

THE GOVERNANCE OF EXCHANGES: MEMBERS' COOPERATIVES VERSUS OUTSIDE OWNERSHIP

OLIVER HART

Harvard University

JOHN MOORE

London School of Economics and Heriot-Watt University¹

I. INTRODUCTION

In all countries, securities exchanges face a number of important new challenges. First, exchanges compete increasingly with each other. This is in large part a result of the reduced cost of communications, which has allowed exchanges to gain access to a geographically dispersed set of customers. The impact of this changing technology was initially felt by regional exchanges, which lost their local franchises and in many cases were forced out of business. However, national exchanges are now also to a large extent in competition internationally. Competition has been heightened by the fact that quite similar eco-

nomic attributes may often be shared by apparently different securities.

Second, the product mix of exchanges is changing. Traditionally exchanges have performed a variety of functions, such as providing a trading mechanism, disseminating information, acting as a clearing house, settling trades, etc. But exchanges no longer need to be vertically integrated in this way. Many of these functions are offered by specialist service providers and, in many cases, exchanges have hived off particular functions. Thus, competition occurs both horizontally between exchanges and vertically between exchanges and service providers.

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Third, the development of technology has meant that exchanges have become more capital intensive. Periodically exchanges need to finance substantial investment programmes. Since the pay-off may often occur several years after the investment, a structure is needed which ensures that those who provided the initial capital also receive the pay-off from the investment.

Fourth, membership of exchanges has become more open and, as a result, more diverse. Members not only perform different roles within the exchange, but they may have other activities outside the exchange (such as over-the-counter business) which in effect make them competitors of the exchange.

These rapid and fundamental changes in the economics of exchanges suggest that it is important to consider whether the governance structures that have evolved in the past are likely to remain appropriate for the future. The success of exchanges in responding to change is likely to depend in large measure on their organizational structure. It is possible to point to a number of instances where reforms have been hindered by an exchange's difficulty in securing consensus among its members. For example, the speed with which the New York Stock Exchange has been able to implement new technologies has been in part determined by the reluctance of floor traders to accept changes that primarily benefited larger brokerage houses.² In Germany the divergent interests of the *kursmakler*, the *freimakler*, and the banks led for a time to the development of competing trading systems and threatened to fragment further an already fragmented market-place. In Chicago conflicts between agricultural and financial futures traders have impeded the proposals by the Chicago Board of Trade to expand the financial futures pit. And so on.

Exchanges differ from most commercial organizations in a number of ways. In particular, a common feature of most major exchanges is that they are run as *cooperatives*. In other words, broadly speaking they are run on behalf of their members, the people who use the exchange (market-makers, brokers, and so on). In London, the Stock Exchange has operated as a cooperative, as has Lloyd's and four futures exchanges (the International Financial Futures Exchange, the Metal Exchange, the Commod-

ity Exchange, and the International Petroleum Exchange). In other countries, too, the major exchanges operate as cooperatives. For example, in the USA, the New York Stock Exchange, the American Stock Exchange, the futures and derivatives exchanges, and the regional stock exchanges are all organized in this way.

There are, of course, wide differences in the details of how these various exchanges are run. For example, they differ in the balance of power given to different types of user, and voting structures differ. Exchanges differ in terms of the role of the board, the delegated powers of the chief executive, and the composition and power of exchange committees. There are different degrees of outside involvement by public-interest representatives. Regulatory environments vary. Many exchanges are non-profit organizations. Membership may be open to newcomers who satisfy certain minimum requirements, or membership may be closed. When the number of seats on the exchange is fixed, changes in membership may or may not be permitted through the trading of seats. There are many other differences besides these among exchanges. But their differences are of less significance than their similarity, namely that they all have a cooperative structure of governance.

In essence, an exchange can be viewed as simply a particular kind of firm, offering a particular kind of service to its users. And so it is striking that, although exchanges are run as members' cooperatives, most commercial organizations do not operate in this way. Certainly, some consumer and worker cooperatives exist; and we see other kinds of cooperatives, such as partnerships, particularly among professional groups (lawyers, consultants, and accountants, for example). Also, many non-commercial organizations act as cooperatives, ranging from sports clubs to religious groups. Nevertheless, measured as a percentage of national product, cooperatives are the exception rather than the rule (Bonin *et al.*, 1993).

The more common form of governance structure is *outside ownership*. This is a very broad category: it ranges from owner-managed busi-

² For a discussion of this issue see Blume *et al.* (1993).

nesses to widely held public corporations. Under outside ownership, the people who have control over the firm, and take decisions on the firm's behalf, are typically not the same people who buy and use the firm's product. That is, in contrast to a members' cooperative, ownership is not bundled with the right to consume.

There are some indications that exchanges are radically rethinking their structure. For example, in October 1990 the Stockholm Stock Exchange took the unusual step of writing to the Swedish Ministry of Finance recommending that the Exchange should be transformed into a limited liability company. Two years later the Exchange made an issue of shares which (after a short interval) could be freely traded.

The Stockholm Exchange is a relatively small exchange, but in 1994 two much larger exchanges announced that they were developing proposals to transform themselves into public companies. These were the Chicago Mercantile Exchange and the New York Mercantile Exchange. A decision by either of these exchanges to change their structure would almost certainly affect their strategy and prompt considerable debate on the governance of exchanges.

Another development that is likely to stimulate interest in exchange structure is the increasing competition between traditional exchanges and limited companies. In some cases, the latter offer trading systems, such as Reuter's Instinet system and Crossing Network for stock trading or Globex for futures trading. In other cases, public companies are competing with exchanges in related activities such as information dissemination or settlement.

II. THE DISTINCTION BETWEEN A COOPERATIVE STRUCTURE AND OUTSIDE OWNERSHIP

To draw a distinction between a cooperative governance structure and outside ownership, one first needs to define what is meant by a 'firm'. We have developed a theory of the firm based on the key notion of *residual rights of control over non-human assets* (Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995). According to this frame-

work, a firm is defined by its non-human assets. In particular, for an exchange, the relevant assets are tangible assets, such as its physical location and its facilities, and intangible assets, such as its rules and its reputation for honesty. Perhaps above all, the key asset of an exchange is market depth: the fact that traders know that they can deal with many other traders at the exchange (i.e. there is an agglomeration effect). As a measure of how important are the assets of an exchange, just imagine how difficult it would be—or at least how difficult it would have been in the past, before the advent of new technologies—for an entrepreneur to duplicate the assets of, say, the London Stock Exchange in order to start up a rival exchange. In the past, these assets afforded an exchange a considerable monopoly advantage, and to an extent still do.

The question then arises: where does authority rest to make decisions concerning the assets? In an ideal world, in which the indefinite future can be anticipated and planned for, all these decisions could be specified in an initial, enforceable contract written by members of the exchange when it is first set up. In such a world, since contracts cover all future contingencies, authority is irrelevant: given that everything has been specified contractually, there is nothing left to decide. In reality, transactions costs prevent the writing of comprehensive contracts, and so actual contracts are highly incomplete. Under these conditions, the allocation of authority and control rights matters, since those in authority determine decisions with respect to which the initial contract is silent.

Our central idea is that the authority to make decisions lies with the *owner(s)* of the exchange. More precisely, the owner has *residual rights of control*—that is, the right to make all decisions except those that have been specified contractually. Decisions, such as: Who should have access to the exchange? What should be traded and how? What are the rules and the fee structure? What facilities should the exchange provide and what investments should be undertaken?

(In passing, note that control rights might not be the attribute one would first associate with ownership. One might instead think that an owner is

someone with the right to the residual income stream, or profit, of the assets. The difficulty with this profit-based view of ownership is that it does not take us very far in discovering what is distinctive about cooperatives. After all, many cooperatives are non-profit organizations, and so the ownership of residual income is a non-issue.)

The advantage of a control-based view of ownership is that it enables us to define a cooperative rather naturally. We offer the following rudimentary model of an exchange run as a cooperative:

Members' cooperative: the assets of the exchange are controlled by the members, who take decisions democratically, on a one-member, one-vote basis.

This model of cooperatives is, of course, a drastic simplification.³ It hides many real-world complications—not least that, in practice, there are often different classes of membership enjoying different voting rights. We will return to the matter of equal versus unequal treatment of different types of member in section VIII. But for the moment we strip away any complexity, and consider a plain voting system, with the rule that a decision is passed if it attracts a simple majority of the members' votes. Even when the decision-making procedure is this simple, we will see that important effects are in evidence.

We will compare the performance of this cooperative structure with the performance of the more conventional governance structure:

Outside ownership: the assets of the exchange are controlled by an outside owner (who maximizes profit).

Here, too, we are simplifying a lot. For example, we do not distinguish between, on the one hand, ownership by an outside corporation which itself has many shareholders, and, on the other hand, ownership by an individual who person-

ally manages the exchange. In effect, we are abstracting from agency problems. We return to this matter in section VIII.

III. A BRIEF SUMMARY OF OUR FINDINGS

We show that both forms of governance, outside ownership and a members' cooperative, are inefficient—but for different reasons and in different ways. Since an outside owner is typically interested only in maximizing profit, he or she has a tendency to make inefficient decisions, tailored to the marginal user. (This is a generalization of the familiar idea that a monopolist inefficiently restricts supply in order to raise price and increase profits.) In a cooperative, collective decision-making is inefficient because in a vote the views of the decisive voter are not necessarily those of the membership as a whole.

We find that two factors critically determine the relative performance of a members' cooperative and outside ownership: the *variation* in membership of the exchange, in terms of the size or nature of the members' business; and the *degree of competition* the exchange faces, either from other exchanges, or from direct trading. In particular, we make two claims:

Claim 1: Outside ownership becomes relatively more efficient than a members' cooperative as the variation across the membership becomes more skewed.⁴

Claim 2: Outside ownership becomes relatively more efficient than a members' cooperative as the exchange faces more competition.

Here, we use 'efficient' as a formal term. We say that outcome X is more efficient than outcome Y if the total pie (that is, total benefits minus total costs) enjoyed by the users and owners (added together) is larger under X than it is under Y.⁵

³ For a recent survey and discussion of the literature on cooperatives, see Hansmann (1994).

⁴ By 'skewed' we mean that the median is not equal to the mean.

⁵ Note that this is not as strong as saying that everyone is better off under X than under Y (the Pareto criterion)—although of course they could all be made better off if there were a suitable redistribution. The great merit of the definition of efficiency given in the text (which is the one commonly used in antitrust cases, and in the area of law and economics) is that it is *distribution-free*: the same outcome will be efficient, regardless of how income and profit are distributed. Of course, in many areas of public policy, it could well be argued that our definition of efficiency is unacceptable as a criterion for making welfare judgements. However, in the present context, where the players are companies and financiers, issues to do with fairness and equity seem less pressing.

A propos claim 1, it is interesting that the diversity of interests between members has emerged as an important issue in the debate over the structure of the Chicago Mercantile Exchange and the New York Mercantile Exchange. For example, *Euromoney* quoted one member of the Chicago Mercantile Exchange as saying:⁶

For the FCMs [futures commission merchants] to bring all the capital and those customers and then to have relatively little say in how the exchange operates is very frustrating. The locals' view is exactly the opposite. Their attitude is: 'We used to run this place. Now we have all these big firms, we have less and less say, we're making less and less money.' The biggest threat to the exchanges is that they may very well not have the right structure to succeed.

Euromoney concluded that tensions between members

lead pessimists to speculate that the governance of the exchanges may pose the biggest threat to their future, with the interests of the institutional side, embodied in the futures commission merchants . . . diverging ever more sharply from those of the locals.

And, with regard to Claim 2, both the Stockholm Exchange and US futures exchanges operate in a particularly competitive environment and this competition appears to have been influential in the debate over the structure of the exchanges. For example, although the Stockholm Exchange had a legal monopoly within Sweden, it analysed its position in 1990 as follows:

During the 1980s, the monopoly position . . . became increasingly overwhelmed by external developments. The internationalization of stock trading meant increased competition from international stock exchanges. The development in the data communications area also facilitated cross-border trading. In addition, the Stock Exchange's form of organization was not sufficiently market-adjusted and made generation of capital for risk investments impossible.⁷

Claims 1 and 2 cast light on the issue of whether it is still sensible to operate exchanges as cooperatives. We believe that the balance of the argument is shifting towards outside ownership; and this seems to be supported by the actions of

the Chicago Mercantile Exchange, the New York Mercantile Exchange, and the Stockholm Exchange. However, exchanges differ in the degree of competition that they face and the diversity of interests that they must accommodate. We do not evaluate the case for individual exchanges to change their structure.

IV. THE PAPER

Our purpose in this paper is to provide a framework for thinking about the governance of exchanges, and to show how the relative merits of a cooperative structure and outside ownership depend on the level of competition and the diversity of interests. We should stress that we make no attempt to model the richness of real-world governance structures. To do so would not only result in an intractable model, but would also rob our analysis of any generality.

The paper is written to be accessible to non-economists as well as economists, at least for the most part. Section V presents an extended analogy: that of a golf club. We pose the question: should a golf club be run as a cooperative by its members, or should it be run by an outside owner? Although the parallel with an exchange is not exact, the golf club analogy has the virtue that it conveys our ideas without requiring numbers or algebra. (Economists may find the golf club analogy frustrating *because* it does not contain numbers or algebra, in which case they may prefer to skim section V, and go on to section VI.)

Section VI presents a model which confirms the intuitions provided by the golfing analogy. It is a simple model of an exchange in which the only decision to be made is what *price* to charge its users. It is unavoidable that we use algebra here, given that the questions are intrinsically too hard for a purely verbal treatment.

In section VII we take a broader look at how and why cooperatives operate inefficiently. Section VIII briefly discusses some other issues.

⁶ 'Confidence Soars as Exchanges' Business Hits Fresh Peaks', *Euromoney*, June 1994, 180–4. See also Smith (1994).

⁷ Stockholm Stock Exchange, *Annual Report* 1990.

V. A GOLFING ANALOGY

To help understand the economic logic behind our ideas, and in particular Claims 1 and 2, consider the analogy of a golf club. In our imaginary club, members divide into two groups: those who seriously concentrate on golf, the *playing members*; and those who get more benefit from the social facilities, the *social members*. The distinction between the two groups is quite marked. However, within each group there is also some variation in preferences. The most fanatical players may never darken the door of the clubhouse, and perhaps some of the socializers have never been seen on the course. But these are the outliers. Almost everyone else has less extreme tastes, and enjoys both golf and socializing, at least to some degree.

For the analogy to succeed, we need to keep it simple, even at the expense of realism. We shall assume that it is infeasible to charge different fees to different types of member. That is, there is no objective way of discriminating between playing members and social members. Also, there is no point in asking people to self-select: the story is that, since almost everyone wants access to both the course and the clubhouse, and it is difficult to monitor the frequency with which different people use one or the other, it isn't sensible to try to impose differential fees. The only kind of fee is an annual membership fee, common to all who wish to stay members.

The other simplification we make is to assume that the membership cannot rise above current levels: there are no potential newcomers interested in joining. However, people may choose to leave. (Like all analogies, this one is imperfect. The prize for spotting all eighteen holes in our argument is a drink at the nineteenth.)

It happens that the membership of our club is somewhat skewed towards the social members. That is, in a ballot the social members could muster a few more votes than the playing members. Imagine, hypothetically, that one were to line up the membership in the order of their preferences, starting from the most extreme social-

izer at one end (the left-hand end, say) and working along to the most fanatical player at the other (the right-hand end). Then, in a head count, one would find that the person who is half way along this line would be a social member—albeit a social member with moderate tastes (he enjoys golf, as well as socializing). We will see that this median person has a pivotal role, and so for future reference it helps to give him a name, George. The fact that George is a social member rather than a playing member simply reflects our assumption that the distribution of membership is skewed towards the social members.

We suppose the playing members are really much more devoted to their golf than the social members are to socializing. In fact, we will assume that if required to do so, the playing members would each be prepared to pay more than twice as much in membership fee as each of the social members. (The reason might be that there are pubs nearby to which the socializers can repair, should they wish to. But this golf course is the only one in the area, and so the playing members have much more at stake in the club.)

The parallel with an exchange should be reasonably clear. The assets of the golf club (the course and clubhouse) correspond to the assets of the exchange. The playing members correspond, say, to large financial institutions; the social members correspond, say, to smaller brokers. In money terms, the large financial institutions have much more at stake in the exchange than have the smaller brokers.

One could draw a different parallel: the playing members might correspond to dealers in, say, financial futures; the social members might correspond to dealers in, say, agricultural commodities. The important point is that there are conflicts of interest.

To return to golf, a decision needs to be taken about investment in the club's future. There are three basic options available:

Option A: Leave the clubhouse alone, but invest heavily in the course: better greens and improved bunkering.

Option B: Make only modest investments in both the course and the clubhouse: better greens and plushier bar.

Option C: Leave the course alone, but invest heavily in the clubhouse: plushier bar and new restaurant.

These three options are in descending order of preference for the playing members, but in ascending order for the social members.

There is also a fourth, more radical option that is on the agenda:

Option D: Sell off the back nine holes, and use the money to build a lavish new clubhouse, with bar, restaurant, business facilities, etc.

Option D is actually the favourite option for the majority of social members; but some of the more moderate social members, including George, prefer Option C to D. (That is, for George, Option C is the best of the four options: he enjoys the facilities of the clubhouse, but he also likes an eighteen-hole round of golf.) Needless to say, the playing members think Option D is terrible.

Incidentally, whichever investment choice is taken, we continue to suppose that the maximum willingness-to-pay of the playing members is still more than twice that of the social members.

We assume that, on efficiency grounds, the options are ranked in the following order:

- Option B (the most efficient),
- Option C
- Option A
- Option D (the least efficient).

Recall that we are measuring efficiency by the size of the total pie: the sum of everyone's benefits minus the cost of investment. (We assume that running costs are negligible.)

Of course, in addition to choosing among the four investment options, the club also needs to set the annual fee. This only affects distribution, and so does not have any efficiency implications—

unless the fee is set so high that the social members choose to leave, which in itself would be an efficiency loss.

In these circumstances, what governance structure should the club adopt? Should it be run by an outside owner? Or should it be run as a members' cooperative, on a one-member, one-vote basis?

An *outside owner* is only interested in profit. Since the playing members are willing to pay more than twice as much to use the club as are the social members, the profit-maximizing strategy is to focus exclusively on the playing members, and to charge them a high fee—even though this means losing just over half the membership (because the social members will leave). The point is that, in terms of overall revenue, halving one's market is worthwhile if one can more than double one's price.

The outside owner tailors his investment decision to suit his chosen market niche, hence he chooses the option the playing members most want: Option A (that is, he will invest heavily in the course).⁸ Notice that, by assumption, this outcome is inefficient: it would be more efficient to make modest improvements to both the course and the clubhouse (Option B). The reason for this distortion is that, in making his investment choice, the outside owner does not take into account the preferences of the social members, since he is pricing them out anyway.

In fact, the outside owner's actions are doubly inefficient. Not only is his investment decision inefficient, but, on top of that, he introduces a second inefficiency when he squeezes the social members out of the club.

Now consider how a *members' cooperative* acts. They have to vote on the investment decision. One might be tempted to think that since Option B yields the biggest total pie, the members will vote for it. After all, they do not have to contend with an outsider who is only interested in profit. Moreover, Option B offers something for everyone: better greens for the playing members and a plushier bar for the social members.

⁸ We suppose that it is worth making the investment, even though the market is halved.

However this simple logic misses the point that, in a democracy, real decision-making power rests with the pivotal voter, who in this case is George. Recall our hypothetical line-up, with George in the middle, each person to the left of him even more of a socializer than he is, and each person to the right more of a player. We argue that because George prefers Option C to the other options, Option C will win (that is, the club will invest heavily in the clubhouse). To see why, suppose there were a contest between Options C and B. George prefers C to B—as does everyone to the left of him. Hence Option C commands more than 50 per cent of the vote, and must win. The same would happen in a contest between Options C and A. Lastly, suppose there were a contest between Options C and D. George prefers C (he doesn't want a lavish new clubhouse if it means selling off the back nine holes)—as does everyone to the right of him. And so, again, Option C commands more than 50 per cent of the vote and wins.

Thus the cooperative votes for an inefficient outcome, Option C. The reason for this is that the pivotal voter, George, a social member, does not represent average opinion. Average opinion would be a suitably-weighted mix of the social members' and the playing members' preferences. The discrepancy between the pivotal voter's preferences and average preferences can be explained by the fact that the distribution of opinion is skewed, in this case towards the social members. This is a subtle, but crucial idea: the shape of the distribution of opinion matters.⁹

One rough way to think about it is that the majority of the electorate comprises social members, who

know that they will be the main beneficiaries of the new bar and restaurant (Option C), and yet the cost is borne by everyone, including the playing members. Relative to the most efficient alternative (Option B), we therefore have over-investment in what the majority enjoys (the clubhouse) and under-investment in what the minority enjoys (the course).

To sum up what our analogy has taught us so far: both governance structures, outside ownership and a members' cooperative, yield inefficient outcomes. An outside owner would go for Option A, where too much is spent on the course, and nothing on the clubhouse. He would also price out the social members. A members' cooperative would vote for Option C, where nothing is spent on the course, and too much on the clubhouse.¹⁰

But recall that, in terms of *relative* efficiency, Option C is ranked higher than Option A, and therefore a members' cooperative is the lesser of two evils. (This is true even without taking into account the fact that an outside owner introduces a second inefficiency when he squeezes the social members out of the club.)

At this point, it is worth drawing the parallel with an exchange. Recall that the playing members might correspond to dealers in, say, financial futures; the social members might correspond to dealers in, say, agricultural commodities. Option A could be investing heavily in the financial trading floor. Option C could be investing heavily in the agricultural trading floor. On the one hand, if the exchange were to be owned by an outsider, he might choose to squeeze out the (smaller) agricultural dealers, and invest heavily on behalf of the financial dealers. On the

⁹ Political scientists have for a long time been thinking about such issues in the context of voting theory. Economists have applied the ideas, particularly to questions of public choice. A notable paper is Roberts (1977), who considers how a society might vote over taxation schedules. In the same paper, Roberts proves a powerful version of the Median Voter Theorem, to which we appeal throughout the paper.

¹⁰ The automatic reaction of economists to an inefficiency is always to ask: why don't the agents concerned bargain their way round it? That is, given that Option B is more efficient than Option C, why don't the gainers (the playing members) bribe the losers (the social members) to switch from Option C to Option B?

Here, and throughout the paper, we assume that there are large numbers of agents, and each agent's characteristics—e.g. how keen he is on golf versus socializing—is private information. Given this, every agent—taking the point of view that he is too small to affect the final outcome—will have an incentive to claim that he is one of those who will be hurt by a proposed change and that he therefore should be compensated. The problem is that if everyone does this, there is no one to do the compensating, and so the bargaining breaks down. (Thus Option C is chosen by the members' cooperative, rather than Option B.) For a formalization of the idea that free-rider problems combined with large numbers and (only a little) asymmetric information leads to bargaining failure, see Mailath and Postlewaite (1990).

other hand, if the exchange were to operate as a members' cooperative, everyone would be kept in, but investment would benefit only the agricultural dealers. Both outcomes are inefficient. But the members' cooperative may be relatively more efficient than outside ownership. In a nutshell, the distortions an outside owner would create because he is only concerned with extracting rent from the users of the exchange can be reduced (but not eliminated) if the users run the exchange themselves. The root problem with either governance structure is the conflict of interest between different groups of user.

It is time to check out Claims 1 and 2, in the golfing context.

Take Claim 1 first. Suppose the distribution of club members skews even further towards the social members. For example, suppose one or two of the former playing members are injured and, because they cannot play golf any longer, they take up socializing in earnest. However, the shift in composition is not so drastic as to change the efficiency ranking of the four options, which is still Option B, followed by C, then A, and finally D.

Not much has changed for the profit-maximizing outside owner. Although he has lost one or two of his playing members, let us suppose that this isn't enough to cause him to switch from his high-fee strategy. This means that he still has the incentive to tailor his investment decision to suit his chosen market, which comprises the playing members. Hence he continues to choose Option A.

The small change in the distribution of preferences may have a big impact on the members' cooperative, however. In the hypothetical lineup, there are now one or two people who have shifted position, from the right of George to the left of him. As a result, George is no longer pivotal. It is now someone else, to the left of him, who occupies the median position. This new person is more of a socializer than George, and, unlike George, he may well prefer Option D to Option C: i.e. he may prefer to sell off the back nine holes to pay for a lavish new clubhouse. As

a result, Option D may now win—an outcome which is even less efficient than Option C. The extra skew in preferences means that the performance of the members' cooperative has deteriorated.

On the face of it, the members' cooperative may now appear to be less efficient than outside ownership, given that Option A is ranked above Option D. But this is not taking into account the second inefficiency an outside owner introduces: viz, that he squeezes the social members out of the club. Overall, the efficiency comparison may go either way. However, what is true is that, as the distribution of preferences becomes more skewed, so outside ownership becomes relatively more efficient than a members' cooperative. That is, Claim 1 is borne out.

Next, take Claim 2. Suppose a new golf club opens up nearby, offering a membership fee well below the fee which an outside owner of our club would charge in the absence of competition—in fact, low enough to attract both groups, playing and social members.

However, the new club's fees are well above what a members' cooperative at our club would charge themselves. (The reason for this may be that the new club has to cover the interest payments on its fixed costs; whereas the land and buildings of the old club were paid for years ago.)

Increased competition has an immediate effect on the outside owner of our club. He can no longer get away with charging a high fee. Instead, he will charge a sufficiently low fee that both playing and social members are deterred from moving to the new club. There is, therefore, no longer any gain from tailoring his investment to suit just the playing members (Option A). He finds Option B more profitable, since it offers something for everyone.¹¹ On efficiency grounds, this is all to the good: Option B is the best of all the options, and the social members are no longer being squeezed out. In the case of an outside owner, then, competition increases efficiency.

Meantime, a members' cooperative is shielded from the competition. Since they can afford to charge

¹¹ The analysis here is actually complicated, and the text rather hides this fact.

themselves a low membership fee, none of the members is near the point of leaving, even though the new club has now opened up. Thus nothing changes. The cooperative continues to vote for the same option, Option C or D, depending on the skewness of the distribution of preferences. In the case of a members' cooperative, then, competition does not improve efficiency.

This means that, in response to competitive pressure, outside ownership becomes relatively more efficient than a members' cooperative—which bears out Claim 2.

The overall message our analogy offers to an exchange currently operating as a members' cooperative is that, *as the population of traders becomes more uneven (which is what has happened in many cases) and/or as the environment becomes more competitive (which it certainly has done recently), so, on efficiency grounds, there may be more of a case for selling off the exchange to an outside owner.*

Before leaving the golfing analogy, we should tease out one final point. Consider a club that is currently run as a members' cooperative. (Ignore competition.) In principle, the members could always vote to sell the club, distributing the proceeds equally. They know that if they do this, control of the club's assets would be given to a new owner who would take Option A. Moreover, he would charge a high membership fee, which the social members wouldn't want to pay.

Notice that a sale is in effect a variant on Option A, in which those people who want access to the club's facilities have to pay a high fee, but a dividend is paid to everyone. There are similar variants on Options B, C, and D. Earlier, when we were considering how a members' cooperative would vote, we implicitly assumed that these 'sale' options would not be attractive enough to get a majority. Instead, we assumed that the cooperative would vote either for Option C or for Option D, depending on the skewness of preferences.

The import of this is that a situation can arise where outside ownership is the superior structure of governance for an exchange (in the sense of maximizing the total pie)—that is, Option A is more efficient than Option D—but a members' cooperative may fail to adopt outside ownership. In such a situation, a degree of outside coercion may be needed for an efficiency-enhancing change in governance structure to occur.¹² The reason is that even though outside ownership leads to a bigger pie, there is no feasible way for the gainers to bribe the losers (see also footnote 10 on this).

We must stress that we would not necessarily advocate coercion under these conditions. Any change which causes some people to lose—even if others gain more—must be viewed with caution. The purpose of our analysis is to point out that changes in circumstances can change the relative desirability of a members' cooperative and outside ownership. We have little to say about the mechanism for moving from one governance structure to another.

VI. A SIMPLE PRICING MODEL

We need to confirm that the intuitions from our golfing analogy can be established rigorously. In this section we look at a simple model of pricing.

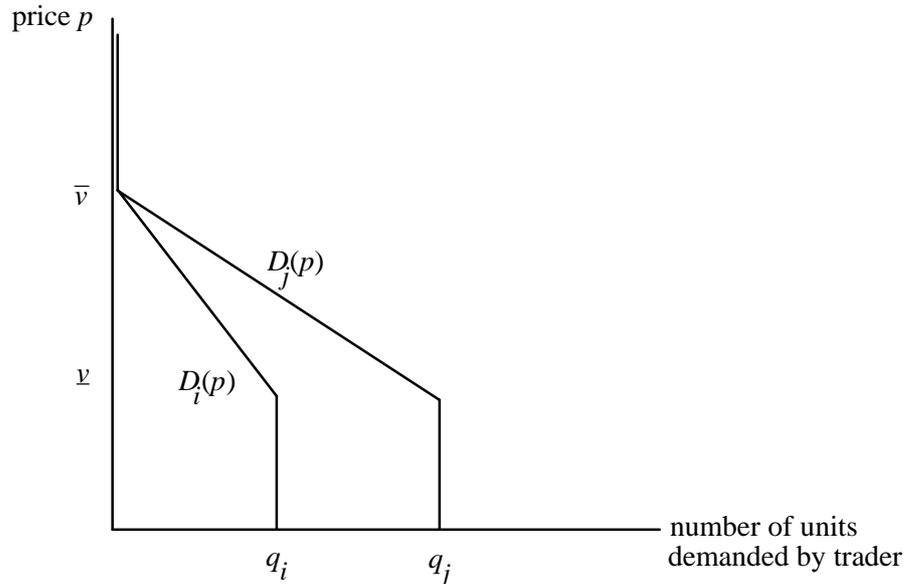
We consider a (very!) stylized exchange. There are three components to our model: the people, the costs, and the benefits.

First, the people. There are $2N-1$ people, $i = 1, 2, \dots, 2N-1$, who use the exchange, and we simply call them all traders. (We don't need to distinguish between market-makers, brokers, and so on.)

Second, the costs. We suppose that the exchange's services can be measured in terms of 'units supplied'—akin to the units of product that a firm supplies. Let us assume that the cost of supplying a unit to a trader equals c , a constant.

¹² If necessary, the non-profit status of exchanges may also need changing, so that former members can be compensated for their loss of membership.

Figure 1



Third, the benefits. We suppose that the benefit trader i derives from a marginal unit of exchange services is captured by the demand curve $D_i(p)$ in Figure 1. (It doesn't matter whether these benefits are profit he gets from trading on his own behalf, or profit he gets from commission for trading on some outsider's behalf.) Also drawn is the demand curve $D_j(p)$ of some larger trader, j .

As the figure shows, each trader demands nothing at a price above some cut-off level \bar{v} , and demand stops rising for prices below some cut-off level \underline{v} . Traders are distinguished by the amount demanded at price \underline{v} : trader i demands q_i ; the larger trader j demands $q_j > q_i$. Between prices \bar{v} and \underline{v} , demand is linear. Assume that $\underline{v} < c < \bar{v}$.

These restrictions on demand are obviously strong, but are made solely for ease of computation.

The aggregate demand curve, $D(p)$, has the same shape as the demand curve of an individual trader i , except that the intercept on the horizontal axis is at

$$Q = \sum_{i=1}^{2N-1} q_i,$$

rather than at q_i .

We order the traders according to their size:

$$q_1 < q_2 < \dots < q_i < \dots < q_{2N-1}.$$

Given this ordering, it is not surprising that trader N will turn out to be the pivotal voter in a members' cooperative. (N is the median of 1, 2, ..., $2N-1$.)

We will confine our attention to *uniform-pricing* policies, even though, in principle, multi-part tariffs would be useful. There are arguments as to why multi-part tariffs may not work—e.g. that second-hand markets develop, or that traders are able to trade through one another. Notwithstanding these arguments, we think that our broad findings would remain intact even if multi-part tariffs were feasible. (For models which do not make the *ad hoc* restriction that pricing policies are uniform, see Sections III and IV of Hart and Moore, 1995.)

Before we analyse what happens under outside ownership or in a members' cooperative, we should establish the efficient bench-mark. First-best efficiency is attained by setting the price, p , equal to the cost, c . We will be able to

judge the extent of inefficiency by how far p deviates from c .

Let us start with an *outside owner*, facing the aggregate demand curve $D(p) = Q(\bar{v} - p)/(\bar{v} - \underline{v})$, for $\underline{v} \leq p \leq \bar{v}$. (Notice that this expression for $D(p)$ reflects the fact that demand is linear between \underline{v} and \bar{v} .) His profit function is

$$\Pi(p) = \{[Q(\bar{v} - p)]/(\bar{v} - \underline{v})\} \times (p - c) \text{ for } \underline{v} \leq p \leq \bar{v}.$$

Differentiating $\Pi(p)$ with respect to p , we find that profit is maximized by setting price equal to

$$p^m = (1/2)(c + \bar{v}).$$

That is, price is higher than cost: there is inefficiency. In choosing the price p^m , the outside owner balances the conflicting goals of maximizing sales and extracting rent from the most valuable trades.

What of a *members' cooperative*? Consider trader i . If the cooperative sets a price of p , he will trade $q_i(\bar{v} - p)/(\bar{v} - \underline{v})$ units. From this he gets a consumer surplus of

$$q_i \int_p^{\bar{v}} (\bar{v} - p) dv / (\bar{v} - \underline{v}) = q_i (1/2)(\bar{v} - p)^2 / (\bar{v} - \underline{v}).$$

In addition, he receives a dividend of $[1/(2N-1)] \times \Pi(p)$. That is, all $2N-1$ members receive an equal share of the exchange's profit $\Pi(p)$. Notice that $\Pi(p)$ will be negative if $p < c$ —in which case the exchange charges its members a per capita membership fee (over and above the price p per unit traded) to cover its trading losses. Overall, trader i gets a pay-off:

$$U_i(p) \equiv q_i(1/2)(\bar{v} - p)^2 / (\bar{v} - \underline{v}) + [1/(2N-1)] \times Q(\bar{v} - p)(p - c)/(\bar{v} - \underline{v}).$$

Differentiating $U_i(p)$ with respect to p , we find that trader i 's pay-off is maximized when $p = p_i$, say, where

$$p_i = \theta_i c + (1 - \theta_i) \bar{v},$$

and

$$\theta_i = Q/[2Q - (2N-1)q_i].$$

Notice that trader i 's preferred price is a weighted sum of c and \bar{v} . The weighting θ_i on c is always greater than half, so that his preferred price is never as high as p^m (the average of c and \bar{v}). Also notice that θ_i is an increasing function of q_i ; and if q_i is greater than the mean, $Q/(2N-1)$, then θ_i is greater than 1. That is, as a trader gets bigger, he prefers a lower price; and if he is larger than average then his preferred price is less than the cost.

These formulae are very intuitive. Each member of the cooperative faces a trade-off. On the one hand, he would like the price to be low, so as to gain as much as possible on his own trades. On the other hand, he would like the price to be high, so as to extract rent from his colleagues. Naturally, the bigger the trader, the more the consumption effect kicks in, and so the lower is his preferred price.

The median trader N 's preferred choice of price, $p_N = p^c$, say, will dictate the outcome of the vote. Bigger traders, whose $q > q_N$, will push for a lower price than p^c ; smaller traders, whose $q < q_N$, will push for a higher price.¹³ That is, the cooperative will vote for a price

$$p^c = \theta_N c + (1 - \theta_N) \bar{v}.$$

The interesting point here is that p^c may be greater than or less than the cost c —depending on whether θ_N is less than or greater than 1, respectively.¹⁴ This in turn depends on whether

¹³ We have not been specific about the precise order of moves that lead to a price of p^c . One possibility is to suppose that anyone is free to put up a proposal or counter-proposal, but it costs a small amount to do so. Given the cost, no one will put up a proposal that can be beaten. In equilibrium, the only proposal which is put up is the winning price of p^c .

¹⁴ In the case where price is less than cost ($p^c < c$), readers may be wondering why a small trader—e.g., trader 1—doesn't quit the cooperative, given that he has to pay a membership fee to cover the exchange's trading losses, and he gets only a small consumption benefit to compensate.

Our model can be amended to deal with this problem. Suppose that, in addition to all its other assets, the exchange has liquid assets whose return more than covers the trading losses. Then there will be a dividend paid out, and no membership fee. Everyone will be better off staying on as a member rather than quitting—even the small traders.

the median, q_N , is less than or greater than the mean, $Q/(2N-1)$, respectively. Only in the knife-edge case where the median exactly equals the mean, will the cooperative vote to set price equal to cost and avoid inefficiency. (In section VII we prove a general proposition to this effect.)

In a members' cooperative, then, the nature of the distortion in price depends on the skewness of the distribution. If the size distribution of members is symmetric, a cooperative works efficiently: price is set equal to cost. However, if a disproportionate number of members are small (so that the median size is less than the mean), then price will be set higher than cost. And vice versa.¹⁵

We end by confirming that Claims 1 and 2 from section III hold in this model.

An increase in the skewness of the size distribution of members—so that the median size is further from the mean—increases the difference between p^c and c , and so increases the inefficiency of a members' cooperative. However, it has no effect on the outside owner's price, p^m . This bears out Claim 1: outside ownership becomes relatively more efficient as the variation across the membership becomes more skewed.

To confirm Claim 2, consider the effect of introducing competition from another, equivalent exchange. Suppose the second exchange charges a fee of p^* , where p^* lies between c and p^m .

The presence of the second exchange has an obvious effect on all of our earlier calculations: *any price above p^* is no longer relevant*, since for prices above p^* all traders would elect to trade on the second exchange.

For an outside owner, the new profit-maximizing strategy is to charge as high a price as he can get away with, namely p^* .

For the members' cooperative, however, nothing need change as a result of competition. Previously, we showed that any price up to p^m would be outvoted by a price of p^c . This continues to hold true, except that now the menu of potential prices is restricted to those below p^* . Thus, *a fortiori*, p^c continues to win—unless $p^c > p^*$, in which case it is straightforward to show that the cooperative will vote for p^* .¹⁶

This bears out Claim 2: outside ownership becomes relatively more efficient than a members' cooperative as the exchange faces more competition.

VII. A BROADER PERSPECTIVE ON VOTING IN MEMBERS' COOPERATIVES

At this point, it may help to give a broader economic perspective on why a members' cooperative typically votes for an inefficient outcome; and to discover under what circumstances it will be efficient.

In any market, total surplus (or total pie, as we have called it), $TS(p)$ say, is made up of the sum of total producer surplus (or total profit), $TPS(p)$ say, and total consumer surplus, $TCS(p)$:

$$TS(p) \equiv TPS(p) + TCS(p).$$

Here p refers to price. However, the argument is much more general: it could be any scalar variable (such as quality or investment).¹⁷

¹⁵ Intuitively, in the case where the smaller members are more numerous, they are more concerned with extracting rent from the larger members than they are with getting down the trading cost to themselves. This is, perhaps, the leading case, insofar as one thinks that in practice votes are, in proportionate terms, more concentrated in the hands of smaller traders. In this case, as with an outside owner, price is set too high. But price is not set as high as it would be by an outside owner—since, recall, p_i is never as large as p^m , for any i (including the decisive median voter, $i = N$).

¹⁶ We assume that resale is impossible—otherwise a member of the cooperative could buy at the low price of p^c , and make a profit by selling to an outsider at the competing exchange for p^* . In the context of exchanges, it is very reasonable to assume away the possibility of resale, given that, unlike apples, exchange services are hard to transport.

¹⁷ The great difficulty in analysing a cooperative when *more* than one decision has to be taken is that we have no equivalent of the Median Voter Theorem. In more than one dimension, there is typically no equilibrium in a simple-majority voting game. One may be able to make progress by appealing to the results in Caplin and Nalebuff (1988) on super-majority voting rules.

The first-best outcome is attained at a price where total surplus is maximized; let this efficient price be p^0 :

$$p = p^0 \text{ maximizes } TPS(p) + TCS(p). \quad (0)$$

In the pricing model of section VI, p^0 equals the cost, c .

Were price to be set unilaterally by the producer(s), he (they) would choose a price p^1 , say, which maximizes $TPS(p)$ alone:

$$p = p^1 \text{ maximizes } TPS(p). \quad (1)$$

Typically, p^1 is higher than the efficient price p^0 —because (1) omits the $TCS(p)$ term from (0), and $TCS(p)$ is decreasing in p near p^0 . In the pricing model, (1) corresponds to an outside owner charging p^1 equal to p^m .

Now consider a cooperative of the $2N-1$ (say) consumers. Total consumer surplus is the sum of each of their individual surpluses, $cs_i(p)$ say, where $i = 1, 2, \dots, 2N-1$:

$$TCS(p) \equiv cs_1(p) + cs_2(p) + \dots + cs_i(p) + \dots + cs_{2N-1}(p).$$

As we have seen in both the golfing analogy and the pricing model, decisions will in effect be taken by the median consumer, $i = N$, say. Given that everyone receives a $1/(2N-1)$ share of the total profit $TPS(p)$, this consumer votes for a price p^2 , say, which maximizes his overall pay-off:

$$p = p^2 \text{ maximizes } cs_N(p) + [1/(2N-1)] \times TPS(p). \quad (2)$$

The first term is his personal consumer surplus; the second term is his dividend (i.e. his share of total profit). In the pricing model, (2) corresponds to the members' cooperative voting for price p^2 equal to p^c .

It is revealing to multiply (2) by the factor $(2N-1)$:

$$p = p^2 \text{ maximizes } TPS(p) + (2N-1) \times cs_N(p), \quad (2')$$

and to contrast this with (0). Clearly, in general p^2 will *not* equal p^0 .

However, there is an important exception. Suppose it happens to be the case that

$$(2N-1) \times cs_N(p) \equiv TCS(p),$$

or, equivalently,

$$cs_N(p) \equiv [1/(2N-1)] \times TPS(p). \quad (3)$$

Then (2') coincides with (0), and p^2 equals p^0 . In this special case, a members' cooperative chooses the first-best outcome.

Equation (3) simply says that the consumer surplus of the median consumer equals the average consumer surplus. Thus we have:

Proposition: A members' cooperative is first-best efficient if, and only if, the median voter has average preferences.¹⁸

In the golfing analogy of section V, the median member, George, did not have average preferences, since he was a social member. As a result, the voting tilted away from the first-best outcome (Option B) towards George's preferred outcome (Option C).

In the pricing model of section VI, the median trader was not necessarily average: $p^c = c$ if and only if $q_N = Q/(2N-1)$.

VIII. FURTHER CONSIDERATIONS

We are aware that, in the interests of clearly presenting our own views, we have trodden a rather narrow path through the forest of questions that naturally arises in connection with cooperatives. To close the paper, then, we will touch upon some of the issues that we side-stepped earlier on. Unfortunately, we do not have space to do them justice.

(i) Expanding and Changing the Membership

We have assumed throughout that the membership of the exchange—that is, the set of potential

¹⁸ This result presupposes that the median voter is pivotal, which is not always the case. See Roberts (1977) for a general result showing when the so-called Median Voter Theorem holds.

users—is fixed. (In our models, we assumed that there was no inward trade.) By making such an assumption, we have avoided one of the major preoccupations of the literature on cooperatives—viz, to what extent will a cooperative choose to expand its membership?

The answer critically depends on whether new members pay their way in; i.e. whether they pay an entry fee to cover any future rents they may subsequently earn. If they do not pay their way in, there is an obvious incentive for existing members to limit the number of new members, so as to avoid dilution. Our view is that this so-called *common pool* problem is an artifact. Economic logic points to the conclusion that entry fees should be allowed for.

Even with entry fees, the question still remains: how far to expand? But notice that this decision is faced both by a members' cooperative and by an outside owner. The expansion decision is very like any other decision—pricing, quality, or investment. As before, the difference in outcome between a members' cooperative and outside ownership derives from the fact that the right to make such decisions rests with different people. We believe that the conclusions from our earlier analysis should, in a broad sense, carry over.

However, there is one special, and very intriguing, new issue that arises. If the membership expands, the composition of the *future* electorate changes. When today's members vote for expansion, they have to take into account the impact on tomorrow's vote. This is difficult territory.¹⁹ And the question is begged: why give any voting rights to new members? Why not sell them non-voting membership instead? We leave such tantalizing issues to future research.

First cousin to the question of expansion is the question of changing the membership. Should individual members be allowed to sell their places?

There is a strong argument for allowing them to do so. If a member cannot sell their place, then they will be much less willing to vote for and contribute to some long-term investment project, given that

their horizon may be shorter than the length of the project. (Why invest in someone else's future?) Our view is that by allowing members to sell their places, a cooperative can largely overcome such horizon problems.

(ii) Free Entry

In practice, although certain exchanges are run as members' cooperatives, they operate within a regulatory environment which obliges them to let new members in free. (The London Stock Exchange is a case in point.) New members may have to meet certain requirements—for example to pass a test of financial fitness—but there is no price of entry *per se*. How does this affect the efficiency of the cooperative relative to outside ownership?

On the face of it, free entry of new members is bad for a cooperative, for the reasons alluded to earlier. There is a serious *horizon problem*: existing members are less willing to invest in the exchange since they anticipate that new members will enjoy the benefits later on, and as a result there is too little investment. Here, 'investment' can be financial, or it can be in the less tangible form of becoming involved in running the exchange and planning for its future. Under-investment problems are exacerbated by the fact that if existing members ever have to leave the cooperative they will not be able to sell their place.

Despite these serious drawbacks, a free-entry rule may nevertheless have some advantages to a cooperative. Recall the analysis of voting over price given in section VI. We learned that a cooperative will typically not price efficiently. In some cases, it will price above cost—just as an outside owner overprices. The question arises: How does the cooperative distribute surplus back to the membership? Surplus is typically not paid out as a dividend (many exchanges operate on a non-profit basis). Rather, it is used to improve facilities, which takes time. Since new members will enjoy these improvements for free, the existing members may choose not to generate any surplus in the first instance. That is, free entry encourages the membership to adopt a policy of pricing at cost—which is more efficient. This

¹⁹ Two interesting papers which address dynamic voting issues are Roberts (1989), which considers dynamic voting in the context of a trade union; and Dewatripont and Roland (1992), which looks at a dynamic political-economy model of transition.

argument does not apply to an outside owner, of course, since he retains his profit. And so the free-entry rule may make a members' cooperative relatively more efficient.

We must also not lose sight of the potential social welfare gains from a free entry rule. The regulatory authorities may insist on such a rule in order to increase competition in the market: members will be less able to keep their commission rates high if outsiders can come into the exchange. So far in the paper, we have ignored these antitrust considerations, and focused on the narrower question of which organizational form is more efficient from the viewpoint of the members themselves.

(iii) Raising Capital

Related to the issue of membership is the question: does a members' cooperative have a peculiar difficulty in raising new capital?

A cooperative can raise money in a number of ways. Clearly, it can use retained earnings, or raise the membership fee. It can also issue debt or non-voting equity. Of course, all these methods can also be used by an outside owner.

What a cooperative cannot do is to sell standard voting equity ('standard' in the sense that the equity is not bundled with other rights—e.g. the right to trade on the exchange). Here, an outside owner is at an advantage, because he can issue voting equity. In this sense, the cost of capital to a cooperative will be higher than for an outside owner.

(iv) Agency Problems

Another respect in which a members' cooperative suffers relative to, say, a public corporation, is that for a cooperative there is typically no effective market for corporate control.

Exchanges are large businesses, run on a day-to-day basis by managers. Normally, an individual member of a cooperative cannot buy up the votes of his colleagues, because unbundling votes from membership is not permitted. Nor is he permitted to acquire power by buying up lots of seats for his own use. Hence it is difficult for an individual to

exert pressure on management, except through the democratic process, which we know suffers from severe free-rider problems. (Why put in a lot of work running a campaign, if one does not reap much by way of personal benefit?) In a cooperative, then, managers may be more entrenched than they would be in a public corporation.

There is another, related, kind of agency problem. What instructions (or incentive scheme) should a cooperative give to its manager? An outside owner has a relatively simple task: he instructs his manager to maximize profit. (Of course, this does not guarantee that the manager *will* maximize profit.) Profit-maximization has the merit of being (at least in principle) a clear-cut objective. A cooperative has a more complex objective: to maximize the pay-off of the median voter, say. But what, in day-to-day terms, does this mean?

To offset these two agency costs peculiar to a members' cooperative, there is an agency cost associated with an outside owner. It is important that the members have an incentive to work hard. The difficulty with an outside owner is that he may be in a position to expropriate more rent from an individual member (and thereby reduce the latter's incentives) than are the fellow members of a cooperative.

(v) Unequal Treatment

Throughout the paper, we have assumed there is only one type of member in a cooperative. However, there may be good reasons for trying to introduce different classes of membership.

In the context of our golf club, one can imagine allowing people to choose between playing or social membership. Different classes of membership might bundle different levels of service with different voting rights and different membership fees. Barzel and Sass (1990) have written an interesting paper in which they discuss how voting rights and membership obligations are allocated in condominiums. Tenants' voting rights and obligations can be assessed in a number of different ways: for example, they can be made to depend on floor area, or on the number of people

in the household. Among other things, Barzel and Sass find that in practice these assessments are made so as keep costs and benefits in proportion to each other—thus minimizing conflicts of interest between different classes of tenant.

Presumably, similar efficiency gains can be obtained from introducing different member-

ship classes in the case of exchanges.²⁰ However, there are also costs. Clear, fixed arrangements such as one member/one vote may have the drawback of leading to inefficient outcomes in the voting; but they have the merit of not being open to abuse. A policy of equal treatment makes it less likely that one class of member will gang up on another—for example, by raising the membership fee of the other class.

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²⁰ Indeed, we see different membership classes in practice. For example, the London International Financial Futures Exchange has five different classes of member: Class A membership has 20 votes (per share); Class B has five votes; and so on down to Class E, with just one vote. Different classes come bundled with different rights to trade.