A THEORY OF FINANCIAL EXCHANGE ORGANIZATION*

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ABSTRACT

Although there has been extensive research on the economic functions of financial exchanges and the properties of prices determined on exchanges, there has been little research on their organization and governance. The heterogeneity of the suppliers of financial services who are members of financial exchanges explains salient features of exchange organization. When suppliers of financial services are heterogeneous, one expects to observe exchanges organized as not-for-profit firms, especially if an exchange can enforce collusive agreements. Moreover, heterogeneity can lead to conflicts between members over rents, which necessitates the creation of formal governance mechanisms. Finally, if exchanges exercise market power or are protected from competitive entry (as is plausible), exchanges may adopt inefficient rules; the efficiency of exchange rules depends on the degree of member heterogeneity, the distributive consequences of these rules, and the ability of exchange governance structures to enforce wealth-enhancing bargains among members with disparate interests.

I. INTRODUCTION

THERE is an extensive literature on the functions that financial exchanges perform.[1] There is virtually no research, however, on the ownership and governance of exchanges. An examination of these structures raises many

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[1] I use the term "financial exchange" to refer to securities exchanges (for example, the New York Stock Exchange), futures markets (for example, the Chicago Board of Trade), and options exchanges (for example, the Chicago Board Options Exchange). Contributions to the literature on the economic functions of exchanges include Lester Telser, Why There Are Organized Futures Markets, 24 J. Law & Econ. 1 (1981); Lester Telser & Harlow Higginbotham, Organized Futures Markets: Costs and Benefits, 85 J. Pol. Econ. 969 (1977); J. Harold Mulherin, Jeffry Netter, & James Overdahl, Prices Are Property: The Organization of Financial Exchanges from a Transaction Cost Perspective, 34 J. Law & Econ. 591 (1991); Stephen Craig Pirrong, The Efficient Scope of Private Transactions-Cost reducing Institutions: The Successes and Failures of Commodity Exchanges, 24 J. Legal Stud. 229 (1995) (hereinafter Successes and Failures); and Stephen Craig Pirrong, The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation, 38 J. Law & Econ. 141 (1995).

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questions. Why are exchanges typically organized as not-for-profit, rather than for-profit, firms? Why have some new computerized exchanges adopted the for-profit form? Why have some members at several major exchanges proposed to change from the nonprofit to for-profit form? What explains the elaborate procedural rules and governing committees adopted by exchanges? Do exchanges adopt efficient rules and regulations for trading? If not, when are deviations from efficiency most likely? Can external regulation rectify these inefficiencies?

This article presents models that help to answer these questions. An important implication of these models is that heterogeneities among exchange members are crucial determinants of salient features of exchange organization. Specifically, when members are homogeneous, for-profit organization dominates nonprofit organization because a for-profit exchange can exercise market power more effectively than a cartel of members. When members are sufficiently heterogeneous, however, inframarginal members may prefer to exercise market power through a cartel enforced by a nonprofit exchange because a for-profit exchange expropriates surplus from them; if heterogeneity is sufficiently great, the low-cost firms prefer the nonprofit form even if an exchange cannot enforce a cartel agreement. Thus, the model implies that the predominance of the nonprofit form is a rational response to differences in costs between exchange members and to member specialization in the provision of different trading services. Moreover, the theory predicts that exchanges with heterogeneous members will implement elaborate governance procedures. Finally, heterogeneities influence the incentive of exchange members to adopt inefficient rules.

The competitive position of an exchange also plays a central role in the analysis. If exchanges face near perfect competition in the supply of financial transactions services, the economics are quite simple and direct: exchanges adopt efficient rules and governance structures because they will not survive otherwise. In contrast, if exchanges possess market power or are protected by entry barriers, things are much more interesting. Profit-maximizing members have an incentive to create rules and organizational structures that allow them to exploit this power. In particular, the survivability of inefficient exchange practices (including collusive pricing of member services and the adoption of inefficient rules) depends crucially on the existence of exchange market power. Therefore, any theory of exchange organization and practices should consider explicitly the role of market power and entry barriers.

These issues have not been analyzed adequately heretofore. Oliver Hart and John Moore compare the pricing and quality decisions of member-cooperative exchanges and outside-owner exchanges, but their member cooperatives can be for-profit rather than nonprofit organizations because

they permit the cooperative exchange to distribute profits to its members.[2] Indeed, although nonprofit organization is a possible outcome in their model, members choose the for-profit form under conditions that Hart and Moore characterize as likely. This result is inconsistent with empirical evidence and is attributable to assumptions about the decision-making process. Moreover, Hart and Moore's median-voter model of the efficiency of nonprice exchange rules does not permit Coasean bargains between heterogeneous members.[3] An analysis that focuses solely on voting rules while ignoring governance structures designed to support mutually beneficial bargains provides an incomplete picture of the economics of exchange decision making and cannot explain crucial features of exchange structure.[4]

The remainder of this article is organized as follows. Section II provides an overview of the functions of financial exchanges and the potential for exchange market power. Section III shows how market power and member heterogeneity determine whether an exchange selects the for-profit or nonprofit form. Section IV presents evidence that bears on this model. Section V discusses the influence of member heterogeneity on exchange governance structure. Section VI examines why exchanges may adopt inefficient rules. Section VII examines the implications of the analysis for regulation of exchanges. Section VIII summarizes the article.

II. The Functions of Financial Exchanges and the Potential for Market Power

Trade in financial assets and contingent claims can take place on a bilateral basis without any formal economic organization, but explicit cooperation among traders can reduce transactions costs in several ways. Specifically, the cost of trade can be reduced through the creation of standards (such as grain-grading systems), the reduction of information asymmetries, the protection of property rights in prices, the creation of a centralized trading facility, and the enforcement of contracts. All of these functions require explicit cooperation between the suppliers of financial transaction services. A formal organization such as an exchange can facilitate and coordinate

[2] Oliver Hart & John Moore, The Governance of Exchanges, Members' Cooperative versus Outside Ownership, Oxford Rev. Econ. Pol'y, Winter 1996, at 53.

[3] The term "Coasean bargains" is made with apologies to Ronald Coase, who may object to the term. It is convenient shorthand for mutually beneficial agreements between independent parties.

[4] Dale Oesterle, Donald Winslow, & Seth Anderson, The New York Stock Exchange and Its Outmoded Specialist System: Can the Exchange Innovate to Survive? 17 J. Corp. Law 231 (1992), argues that not-for-profit (NP) exchanges impede innovation and recommends that exchanges switch to for-profit form but does not explain why exchanges choose NP form.

such cooperation. Thus, exchanges are in large part institutions devised to reduce transactions costs.[5]

Cooperation is a double-edged sword. Cooperation to reduce transactions costs is beneficial, but exchange members can also cooperate to extract rents from nonmembers. One would expect financial market participants to structure exchanges and their rules to exploit both sources of cooperative gain.

Elsewhere I derive models that predict that exchanges face little direct competition and that their members will earn supercompetitive rents as a result.[6] In these models an exchange can choose the size of its membership strategically. Because of the nature of liquidity and the existence of fixed costs, an exchange with heterogeneous members can always choose a membership size that (1) is smaller than optimal and (2) is just large enough to deter entry by a competing exchange. The restriction on the number of members generates rents for them. Moreover, condition 2 implies that the market is not contestable. As a result, the exchange may be able to extract additional rents through brokerage cartels or other means.[7]

This proposition may be somewhat controversial, but there is considerable evidence that financial exchange markets are not perfectly competitive. I present this evidence in detail elsewhere, so a summary suffices here.[8] First, virtually all exchanges restrict the number of members. The number of members on the New York Stock Exchange (NYSE) has not changed since 1929; the number of memberships on the Chicago Board of Trade (CBT) and the Chicago Mercantile Exchange (CME) has also remained static for years. Moreover, when futures exchanges such as the CME and CBT have added new members, they have done so by creating new membership categories with limited trading rights, thereby protecting their original members from competition from the new entrants. Second, both futures and securities exchanges almost universally enforced collusive agreements between members until governments eliminated these commission cartels by regulatory fiat. These cartels were clearly successful; commissions, membership prices, and the equity values of exchange members fell sub-

[5] Pirrong, Successes and Failures, *supra* note 1.

[6] Craig Pirrong, The Organization of Financial Exchange Markets: Theory and Evidence, 2 J. Fin. Markets 329 (1999).

[7] The analysis does not assume that exchanges face no competition. For example, over-the-counter (OTC) derivatives compete with exchange-listed derivatives. As long as the OTC products are imperfect substitutes for the exchange-traded products, the implications of the analysis carry through.

[8] Pirrong, *supra* note 6.

stantially after the NYSE cartel was eliminated.[9] Third, the ratio of the market value of exchange memberships to the value of exchange assets is far greater than one even in the postcartel era; for the CME and CBT, this ratio is frequently far above five, while for the NYSE it has been well above two.[10] This indicates that the privilege of trading on an exchange generates substantial rents. Since this ratio is persistently high, it is evident that competitive entry from other exchanges has not dissipated these rents.[11] Fourth, many futures and options markets have nearly 100 percent market share for the products they trade despite the absence of any regulatory barrier precluding the creation of competing contracts.[12]

If an exchange possesses market power, members desiring to maximize their wealth will attempt to exploit it. They can do so through a variety of ways. They can charge supermarginal cost prices for exchange services. They can form a cartel that charges supermarginal cost prices for member services. They can create and enforce rules that allow them to extract rents in the form of trading profits from the consumers of the exchange's services. This raises two questions: how will an exchange exploit market power, and what are the resulting implications for the organization and governance of exchanges?

Specialization is also an important determinant of the structure of economic organizations. Exchange members provide a diverse array of services, and some degree of specialization is efficient. Heterogeneities in exchange membership arising from specialization or differences in the endowments of practitioners of a particular specialty imply that exchange rules have distributive implications. Suppliers of some specialized services may lose from the adoption of a rule that maximizes the joint wealth of exchange membership. They may attempt to prevent the adoption of such rules. In addition, some parties may benefit from the adoption of rules that do not maximize joint member wealth. An exchange may adopt these rules because beneficiaries exert pressure. These possibilities create the incentive

[9] Gregg Jarrell, Change at the Exchange: The Causes and Effects of Deregulation, 27 J. Law & Econ. 273 (1984).

[10] Pirrong, *supra* note 6, table 2.

[11] The ratio of exchange membership values to exchange assets—the q ratio of an exchange—underestimates the rents attributable to market power or entry barriers. Seat prices capitalize rents accruing to the marginal member resulting from entry barriers or market power. Inframarginal members benefit more from market power or an entry barrier than marginal members. In contrast, all shareholders of a publicly traded firm are identical. Therefore, whereas q ratios for public firms may accurately measure rents attributable to market power or entry barriers, q ratios for financial exchanges underestimate them.

[12] Pirrong, *supra* note 6, table 1.

to craft governance structures that prevent rent dissipation and encourage joint wealth maximization.

The following sections analyze the implications of heterogeneity and market power for the organization and governance of exchanges.

III. The Organizational Form and Ownership Structure of Financial Exchanges

A. *Introduction*

The traditional financial exchange is a member-owned commercial mutual firm. The individuals who trade on the floor of the exchange own its assets and control its governance, and only members can trade on the floor. This form of organization is adapted to the nature of floor trading. Floor traders possess very unique skills that generate substantial quasi rents. Moreover, the natural monopoly tendencies of trading in a particular asset or contract limit the effectiveness of exit as a means of protecting an individual trader against holdup. Personal reputation among other traders is very important in face-to-face trading. A trader would lose much of this reputational capital when moving to another exchange.[13] Furthermore, an exchange must invest in specialized, site-specific capital such as trading floors and communications facilities.[14] Given these features, member ownership of an exchange limits the scope for opportunism. If traders do not own the exchange facilities, their specialized human and reputational capital would be acutely vulnerable to expropriation by whoever does own them. In turn, this owner of the specialized physical assets would be acutely vulnerable to holdup by traders. Under these circumstances, trader ownership of exchange assets economizes on transactions costs. Similarly, since exchange rules affect trader wealth, governance by members limits the scope for wasteful opportunism.

Commercial mutuals may be either for-profit or nonprofit. Until recently, almost all exchanges have been organized as nonprofits.[15] In the 1990s, some for-profit exchanges have been created, and some previously nonprofit exchanges have abandoned the mutual form and switched to the for-

[13] Wayne Baker, Floor Trading and Crowd Dynamics, in The Social Dynamics of Financial Markets (Patricia Adler & Peter Adler eds. 1984), shows that floor traders have difficulty making inroads when moving to a different trading pit from the one they normally trade even though the pits are on the same exchange.

[14] The Chicago Board of Trade's new building that houses its financial floor is large enough to enclose a Boeing 747 and has 27,000 miles of wiring for computers and communications equipment. This facility was designed specifically to serve as a trading floor, occupies very valuable real estate, and would require massive renovation to serve any other purpose.

[15] Section IV examines the history of exchange organizational form in more detail.

profit form. This section shows that market power and the degree of member heterogeneity determine whether a mutual exchange is organized as a for-profit (FP) enterprise or a not-for-profit (NP) institution. The analysis rests on two basic assumptions: (1) the members of an exchange are profit maximizers, and (2) exchanges have some market power; that is, their members collectively face a downward-sloping demand curve for their services.

Profit-maximizing exchange members can exploit the market power inherent in centralized trading in at least two ways. First, the exchange can charge a supermarginal cost price for its services (such as per-trade fees) and distribute the resulting surplus to its members. In this case, the exchange is organized as an FP enterprise, such as a corporation, partnership, or an FP mutual. Second, the exchange can set the prices of its services equal to marginal cost and create rules that allow its members to exploit the monopoly power. These rules may include limitations on the number of members in the exchange and the enforcement of cartels among exchange members. In this case, the exchange is organized as an NP institution that facilitates profit maximization through the enforcement of rules that reduce competition between members.

The crucial distinction between FP and NP exchanges in this context is that the FP form allows transfers between the exchange and its members; the exchange can price its services to earn a surplus that it distributes to its members through a dividend or other means. In contrast, an NP exchange cannot distribute a surplus to its members.

At first blush, it appears that FP dominates NP. A profit-maximizing exchange effectively acts as a joint sales office for the membership and is not vulnerable to the cheating that undermines cartel agreements. The model presented below demonstrates, however, that if (1) exchange members are heterogeneous and (2) FP exchanges distribute profits proportionally to membership, there will be strong resistance to FP organization. Under these conditions, inframarginal exchange members prefer to extract rents through collusion enforced (even imperfectly) by an NP organization rather than through a joint-profit-maximizing firm. Moreover, if heterogeneity is sufficiently pronounced, there will be considerable support for the NP structure even if the exchange cannot enforce collusive arrangements among members.

The analysis proceeds in two steps. Section III*B* analyzes the fundamental determinants of support for FP and NP organization. Based on this foundation, Section III*C* presents a model that analyzes how disagreements among members over organizational form are resolved. Section III*D* discusses the empirical implications of the analysis, and Section III*E* is a summary.

B. *A Model of Trader Preferences over Exchange Ownership Form*

The formal model presented in this section assumes that exchange members provide only a single type of service. Brokerage is one example of an exchange member service. To make the analysis more concrete, I refer to exchange members as brokers. I subsequently expand the analysis informally to include the more realistic case in which exchange members provide a variety of different services. The limited model is sufficient, however, to elucidate the forces that influence support for alternative organizational forms.

First assume that all brokers are homogeneous. That is, all incur identical costs and offer identical services. There are N broker-members. The marginal cost function of each is

$$\mathrm{MC}_i = \alpha + \beta q_{S,i},$$

where $q_{S,i}$ is the quantity of brokerage produced by member i. The demand for brokerage services provided by the exchange's members is

$$P = A - BQ,$$

where

$$Q = \sum_{j=1}^{N} q_{S,j}.$$

For simplicity assume that the exchange's marginal cost of providing its services equals zero. A for-profit exchange chooses a per-trade fee of t and distributes the profits to the members in equal shares. Given the choice of t, exchange members compete to supply brokerage. Thus, the price of brokerage services equals the marginal cost of these services. Under these conditions, the per-trade fee maximizes

$$Q(P + t)t + N\frac{(P - \alpha)^2}{2\beta},$$

where the first term is the exchange's revenue from the per-trade fee and the second term is the total producer surplus earned by brokers-members. The variable P is the equilibrium price of member services. Moreover,

$$P = \alpha + \beta\frac{Q(P + t)}{N}$$

because the price customers pay for brokerage equals the sum of the marginal cost and the tax.

It is obvious that with a homogeneous membership, if the exchange en-

forced a brokerage cartel, all brokers would agree on the optimal price P to charge. Maximization of joint profits by an FP exchange offers one major advantage over collusion by members, however, even if an NP exchange polices the brokerage cartel. Cheating is profitable if brokers collude. A profit-maximizing for-profit exchange faces no cheating problem. Thus, for the same reason industrial cartels should favor joint sales agencies, exchanges with homogenous members should create an FP organization rather than an NP organization that enforces collusion between exchange members because the joint sales agency incurs lower enforcement costs.

Results change if there is sufficient membership heterogeneity. Now assume two classes of broker-members, high-cost brokers and low-cost brokers. The marginal cost curve of the low-cost firms is

$$MC_{L,i} = \alpha_L + \beta_L q_{S,i},$$

and the marginal cost curve of the high-cost firms is

$$MC_{H,i} = \alpha_H + \beta_H q_{S,i},$$

where $\alpha_H > \alpha_L$ and $\beta_H > \beta_L$. The number of high-cost members is N_H, and the number of low-cost members is N_L.

First, consider a for-profit exchange that chooses a trade fee t. The exchange distributes the proceeds this fee generates to the members. Each member (regardless of type) receives the same distribution.[16] Given the fee,

[16] The constraint that exchange profits are distributed in equal shares to each member is somewhat arbitrary. It is of course possible for members to negotiate more elaborate sharing agreements. If for-profit ownership is joint profit maximizing, the gainers can theoretically compensate the losers in order to induce support for a for-profit organization. Such Coasean bargains face severe practical difficulties, however. First, they may be difficult to enforce. Those that gain under the for-profit form—the high-cost firms—can promise to pay a disproportionate share to low-cost firms in order to obtain their support and then renege subsequently. Unless such Coasean bargains can be enforced, an organization that does not maximize joint member wealth cannot survive. Second, if firms have private information about costs, it may be extremely costly—if not impossible—to negotiate a mutually beneficial sharing arrangement. Type-dependent sharing rules are informationally demanding. If type is private information, equal sharing is the likely outcome of the bargaining that leads to the formation of an exchange. Type-dependent sharing also makes it costlier to transfer exchange memberships. The for-profit exchange is similar to an "Illyrian firm." The term "Illyrian firm" sometimes is used to describe a labor-managed firm that distributes revenue net of payments to capital pro rata to worker-member-owners. The literature on Illyrian firms focuses on whether labor-owned firms will operate differently from investor-owned ones. Norman J. Ireland, The Economic Analysis of Labour-Managed Firms, 39 Bull. Econ. Res. 249 (1987). This literature does not examine why a worker-owned firm would choose to organize as a nonprofit with a binding nondistribution constraint. Moreover, issues relating to worker heterogeneity are largely absent from articles on the Illyrian firm. Therefore, the present article addresses issues that are quite different from those raised in the literature on labor-owned firms, though perhaps the analysis of the present article can help explain why Illyrian firms are so rare. That literature may be of some relevance in evaluating how a for-profit exchange owned by intermediaries would operate differently from a for-profit exchange owned by outside investors.

brokers compete for customers and charge a price equal to the marginal cost. It can be shown that for a given t, the equilibrium price for brokerage services in the for-profit exchange is

$$P = \left(\frac{A - t}{B} + \frac{N_L\alpha_L}{\beta_L} + \frac{N_H\alpha_H}{\beta_H}\right)\Bigg/\left(\frac{1}{B} + \frac{N_L}{\beta_L} + \frac{N_H}{\beta_H}\right).$$

Note that

$$-1 < \frac{dP}{dt} = (-1/B)\Bigg/\left(\frac{1}{B} + \frac{N_L}{\beta_L} + \frac{N_H}{\beta_H}\right) < 0.$$

Low-cost and high-cost firms disagree over the appropriate choice of t. The total profit earned by a low-cost firm (including producer surplus and the share of exchange profits) is

$$\Pi_L = \frac{(P - \alpha_L)^2}{2\beta_L} + \left(t\frac{A - P - t}{B}\right)\Bigg/(N_L + N_H).$$

The first term gives the low-cost firm's surplus. A similar expression holds for high-cost firms:

$$\Pi_H = \frac{(P - \alpha_H)^2}{2\beta_H} + \left(t\frac{A - P - t}{B}\right)\Bigg/(N_L + N_H).$$

Note that the change in distributed profits (the second term in these expressions) that results from a change in t is the same for both types of firms. However, a change in t causes the profits from brokerage activities for low-cost firms to fall more than for high-cost firms:

$$\frac{(P - \alpha_L)}{\beta_L}\frac{dP}{dt} < \frac{(P - \alpha_H)}{\beta_H}\frac{dP}{dt} < 0.$$

The left-most term is the fall in brokerage profits for low-cost firms in response to a change in t, and the middle term is the fall in brokerage profits for high-cost firms. Thus, a rise in t has two effects. It may increase the total rents to be divided between high-cost and low-cost firms, but it also redistributes rents from low-cost firms to high-cost firms. This redistribution does not occur in an NP exchange. Thus, the possibility of redistribution reduces the support of low-cost firms and increases the support of high-cost firms for the FP form.

Disagreement between high-cost and low-cost firms is more acute if the exchange can enforce a collusive agreement. If members compete, the abil-

ity to extract rents from consumers by raising t may more than offset the losses the low-cost firms suffer as a result of the redistribution effect. Consequently, the low-cost firms may support the FP form if members compete. However, if an exchange can enforce a collusive agreement, low-cost firms can extract rents from consumers by charging supercompetitive commission rates while avoiding the redistribution of rents to high-cost types. Therefore, low-cost firms prefer the NP form and collusion to the FP form.

The foregoing analysis raises a crucial question: how is the conflict between heterogeneous interests resolved? The next section shows that under plausible conditions, low-cost firms win out and the NP form predominates.

C. *Equilibrium Choice of Exchange Organizational Form*

The prior analysis demonstrates that heterogeneous members differ in their preferences over organizational form but does not predict which faction will prevail. Indeed, the analysis implicitly assumes that an exchange will include both types of firms, but this is not necessary. There are a variety of possible outcomes:

1. Low-cost firms form one exchange and high-cost firms form another. Since membership of each exchange is homogeneous, each is FP.
2. Low-cost and high-cost firms combine to form an FP exchange.
3. Low-cost and high-cost firms combine to form an NP exchange.

This section demonstrates that the ability of low-cost firms to form their own exchange—alternative 1—can decisively influence the choice of organizational form. Specifically, if heterogeneity is sufficiently great and an exchange can create a cartel that charges supermarginal cost prices, then both high-cost and low-cost firms support alternative 3. The intuition behind this result is as follows. Low-cost firms strictly prefer option 3 if collusion is allowed because (1) including high-cost types in the exchange limits competition from them and exploits economies of scale and (2) the NP form restricts the ability of high-cost firms to extract rents from the low-cost firms. High-cost firms prefer option 2 because of reduced competition, scale economies, and the ability to extract rents from low-cost firms. Nonetheless, the low-cost firms can induce the high-cost firms to agree to the NP form if they can credibly threaten to form a separate exchange. This threat is more credible when the difference in cost between low- and high-cost firms is large because under these circumstances (1) the possibilities for rent extraction are greater and (2) the competitive threat posed by high-cost firms is less severe.

Some notation is useful in demonstrating this point. Each low-cost firm's profit under alternative 1 is $\Pi_L^F(0, L)$ whereas each high-cost firm's profit

under this alternative is $\Pi_H^F(H, 0)$. Each low-cost firm's profit under alternative 2 is $\Pi_L^F(H, L)$, and each high-cost firm's profit under this alternative is $\Pi_H^F(H, L)$. Finally, under alternative 3 each low-cost firm earns $\Pi_L^N(H, L)$, and each high-cost firm earns $\Pi_H^N(H, L)$.

The formal analysis is based on the following assumptions:

ASSUMPTION 1. The fixed costs of operating an exchange equal f. Exchange members split fixed costs equally.

ASSUMPTION 2. If high-cost and low-cost firms form separate exchanges, the high-cost firms act as a competitive fringe, and the low-cost exchange acts as a dominant firm.

ASSUMPTION 3. If high-cost and low-cost firms join to form a single for-profit exchange, the price of exchange services t is determined by majority vote. The preferences of the median firm determine the outcome.

ASSUMPTION 4. The median firm is high cost. That is, $N_H > N_L$.

ASSUMPTION 5. If the high-cost and low-cost firms combine to form a single nonprofit exchange, the exchange enforces a brokerage cartel. Under this cartel, each type of firm earns a higher revenue net of variable cost than if high-cost and low-cost firms form competing exchanges.

ASSUMPTION 6.

$$B > \frac{\theta}{1 - \theta}(N_L\beta_H + N_H\beta_L),$$

where $\theta = N_L/N$.

These assumptions require comment. Assumptions 1 and 5 provide a motive for high-cost and low-cost firms to form a single exchange; unless both types are present in the same exchange, the for-profit form would dominate. There are clearly fixed costs in exchanges, including the costs of operating facilities (such as a trading floor or computer system). Moreover, there are other sources of scale economies, including network effects and centralized clearing. Assumption 2 makes the analysis somewhat easier, but the implications of the model are robust to changes in the form of competitive interaction between exchanges.[17] Assumption 5 is plausible if assumption 2 holds because the combined-type exchange can restrict output more effectively than a dominant firm. Both types of firms benefit from this reduction in output. Moreover, under assumption 5, $\Pi_L^F(H, L) < \Pi_L^N(H, L)$. Assumption 4 is necessary to make the analysis interesting. If low-cost firms outnumber high-cost ones, their views prevail if voting determines organiza-

[17] This assumption is also an accurate description of interexchange competition in the nineteenth-century United States. The Open Board in New York and the Open Board in Chicago both operated as a competitive fringe. They did not restrict entry and did not set brokerage rates collusively.

tional form. A primary objective of the analysis is to determine whether the NP form can prevail even if high-cost firms outnumber low-cost ones. If so, the NP form can predominate in a wide variety of environments with different distributions of trader types. In words, assumption 6 states that the marginal cost of member services curve cannot be much steeper than the market demand curve; the term in parentheses on the right-hand side of the expression is the slope of the marginal cost curve. This technical assumption is necessary to ensure that both types of firms produce positive outputs in the FP exchange at the choice of t that maximizes the profits earned by the high-cost types.

The first step of the analysis is to derive the optimal exchange fee under alternative 2, the FP exchange with both types of firms. Since the median member of this exchange is high cost, t maximizes

$$\Pi_H^F(H, L) = \frac{(P - \alpha_H)^2}{2\beta_H} + \frac{t(A - P - t)}{B(N_L + N_H)} - \frac{f}{(N_L + N_H)}.$$

This implies the first-order condition

$$\frac{d\Pi_H^F(H, L)}{dt} = 0 = \left[\frac{(P - \alpha_H)}{\beta_H} - \frac{t}{B(N_L + N_H)}\right]\frac{dP}{dt} + \frac{(A - P - 2t)}{B(N_L + N_H)}. \quad (1)$$

At the value of t that solves (1),

$$\frac{d\Pi_L^F(H, L)}{dt} = \left[\frac{(P - \alpha_L)}{\beta_L} - \frac{t}{B(N_L + N_H)}\right]\frac{dP}{dt} + \frac{(A - P - 2t)}{B(N_L + N_H)} < 0. \quad (2)$$

The inequality follows directly from (1) and the fact that the slope and intercept of the low-cost marginal cost curves are smaller than for their high-cost-firm counterparts. This result means that the high-cost firms choose a trade fee that exceeds that which low-cost firms would choose in order to extract rents from the low-cost firms.

The choice of t depends on the cost and demand parameters. For example,

$$\frac{dt}{d\alpha_L} = -\frac{\partial^2\Pi_H^F(H, L)/\partial\alpha_L\partial t}{\partial^2\Pi_H^F(H, L)/\partial t^2}. \quad (3)$$

The sufficient conditions for a maximum imply that the denominator of this expression is negative. Moreover,

$$\frac{\partial^2\Pi_H^F(H, L)}{\partial\alpha_L\partial t} = \frac{\partial P}{\partial\alpha_H}\left(\frac{1}{\beta_H}\frac{\partial P}{\partial t} - \frac{1}{BN}\right) < 0. \quad (4)$$

Thus, $dt/d\alpha_L < 0$. That is, as the marginal cost curve for low-cost firms shifts up (down), high-cost firms vote to reduce (raise) the exchange fee. Similar results hold for other cost parameters.

This determines how changes in marginal costs affect the profits of the low-cost firms:

$$\frac{d\Pi_L^F(H, L)}{d\alpha_L} = \frac{\partial \Pi_L^F(H, L)}{\partial t}\frac{dt}{d\alpha_L} + \frac{\partial \Pi_L^F(H, L)}{\partial P}\frac{dP}{d\alpha_L} + \frac{\partial \Pi_L^F(H, L)}{\partial \alpha_L}. \quad (5)$$

Expression (4) implies that the first term of (5) is positive. Moreover,

$$\frac{dP}{d\alpha_L} = \frac{\partial P}{d\alpha_L} + \frac{dP}{dt}\frac{dt}{d\alpha_L} > 0.$$

Assumption 6 implies that

$$\frac{\partial \Pi_L^F(H, L)}{\partial P} > 0.$$

Finally, the envelope theorem implies that the third term is

$$\frac{\partial \Pi_L^F(H, L)}{\partial \alpha_L} = -\frac{P - \alpha_L}{\beta_L} = -q^*(t),$$

where $q^*(t)$ is the output produced by each low-cost firm under alternative 2.

This analysis implies that high-cost firms benefit from a decline in low-cost firms' cost; the first two terms in (5) represent the change in the rents extracted by the high-cost firms in response to a marginal cost change. When the marginal costs of low-cost firms fall, their high-cost counterparts vote to raise the trading fee to capture some of the resulting profit.

As a result of this expropriation, low-cost firms will not join a joint FP exchange that includes the high-cost types if they have a more profitable alternative. One alternative is to threaten to form an independent exchange including only low-cost types. By assumption 2, this exchange operates as a dominant firm. The dominant exchange faces a demand curve given by the horizontal difference between the market demand curve and supply curve of the high-cost firms:

$$P(Q_L) = \frac{(A/B) + (\alpha_H N_H/\beta_H)}{(1/B) + (N_H/\beta_H)} - \frac{B\beta_H}{\beta_H + BN_H}Q_L,$$

where Q_L is the output of the low-cost firms. The low-cost firms choose Q_L to maximize

$$\Pi_L^F(0, L) = \left[P(Q_L)Q_L - .5N_L\left(2\alpha_L + \beta_L \frac{Q_L}{N_L}\right)\frac{Q_L}{N_L} - f \right] \Big/ N_L. \quad (6)$$

The next-to-last term in the brackets is the total variable cost incurred by the low-cost firms. A full analysis of this expression is unnecessary for the purposes at hand. Instead, it suffices to note that by the envelope theorem,

$$\frac{d\Pi_L^F(0, L)}{d\alpha_L} = -\frac{Q_L}{N_L} = -q_L, \quad (7)$$

where q_L is the output of each low-cost firm that belongs to the low-cost-firm-only exchange.

Define $\Delta\Pi = \Pi_L^F(0, L) - \Pi_L^F(H, L)$. Low-cost firms cannot credibly threaten to form their own exchange unless $\Delta\Pi > 0$. Note that $\Delta\Pi < 0$ if the firms are homogeneous, that is, if $\alpha_L = \alpha_H$ and $\beta_L = \beta_H$. This occurs because (1) there is less competition if all firms form one exchange, (2) the interests of all firms are aligned (that is, all would choose the same t), and (3) per-firm fixed costs are lower with a unified exchange. However, as the firms become sufficiently heterogeneous, this inequality reverses.

To see why, it is useful to simplify the analysis by assuming that $\beta_L = \beta_H = \beta$. That is, only the intercepts of the marginal cost curves can differ between high-cost and low-cost firms. This allows a simple measure of heterogeneity, $h = \alpha_H - \alpha_L$. Hold α_H fixed. Then heterogeneity changes only when α_L changes. Note that

$$\frac{d\Delta\Pi}{d\alpha_L} = \frac{d\Pi_L^F(0, L)}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial\alpha_L} - \frac{d\Pi_L^F(L, H)}{dt}\frac{dt}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial P}\frac{dP}{d\alpha_L}. \quad (8)$$

With some extensive algebra, it is possible to show that

$$\frac{d\Pi_L^F(0, L)}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial\alpha_L} = -[q_L - q^*(t)] < 0.$$

The inequality holds because the low-cost firms in the dominant-low-cost-firm exchange produce more output than they would in an FP exchange that includes both types of firms. Output is higher because (1) there is more competition with two exchanges and (2) the high-cost firms force low-cost firms to produce less output than they would like by charging too high a t. Moreover, as noted immediately below (5),

$$-\frac{\partial\Pi_L^F(L, H)}{\partial t}\frac{dt}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial P}\frac{dP}{d\alpha_L} < 0$$

because of the expropriation effect. Thus, $d\Delta\Pi/d\alpha_L < 0$. This means that as α_L falls (that is, as h increases), it becomes more attractive for the low-

cost firms to "vote with their feet" and form their own exchange. Given this result, the following lemma follows immediately:

LEMMA 1. There is some minimum level of h, h^*, such that $\Delta\Pi > 0$ for all $h > h^*$. Thus, if high-cost and low-cost firms are sufficiently heterogeneous, low-cost firms can credibly threaten to form their own exchange.[18]

This and assumptions 1–6 above in turn imply the following:

PROPOSITION 1. If assumptions 1–6 hold, and if $h > h^*$, then high- and low-cost firms form a single nonprofit exchange.

Proof. Lemma 1 implies that if $h > h^*$, the low-cost firms prefer their own exchange to forming a for-profit exchange with the high-cost types. Thus, they can credibly threaten to form their own exchange instead of forming an FP exchange with the high-cost firms. By assumptions 1 and 5, high-cost firms prefer to join an NP exchange than form an independent exchange to compete with an exchange operated by the low-cost types; a single exchange increases revenues net of variable cost for both types and reduces total fixed costs. Thus, all firms agree to form an NP exchange.

The preceding results must be altered somewhat if assumption 5 does not hold, that is, if members of an NP exchange compete rather than collude in setting the price of their services. In this case, it is possible that $\Pi_L^F(H, L) > \Pi_L^N(H, L)$ for some values of h, in which case all traders strictly prefer a joint FP exchange. However, note that

$$\frac{d[\Pi_L^N(L, H) - \Pi_L^F(L, H)]}{d\alpha_L} = \frac{d\Pi_L^N(L, H)}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial\alpha_L} - \frac{d\Pi_L^F(L, H)}{dt}\frac{dt}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial P}\frac{dP}{d\alpha_L}$$

and

$$\frac{d\Pi_L^N(L, H)}{d\alpha_L} - \frac{\partial\Pi_L^F(L, H)}{\partial\alpha_L} = -[q_L^C - q^*(t)] < 0,$$

where q_L^C is the output of the low-cost types under alternative 3 when exchange members compete. The inequality holds because competitive output is greater than the output produced by the FP exchange since the supercompetitive fee reduces member output. Therefore,

$$\frac{d[\Pi_L^N(L, H) - \Pi_L^F(L, H)]}{d\alpha_L} < 0.$$

[18] Similar results obtain for changes in the slopes of the marginal cost curves for the two types of firms.

Thus, there exists an h^{**} such that $\Pi_L^F(H, L) < \Pi_L^N(H, L)$ for all $h > h^{**}$. Given these results, a revised version of Proposition 1 holds:

PROPOSITION 1*. If $h \geq h^{**}$, then (1) low-cost firms can credibly threaten to form their own exchange and (2) low-cost firms earn a higher profit as members of an NP exchange that includes high-cost firms (that is, alternative 3) than as members of an FP exchange that includes high-cost firms (that is, alternative 2). Therefore, if $h \geq h^*$, all firms agree to join an NP exchange.

In general, $h^* \leq h^{**}$ because when collusion is disallowed h must satisfy an additional constraint to ensure that low-cost firms prefer the NP to the FP form. That is, with no collusion it may be the case that $\Pi_L^F(0, L) - \Pi_L^F(H, L) > 0$, but $\Pi_L^N(H, L) - \Pi_L^F(H, L) < 0$ because of the ability of an FP exchange to exercise market power even when collusion by members of an NP exchange is precluded. If so, low-cost firms prefer FP. When collusion is allowed, $\Pi_L^N(H, L) - \Pi_L^F(H, L)$ is always positive. Since more constraints must be satisfied to ensure that low-cost firms prefer NP in the no-collusion case, the level of heterogeneity sufficient to ensure adoption of NP cannot be smaller and may be greater than when collusion is feasible.[19]

Although the analysis has considered only one source of heterogeneity—differences in cost among brokerage suppliers—an actual exchange is more complicated, and the scope for heterogeneity is more pronounced as a result. Exchange members specialize in supplying different kinds of services, including liquidity, risk bearing, and account management in addition to brokerage. Practitioners of different specialties may earn different profits. There can be heterogeneities within a given class of specialists as well. The foregoing analysis can be extended to show that specialties generating high

[19] The propositions establish sufficient, but not necessary, conditions for the formation of an NP exchange with heterogeneous membership. Therefore, it is only possible to say that firms may create an FP exchange if heterogeneity is low. Even if $\Delta\Pi < 0$, however, all firms may agree to form an NP exchange. Under assumptions 1–6, high-cost firms can never credibly threaten to form their own exchange unilaterally if low-cost firms insist on the NP form. The form selected when $h < h^*$ (with collusion) or $h < h^{**}$ (without collusion) therefore depends on the outcome of negotiations between the high- and low-cost firms when neither can credibly vote with their feet. The outcome of such a negotiation is uncertain and almost certainly depends on the particular assumptions made about the bargaining process. Membership collusion favors the NP form regardless of the specific assumptions pertaining to bargaining. Specifically, the FP exchange does not maximize the joint wealth of heterogeneous firms because high-cost firms favor a price that exceeds the joint-wealth-maximizing price in order to extract rents from the low-cost types. An NP exchange that implements a cartel may come nearer to maximizing joint profits. This opens the possibility for a Coasean bargain between high-cost and low-cost types in which low-cost firms "bribe" high-cost firms to accept the NP form. Although there are clearly impediments to consummating such a bargain (such as information asymmetries and enforcement problems), the fact that the NP form mitigates rent dissipation favors its adoption even if $h < h^*$.

rents may prefer not-for-profit to for-profit organization, whereas specialties that earn small rents prefer the for-profit form.[20]

The reason for this is straightforward. The membership price equals the capitalized value of the marginal member's profits. Inframarginal members receive the competitive return on the value of their membership, plus some additional profit reflecting their superior human or financial capital. The marginal member desires to maximize the value of his membership, whereas an inframarginal member does not necessarily have this objective. The FP form maximizes membership value because it allows the redistribution of wealth from inframarginal members to marginal ones. Thus, a marginal member favors FP organization, whereas an inframarginal member may not.

D. Empirical Implications and Comparative Statics

The foregoing theory predicts that (1) the NP form will be the preferred form of organization if traders are sufficiently heterogeneous and (2) the level of heterogeneity needed to support the NP form is lower when exchange members can collude. The theory also implies that support and opposition for each organizational form may change over time as the distribution of rents among members changes or the composition of the membership changes.

Various factors affect the critical level of heterogeneity required to ensure the choice of NP organization. Specifically, changes in the numbers of high-cost and low-cost types due to technological shocks can also lead to a change in organizational form. For example, a technology shock that increases N_H and reduces N_L but leaves total membership size fixed can result in a shift from NP to FP. The formal analysis is quite involved, but the intuition is straightforward. For a given h, a decline in N_L and an offsetting rise in N_H cause $\Delta\Pi$ to fall because (1) per-member fixed costs in a low-cost-firm exchange are higher when N_L is smaller, (2) high-cost firms in a joint FP exchange vote to reduce t because there is less wealth to be expropriated from low-cost types as their numbers decline, so more of the deadweight tax burden falls on the high-cost types, and (3) the price of member services rises in the FP exchange because the change in membership composition shifts up the supply curve of member services but the profitability of the low-cost-firm-only exchange falls because this change in composition shifts down the demand curve and shifts up the marginal cost curve for this exchange. Thus, for some h such that $\Delta\Pi > 0$ before the change in membership composition, $\Delta\Pi < 0$ after the change. This results in a change in ownership form from NP to FP.

[20] I have derived models of ownership form when different classes of members provide complements rather than substitutes. These derivations are available on request.

The degree of competition between independent low-cost and high-cost exchanges also affects h^*. The more competition between low-cost and high-cost exchanges, the less credible the low-cost firms' threat is to form their own exchange. In the context of the earlier model, h^* would be lower (higher) with Cournot (perfect) competition between the exchanges than under the dominant-firm model because more severe competition reduces $\Pi_L^F(0, L)$ but does not affect $\Pi_L^F(H, L)$. Finally, increases in scale economies can also lead to shifts from NP to FP. This occurs because low-cost firms forgo scale economies when they form their own exchange. As f rises, it is costlier to escape expropriation by forming an independent low-cost exchange.

E. Summary

Not-for-profit organization of member-owned financial exchanges is a means of protecting inframarginal suppliers of trading services from expropriation by marginal suppliers. The models analyzed above imply that (1) exchange members will choose the NP form if heterogeneity is sufficiently great; (2) exchanges with homogeneous members choose the FP form; (3) an exchange is more likely to be organized as an NP firm when it can enforce collusive pricing by its members, meaning that nonprofit organization and collusion are complements that should be observed together; and (4) the relative numbers of different types of members, the severity of interexchange competition, and economies of scale determine the level of heterogeneity sufficient to lead to the adoption of the NP form.

The analysis depends crucially on the assumption that the nondistribution constraint is binding. If it is not, the NP form does not preclude redistribution. It has been suggested that an exchange could circumvent this constraint by (1) choosing a fee t that maximizes $\Pi_H^F(H, 0)$ and (2) accumulating the resulting surplus instead of distributing it to members. Under this proposal, the exchange seat price would capitalize the value of the accumulated surplus, and members could capture this surplus through the appreciation in the value of their seats.[21] This would break the nondistribution con-

[21] For the surplus accumulation scheme to work there must be some means by which surplus can eventually be distributed to members. One way is through dissolution of the exchange. Henry Hansmann, Reforming Nonprofit Corporation Law, 129 U. Penn. L. Rev. 497 (1981), shows that most state nonprofit laws do not constrain distribution of assets on liquidation of an NP firm. An exchange could incorporate as a nonprofit, accumulate a surplus, dissolve and distribute the surplus, and then reincorporate. Although this is feasible, it may be impractical for an exchange. The inframarginal types could block dissolution or reincorporation unless the exchange adopted a less flimsy nondistribution constraint. Moreover, if dissolution and reincorporation are costly, it will be economical to defer these actions. Deferral, however, increases the risks of dissipation discussed in the text. The rules of most exchanges do not explicitly describe what happens in the event of dissolution, but this can be inferred. For example, the rules of the CBOT specify that members who have the right to trade only a subset of the exchange's contracts receive a smaller distribution of assets

straint, but for several reasons this possibility does not undercut the conclusions of the foregoing analysis. First, in terms of the model, if the low-cost types can utilize their exit threat to block direct distribution through a for-profit exchange, they can use this threat to preclude the accumulation of a surplus as a means of circumventing the constraint. Second, the accumulation of large cash reserves creates a potential for dissipation through managerial consumption of perquisites, wasteful investment, and so on. This potential for dissipation reduces the incentive to accumulate. Third, exchange financial statements and membership prices demonstrate that exchanges do not follow this policy in practice. Under the surplus accumulation theory, increases in seat prices and increases in the equity of exchange members should be of similar magnitude.[22] In fact, in recent years exchange membership values have increased by far larger amounts than member equity. The ratio of the average change in membership value to the average change in member equity over the 1986–96 period was 12 for the CME, 6.7 for the CBT, 5.2 for the Chicago Board Options Exchange, 2.5 for the Coffee, Sugar, and Cocoa Exchange, 13.5 for the New York Cotton Exchange, and 2.08 for the NYSE. Thus, accumulation of surplus has not driven increases in seat values over this period. Thus, exchanges have not in fact circumvented the nondistribution constraint through surplus accumulation. This is consistent with the view that the threat of exit by inframarginal members effectively constrains redistribution.

The theory presented herein differs from the only other extant theory of exchange organization, that of Hart and Moore, in many respects.[23] Hart and Moore analyze pricing by cooperative exchanges with heterogeneous members. They permit a member-owned exchange to price its services to earn a profit that is distributed to the membership. Pricing decisions are the result of a majority vote of the members. Appealing to the median voter theorem, they show that an exchange will be organized as FP if the distribution of trader sizes is skewed toward high-cost firms. They argue that such skewness is likely, in which case they cannot explain the ubiquity of the NP

on dissolution than full members. The CME rules state that holders of limited memberships have only fractional votes when deciding on distribution of assets upon dissolution. The CBOT rules suggest the existence of a fixed allocation of exchange assets on dissolution, whereas the CME rules suggest that shares are determined by vote.

[22] To see why, consider the following simple model. Call $V(t)$ the value of member equity at t. Assume that the exchange prices services to generate an annual surplus that maximizes the wealth of high-cost types to maximize the seat value. Call the current value of this annual surplus $v(t)$, and assume that it grows at a rate g per year. The interest rate is r. In this case, total membership value at t would equal $M(t) = V(t) + v(t)/(r - g)$. The year-to-year change in $M(t)$ equals $M(t) - M(t - 1) = V(t) - V(t - 1)$. Therefore, seat prices and member equity should grow by the same amount under this surplus accumulation hypothesis.

[23] Hart & Moore, *supra* note 2.

form; only if the distribution of traders is skewed toward the low-cost firms will the median voter/member select the NP form. Moreover, they do not examine the effects of collusion on the choice of organizational form.

Their assumption that organizational form and pricing are determined by majority vote of all firms is not plausible in this context because it neglects the possibility that low-cost firms can form their own exchange if high-cost firms attempt to extract too much surplus from them. As propositions 1 and 1* demonstrate, low-cost firms have considerable power over the high-cost firms because of their ability to form their own exchange. Even if high-cost firms outnumber low-cost ones, both types may agree to form an NP exchange because the threat of exit constrains the ability of high-cost firms to expropriate low-cost ones.

This theory thus provides a more complete explanation for exchange organizational form than the received literature on exchange governance. Moreover, the theory provides a new rationale for the formation of not-for-profit organizations. Heretofore, the literature on nonprofits has focused on the provision of charitable services and has shown that the NP form can reduce transactions costs by assuring donors that their contributions will not be appropriated opportunistically.[24] The present theory shows that the NP form can also reduce transactions costs in certain noncharitable organizations. More generally, the analysis is potentially applicable to the structure of sharing arrangements in cooperatives and partnerships, including sports leagues and legal firms. In particular, the theory may shed light on why some cooperative organizations (such as the National Football League) share virtually all revenues whereas intermember transfers are far more limited for others (such as Major League Baseball).[25]

IV. Empirical Evidence on Exchange Organizational Form

A. *Introduction*

The theory just presented makes a variety of predictions about the organization of exchanges. This section demonstrates that several of these predictions are borne out. Exchanges have traditionally been organized as non-

[24] Henry Hansmann, The Role of Nonprofit Enterprise, 89 Yale Law J. 835 (1980). David Easley & Maureen O'Hara, The Economic Role of the Nonprofit Firm, 14 Bell J. Econ. 531 (1983), shows that the nondistribution constraint can improve welfare when managers can observe a firm's output but its customers cannot. This condition is relevant for donative charities (for example, CARE).

[25] Hansmann, *supra* note 21, expresses doubts that transactions costs or contract failures explain the adoption of the NP form by mutuals or groups of FP firms. He does not explicitly consider member heterogeneity. Once heterogeneity is considered, the choice of the NP form becomes more understandable.

profits. Moreover, exchanges have traditionally established brokerage cartels. Recently, some exchanges have adopted for-profit organization. These have been new computerized exchanges or exchanges that have switched to computerized trading; trader heterogeneity is smaller in computerized exchanges, so their use of the for-profit form is consistent with the theory. Finally, other exchanges have explored the possibility of converting to the for-profit form. As the theory predicts, the supporters of such change tend to be marginal members, whereas inframarginal tend to oppose it.

B. Exchange Organizational Form

With some recent exceptions (discussed in Section IV*D infra*), financial exchanges throughout the world are now, and have been, organized as nonprofit organizations. Largely due to differences in the corporation laws across jurisdictions, the specific legal forms adopted by exchanges vary. Most securities exchanges in the United States were organized as unincorporated voluntary membership associations. They mix the features of partnerships, joint stock companies, and corporations.[26] Early futures exchanges in the United States were typically organized as corporations created by special legislative acts.[27] Some were organized as joint stock corporations.[28] Newer U.S. exchanges have been organized under state membership corporation laws.[29] Regardless of the formalities, legal decisions typically consider exchanges as voluntary associations.[30] Both U.S. securities and commodity exchanges are exclusively NP organizations.[31] Similarly, non-U.S.

[26] John Dos Passos, The Law of the Stock Exchange, in The New York Stock Exchange (Francis L. Eames ed. 1968).

[27] Julius Baer & George Woodruff, Commodity Exchanges (1929).

[28] 5 Federal Trade Commission, Report of the Federal Trade Commission on the Grain Trade 190–94 (1920).

[29] See Baer & Woodruff, *supra* note 27, chs. 12 & 13.

[30] *Id.*, chs. 12 & 13 nn.2–15, provides an extensive list of court decisions regarding the legal status of financial exchanges.

[31] It may be argued that prevailing organizational form is due to historical accident. Most older exchanges started in the nineteenth century as chambers of commerce. It is natural for such bodies to be organized as nonprofits, so perhaps the initial form persisted due to inertia. This explanation faces several difficulties. First, if movement to the FP form would generate substantial benefits, passive acceptance of the existing NP form is extremely costly. Second, many newer exchanges formed outside the United States that did not begin as chambers of commerce adopted the nonprofit form. These include the Sydney Futures Exchange (1960), the Paris Matif (1986), the International Petroleum Exchange (1980), and the London International Financial Futures and Options Exchange (1982). Inertia cannot explain the selection of the NP form by these exchanges. Third, as noted in section IV*E*, several U.S. exchanges have explicitly considered the possibility of changing ownership form but have yet to implement such changes. This demonstrates that (1) exchanges do not consider organizational form preordained and immutable and (2) at least some members benefit from retaining the existing form.

exchanges differ in their formal legal organization but, with one limited exception, operate as NP entities.[32] Crucially, in all cases that I have examined, exchanges do not distribute profits to their membership. Exchanges that earn revenues in excess of costs typically invest these surpluses in guarantee funds or the exchange clearinghouse to be used only in the event of a default on futures contracts. Exchange assets are distributed to members only upon dissolution of the exchange.

C. Collusion on Exchanges

Exchanges long ago adopted and enforced rules fixing minimum commission charges. The New York Stock Exchange operated a broker cartel from its genesis in 1792. This cartel persisted until the Securities Acts Amendments of 1975 prohibited the practice. Exchange-enforced collusion on commodity exchanges is of more recent provenance, but it is still a practice of long standing. The Chicago Board of Trade adopted a commission rule in 1901. The Federal Trade Commission (FTC) study of exchanges found that all major U.S. grain exchanges fixed commissions on both cash and futures trades in 1920. Fixed commissions persisted until the early 1970s.

Brokerage cartels were also common overseas. As recently as 1985, 38 futures exchanges in eight countries fixed commission rates.[33] Moreover, most of these exchanges price discriminated by creating "associate memberships." Associate members had no voting power but paid discounted commissions. These exchanges limited associate membership to commercial firms that are large users of futures and, hence, elastic demanders. Similarly, until eliminated by government fiat in the 1980s, most world stock exchanges fixed commission rates.[34]

[32] R. Forrester, Commodity Exchanges in England, 155 Annals Am. Acad. Pol. & Soc. Sci. 196 (1931), provides details on the organization of English exchanges. A. De Lavergne, Commodity Exchanges in France, 155 Annals Am. Acad. Pol. & Soc. Sci. 218 (1931); V. Porri, Commodity Exchanges in Italy, 155 Annals Am. Acad. Pol. & Soc. Sci. 234 (1931); and Hans Hirschstein, Commodity Exchanges in Germany, 155 Annals Am. Acad. Pol. & Soc. Sci. 208 (1931), describe the operations of Continental exchanges. Early Japanese exchanges are the exception. Zensaku Sano & Sentaro Iura, Commodity Exchanges in Japan, 155 Annals Am. Acad. Pol. & Soc. Sci. 223 (1931), shows that Japanese commodity exchanges were almost exclusively FP enterprises managed independently of the brokers and traders using them. The Bourse Act of 1887 favored the formation of associational organizations in place of the joint stock exchanges but failed in this object. The 1893 amendment to this act recognized both for-profit and associational exchanges. In 1897, there were 123 FP and five NP exchanges in Japan.

[33] Gerald Roberts, Guide to World Commodity Markets (1985).

[34] Economist Publications, Directory of World Stock Markets (1988); Roberts, *supra* note 33. Cheating on these agreements was apparently pervasive. The NYSE and CBT rules from the collusion era both contain provisions clearly intended to prevent circumvention of the

D. For-Profit Organization of Computerized Exchanges

In recent years, for-profit exchanges have been created in Europe; OM Stockholm Fondkommission (OM) in Sweden, Deutsche Börse (DTB) in Germany, and Österreichische Termin und Optionborse (ÖTOB) in Austria are three prominent examples. These exchanges share one important feature: they trade by computer rather than open outcry on a floor. Recent events provide further evidence of the tie between trading technology and ownership form. In 1997, the Sydney Futures Exchange decided to "demutualize" (that is, convert to for-profit form with nonmember ownership) simultaneously with its decision to replace a traditional open outcry market with computerized trading. The International Petroleum Exchange plans to demutualize and introduce computerized trading. Finally, the London International Financial Futures and Options Exchange (LIFFE) has shifted to electronic trading and will also demutualize.

Computerization and ownership form are linked for at least two reasons. First, electronic trading reduces trader heterogeneity. Several different types of intermediaries take part in open outcry trading. These include "locals" who trade on their own account on the floor, pit brokers who fill orders, and large brokerage firms that direct customer orders to the floor and keep customer accounts. Computerized exchanges dispense with locals and pit brokers.[35] Computerization therefore reduces the heterogeneity of exchange membership. This reduction eliminates the justification for the NP form.

Second, the nature of electronic trading reduces the need for member ownership. The skills of a computerized trader are not product specific and can be utilized in a variety of markets. With current technology a trader can switch between computerized exchanges with a keystroke. This limits the ability of an exchange to expropriate traders, which in turn undercuts the need for trader ownership. Once the link between ownership and participation is broken, the NP form loses its purpose of limiting dissipation within the cooperative form.

Many computerized exchanges have adopted hybrid forms of organization. For example, the DTB and the ÖTOB are FP exchanges owned primarily by major banks that are the exchanges' major customers and are thus

commission rules. The Japanese stock market rebate scandals of the early 1990s are symptomatic of cheating on cartel agreements.

[35] Hence the vehement opposition of local traders and pit brokers to computerized trading. The floor members of MATIF, the Paris futures bourse, went on strike when the exchange announced plans to adopt computerized trading. Floor traders at the Chicago Mercantile Exchange opposed the trading of a new "mini" S&P 500 futures contract on computer; the exchange eventually allowed computer trading of the contract side by side with open outcry but put limitations on the use of the computerized system in order to shield the floor traders from competition.

mutuals. These exchanges also permit nonowners (typically professional trading firms that participate in several markets) to trade for a fee. The adoption of the FP form is consistent with the homogeneity of these exchanges' owners; the mutual form protects their interests as major customers. Moreover, trading firms that participate in several markets are not locked into a single exchange and hence do not require the protections that ownership affords.

Some exchanges contemplating the shift to the FP form are considering complete separation of ownership and trading privileges. For instance, LIFFE is considering becoming a public company with no link between ownership and trading privileges. It is unlikely, however, those who own exchanges and those who trade on them will be as distinct as shareholders in Kellogg and the consumers of Corn Flakes. Since large intermediaries (mainly large brokerage firms) have an important stake in the rules and governance of an exchange, they are likely to acquire ownership stakes.[36] In the event, even exchanges with publicly traded shares may operate similarly to mutuals. Other (most likely smaller) firms may well trade on these exchanges without the protection of ownership because, unlike floor traders, they are not subject to holdup by the computerized exchange.

E. Attempts to Change Organizational Form

Exchange members at several major futures exchanges, including the CBT, the CME, and the New York Mercantile Exchange (NYMEX), proposed to adopt a for-profit ownership form in the 1993–95 period. The proposals were not brought to a vote at NYMEX or the CME, and it was defeated at the CBT. Nonetheless, the history of these proposals is broadly consistent with the theory outlined above.

Floor traders (locals and independent floor brokers) were the primary supporters of these measures on each exchange. They asserted that increased institutional trading activity and "upstairs" trading by individuals away from the floor with real-time access to market information and news had eroded the advantages of trading on the floor and that their incomes had fallen as a result of these developments. They argued that their exchanges should do more to enhance seat values and that for-profit organization combined with higher trade fees (with the proceeds distributed to members) would achieve this objective. In contrast, large institutional traders and large futures commission merchants (FCMs) opposed these proposals.

[36] As an example, the International Petroleum Exchange has announced plans to sell a 70 percent ownership stake to a consortium of five large customers (energy trading firms), with the remaining 30 percent to be sold to public investors.

They argued that a shift to for-profit status would reduce commissions and trading volume.

These events are consistent with the predictions of the model of exchange organizational form. A technology shock (that is, increased institutional trading and upstairs trading) dissipated rents earned by a subset of exchange members. The marginalization of these members increased the support for the for-profit form as a means of increasing their wealth. In contrast, FCMs—almost certainly inframarginal members with specific investments that would have lost value after an increase in exchange fees—opposed this measure.

V. Rent Seeking, Commitment, and the Governance of Exchanges

The foregoing analysis emphasizes the role of member heterogeneity and distributive effects in determining exchange organizational form. These considerations also strongly influence the governance structure of member-owned exchanges.[37]

A more complete characterization of the trading process than employed in the previous section demonstrates the need for complex governance structures to support member bargains and control opportunism. The execution of trades on an exchange involves the use of many complementary inputs supplied by members who specialize in particular functions. A customer submits an order to a brokerage/commission house where he has an account. The commission house provides account management services and may have specialized capital (such as reputation and customer lists). In an open-outcry exchange, the commission firm typically uses an independent floor broker to execute the order. The broker may trade with another broker to execute the customer order but may also trade with an independent floor trader buying and selling on his own account. In the equity market, the specialist may execute the order. Some floor traders (called "locals" on futures exchanges) are scalpers who specialize in absorbing order imbalances and turn their positions rapidly. Other floor traders are position traders who hold positions for longer periods. These individuals provide liquidity and risk-bearing services.

Depending on the nature of order flows and the distribution of special-

[37] For excellent discussions of the role of formal governance processes in other contexts, see Scott Masten, Commitment and Political Governance, or Why Universities, Like Legislatures, Are Not Organized as Markets (Working paper, Univ. Michigan Bus. Sch. 1999); and Barry Weingast & William Marshall, The Industrial Organization of Congress; or, Why Legislatures, Like Firms, Are Not Organized as Markets, 96 J. Pol. Econ. 132 (1988). The present analysis draws extensively from each.

ized information and human and financial capital, different traders earn different profits. Moreover, given the demand to trade by customers, each type of input faces a derived demand. As a result, an increase in the effective price charged by one type of member reduces the derived demand for the services of other types. The rules governing the trading process and the nature of the enforcement of these rules can influence the effective prices of member services. A rule that helps brokers (a brokerage cartel) may hurt those providing complementary services (locals). Thus, rules can be a means by which wealth is redistributed from one class of traders to another.

Even given these distributive effects, members clearly have an incentive to choose rules that maximize joint surplus by negotiating Coasean bargains. There are myriad obstacles to the implementation of such bargains, however. Reneging is an ever-present possibility, especially if bargains require asynchronous performance or if the different parties to the bargain realize their benefits at different times. Reputation and formal contracting may mitigate these hazards but are unlikely to eliminate them altogether. The potential complexity of wealth-increasing bargains can also impede their implementation. The difficulties of complete contracting in a dynamic and complex environment are well known. Third-party enforcement of contracts is also costly, especially given the specialized and arcane features of financial markets. Information asymmetries may also bedevil the completion of Coasean bargains.

Well-crafted governance structures that reduce enforcement and negotiation costs can mitigate impediments to deals that enhance member wealth. Barry Weingast and William Marshall have identified several governance features that can achieve these ends.[38] These include well-defined committee jurisdiction over specific rules, committee monopoly right to bring alternatives to the status quo to a vote, and a requirement that committee proposals receive a majority vote to overturn the status quo. These characteristics make bargains between members more durable by giving committees veto power. A proposed rule change intended to undo opportunistically a standing bargain cannot succeed if it harms the committee with jurisdiction.

Governance structures observed on financial exchanges are similar to those identified by Weingast and Marshall. I have examined the rules of the five largest futures exchanges in the United States,[39] as well as those of the New York Stock Exchange and the Chicago Board Options Exchange. The rules and bylaws pertaining to governance are remarkably uniform across

[38] Weingast & Marshall, *supra* note 37.

[39] The CBT, CME, NYMEX, the Coffee, Sugar and Cocoa Exchange, and the New York Cotton Exchange.

exchanges. Each exchange designates a board of directors. The board must approve all rule changes (unless a prespecified number of members formally petition for an election to approve rules not approved by the board). Upon approval by the board, rules are submitted to the membership for approval by majority vote. Moreover, the rules create standing committees that have jurisdiction over certain matters. In certain cases, the board can create special committees with jurisdiction over particular issues. The designated committee must approve all rules within its jurisdiction by a majority vote of its members before it is forwarded to the exchange's directors (and subsequently the membership) for approval.

Exchange governance is often criticized as slow, political, and resistant to change. Despite this criticism, exchange governance is adapted to the heterogeneous memberships of exchanges. Indeed, the alleged defects of exchange governance are necessary for it to serve its purpose; though cumbersome, multilayered governance structures are needed to facilitate the enforcement of bargains between diverse interests that enhance joint member wealth. Committee jurisdiction alone does not ensure enforcement of all bargains, but the restriction that an exchange's board of directors approve all rule changes reduces the scope for opportunistic actions by a committee that serves a particular interest. The requirement of board approval of rule changes limits the ability of a single committee to undertake a unilateral action that serves its members' interests but harms the membership at large. The ability of individual committees or the directors to extract too much wealth from members is also constrained by provisions that (1) all rules approved by committee and board must receive majority support from the entire membership and (2) members can petition to put rules not approved by board or committee to a vote.

Weingast and Marshall also emphasize the role of the committee assignment mechanism in Congress in ensuring that a committee is dominated by legislators with the highest stake in its jurisdiction. Whereas there are formal rules for allocating committee slots to members in Congress, exchange rules are largely silent on the process of selecting committee members. The rules for all exchanges examined specify that the board of directors selects the members of standing committees but provide few constraints on their discretion. Chicago Mercantile Exchange rules specify that all affected parties receive representation in committees. For example, each agriculture product committee must include representatives of floor brokers, independent floor traders, and processors, producers, and marketers of the product. Such requirements are not universal, however. For example, Chicago Board of Trade rules do not impose similar constraints on committee makeup.

Discussions with exchange members suggest that despite the apparent lack of formal procedures to allocate committee slots, committees nonetheless reflect a diversity of interests and are dominated by members with the highest stakes in their jurisdiction. An opportunity cost mechanism appears to produce this result. Committee service is time consuming, and committee members receive no remuneration. Consequently, only members with large stakes in a committee's activities are willing to incur the participation cost. This mechanism differs in detail from that identified by Weingast and Marshall for Congress but has the same result.

Although these institutional features enhance the enforceability of such agreements, they might not ensure that exchanges implement all wealth-increasing bargains and only wealth-increasing bargains. The next section shows that possibilities for imperfect enforcement have important implications for the efficiency of exchange rules, where efficiency encompasses the effect of exchange rules on both members and nonmembers.

VI. The Efficiency of Exchange Rules

There is a strong presumption in the literature that exchanges adopt first-best rules.[40] This section demonstrates that this presumption has little analytical foundation when exchange members are heterogeneous and face a downward-sloping demand curve for their services.

An extension of the model in Section III illustrates the factors that influence the efficiency of exchange rules. Assume that a nonprofit exchange can adopt a rule that reduces α_L but does not change α_H. As a concrete example, the exchange could allow floor traders to use a communications device (such as a headset) that improves the efficiency of large brokers but is uneconomic for smaller brokers to employ.[41]

Adoption of this rule would increase the wealth of the low-cost firms and reduce the wealth of the high-cost firms and could either increase or decrease joint member surplus. Specifically,

$$\frac{d\Pi_L^N(H, L)}{d\alpha_L} = \frac{\partial \Pi_L^N(H, L)}{\partial P} \frac{\partial P}{\partial \alpha_L} + \frac{\partial \Pi_L^N(H, L)}{\partial \alpha_L},$$

[40] See, for example, Daniel Fischel & Sanford Grossman, Consumer Protection in Futures and Securities Markets, 4 J. Futures Markets 273 (1984); Frank Easterbrook, Monopoly, Manipulation, and the Regulation of Futures Markets, 59 J. Bus. S103 (1986); Linda Edwards & Franklin Edwards, A Legal and Economic Analysis of Manipulation in Futures Markets, 4 J. Futures Markets 333 (1989); and Mulherin, Netter, & Overdahl, *supra* note 1.

[41] There has in fact been disagreement among members at the CBT and the CME regarding whether to allow use of headsets on the floors of these exchanges.

where

$$0 < \frac{\partial P}{\partial \alpha_L} = (N_L/\beta_L) \Big/ \left(\frac{1}{B} + \frac{N_L}{\beta_L} + \frac{N_H}{\beta_H} \right) \equiv \phi < 1$$

and

$$\frac{\partial \Pi_L^N(H, L)}{\partial \alpha_L} = -\frac{\partial \Pi_L^N(H, L)}{\partial P} = -\frac{(P - \alpha_L)}{\beta_L} < 0.$$

Therefore,

$$\frac{d\Pi_L^N(H, L)}{d\alpha_L} = -\frac{(P - \alpha_L)}{\beta_L}(1 - \phi) < 0.$$

Conversely,

$$\frac{d\Pi_H^N(H, L)}{d\alpha_L} = \frac{(P - \alpha_H)}{\beta_H}\phi > 0.$$

If

$$-N_L \frac{(P - \alpha_L)}{\beta_L}(1 - \phi) + N_H \frac{(P - \alpha_H)}{\beta_H}\phi < 0,$$

the rule increases the joint wealth of the exchange members; member wealth decreases if the reverse inequality holds. Since the rule reduces costs, its adoption increases the combined surplus of exchange customers and members and hence is first best.

Since the rule change harms the high-cost types, if they represent a majority, it is possible that the first-best rule will not be adopted. Adoption of the rule under these circumstances would require the consummation of some Coasean bargain between the low-cost and high-cost types. Such a bargain is more likely to occur the more effective the exchange's governance structure; if the governance structure is ineffective, the inefficient rule may prevail.

Conversely, if the first-best rule reduces total member surplus, the more likely it is to be adopted the less effective the exchange's governance structure. That is, an exchange is more likely to adopt a (first-best) rule that reduces total member when the governance structure fails to achieve many Coasean bargains. An ineffective governance structure that passes rules that

make a minority better off but dissipate member wealth can therefore result in the adoption of rules that increase joint customer and member wealth.[42]

It is also important to note that market power is crucial to these results. If the exchange faces a perfectly elastic demand curve, the rule change will not reduce the wealth of the high-cost types. They have no incentive to oppose the rule under these circumstances.

This analysis again demonstrates the influence of member heterogeneities on exchange actions. In particular, owing to the specialization of exchange members, rules have different effects on different constituencies. These may include rules relating to broker collusion, the design of contracts, policing of floor trading activities, or precautions against trader default. The efficiency of the rules that are adopted depends on the governance mechanisms available to structure and enforce bargains between these competing interests. Inefficient rules may persist because the bargains between exchange members required to implement efficient rules that also enhance joint member wealth may be infeasible. Alternatively, inefficient rules may persist because they maximize joint member wealth and exchange governance structures support the agreements necessary to implement them.

VII. Self-Regulation and Government Regulation

The foregoing analysis implies that self-regulation of financial markets is not necessarily first-best efficient because (1) the interests of exchange

[42] Customers joining exchanges may limit the adoption of rules that harm consumers of exchange services. As members, users of exchange services (such as large commercial hedgers) can bargain with other members to eliminate inefficiencies and rely on the exchange's internal governance structure to help enforce these bargains. Integration is not uncommon. Commercial hedgers are important and influential members of most major commodity exchanges. For instance, the FTC documented that end users of agricultural futures markets were members of each of the seven exchanges studied. 5 Federal Trade Commission, Report of the Federal Trade Commission on the Grain Trade 228–31 (1920). Although integration should temper inefficiencies, it is unlikely to eliminate them. Users of exchange services must overcome free-rider and asymmetric-information problems to oppose inefficient rules even if they are insiders. Moreover, some mutually beneficial deals may still be unenforceable even if customers are also members. In addition, a customer must pay an amount equal to the rents earned by the marginal exchange member to obtain membership. If a customer is a less efficient supplier of exchange services than this marginal member, integration is costly. Thus, comparative advantage limits the scope for integration. Finally, users of exchange services may benefit from some inefficient rules. Their integration will increase the likelihood of the adoption of these rules (even if it reduces the likelihood of adoption of some other costly rules). Exchanges may also limit integration because it can be a means of undercutting brokerage cartels. The NYSE rules prevented institutional traders from becoming members, and the NYSE successfully lobbied Congress to ensure that the 1975 amendments to the Securities and Exchange Act prohibited a broker affiliated with a money manager from executing any of the latter's brokerage business. Futures exchanges denied farmer cooperatives membership before 1936; the Commodity Exchange Act forced the exchanges to admit the cooperatives over the intense objections of the exchanges.

members are sometimes not well aligned with the interests of the consumers of their services or (2) intraexchange distributive conflicts can impede the adoption of efficient rules. As a result, external regulation may (but may not) improve the efficiency of financial exchanges.

Further generalization is extremely hazardous because the analysis also implies that the efficiency (or lack thereof) of a particular exchange rule or policy depends crucially on the specifics of the issue and the nature of the particular exchange(s) involved. The incentives of an exchange to adopt a particular rule or policy vary with its market power, the characteristics of its membership, and the nature of its governance process.

The analysis does suggest one important consideration that regulators and legislators should keep in mind when overseeing the activities of financial exchanges. Specifically, exchange rules are the product of bargains, and potentially complex ones at that, between specialized members with diverse interests. Forcing an exchange to adopt or change a particular rule can change the entire set of bargaining possibilities, with potentially undesirable consequences. For example, eliminating broker cartels can lead an exchange's members to substitute even more costly mechanisms to exploit an exchange's market power. Put differently, specific rules and practices cannot be regulated in isolation because changes in one rule can have spillover effects. Thus, this analysis provides a public interest rationale for some regulation of financial exchanges but also implies that a healthy helping of caution is warranted in acting on it. The potential for "government failure" further qualifies the case for external regulation.

Another implication of the analysis is that market power is the fundamental source of inefficiency in exchange rules and policies. Some market power is inevitable given the network aspects of trading and the ability of an exchange to deter entry by controlling the size of its membership,[43] but regulation can have some effect on the degree of competition between exchanges and competing suppliers of financial services, such as the over-the-counter markets. The theory suggests that policies designed to encourage competition may have more salutary effects than the micromanagement of exchange rules. It also shows that regulations ostensibly designed to address one source of inefficiency can have very adverse consequences, even if they accomplish their stated purpose, if at the same time they impede competition. For example, restrictions on cash market forward contracts or swaps (which compete with exchange-traded instruments) under the Commodity Exchange Act can reduce the competition futures exchanges face and make inefficient rules more likely.

[43] Pirrong, *supra* note 6.

VIII. Summary and Conclusions

Financial exchanges are complex economic institutions. This article argues that salient features of exchanges, including their ownership form and governance, spring from member heterogeneity and market power. Member heterogeneity results from specialization and differences in costs. Heterogeneity may create conflicts between members over rents. Although there are incentives to enter into wealth-increasing Coasean bargains to mitigate these conflicts, enforcement of these bargains is frequently problematic. Therefore, members have an incentive to choose organizational forms and craft governance structures that encourage joint wealth maximization. These include nonprofit organizational form and the creation of elaborate committee and voting structures. When heterogeneity and market power are explicitly incorporated into the analysis, many features of financial exchanges are more readily understood, whereas these features are quite mysterious when these factors are ignored.

This analysis also provides normative implications. When an exchange possesses market power (a hypothesis that the evidence strongly supports), the maximization of joint member wealth supported by well-designed governance and organizational structures may conflict with efficiency. Improving the ability of exchange members to maximize their joint wealth may increase their ability to extract rents from consumers of their services through collusion or inefficient rules. Thus, exchange governance structures that maximize member wealth are not necessarily efficient.

Some may find the analysis here unduly pessimistic given its focus on market power, rent seeking, and the possibility of inefficient rules. This warts-and-all approach is a necessary antidote to the prevailing literature on exchanges in which these considerations are almost totally absent. Exchanges are vibrant institutions that provide numerous valuable services. Understanding them in their totality, however, requires a sober analysis of the problems and opportunities that confront their members. Moreover, financial exchanges have been the subject of considerable regulation throughout the world. An evaluation of the costs and benefits of regulation depends crucially on the costs and benefits of exchange self-regulation. It is impossible to determine these costs unless one explicitly considers how efficiency considerations, rent seeking, and market power interact to shape exchange organization, rules, and policies. This research represents a first step in this process.

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