process tends to drive business to this more efficient exchange.

means, including the choice of ownership and organizational forms, and the nature of exchange governance.

First consider who should own the exchange, examining first a traditional open outcry exchange. Recall that both the human capital and physical capital involved in the trading process is highly specialized, and that its value in alternative uses is low compared to its value in trading. Separation of ownership of the physical and human capital would create the potential for opportunistic holdups. Therefore, basic transactions costs considerations imply that the owners of the human capital should own the physical capital. That is, transactions cost considerations imply that exchanges should be organized as mutuals, where the members who trade on the exchange own its physical and financial assets. And indeed this has historically been the case. Exchanges are typically member-owned mutual firms. This form protects the specific physical and human capital from expropriation.

Next consider the specifics of the mutual form. Mutuals can be organized as for-profits or not-for-profits. The crucial difference between these forms is that for-profit mutuals can distribute surplus to members, but non-profits cannot. At first blush, one would think that highly profit motivated individuals, who traders most definitely are, would choose the for-profit form. But distributive considerations in the presence of large rents and quasi rents strongly suggest otherwise.

In a traditional firm, shareholders are relatively homogeneous and agree that the firm should choose price and output maximize profit and be free to distribute it to the shareholders. In contrast, the heterogeneous members of an exchange do not necessarily agree on pricing and distribution policies because these policies can be

used to redistribute rents among the members. In particular, pricing and distribution policies can be used to transfer rents from one group of members (floor brokers, say) to another group providing a complementary service (locals, say).

For instance, suppose that the supply of brokerage services is less elastic than the supply of locals' services. A tax incidence-type analysis implies that given these conditions, charging a per trade fee that generates revenues in excess of the costs of operating the exchange, and distributing the surplus equally among the members would tend to redistribute rents from the brokers to the locals. The fee would reduce the prices both locals and brokers can charge for their services, but the impact on brokers would be greater due to the smaller elasticity of supply of broker services. Brokers and locals would participate equally in the proceeds of the fee, however, and this would effectively transfer rents from the brokers to the locals. Similarly, pricing and distribution policies can be used to transfer rents from efficient, inframarginal members to less efficient (but potentially more numerous) ones (Pirrong, 2000).

The non-profit form precludes this sort of rent extraction and redistribution. The distribution constraint that is the essence of the non-profit form implies that profits generated by exchange fees cannot be used to shift rents from one group of members to another. Thus, the non-profit form reduces incentives to engage in wasteful rent seeking, or to use the exchange fee structure in ways that distorts exchange output in order to redistribute wealth to a politically powerful constituency in the exchange.

In fact, open outcry exchanges almost uniformly were organized as non-profits (Pirrong, 2000).

Now consider exchange governance. Elimination of the use of exchange pricing and distribution policies to redistribute rents does not foreclose all avenues for rent seeking. Exchange rules also have distributive consequences. For instance, a seemingly innocuous rule, such as the size of the minimum price increment (the "tick"), can redistribute rents. Locals make a profit by buying at the bid, and selling at the offer. The difference between these, the tick size, determines the profitability of supplying liquidity. Raising the tick size tends to increase the profitability of making markets as a local, but given the complementarity of the services of exchange members, this tends to reduce the derived demand for brokerage services, and reduce the wealth of brokers.

Rent seeking through the rule-making and enforcement process involves real costs, and provides a reason for creating governance structures that mitigate this waste and support the consummation of wealth enhancing Coasean bargains. The literature on the industrial organization of legislatures (Weingast and Marshall, 1988) demonstrates that the use of committees that have exclusive jurisdiction over specified rules, and the requirement that all proposed changes to rules gain approval of the committees whose constituents are affected, can support these goals. Requiring the acquiescence of affected committees to rule changes prevents ex post reneging on Coasean bargains, and therefore helps enforce such deals. Furthermore, the effective veto power of committees over rules that adversely affect its constituents mitigates the possibility of using rule changes to extract rents from

those constituents. Thus, this theory predicts that organizations that have the ability to redistribute large rents by changes in rules should utilize political, committee-dominated governance structures.

Exchanges do just this. Indeed, exchanges are notorious for the reliance on committees, and the byzantine nature of their governance. These mechanisms create checks and balances that mitigate rent-seeking battles among exchange members.

The efficient organizational form and governance structure may be technology-dependent because technology affects the magnitude of rents and quasi rents, and their distribution. A major shock to trading technology provides a test of the foregoing implications. In the 1990s, and especially the 2000s, advances in computing capability and communications technologies made computerized, electronic trading of securities and derivatives feasible. Indeed, electronic trading has many advantages over traditional floor-based trading. For one thing it is much more rapid; although orders can move between customer to the floor with startling speed in open outcry markets, in a computerized market they can move at the speed of light. Moreover, errors and mistakes are less likely in computerized markets. Furthermore, and perhaps most importantly, computerized markets allow anyone in the world with a computer and cash to supply liquidity to the markets on effectively equal terms, whereas in a floor-based system, those on the floor have preferential access to information and can act on it more rapidly, giving them a substantial advantage over those located off-exchange in supplying liquidity. What's

more, electronic systems are readily scalable to permit expansion of trading volumes; open outcry floors are not as readily scaled.

Electronic trading also reduces some information disparities. In an open outcry market, those on the floor of the exchange can observe prices, bids and offers directly and in real time, whereas those off-the floor must rely on the (time consuming) process of relaying information from the floor to them. Floor traders also can observe who is trading, and other forms of "soft" information that is not available to those away from the floor. In contrast, in an electronic market everyone with a trading screen sees the same bid, offer, price and volume information at the same time. Whereas floor traders have the advantage of seeing more information, and seeing it sooner, and can profit from these advantages, no such disparity exists in an electronic market.

Thus, technological change reduced the cost of providing transactional services. At the same time, however, (a) reduced the heterogeneity of the suppliers of transactional services, and (b) reduced the rents that some of these suppliers could earn. With respect to heterogeneity, note that electronic trading eliminates the need for some kinds of agents altogether, notably floor brokers. Moreover, electronic trading that permitted the entry of large numbers of liquidity suppliers trading "upstairs" reduced the time and space advantage, and hence the rents, of traditional locals on floor exchanges. The elimination of information disparities in electronic environments also erodes the rents of some exchange members.

This technological shock had two major effects, both related to its effect on exchange member rents and their distribution.

First, the fact that electronic trading devalued the specialized human capital and the rents attributable to advantages of time and place made traditional exchanges resist fiercely the move to electronic trading. The advantages of incumbency arising from network effects and switching costs allowed them to do so successfully for some time. However, the evident and growing efficiencies of electronic trading relative to open outcry transacting credibly threatened the open outcry exchanges with extinction due to the entry of a more efficient electronic exchange; the ability of the computerized Deutsche Terminborse to wrest the entire market share for German government bond futures from the incumbent open outcry LIFFE exchange in 1998 demonstrated this with a vengeance. As a result of the threat of competition, open outcry exchanges in the United States and elsewhere were compelled to transition to electronic trading.

Second, electronic trading's effect on rents and their distribution undermined the need for the elaborate organizational and governance structures devised to protect rents in open outcry exchanges. Specifically, since in an electronic environment it was possible to trade in large volumes without relying on a group of very specialized intermediaries located in a highly specialized physical facility, intermediary ownership of an exchange was no longer an efficient adaption to production technology. Similarly, absent a set of specialized, heterogeneous intermediaries, non-profit ownership and politicized exchange governance were no longer required to protect these intermediaries' rents.

Thus, this major technological change to electronic trading eliminated the need for member ownership, non-profit form, and political governance. As a result,

in parallel with the adoption of electronic trading, exchanges "demutualized." That is, they converted to for-profit firms. Moreover, after initial transition periods in which most of the equity in exchanges was held by members, exchanges executed initial public offerings and many members sold their shares to the public. In short order, exchanges transformed from non-profit mutuals to for-profit investor owned firms.

The history of exchanges demonstrates how the nature of the trading technology, and its effect on the magnitude and distribution of rents, exerted a decisive effect on the institutional framework in which markets for securities and derivatives were manufactured. In traditional face-to-face open outcry markets, technological conditions, market power, and the complementarity of trading activities generates economic rents and a complicated distribution of these rents. Moreover, exchange rules and pricing policies can dramatically affect both the magnitude and distribution of these rents. Economizing on rent seeking led to the evolution of arguably unique ownership and governance structures.

A major technological change completely altered the rent generating process. Electronic trading eliminated the rents arising from specialized skills possessed by a small cadre of intermediaries. These rents no longer needed specially crafted organizational and governance structures to protect them. As a result, organization and governance changed in parallel with technology. The unique ownership and governance structures were replaced by much more commonplace ones.

This does not mean that rents and quasi rents disappeared altogether. Nor did the technological change eliminate all sources of complementarity in the trading

process. Network effects and switching costs are important in electronic markets, just as in open outcry ones. These give rise to economies of scale, market power, and the associated rents. Moreover, the economies of scale and scope in clearing and settlement also remain, and these functions remain complementary to trade execution. These factors are salient considerations in the main organizational challenges that exchanges and market users have faced in the last half of the first decade of the new millennium, to which I now turn attention.

V. Vertical Relations and Exchange Organization

The earlier analysis of execution, clearing, and settlement noted that each of these functions is characterized by strong scale economies. If these services are supplied by firms that specialize in a single function, the strong scale economies in each tend to result in the survival of a single firm in each function, each of which has some market power. Moreover, competition for these monopolies can wastefully dissipate market power rents. Due to the aforementioned complementarity of clearing, settlement, and execution, separate ownership, control, and pricing of these functions therefore creates a tri-lateral monopoly problem. This, in turn, creates the potential for inefficiencies.

First, due to complementarity, multiple-marginalization problems arise. Independent price setting by the three firms results in a price that exceeds the monopoly price that an integrated monopoly firm would charge.

Second, even if the exchange, clearer, and settlement agent enter into a contract (or set of contracts) that prices each firm's services in a way that avoids

multiple-marginalization and ensures that the ultimate customer of financial transaction services pays the monopoly price (which maximizes the rent to be divided between the three entities), wasteful rent seeking and opportunism can arise. Recall that each entity employs specific capital, and that this capital is likely to be quite durable. These considerations lock the (putatively separate) suppliers of execution, clearing, and settlement services into long term, trilateral relationships. Due to the long term nature of the relationships, the parties are likely to rely on long term contracts to govern their interactions. However, the specific assets of the clearer, exchange, and settlement firm give rise to quasi rents, and each firm has the incentive to engage in *ex post* opportunism to expropriate them. That is, even if the parties sign long term contracts, they have an incentive to violate the contract or evade performance in order to expropriate these quasi rents. Unpredictability in the economic environment makes complete contracts impossible, and parties can exploit this incompleteness in an attempt to profit at the expense of their contracting partners. This rent seeking utilizes real resources.

Integration of the complementary trading functions abolishes the deadweight losses arising from multi-marginalization and opportunism. Although integration does not result in a first best outcome (because the integrated entity is a monopoly, and presumably charges supermarginal cost prices) it offers some advantages over a dis-integrated structure because it avoids the costs associated with inefficient pricing and rent seeking. It can also adapt to unpredictable changes in conditions, such as technology or regulatory shocks, which challenge contractual

governance of the relationships between distinct execution, clearing, and settlement firms.

This is not to say that vertical integration is free. As noted by Williamson, due to their inability to precommit to a high powered incentive system, integrated divisions are typically operated subject to low powered compensation schemes that attenuate incentives to reduce costs and innovate. Moreover, information asymmetries between managers give rise to costly information rents and the use of low powered incentives.

Thus, standard transactions cost considerations imply that integration of trade execution, clearing, and settlement offers several advantages. Assuming *arguendo* the existence of separate execution, clearing, and settlement firms, vertical merger increases the rents to be split among their owners, and due to the elimination of double marginalization and opportunism, it can actually reduce deadweight losses, and make the consumers of these services better off. Thus, integration is plausibly a second-best response to the natural monopoly characteristics of trading, clearing, and settlement.

Although vertical integration is a well-recognized way to mitigate transactional hazards, there are other ways to organize firms and to govern relationships between them in order to control transactions costs in the presence of small-numbers and specific asset problems such as those inherent in trade execution, clearing, and settlement.

For instance, a user cooperative can eliminate multiple marginalization problems; consumer cooperatives are a well-known response to market power.[5] Recall that brokerage firms utilize clearing services. These brokerages can form a cooperative firm that supplies clearing.[6] It is possible for this cooperative to choose prices that eliminate double marginalization. In particular, the cooperative can charge prices equal to marginal costs, and levy fees unrelated to output to cover fixed costs.

This does not mean that this alternative is as efficient as, or more efficient than, integration. Several potential problems arise, including:

- The clearing cooperative cannot internalize all benefits from investments to improve productivity or improve service quality because some of these benefits accrue to the monopoly exchange. For instance, if the cooperative invests in technology to reduce costs, and this investment is non-contractable, the exchange's derived demand rises. In response, the exchange raises the price of execution, thereby capturing some of the cost reduction. This reduces at the margin the cooperative's incentives to invest, and leads to underinvestment.
- The foregoing analysis assumes that (a) the cooperative implements an open access policy, and (b) the per unit fee it charges members is set competitively, that is, the cooperative does not enforce a broker

[5] Hannsman (1996). Hausman, Leonard, and Tirole (2003) present a model showing how a non-profit cooperative can induce an efficient outcome in a network industry.

[6] A similar argument can be applied to settlement, or to execution.

cartel. Both assumptions are subject to challenge. For instance, the New York Stock Exchange and other financial exchanges were non-profit mutuals that enforced broker cartels that set minimum commissions and restricted entry by limiting the number of memberships.[7] Elsewhere I show that a cooperative natural monopoly firm can exercise market power, and allow its members to earn economic rents, by restricting membership. In these models, a particular service is subject to increasing returns.[8] A coalition of suppliers forms a cooperative that performs this service for its members. The cooperative charges these members a fee just sufficient to cover the fixed cost that gives rise to the scale economy. The members then compete for customers (those who need to clear transactions, in this instance). Due to the presence of scale economies, there is a critical size of membership that is (a) smaller than optimal, but (b) just large enough so that any other competing cooperative is too small to cover its fixed costs. Due to its smaller than optimal membership, the cooperative's output is inefficiently small; this effectively results in double marginalization. Thus, to avoid this possibility, it is necessary to constrain the cooperative's ability to

[7] Tomas J. Philipson and Richard A. Posner (2001), and Hansmann (1996) argue that even non-profits may exercise market power even though they cannot distribute profits to their owners. For instance, they can charge supracompetitive prices for goods over which they have market power, and use the resulting profits to subsidize the production of other goods for their owner-members.

[8] In Pirrong (1999) the increasing returns arise from a fixed cost. In Pirrong (2002) network effects create a scale economy.

limit membership. This is not a straightforward task, as in the case of clearing and settlement (which involve mutualization of some risks) it is economically sound to impose financial requirements on members to mitigate moral hazard and adverse selection problems; it is no mean feat to determine whether a given financial requirement is justified as a prudent way to maintain the solvency of the clearing and settlement firm, or is instead set inefficiently high in order to restrict membership. Moreover, due to the complementarity of trade execution and clearing, when deciding on the profit maximizing membership, the cooperative ignores the impact of the resultant output restriction on the derived demand for the execution venue's services; this causes a double marginalization inefficiency.[9]

- Separation of trade execution and post-trade services can impede coordination. For instance, a change in a trading or clearing system (such as the addition of a new product for trading, or the offering of a new clearing or trading functionality such as straight-through processing) often requires changes to both the clearing and trading systems. The incentives to adopt efficient changes may not be well aligned when trade execution and post-trade services are carried out by different firms. Similarly, sometimes there is a need to coordinate

[9] The form of the cooperative's payout policy is also important. If the cooperative's rebates are based on the quantity of cooperative services each member purchases, the outcome can be efficient. However, if the cooperative rebates surplus in fixed shares, it is possible to devise a combination of member shares, and the price of cooperative services that results in a monopoly outcome that maximizes joint member profits but creates a deadweight loss. See Pirrong (2008).

responses to market shocks (such as a market crash) or regulatory changes. Implementation of such changes requires negotiation across firm boundaries, which can provide an opportunity for hold up to extract the quasi rents that arise from specific investments. This impairs incentives to introduce efficiency-enhancing innovations or to respond efficiently to shocks.

- Effectively operating as a non-profit, the clearing firm's management is subject to low-powered incentives.
- If the clearing entity cannot finance fixed costs through the use of fixed assessments (due to information asymmetries, for instance), and therefore must charge a per unit fee in excess of marginal cost, there is double marginalization as the clearer's markup over marginal cost drives the exchange's derived demand for execution services below that which prevails under integration.

A vertically integrated exchange is not vulnerable to expropriation of the returns to investment, or to holdups that impede coordination. The integrated exchange has no incentive to limit brokerage participation in the clearinghouse for strategic purposes, as this reduces the derived demand for its services. On *a priori* grounds it is not possible to determine whether incentive power is weaker in an integrated exchange than with an effectively non-profit clearer. However, on balance, unless the costs of low powered incentives for an integrated firm are substantially higher than for the post-trade processor, integration dominates supply of post-trade services by a cooperative.

These problems with the cooperative solution can mitigated by extending control and ownership rights in the cooperative to the exchange. That is, shared governance--partial integration--is one means of attenuating the transactions costs associated with the separation of trade execution and post-execution service providers.

In sum, although a vertically integrated exchange that offers trade execution, clearing, and settlement services does not result in a first best outcome, alternative arrangements in which clearing and settlement are separated from execution incur deadweight costs as well. These alternatives might have some merit, as compared to vertical integration, to the extent that regulation or cooperative ownership of one segment of the industry (such as clearing and settlement) facilitates competition in another (such as trade execution), and even then only to the extent that the associated efficiency gains outweigh any efficiency losses that arise in a disintegrated industry.[10] However, in the case of financial transactions, each of the three segments of the industry has strong natural monopoly elements. The creation of a clearing cooperative, for instance, does not eliminate the centripetal force of liquidity that gives exchanges that execute exchanges considerable market power. Thus, a clearing/settlement cooperative does not eliminate the liquidity-based market power of a trade execution venue, but incurs costs from low powered incentives, weak incentives to reduce costs, or entry restrictions, or some combination thereof; again, this arrangement is preferable to integration only if

[10] This is arguably the case in electricity, where transmission is arguably a natural monopoly but generation is plausibly competitive. Nonetheless, vertical disintegration in electricity has not led to obvious improvements in welfare, and may indeed have impaired efficiency.

these costs are lower than the transactions costs (arising from low power incentives, for instance) incurred by the integrated firm.

In fact, vertical integration of trade execution, settlement, and clearing in a single firm--an exchange--is the modal form of organization in centralized securities and derivatives markets (Pirrong, 2008). In most cases, the clearing and settlement operation is a division or wholly owned subsidiary of the exchange where transactions are executed. In most of the remaining instances, the execution venue has an ownership stake or governance role, or both, in the clearing and settlement entities. The exception that proves the rule is the London Stock Exchange, and even this entity operated its own settlement division until mismanagement of technology induced regulators and users to set up a separate venture.

Indeed, vertical integration is increasingly important in these markets. In 2007-2009, several exchanges (including the InterContinental Exchange, The Swiss Stock Exchange, and LIFFE) have ceased obtaining clearing services from separate firms, and integrated this function. Even the London Stock Exchange, long an advocate of dis-integration (most likely out of necessity, rather than conviction), is actively considering integrating clearing functions.

Pervasive economies of scope in clearing and settlement are leading to diminished exchange roles in some clearing and settlement entities, such as DTCC and NSCC in the United States, and LCH.Clearnet in Europe. The scope economies in clearing and settlement extend across multiple exchanges, and also across centralized exchange and decentralized OTC markets. In particular, the consolidation in banking and intermediation, whereby large intermediaries (such

as, Goldman Sachs or Citigroup or HSBC) participate in myriad exchange and OTC markets, has increased these scope economies in clearing and settlement. This provides a strong incentive to consolidate clearing and settlement across exchanges and OTC markets. This has raised the opportunity cost of vertical integration and exchange control over clearing and settlement, relative to the alternative form of organization, clearing and settlement cooperatives owned and operated by users of clearing and settlement services. The decline in exchange ownership and control over clearing and settlement entities that span exchange and OTC markets is consistent with this change in relative costs.

In American futures markets, the move to electronic trading has enhanced economies of scope in trade execution. The two largest futures exchanges integrated their clearing functions (by contract) in 2003, and agreed to merge in 2006. The merger was completed in 2007. The merged entity clears through the exchange-owned clearinghouse. In this instance, economies of scope in clearing and trade execution allow economizing on transactions costs in clearing through vertical integration, without sacrificing scope economies in execution.

Thus, consistent with the theory just outlined, which states that exchange ownership of execution, clearing, and settlement operations economizes on transactions costs, such integration is the primary means of organizing these functions except where scope economies in clearing and settlement encompass markets where scope economies in execution are absent (such as across exchange and OTC markets.)

One major area of controversy in this area is whether integration is anticompetitive, and is intended to leverage monopoly power in clearing into monopoly power in execution. This criticism ignores altogether the Chicago critique, and represents a throwback to a largely discredited antitrust doctrine that looks askance at vertical integration.

Specifically, if, as the critics of integration assert, clearing is in fact a natural monopoly, the monopoly clearer could extract all rents without integration by choosing the monopoly price for clearing. Indeed, the monopoly entity has an incentive to encourage competition in complementary functions in order to increase the derived demand for its services.

These arguments also presume that execution is potentially competitive, thereby overlooking the well-documented, and theoretically understandable, effect of network effects in liquidity on execution. Execution also tends to be a natural monopoly. Integration of a dominant clearing entity and a dominant execution venue avoids multiple marginalization problems, and economizes on transactions costs, without reducing competition. (Although the market, absent some regulatory intervention, such as forced sharing of order flow, will not be competitive in any event. Pirrong, 2005.) Pirrong (2008) presents a model that explicitly incorporates the increasing returns resulting from liquidity and economies of scale in clearing that demonstrates that integration is efficiency enhancing under the conditions that most plausibly hold in exchange markets.

VI. Summary and Conclusions

Exchanges for financial instruments are often held out as the archetypal competitive market. In fact, they are the quintessential manufactured market. They are institutions deliberately designed to support transacting in securities and derivatives. Historically, and into the present, they have adopted measures to reduce transactions costs, such as measurement and contract enforcement costs.

The rather unique technological characteristics of trading—especially in the now ebbing "open outcry" era of face-to-face trading—have exerted a decisive influence on the way these markets are manufactured. Trading of financial instruments involves myriad complementary functions requiring specialized human and physical capital, and which are subject to very strong scale economies. These features give rise to extensive rents and quasi-rents, and create daunting coordination challenges. Exchange operators have responded by crafting organizational and governance structures that reflect complex trade-offs between efficiency and rent seeking considerations. Many exchange rules, organizations, and governance structures are clearly intended to enhance efficiency by reducing transactions costs and mitigating rent seeking. Other rules, however, are less laudable, being best understood as means to create and secure rents by exploiting the competitive impediments that arise from extensive scale and scope economies. Moreover, the voluntary nature of exchanges and the difficulty of crafting and enforcing some Coasean bargains has precluded them from creating and enforcing

rules that would mitigate certain forms of inefficient conduct, such as market manipulation.

The facts that exchanges (a) are organizations designed to advance the interests of the intermediaries who trade on them (and have historically owned them), (b) sometimes implement inefficient rules that benefit their member-owners, and (c) sometimes are incapable of implementing efficient rules, have led governments to impose extensive regulations on exchanges. Regulation has increased substantially the complexity of the manufacturing process. In particular, it has altered the bargaining process that ultimately determines exchange rules, and shifted the nexus of many of the negotiations from exchange board rooms to legislative chambers and regulators' offices. As a result, exchange rules now reflect the influence of a broader collection of interests, including those who do not participate directly on exchanges.[11] Indeed, the foregoing discussions of the elevator controversy in Chicago (ultimately resolved by legislative intervention) and manipulation (the prevention of which being the motivation for much US regulation of derivatives and securities markets) provide excellent illustrations of how regulatory interventions have altered the content and character of exchanges.

But although regulatory intervention has substantially altered exchange rules and the processes of exchange governance, the fact remains that these rules and processes reflect a balance between efficiency and distributive considerations. These are the materials from which the archetypal markets are manufactured.

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[11] As an extreme example, onion farmers from Michigan succeeded in pressuring the United States Congress to outlaw trading in onion futures.

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