Shareholder Voting Power and Corporate Governance: A Study of Large British Companies

by

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Abstract

The pattern of ownership and control of British industry is unusual compared with most other countries in that ownership is relatively dispersed. Majority ownership by a single shareholder is unusual. It is not uncommon for the largest shareholding to be under 20 percent and in many cases much less than that. A similar pattern occurs in the USA.

The question of voting power is the focus of this paper. Conventional analyses of control through voting use a 20% rule to identify a controlling bloc, either a single individual or institutional shareholder or a group voting together.

Theoretical voting power of minority shareholding blocs is studied using a voting power index. This is applied to a model of ownership control described in Leech (1987) based on the definition of control used by Berle and Means (1932). The results give support for use of a 20 percent rule in many cases but not all. Also they support the idea that many companies are potentially controlled by a bloc of a few large shareholders working in concert, in almost all cases a voting bloc of the top six shareholdings combined could have working control whether or not it commanded a majority of the shares.

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How variation in the patterns of share ownership affects the performance of companies is a field of research that has generated a large literature spanning a range of disciplines, particularly economics, law and management. As its owners, shareholders collectively occupy a position of fundamental authority within the firm, giving rise to certain rights in respect of their assets: the right to make decisions by voting at company meetings, the right to transfer assets to another person and the right to receive income from those assets, and thereby maintain relationships with the firm. Each of these dimensions of the relation between ownership and the management or control of the firm has stimulated a large volume of research into some aspect of corporate governance, and its effect on performance[1].

Much conventional literature stresses the importance of the second dimension, which is the basis of takeovers and the market for corporate control as a discipline on management, that prevents them departing too far from maximising the value of the firm and therefore acting in the interests of the owners. It is often suggested that, by contrast to this, governance mechanisms based on relationships between owners and managers, and on shareholder voting, are ineffective because of pervasive free rider problems. In a country where share ownership is widely dispersed as in the UK, typically shareholdings are so small, in percentage terms, that on the one hand their owners lack the necessary incentives to become active owners, and on the other their voting power is so diluted that they can have little

[1] See Shleifer and Vishny (1997).

influence anyway[2]. Many studies of the effect of takeovers on performance have been published without having produced strong evidence that the market for corporate control has been an effective corporate governance mechanism; moreover, the ability to sell shares in an underperforming company on the open market has become severely limited as an aspect of the growth of institutional investors in recent years. Financial institutions find it impossible to sell their shares in a company whose management are not acting sufficiently in their interests, for a variety of reasons[3]. Therefore there are moves towards a reappraisal of the conventional wisdom leading to a greater emphasis on voting and relationships between investors and firms.

This study investigates this question of the relationship between the voting power represented by shareholdings and control of the company. I explicitly disregard the free rider problem and make the assumption that all shareholders have sufficient incentives to be active owners in the sense of taking part in top decision making in the firm. This is to assume that the private benefit accruing to an individual shareholder that results from a correction of management failure following shareholder action will outweigh the costs involved to him. This is clearly a reasonable assumption to make about *large* shareholders whose holdings are very substantial accumulations of capital; it is questionable to assume the same of small shareholders but their role turns out to be very small anyway and therefore I make this assumption as a formality[4].

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[2] See Franks and Mayer (1997).

[3] Financial institutions are increasingly holding a wide range of companies in their portfolios, because of their sheer size and the need to diversify. They may also operate tracker funds where they try to mimic an index; to sell the shares of a company that is doing badly obviously contradicts this and is not feasible. Moreover they will wish to participate in the upside when the firm recovers. For a financial institution selling the shares is difficult because there will be few buyers and it will have a destabilising effect on the price, and therefore selling out is no longer available as an option. See for example Charkham and Simpson (1999).

[4] Assuming shareholders to have an active relationship with the firm is reasonable in view of the previous footnote.

This paper therefore focuses on the analysis of the voting power of shareholders and seeks to use it to throw light on the question of control. The approach followed is based on the one originally adopted by Berle and Means in their seminal study of ownership and control of US corporations in 1929[5] in which control through ownership is assumed to have been identified if there is found to be a dominant minority shareholder who has enough voting power to be able to win votes at company meetings. Voting power is measured using the technique of power indices in which the power of a shareholder depends not only on the size of the holding but also on how widely held are the other holdings.

The Measurement of Formal Voting Power

Shareholders collectively constitute a voting body which makes collective decisions using weighted majority voting, each member having a different number of votes according to his holding. This makes the analysis of shareholders' formal voting power, and of company control, somewhat difficult because a key property of weighted voting systems is that the power of each member - defined as his capacity to determine the result of any particular vote or ballot - is not related in any simple way to his weight. It is necessary to make a strong distinction between a member's voting *weight*, represented by his shareholding, and voting *power*, as his ability to determine the outcome of any general ballot. Power is defined formally in terms of the outcome of a hypothetical division or ballot as the member's ability to *swing* any coalition[6] of players from one which is losing to one which is winning by joining it, casting his votes the same way as the others.

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[5] Berle and Means (1932).

[6] The term "coalition" is here used to signify a group of members who cast their votes the same way in a particular division or ballot. It should not be taken as meaning that the group has any more permanent existence. However the term *will* be used in this sense later in the paper when I analyse blocs of shareholdings.

An example illustrating this point is a company with three shareholders whose holdings are 49, 49 and 2 percent. Clearly although the weights differ considerably, one of the shareholdings being very much smaller than the others, when we consider their respective powers to swing the decision, they are all equal. Any two are required for a majority: the 2 percent player can join with one other to swing the vote from a minority with 49 percent to a majority with 51 percent[7], and each of the two 49 percent players can swing the vote from 49 percent to a majority with 98 percent.

Counting the *number* of swings each player can make in this way gives a measure of absolute voting power. Taking into account also the total potential number of votes or ballots which can be taken within the game, enables a power index to be defined for each player. Consider first all the four possible coalitions of votes which the 2 percent player could join: {Ø} (the empty set), {49}, {49}, (49,49}, the total votes being 0, 49, 49, 98 which would become 2, 51, 51 and 100. It can therefore swing two of them, the two with 49percent; it can make no difference to the decision by voting with the coalition in the other two cases. This player can therefore swing 1/2 of the decisions so its power index is 1/2. For one of the 49percent players, the coalitions are {Ø},{2},{49},{2,49} and the total numbers of votes are 0, 2, 49, 51 which become 49, 51, 98, 100. Therefore this player with 49 percent weight can swing two decisions out of 4 and therefore its index is also 1/2. Therefore each of the three players has an ability to swing 1/2. It is mathematically convenient to consider all the possible voting outcomes which could occur as if they were random and equally likely since the approach treated each equally. Therefore the probability of a swing is 1/2 for each player.[8]

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[7] The decision rule requires a 51 percent majority here because the examples involve discrete data. The analysis of the real data later in the paper will use a 50 percent rule.

[8] There are three players each with a power index of 1/2. In the literature on power indices it is frequently assumed that the total power of decisions is divided among the players so that the indices represent shares of

By contrast, as an example which illustrates the utility of the approach, consider a company with one shareholding of 30 percent and 70 shareholdings of 1 percent. A decision by majority vote requires 51 percent support. Consider the power of the large blocholder. There are 2^{70} different possible coalitions of the small players, since each can vote either "for the motion" or "against the motion". Assuming each small player votes each way with equal probability independently of the others, the total number of votes cast by them "for the motion" - call this Y - is distributed with a binomial distribution, with parameters (in the usual notation) n=70 and p=0.5, or in the usual shorthand, $Y \sim B(70, 0.5)$. The swing probability of the large player is then found using this distribution, as the probability that the large player can swing the vote, which occurs when Y is at least 21 and less than 51. This is the binomial probability, $P(21 \leq Y \leq 50) = 0.999370$. Therefore the 30 percent player is very powerful, in that his swing probability is very close to unity indeed, but it is necessary to check the powers of the small players also to establish relative power.

So consider a player with 1 percent of the votes. A swing occurs when that player is able to change a losing coalition into a winning one, which means changing one with 50 percent of the votes into a 51 percent majority. In this case it is necessary to consider the total votes of 69 small players as random and also to treat the votes of the largest player as being random. The total number of votes cast by these small players, say U, has the binomial distribution, $U \sim B(69, 0.5)$. To find the swing probability of a small player with 1 percent of the votes it is necessary to allow for the large player as well as the other 69 small players. There are two equally probable cases: (1) where the large player votes "for", so therefore for a swing $30+U=50$, and so we must have $U=20$; (2) where the large player votes "against" so

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power and sum to one. In this example if such a *normalised* index were used each player would have an index of 1/3. I do not adopt this approach for reasons discussed below, following Coleman (1971).

therefore U=50 for a swing. The swing probability for the small player is then 0.5P(U=20)+0.5P(U=50) = 0.000137.

It is clear from this example that the player with 30 percent is effectively totally dominant and can be said to have working control, while the small players individually are virtually powerless. This property of weighted voting to assign very great power to a bloc of votes faced by a very dispersed distribution among a large number of other players explains why shareholder power is so important to the system of corporate governance even in countries without large concentrations of share ownership such as the UK. Dispersed ownership in itself does not necessarily imply dispersed power.

Power Indices

The power index is defined formally as follows. Let the members of a weighted voting body be indexed by the set N={1,2,3,…,n} and let members vote "for" or "against" a motion in some hypothetical division or ballot. The weighted votes of individual members, their shareholdings, are denoted by w_i and arranged in decreasing size order such that $w_i \geq w_{i+1}$ for all i=1,2, …, n. The weights in this case satisfy $w_i < 0.5$ for all i and $\sum w_i = 1$. A coalition of members all voting "for" is denoted by a subset of N, $S \subseteq N$. The number of votes cast by members of S is denoted by the function w(S) and. Thus, $w(S) = \sum_{i \in S} w_i$. The coalition is said to be winning if $w(S) \geq 0.5$.

The power index for each player is defined in terms of *swings*. A swing is a pair of coalitions represented by subsets, $(S_i, S_i+\{i\})$ such that $w(S_i)<0.5$ and $w(S_i+\{i\})\geq 0.5$. That is, S_i represents a losing coalition which becomes winning with the addition of the votes of member i. Let the number of such swings be η_i taking into account all subsets of N – {i}. The number of such subsets is 2^{n-1}. The power index for player i, Π_i, is defined as the relative number of swings:

$$\Pi_i = \eta_i/2^{n-1.} \qquad i=1,2,\ldots,n.$$

If all coalitions – that is, all possible voting outcomes - are taken to be equally likely, this index can be regarded as a probability, sometimes referred to as the swing probability. However it *need* not be thought of in probabilistic terms: it is simply the proportion of the coalitions that do not include member i that are swings. Assuming the index to be a probability is convenient for purposes of computation. However an assumption of probabilistic voting carries the implication that shareholders are assumed to vote randomly, independently of each other with equal probability "for" and "against". This assumption is merely a convenience which enables *formal voting power* to be analysed and does not imply that they necessarily behave in this way.

This index was originally proposed by Penrose (1946), in a neglected article, and has subsequently been re-invented by a number of other writers, notably Banzhaf (1965), after whom it is known by various names, notably the Absolute Banzhaf Index or the Non-normalised Banzhaf Index, Coleman (1971) and others[9]. Many researchers use a normalised version which has the property that the power indices sum to unity over all the members. The reason for doing this is to enable an analysis in which voting power is thought of as being

[9] Felsenthal and Machover (1998) give an excellent account of the history of the measurement of voting power.

shared among the members[10]. In this paper I do not use the normalised power index because I will be mainly concerned with the power of the leading shareholder or group of shareholders in relation to the question of control.

The idea of a power index as a general measure of formal voting power originated in the classic paper in the American Political Science Review in 1954 by Shapley and Shubik[11]. The index proposed there, the Shapley-Shubik index, which is widely used, and popular among game theorists, is based on a different voting model to the one just described, and has the fundamental property of always being normalised. It has frequently been compared with the normalised Banzhaf index. Both these indices are often referred to in the literature as the classical power indices and both have been widely applied with sometimes similar but often widely different results. This has led to a problem of choice of index and, in the absence of compelling independent evidence on the powers of players in the real-world weighted voting games to which they have been applied[12], to something of an impasse in the development of the field. As a result there has been considerable theoretical work on the comparative properties of the indices, to the proposal of new indices, and also to the rejection of the power indices approach entirely[13]. Nevertheless the method promises to have utility in the analysis of power in general voting systems and in the design of constitutions. A recent study (Leech, 2000a) addresses this problem of the comparative utility of the two indices and, on the basis of a comparison of the empirical performance of the two "classical" power indices, finds

[10] This practice, although widespread, has been challenged by game theorists on the grounds that normalisation is arbitrary because the swings are not unique, and more fundamentally by Coleman (1971) on grounds that power is not shared in this way.

[11] Shapley and Shubik (1954). Shareholder voting was always suggested as an application of these ideas, right from the earliest days, see also Shapley (1961).

[12] For example the United Nations, the US Presidential Electoral College, the European Union Council, and others.

[13] Accounts of the measurement of power and of the different indices and the theoretical debates on their comparative properties are given in Lucas (1988), Straffin (1994) and Felsenthal and Machover (1998).

against the Shapley-Shubik index. This index of voting power is not therefore used in this study preferring instead the index due to Penrose, referred to below simply as a power index[14]. The details of the calculation of the indices are omitted; they can be found in Leech (2000b) [15].

The Applicability of Power Indices to Shareholder Voting

The Shapley-Shubik power index is an application of the Shapley value (Shapley, 1953) as a means of evaluating the worth to each player of participating in a co-operative game. The central idea of the Shapley value is *bargaining* among the players over the spoils of an action resulting from a decision. This bargaining approach to thinking about voting in a collectivity was however severely criticised by Coleman (1971) who argued that the consequences of a collective decision taken by majority voting could not usually be thought of in this way. A decision about an action that the collectivity could take would have consequences for the members that could only be understood in the wider context, and could not be conceived of as sharing the spoils. An example from corporate governance would be a decision to replace the top management in a public company: if performance subsequently improved then the entitlement to the additional profits would normally be distributed among all shareholders in proportion to their shareholdings and not according to their individual voting powers or in some sense their contributions to the making of the particular decision. The alternative approach therefore, and the one adopted here, is where the results of

[14] Other studies of voting power in international organisations that use weighted voting, by the author, which use the approach advocated by Penrose (1946) and refinements by Coleman (1971) are in Leech (2000c and 2001).

collective decisions are in the nature of public goods with respect to the collectivity concerned; voting is a matter of political democracy and the power index is a measure of general voting power and not a value.

The approach to the measurement of power just described treats the firm internally as a kind of public body. It might be seen as applicable to a *public* corporation operating within a regulatory framework with high standards of corporate governance, including the legal protection of shareholder rights. This is in contrast to a firm seen as a source of profits to be split among the owners by some sort of bargaining process based on power, a model perhaps more appropriate to private companies. The question arises as to whether the measure of power used is appropriate in this context given its assumptions. The power index is a measure of abstract power and has no regard for preferences or the issues about which voting takes place. This is obviously something that has to be qualified since it will not apply in all cases. It can not be applied to specific issues with a given distribution of preferences, for example where all shareholders are unanimous, such as a policy which makes them unambiguously happier or one that reduces the value of the firm with no offsetting benefits. Nor can this model be used to make statements about control involving a powerful minority shareholder being able to expropriate the majority by appropriating the private benefits of control to himself.

The approach adopted in this paper is an essentially *political* one where the firm is regarded as a democratic body that has to make strategic decisions in situations of

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[15] In a previous paper (Cubbin and Leech(1983)), John Cubbin and I proposed a measure of the voting power of the largest shareholding bloc which we called the *degree of control*. The degree of control was defined as the probability that the largest bloc could be on the winning side in a vote, assuming the same voting model as the power index. There is a simple relation between it (denoted by α) and the power index for the largest shareholder, $\Pi_1 = 2\alpha - 1$.

fundamental uncertainty where the potential for making mistakes is enormous. There are many situations where this occurs.

For example, a retail company may have enjoyed considerable success in expanding its sales of a new brand and have developed a chain of very profitable shops. The chief executive may wish to build on this success by an ambitious policy of expansion on a much larger scale and proposes the purchase of a large store, much larger than any in the chain, in the centre of every major city in the country. Extrapolating past performance, the proposal would seem to be profitable, but the quantum change in scale involved raises the question of whether the formula that has been successful in the past would still continue to be so. Shareholders have the duty of making the decision under conditions of fundamental uncertainty. Another example would be where a successful business expands abroad; there are many examples of UK companies that have lost out by attempting to expand into the United States. The power of large shareholders is important in such cases where there is no obviously best action. Other examples occur where changes in the external trading environment take place which necessitate a fundamental strategic reappraisal. One would be a successful clothing retailer which develops its own credit card primarily for use in its stores; demand for clothes falls as the market for clothing changes with changing consumer tastes leaving the company with a profitable financial services division but no longer a profitable clothing seller. Shareholders will inevitably have to decide between two incommensurable strategies: on the one hand, changing the fundamental nature of the business from primarily selling clothes to financial services, and on the other, a new management plan confidently proposed which will guarantee to restore former glory. A common case is where the board of directors is split, the management on one side and the non-executive directors on the other, the shareholders having to resolve the issue. Then voting power becomes important.

Another example that occurred recently in the UK is where there are two rival bids to take over a company, which may differ in the bid price but are also different in the method of financing. Both bids are in terms of a mixture of cash and shares but the higher bid has a higher share element and there is uncertainty about what the share value will be because it depends on many factors. In such a case the model of shareholder voting applies since there is no objective reason to vote either way in the absence of information. Another case where the model might apply is where the chief executive wishes to be paid a large rise on promises of future success; shareholders must decide this on the basis of unknowable future performance. Where there is always this kind of uncertainty is in the appointment of directors and especially the chief executive; there may be two candidates with similar track records and there may be strong reasons for appointing each, but there may turn out to be large differences in competence in the future were either to be appointed.

In all such cases, the voting model used to measure shareholder power is a reasonable approximation and also the voting power of large shareholders is important in determining the outcome. Shareholders usually have to decide whether to accept management proposals to enhance shareholder wealth with associated benefits for managers. Often the benefit obtained by management is in the short run and that by shareholders over a much longer term so the latter must make decisions about voting subject to a lot of uncertainty. In the absence of substantial share ownership by management, which is a reasonable assumption since directors' holdings are no longer significant in the great majority of companies in the UK, there is little difference of interest among shareholders, and therefore shareholders are not likely to be committed to any particular side in the vote. It is therefore reasonable to use the power indices approach to measure voting power and infer something about shareholder control.

A Model of Ownership Control

In previous work (Leech (1987)) I proposed a model of minority ownership control in the spirit of Berle and Means based on the formal voting power of the largest bloc of shares as measured by a power index. A company is classified as owner-controlled if the power index for the largest shareholder, or group of shareholders, exceeds some very high level and no other shareholder or group has any appreciable voting power. The essential advantage of this approach over the conventional “fixed rules” approach to identifying control used by many authors[16] is that the power of a large owner depends not only on the percentage of the voting equity he has but also on the distribution of all the other shareholdings. The fixed rule infers control only from the size of the largest bloc and this can be misleading if the other holdings are not widely dispersed and there is another large holding that could be voted independently. Thus, for example, a shareholder with 20% of the shares could be regarded as controlling in some cases but not in others on the basis of power indices, while he would always be deemed to be controlling if a fixed 20% rule were used.

Figure 1 about here

Figure 1 shows the model of minority voting control described in Leech (1987). The horizontal axis shows the number of shareholder members of the potential controlling coalition or bloc, starting with the largest and adding successively smaller holdings. A bloc of

[16] See Short (1994) for a survey. La Porta et. al. (1999) have recently used a fixed rule based on 20%.

k members has s_k shares and its power is indicated by its power index, Π_κ; both functions are shown on the vertical axis. A typical concentrated ownership structure is shown with the ownership-concentration function s_k represented by AB and the power-index function Π_k represented by CD. The group has majority control when it has k' members, such that $s_{k'} = 0.5$ and therefore $\Pi_{k'} = 1$. It is assumed to have working control when its power index is very close to 1. In the diagram this is represented as being when the bloc size is k* members, with s_{k*} shares, and its voting power is Π^*. The threshold Π^* is chosen appropriately. This model is the basis of the empirical approach reported in the next section[17]. Since the model is being used here to examine properties of the distribution of ownership, and the blocs are potential rather than actual, in the results section below they are referred to as "controlling" in quotes.

The Data Set: A Sample of Large UK Companies

The data set is based on 444 companies taken from the sample collected by Leech and Leahy (1991), leaving out those where there was a majority shareholder. All were listed on the London Stock Exchange in the mid-eighties and included about a third of the Times 1000 as well as some smaller companies and some financial companies. They comprise neither a representative sample nor a random sample since they were chosen on the sole basis of the availability of detailed ownership data to give the voting weights. The source was a commercial information service called "Who Owns What on the London Stock Exchange," which existed briefly, to which one could subscribe annually and receive periodic printouts

[17] There is a potential causality problem here since the model can be used to determine control endogenously by choosing the shape of the curve s_k. Therefore we might expect observed ownership structures of actual firms to reflect this.

showing details of all shareholdings greater in size than 0.25 percent of the total of each class of equity[18].

For most companies there was only one class of voting share but in the small number of cases where there were two, they were combined into one distribution taking into account any differences in voting weights and voting rules. Many of the holdings were in the names of nominee companies but wherever possible these were reassigned to their beneficiaries using a directory of nominees provided with the subscription to identify them. Holdings in the same firm by different members of the founding family, and other interest groups closely associated with the company, were amalgamated into a single bloc using surnames and other information. The data used therefore can be assumed to be reasonably close to beneficial holdings taking into account voting alliances.[19]

The data collected were based on searches of company registers made in 1985 and 1986. The number of large shareholdings observed (after amalgamation by Leech and Leahy) varies in the sample between a minimum of 12 and a maximum of 56, with a median of 27. The proportions of voting equity these represent vary between 19 percent and 99 percent, the median being 66 percent. The dataset is therefore both detailed and fairly comprehensive.

The data are summarised in Table 1. The table shows the distribution of the size of the largest shareholding, w_1, and also the joint distribution of w_1 with the second-largest holding, w_2, in order to indicate the variation in patterns of ownership concentration between firms in the sample. Some 49 companies have relatively concentrated voting structures with w_1

[18] The Warwick University Library took out a one-year subscription to it at my suggestion.
[19] The source and method of construction of the data set are described in Leech and Leahy (1991). There might remain a slight underestimation of the true concentration of ownership to the extent this information was incomplete.

greater than 30%, but in the great majority of cases w_1 is less than 30 percent. There is also a wide range of variation in the size of w_2 given w_1. For example in the group of 85 companies where w_1 is between 20% and 30%, w_2 is less than 10% in 38 cases, between 10% and 20% in a further 38 cases and greater than 20% in 9 cases.

Table 1 about here

The Problem of Incomplete Data and the use of Oceanic Games

The data collected on the distribution of share ownership is necessarily incomplete because large public companies typically have many thousands of shareholders and it would obviously be prohibitive to collect them all. In any case, there would be little to be gained because in practice almost all of these are far too small to represent any real voting power. On the other hand, they have a formal role to play in the voting bodies being analysed and therefore we must deal with them appropriately.

The solution to this incompleteness problem, that is adopted here, is to consider, and analyse separately, two modified share ownership structures for which the data we do observe would be appropriate. Two sets of indices are calculated, assuming two different games where the unobserved shareholders conform to two extremes of “concentrated” and “dispersed” ownership; both of these cases are arithmetically consistent with the observed data. The "concentrated" case takes the extreme that the unobserved weights are all equal to the threshold for observation, 0.25%[20] and the number of players is finite although large. The "dispersed" case assumes an "oceanic game" in which it is assumed that the unobserved very small holdings are individually infinitesimally small and they are infinite in number.

[20] Strictly slightly smaller.

Thus, for any company, let the largest k shareholdings (out of n in total) be observed represented by w_1, w_2, w_3, etc. in decreasing order of size, the smallest being w_k (normally equal to 0.0025). There is no information about the remaining n-k holdings except that they are all no larger than w_k. It is not necessary to know n, the total number of shareholders in the company; although this information could be collected from share registers, it would add extremely little to the analysis to do so. The two limiting cases are referred to respectively as limiting case C (Concentrated) and limiting case D (Dispersed).

For limiting case C it is necessary to find the corresponding value for the finite number of shareholders. If w_k is the smallest weight observed in the data, then we know that all the non-observed weights are no greater than w_k. The most concentrated pattern of ownership occurs when these are all equal to w_k. Then the corresponding number of shareholders, n', is,

$$n' = \text{integerpart}((1 - s_k)/w_k) + k + 1.$$

The distribution of voting weights in limiting case C is then obtained by letting $w_i = w_k$ for all $i = k+1, ..., n'-1$ and $w_{n'} = 1 - s_k - (n'-k-1)w_k$. Obviously $w_k = 0.0025$.

These two limiting cases are analysed separately, case C using the algorithm described in Leech (2000b) to calculate the indices for all n' assumed members and case D as an "oceanic game”. Power indices for oceanic games have been thoroughly studied and there is a good literature on them. The approach adopted here follows Dubey and Shapley (1979), who showed that the power indices for an oceanic game with k major players with combined weight of s_k and a majority requirement or quota of q are the same as for a finite game consisting only of the k major players and a modified quota of $q - (1-s_k)/2$. These can be calculated using the algorithm of Leech (2000b).[21] However there was very little difference in the results from the two polar cases.

Table 2 about here

Results

Power Indices for Illustrative Companies

Table 2 presents power indices for large shareholdings in some illustrative companies. The firms have been selected to span the range of variation in the first two shareholdings within the sample. Plessey has the most dispersed ownership with a largest shareholding of under 2% and Associated Newspapers is one of several which are just short of having majority control. Two firms have been selected in each range of values for w_1: 10 – 20%, 20 – 30%, 30 – 40%, 40 – 50%. In each range the two companies are those with relatively large and small values for w_2. The results for these firms might then be taken as illustrative of the effects of ownership concentration in terms both of the size of the largest holding and the relative dispersion of the other holdings as reflected in the second largest. Results are shown for representative shareholders numbered 1, 2, 3, 5, 10 and 20. Figure 2 shows corresponding graphs for the power indices for the top ten shareholders of the same companies.

Figure 2 About Here

The values of the power indices in Table 2 are sensitive to differences in ownership structure and vary considerably. They appear to conform to commonly held *a priori* notions

[21] Typically the finite games assumed for case C have upwards of n' =300 players and require an algorithm which can cope with such large games. As regards the oceanic games in case D, the results of Dubey and Shapley are subject to conditions on q to ensure existence, but in this case q=0.5 and the conditions are always met.

of the power of shareholding blocs of a given size in relation to others. Where ownership is widely dispersed as in the case of Plessey, power is also widely dispersed. Where it is highly concentrated, as in Ropner or Steel Brothers, with a shareholding over 40%, giving control, the index reflects this. In other cases where ownership is less concentrated, there is considerable variety of results associated with differences in ownership structure.

A comparison of Sun Life and Liberty, for example, shows the sensitivity of the power of the largest shareholder to the size of the second largest shareholding. The 22% largest shareholding in Sun Life has a power index over 99% suggesting that it can be regarded as a controlling holding and reflecting the relatively high dispersion of ownership of the other 78% of shares. In the case of Liberty, however, both the largest two holdings are above 22% which must mean that the largest shareholder is not much more powerful than the second-largest and this result is obtained; both have an index of about 0.5 and, in this case, the third shareholder has enhanced power as a result. A similar finding emerges for companies with a shareholding of between 30 and 40 percent. A 31% shareholding has a power index over 99% in Securicor where there are no other large owners. On the other hand a similar-sized stake in Bulgin has an index of only 86% because of the presence of a large second shareholder with 22% of the votes.

These results are plausible in that they are in broad agreement with both the results of Berle and Means and more recent conventional ideas about the power of shareholder blocs and minority ownership control. It has been possible to find many cases where the power index for a voting bloc greater than 20 percent is extremely close to 100 percent.

The Complete Sample

Results for the full sample are shown in Figure 3[22]. Figure 3(a) shows the respective power indices for the largest shareholding, Π_1, against its size w_1; Figure 3(b) shows the equivalent plots after the largest 4 shareholdings have been combined into a single bloc, of size s_4. Only the results for Case C have been presented since the oceanic indices for Case D are very close to them. These plots are useful for giving an insight into the respective behaviour of the power indices in the population as a whole and their potential as a basis for identifying minority control.

Figure 3 About Here

There is considerable variation reflecting differences in ownership structure. Concentration in terms of the size of the largest shareholding has very little effect up to over 15% but after that power varies widely. These results suggest that shareholdings between 20 and 30 percent can be said to have voting control in many cases but not in many others. Voting control is possible on the basis of a holding below 20 percent but such cases are not common. Most (but not all) holdings greater than 35 percent have a power index almost equal to 1. The variation among firms suggests that this index may be useful as a guide to differences in company control by shareholders.

Figure 3(b) shows that combining the top four shareholdings into one voting bloc is very powerful indeed in most cases. In some companies such blocs would be majority shareholders but it is interesting that the result does not depend on this. Intuitively combining top shareholdings in the manner assumed has a double effect in both increasing concentration via the size of the bloc and reducing the dispersion of the remainder; these effects reinforce one another in concentrating voting power.

Potential Controlling Blocs

Figure 4 examines the model of ownership control by a bloc of large shareholders, presented above, in the light of the data, by graphing the power of blocs of different sizes. Results are shown for two illustrative companies in which the power indices have been calculated for each assumed bloc of shares, of size s_k, for k=1 to 20[23], and the ownership concentration curve. Plots are given for two companies, Plessey, which has the most dispersed ownership structure, and Birmid Qualcast, only slightly more concentrated. Each plot shows the number of members of the group, k, on the horizontal axis and s_k , the size of the bloc, and the associated power index (for both cases C and D) on the vertical axis. The plots show the same general pattern for both companies, consistent with the theoretical model in Figure 1. The inference can be drawn that for the great majority of companies a bloc comprising a small number of top shareholders would effectively have control. This pattern is typical of the whole sample, not just of these two illustrative companies.

Figure 4 About Here

Figure 5 investigates this effect by calculating the proportion of the sample which would satisfy the definition of control by blocs of different numbers of shareholders on different definitions of the voting power threshold for control, Π^*=0.99, 0.999 and 0.9999

[22] The numerical values of the indices are available from the author.

respectively. It shows that it is pervasive and that the power of a shareholder bloc comprising, say, the top six holdings would be very considerable indeed in most companies. Using the voting power control threshold $\Pi^*=0.9999$, over 75 percent of the companies in the sample would be deemed to be owner controlled. Virtually every company in the sample would be owner-controlled by the top ten shareholders combined.

Figure 5 About Here

Figure 6 shows the size distribution of these "controlling" blocs in terms of the concentration of ownership they represent using the $\Pi^*=0.9999$ criterion. It shows that the effect reported in the previous two paragraphs does not depend on the blocs having a voting majority. For example, where there are controlling blocs comprising just the top six shareholders (75% of the sample companies), in only 30 percent of cases does the bloc have a majority of the shares, and in 22 percent of cases it is between 30 and 40 percent of the equity. On the other hand, it represents between 20 and 30 percent of the equity in 8.1 percent of cases.

Figure 6 About Here

[23] 16 for Liberty.

Conclusions

This paper has looked at the voting power of large shareholders in the widely dispersed ownership observed on the stock market of the United Kingdom. It has adopted a methodology due to Berle and Means supplemented by the technique of power indices for measuring power derived from game theory. The empirical findings are consistent with earlier work and also institutional practice.

The results show that a significant minority shareholder can be very powerful, almost as powerful as a majority shareholder, if the dispersion of the rest of the holdings is sufficient. In most companies a 20 percent shareholding can have working control, but in other companies the figure is greater and in some less. In almost all companies if the top shareholders formed a voting bloc this would be extremely powerful. In almost all companies the top six shareholders could form a voting bloc with working control, whether or not it had a majority of the shares.

The approach has treated the company as a quasi-political body in which shareholders are voters choosing public goods, a reasonable way of looking at a public company where there are good standards of corporate governance. It ignores completely the question of incentives. A better model might be one which recognises that shareholders are of two types: those with substantial stakes who have strong private incentives to take part in collective action and those whose stakes are so small that it is rational for them to abstain. This requires a model of shareholder incentives and is the subject of future work. However such a model of voting power would be likely to show that relatively small holdings are in fact very powerful within the reduced group of active shareholders that would be identified. The approach adopted here, where all shareholders are taken into account regardless of size, biases the analysis away from finding considerable shareholder power and therefore makes the results more significant.

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Table 1 The Sample: The Largest Holding versus the Second Largest

		w_1						
		<5%	5-10%$	10-20%	20-30%	30-40%	40-50%	Total
		41	144	125	85	30	19	444
w_2	< 5%	41	46	15	12	2	2	118
	5-10%		98	73	26	10	9	216
	10-20%			37	38	11	5	91
	20-30%				9	4	2	15
	30-40%					3	1	4
	40-50%						0	0

Table 2 Power Indices for Top Shareholders, Illustrative Companies

Company	Shareholder:	1	2	3	5	10	20
Plessey	Weight	0.019	0.015	0.013	0.011	0.009	0.004
	Index (C)	0.254	0.192	0.165	0.134	0.112	0.052
	Index (D)	0.361	0.268	0.230	0.185	0.154	0.071
United Spring	Weight	0.123	0.109	0.098	0.037	0.014	0.005
& Steel	Index (C)	0.502	0.433	0.391	0.117	0.046	0.016
	Index (D)	0.508	0.440	0.400	0.113	0.045	0.016
Suter	Weight	0.128	0.065	0.053	0.031	0.017	0.009
	Index (C)	0.692	0.246	0.209	0.120	0.068	0.034
	Index (D)	0.707	0.244	0.210	0.121	0.068	0.034
Ranks Hovis	Weight	0.149	0.037	0.035	0.022	0.014	0.008
McDougall	Index (C)	0.912	0.070	0.068	0.047	0.031	0.017
	Index (D)	0.940	0.053	0.052	0.038	0.025	0.014
International	Weight	0.163	0.032	0.018	0.016	0.011	0.004
Signal	Index (C)	0.984	0.015	0.011	0.010	0.007	0.003
& Control	Index (D)	0.998	0.002	0.002	0.002	0.001	0.001
Sun Life	Weight	0.222	0.035	0.019	0.013	0.009	0.005
	Index (C)	0.9996	0.0004	0.0003	0.0003	0.0002	0.0001
	Index (D)	1.000	0.000	0.000	0.000	0.000	0.000
Liberty	Weight	0.2263	0.2257	0.089	0.050	0.018	
	Index (C)	0.5013	0.4982	0.278	0.132	0.047	
	Index (D)	0.5014	0.4983	0.280	0.133	0.047	
Securicor	Weight	0.316	0.073	0.053	0.029	0.016	0.008
	Index (C)	0.997	0.003	0.003	0.003	0.002	0.001
	Index (D)	0.998	0.002	0.002	0.002	0.001	0.001
Bulgin	Weight	0.310	0.222	0.045	0.028	0.009	0.003
	Index (C)	0.862	0.138	0.122	0.079	0.025	0.007
	Index (D)	0.874	0.126	0.120	0.082	0.025	0.007
Ropner	Weight	0.410	0.060	0.050	0.020	0.012	0.003
	Index (C)	1.000	0.000	0.000	0.000	0.000	0.000
	Index (D)	1.000	0.000	0.000	0.000	0.000	0.000
Steel Brothers	Weight	0.425	0.213	0.038	0.030	0.007	0.003
	Index (C)	0.9996	0.0004	0.0004	0.0004	0.0002	0.0001
	Index (D)	0.9999	0.0001	0.0001	0.0001	0.0000	0.0000
Associated	Weight	0.4995	0.026	0.021	0.021	0.013	0.006
Newspapers	Index (C)	1.0000	0.000	0.000	0.000	0.000	0.000
	Index (D)	1.0000	0.000	0.000	0.000	0.000	0.000

Figure 1: A Model of "Minority Control"

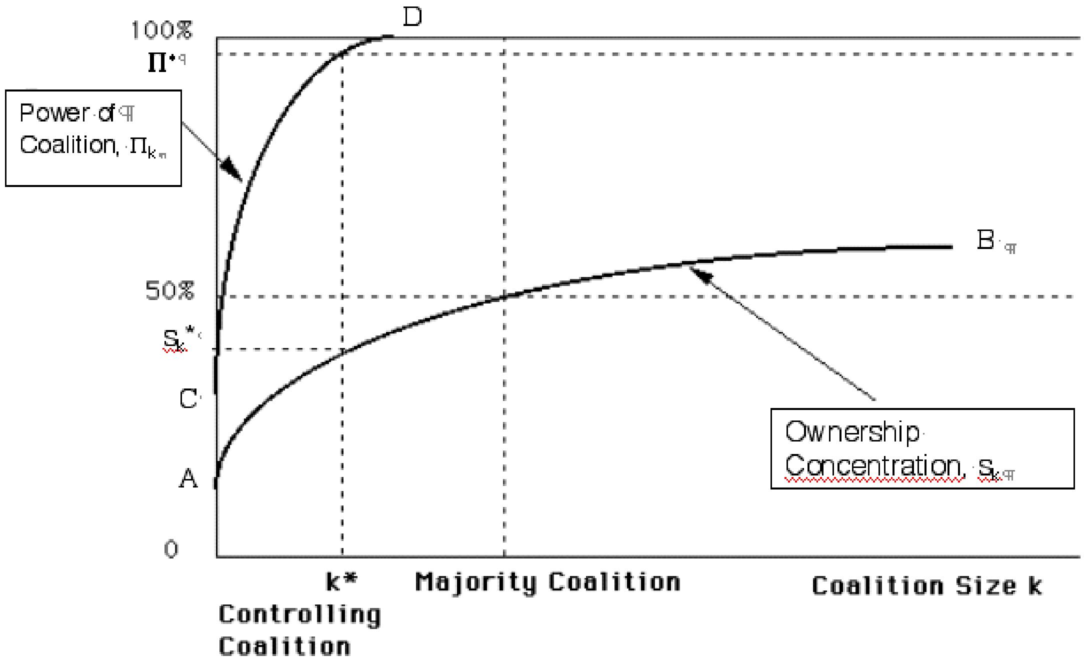
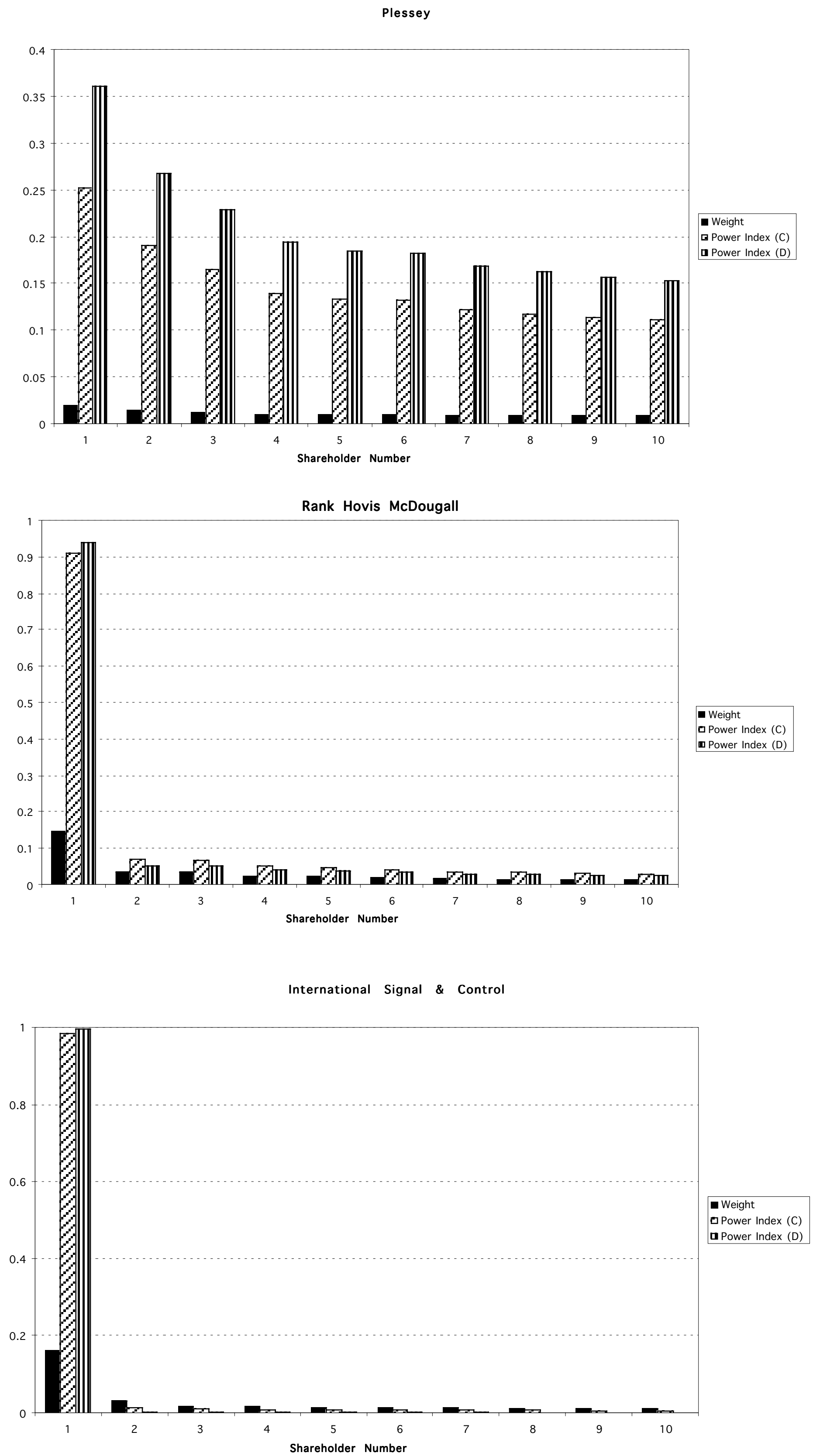
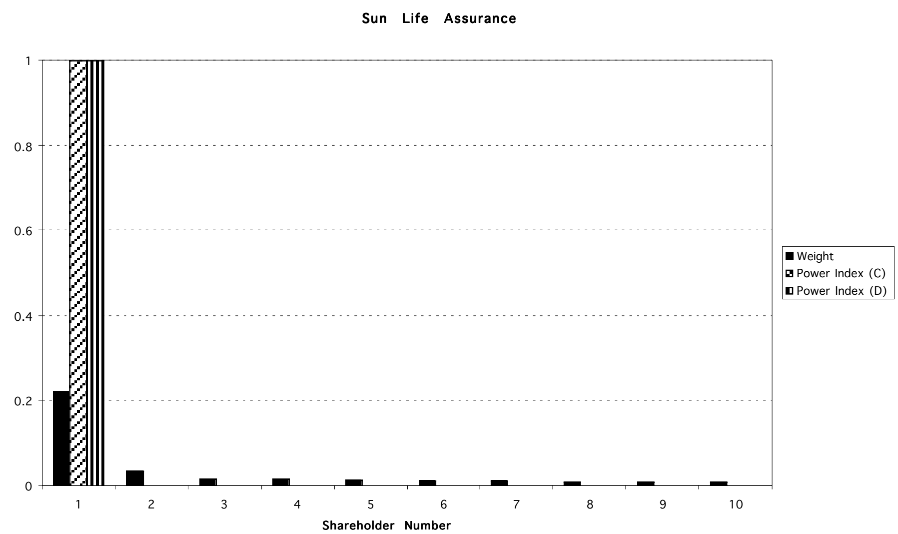
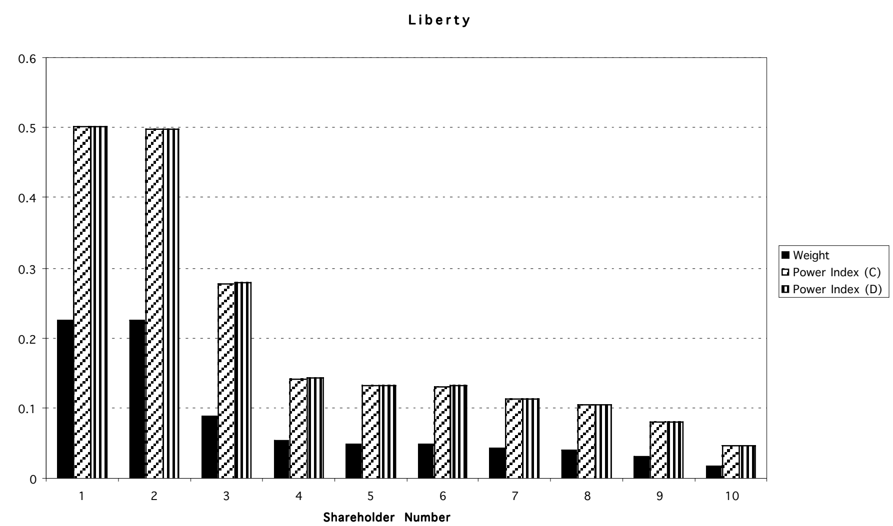
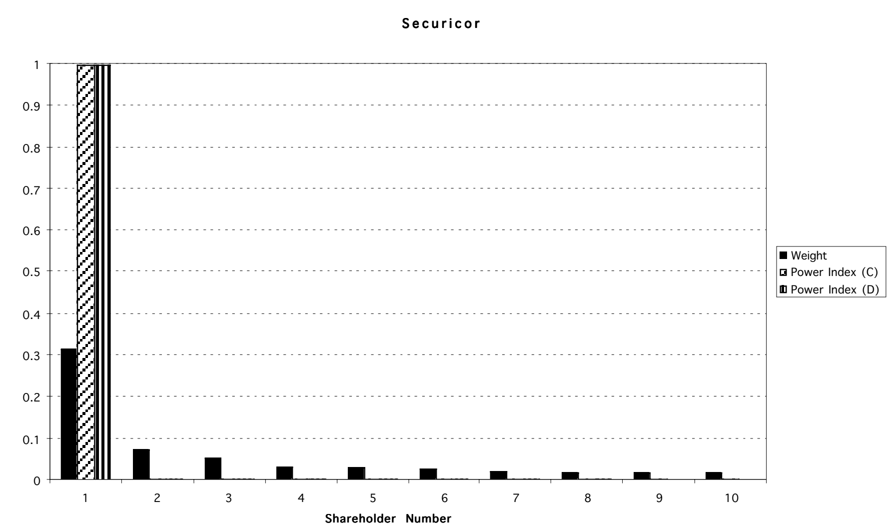


Figure 2: Power Indices for the Top Ten Shareholdings, Illustrative Companies

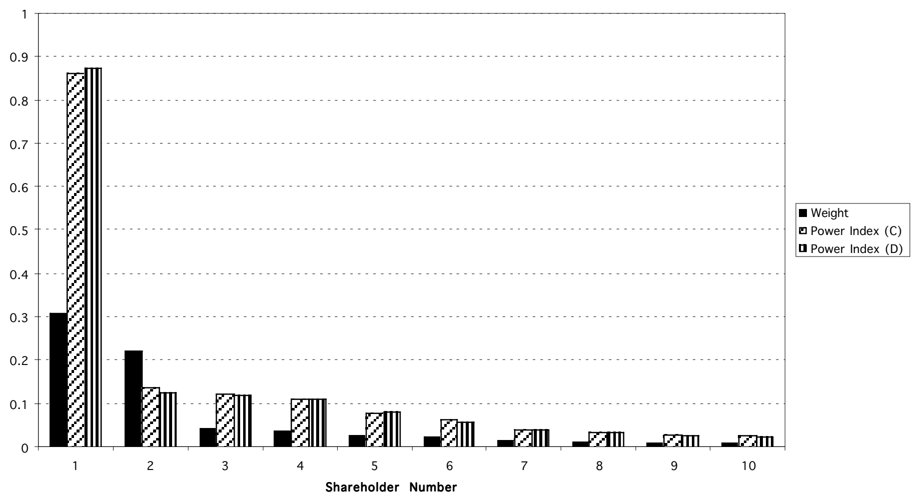



Sun Life Assurance
Weight
Power Index (C)
Power Index (D)
Shareholder Number

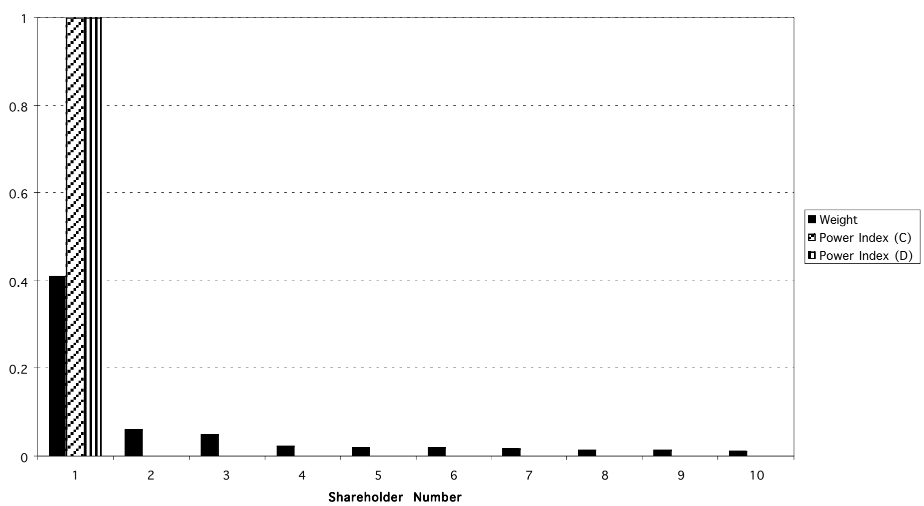

Liberty
Weight
Power Index (C)
Power Index (D)
Shareholder Number


Securicor
Weight
Power Index (C)
Power Index (D)
Shareholder Number

A F Bulgin



Ropner



Steel Brothers

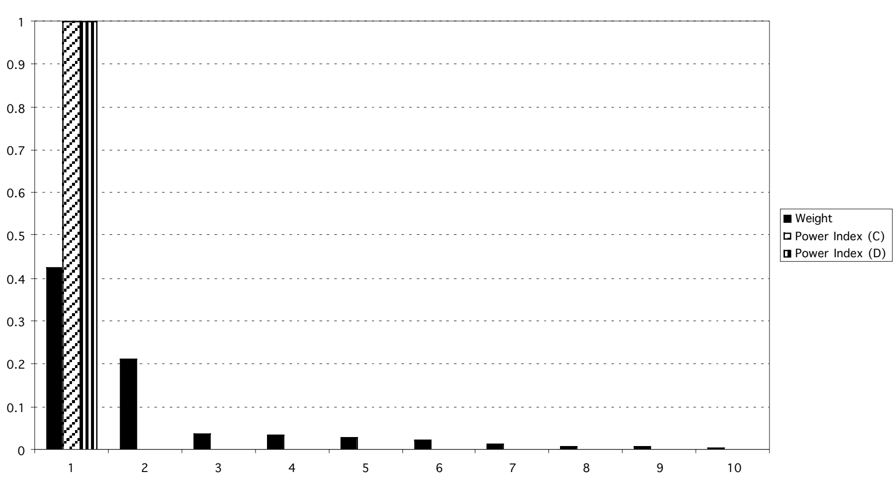


Figure 3(a)

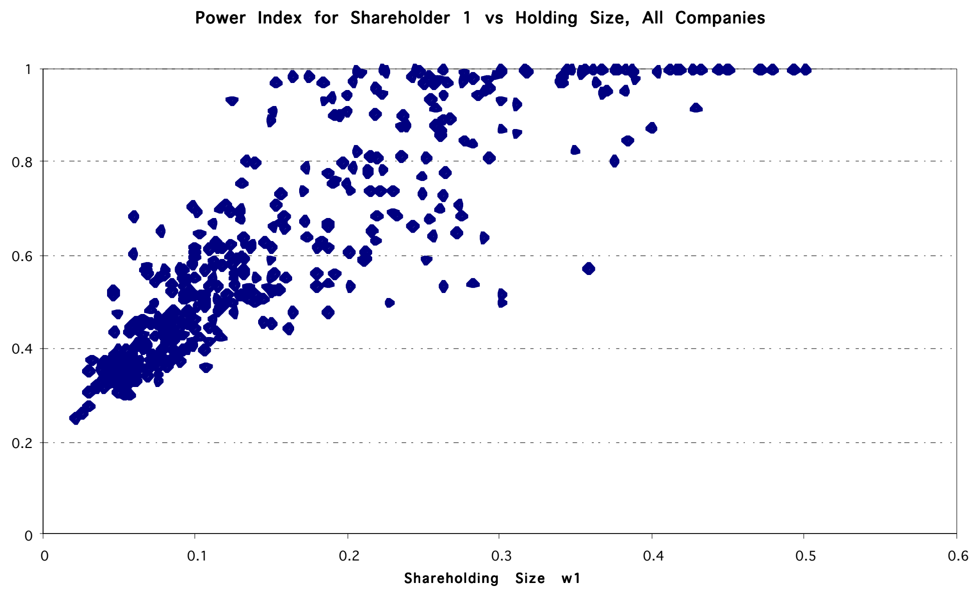
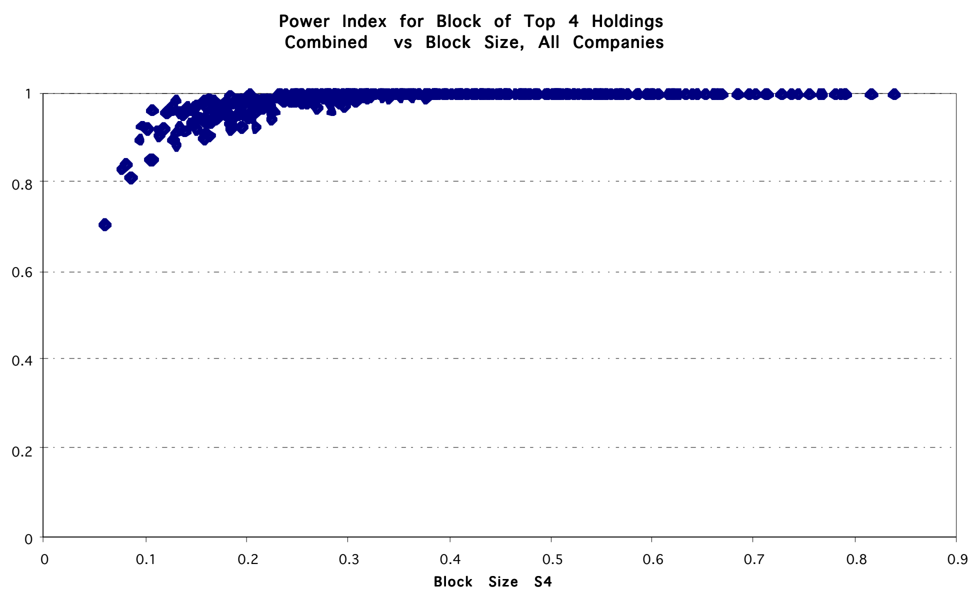
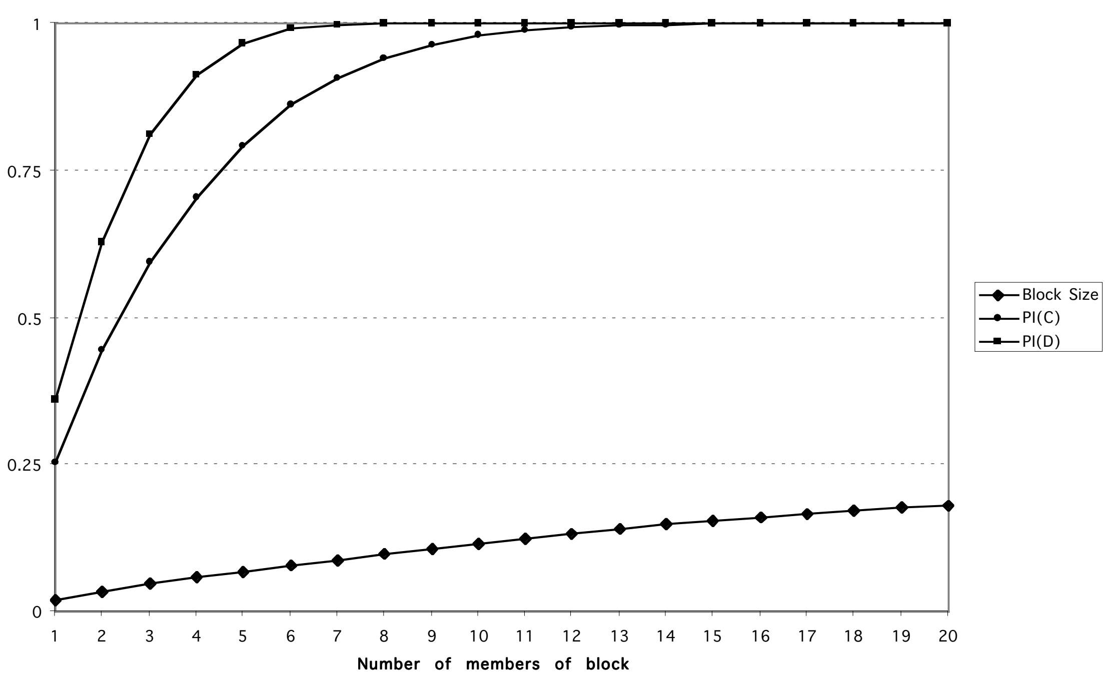


Figure 3(b)



<u>Figure 4 The Power of a Block of Large Shareholders</u>

Plessey



Birmid Qualcast

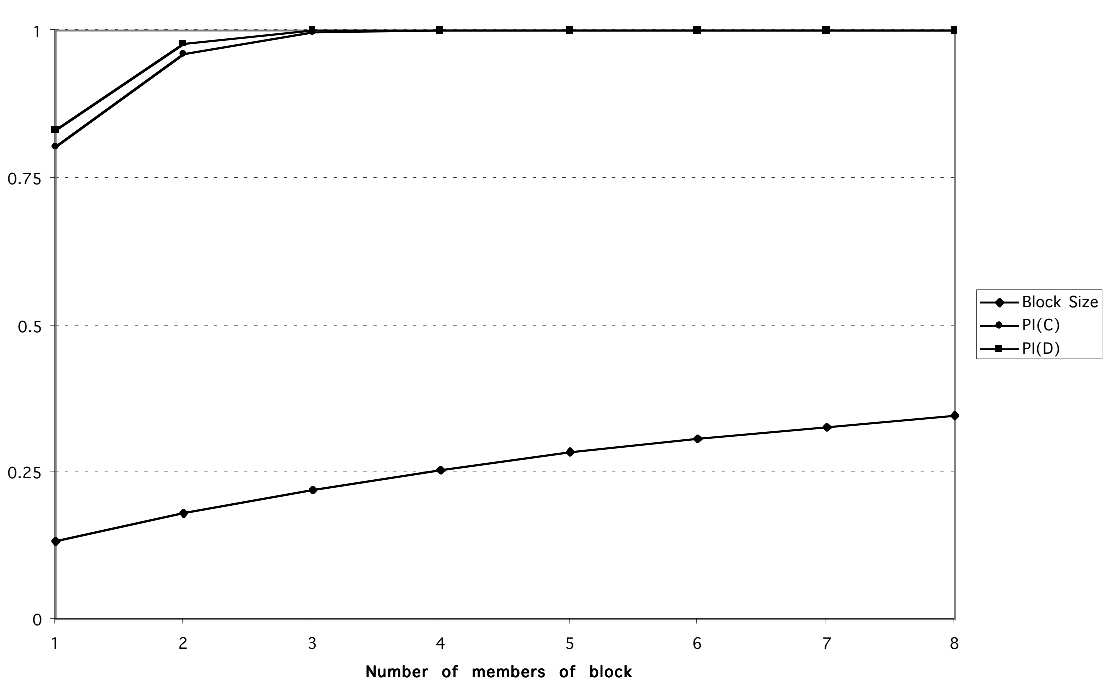
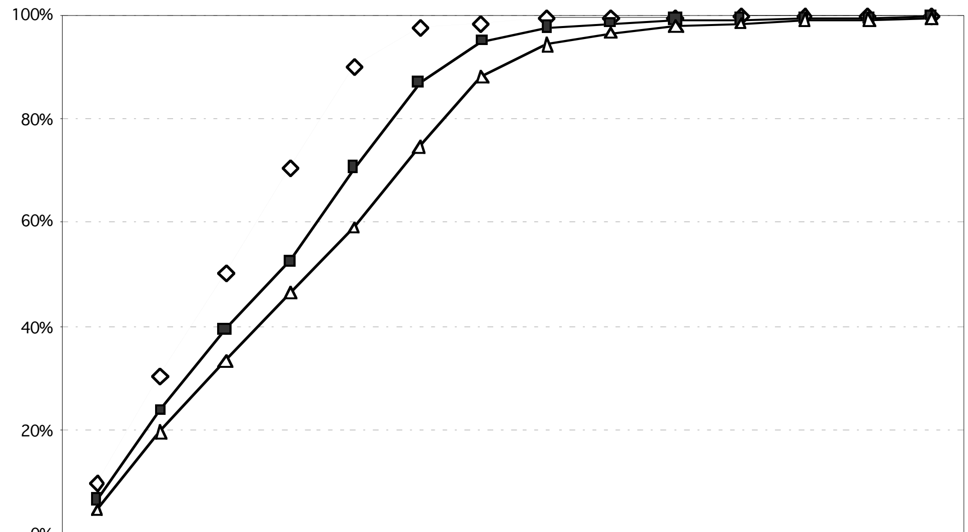


Figure 5 Potential Controlling Blocs

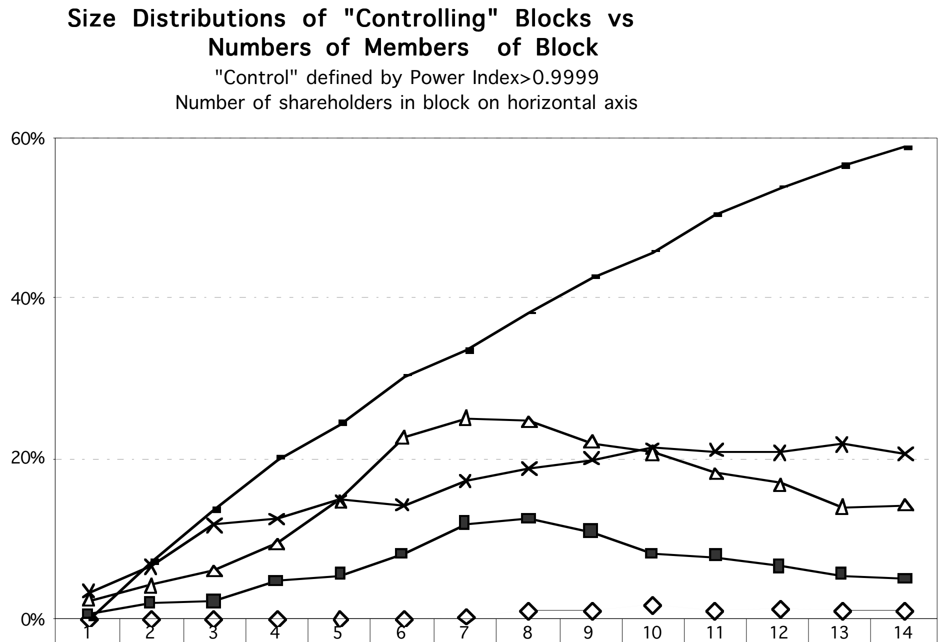
Percentages of Firms "Controlled" by Shareholder Blocks with Different Numbers of Members

Number of shareholders in block on horizontal axis



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PI>0.99	9.7%	30.2%	50.7%	70.5%	89.9%	97.3%	98.6%	99.5%	99.8%	99.8%	100.0%	100.0%	100.0%	100.0%
PI>0.999	6.8%	24.1%	39.4%	52.9%	70.9%	86.9%	95.0%	97.7%	98.6%	99.3%	99.3%	99.8%	99.8%	100.0%
PI>0.9999	4.7%	20.0%	33.6%	46.6%	59.2%	75.0%	88.3%	94.6%	96.8%	98.0%	98.6%	99.3%	99.3%	99.8%

<u>Figure 6 the Sizes of Potential Controlling Blocs</u>



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
10 to 20%shares	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.9%	0.9%	1.8%	1.1%	1.4%	1.1%	1.1%
20 to 30%shares	0.7%	2.0%	2.3%	4.7%	5.6%	8.1%	11.9%	12.4%	11.0%	8.1%	7.9%	6.5%	5.7%	5.0%
30 to 40%shares	2.5%	4.3%	6.1%	9.5%	14.6%	22.5%	25.2%	24.5%	22.1%	20.9%	18.2%	16.7%	14.0%	14.4%
40 to 50%shares	3.6%	6.5%	11.7%	12.4%	14.6%	14.2%	17.3%	18.7%	20.0%	21.4%	21.2%	20.9%	21.9%	20.5%
more than 50%	0.0%	7.2%	13.5%	20.0%	24.3%	30.2%	33.6%	38.1%	42.8%	45.7%	50.2%	53.8%	56.6%	58.8%