Applied Financial Economics, 1998, **8**, 175–180

Ownership structure and firm performance: evidence from the UK financial services industry

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Theory tells us that managerial ownership of shares in a firm generates two conflicting effects on management behaviour, i.e. the convergence effect whereby increased managerial ownership can improve corporate performance, and the entrenchment effect which counters it. A number of studies have sought to evaluate these effects empirically. The results in the literature are not uniformly in agreement. In this paper, we distinguish between measures of ownership and measures of control implied by this ownership. Furthermore, we provide evidence supporting the entrenchment and convergence effects using UK data.

I. INTRODUCTION

Economists have been interested in the effects of the separation of ownership and control in the modern corporation at least since the classic works of Berle and Means (1932) and Coase (1937). This interest continues, as evidenced by major studies in the last decade (Cosh and Hughes, 1987; Jensen and Murphy, 1990). The major focus of concern has been the potential conflicts of interest between managers (who run corporations) and shareholders (who own them). One method suggested to reduce this potential conflict is to increase the identity between the two groups, typically through inducing managers to own shares in the company.

Modern work on this issue has shown that managerial ownership of shares in a firm generates two conflicting forces on management behaviour, namely the convergence of interest effect and the entrenchment effect (Jensen and Meckling, 1976; Fama and Jensen, 1983; Hart, 1983; Jensen and Ruback, 1983). Under the former, the relationship between managerial stake and market value of the firm is positive, as management and shareholder interests converge. Under the latter, this relationship is negative, as a larger managerial stake entrenches and insulates management from the market for corporate control.

A number of studies have sought to evaluate empirically the link between managerial share ownership and firm performance. However, the results are not uniformly in agreement. Demsetz (1983) argues that there should be no relationship between ownership structure and firm performance. Pursuing this argument empirically, Demsetz and Lehn (1985) find no significant correlation between profit rates and various measures of ownership concentration in a sample of 511 US companies using 1980 data. Tsetsekos and DeFusco (1990) construct portfolios arranged according to managerial share ownership and report no significant differences in the returns on the various portfolios. In contrast, Mehran (1995) provides evidence of a positive relation between managerial equity ownership and firm performance. Similarly, Wruck (1988) finds a strong and, on average, positive link between the change in ownership concentration and firm performance.

Several other studies find evidence for a non-monotonic relationship between ownership concentration and the market value of the firm. Using a sample of 371 Fortune 500 firms, Mork *et al.* (1988) find that the relationship is positive for managerial ownership between 0 and 5%, negative between 5 and 25% and positive thereafter. Hermalin and Weisback (1991) study 134 NYSE firms and use CEO stock ownership to represent managerial share holding. They find the relationship to be positive for CEO stock ownership between 0 and 1%, negative between 1 and 5%, positive between 5 and 20% and negative thereafter. McConnell and Servaes (1990), analysing 1976 data for a sample of 1173 firms and 1986 data for a sample of 1093 firms, find the relationship to be positive between 0 and somewhere in the range 35–50% and negative thereafter. Similar findings are reported by Jarrell and Poulsen (1988) and Stulz (1988).

Most of the work in the literature assumes that managerial ownership of shares is representative of managerial control. It is thus used as an explanatory factor in firm performance without considering the ownership pattern of the rest of the firm's shares. This means that the concentration of managerial share ownership is considered, but the degree of control that this ownership confers is not.

Our first objective in this paper is to assess whether the concentration of share ownership and the degree of control exerted by the large share holding groups go hand in hand in terms of their effects on company performance. Using a measure developed by Cubbin and Leech (1983), we find that the effects of concentration and control on firm performance are radically different. Thus, we suggest that it is managerial control, rather than the level of managerial share holding that is the relevant explanatory variable for assessing firm performance.

Our second objective is to attempt to estimate ranges of managerial share ownership over which the entrenchment and convergence effects are predominant, using UK data. Much of the research thus far has used US data and it is of interest to examine whether data from other countries support similar results. We set up and test a non-monotonic relationship and find it to be well-supported by the data. Further, the estimated ranges for the entrenchment and convergence effects are very similar to those estimated in some US studies.

In Section II we present our methodology. In Section III we describe our data and estimation, and discuss our results. We offer some concluding remarks in Section IV.

II. METHODOLOGY

We use data for the UK financial services industry. The financial services industry was chosen for a number of reasons. The growing importance of financial services in the economic activities of advanced countries and the recent developments in financial markets, such as deregulation, credit expansion and the introduction of new financial instruments have put a sharp focus on the industry. In addition, problems relating to information asymmetry and investor protection are of particular relevance for financial services. This is because financial institutions are particularly susceptible to information problems and externalities.

Measures of the firm's performance are the dependent variables in our study. We measure the firm's performance by its rate of return on the stock market. We use both the actual rate of return as well as the abnormal rate of return. We provide precise definitions of the variables used in Section II below.

In approaching the first of our objectives, we must use measures of share ownership concentration and measures of control implied by the pattern of share holding as independent variables. It is well established that of all the available measures of concentration, the Herfindahl index (H) is particularly strong in terms of satisfying the requirements of a good index (Hannah and Kay, 1977; Schmalensee, 1977; Encaoua and Jacquemin, 1980). Thus, we use the 'H' index as our measure of ownership concentration.

In order to measure the 'degree of shareholder control', we use the Cubbin–Leech index (α). This measure depends positively on the proportion of shares held by a particular group of investors and inversely on the degree of concentration of the remaining shares. This expresses the notion that control depends not only on the number of shares owned, but on the dispersal of the unowned shares. We address the first question by contrasting the estimates based on the 'H' index with those based on the 'α' index.

The dependent variable is the firm's financial rate of return, which can be affected by the riskiness of its investment strategy and by the sensitivity of its share price to movements in the overall share market. Hence, we normalize the estimation by incorporating firm-specific financial measures. In particular, we introduce the coefficient of systematic risk (beta) and the coefficient of specific risk as additional regressors.

We use the percentage of directors' equity ownership as our proxy for managerial share ownership. We recognize the possibility that the relationship between this variable and the firm's performance may be non-monotonic. We introduce this possibility by setting up a standard cubic for estimation, allowing the data to support or reject the hypothesis of non-monotonicity.

We note that there is a substantial literature documenting the relationship between firm size and financial returns. Roll (1981), Banz (1981) and Dimson and Marsh (1989) are just a few examples of work estimating this relationship. We therefore normalize for firm size in our estimation procedure.

III. DATA, ESTIMATION AND RESULTS

Data

The primary source of data is Datastream, supplemented by the London Business School Risk Measurement Service. Data relate to the UK financial services sector. The data set comprised of a total of 111 firms and included banks, merchant banks, insurance companies and insurance brokers. The data relate to the period 1992–94. Summary statistics describing the data are presented in Table 1.

The actual rate of return is denoted by ACROR and is the percentage capital appreciation plus the dividend yield over the year, where gross dividends are assumed to be

Table 1. *Summary statistics*

Variable	Mean	Std. Dev.	Maximum	Minimum
ACROR	9.196	6.774	45.60	− 20.00
H	37.461	24.222	92.80	11.20
ALPHA	66.039	10.528	93.69	50.00
BETA	0.9554	0.2819	1.64	0.11
SPRISK	28.990	13.184	70.00	9.00
MCAP	898.370	1907.90	12 060.00	1.90
DIROWN	9.639	15.065	74.70	0.01

re-invested in the firm's shares at the end of the month in which they are paid. The abnormal rate of return is denoted by ABROR and is the performance of the firm's shares over the year, relative to the market as a whole. It is equal to the difference between the actual return on the share and percentage return available over the same period from an investment in a diversified portfolio with the same risk characteristics, as measured by beta.

The Herfindahl index is well known and defined as $H = \sum_j (m_j)^2$, where m_j is the percentage holding of the jth largest share holding group. We compute the Cubbin–Leech index associated with the largest share holding group.[1] This is defined to be $\alpha_1 = F[(m_1)/(H - m_1^2)^{1/2}]$, where $F[.]$ is the standard normal distribution function and m_1 is the percentage holding of the largest share holding group. We denote this value by ALPHA.

The firm's systematic risk is measured by BETA. This is the standard measure derived from the Capital Asset Pricing Model (CAPM). The risk of non-market related fluctuations in share price is measured by the firm's coefficient of specific risk. This is denoted by SRISK.

The measure of directors' equity is equal to the sum of the percentage stake owned by beneficiary and non-beneficiary directors of each company. This variable is denoted by DIROWN.

Given that our sample consists of firms in the financial services sector, the interpretation of measures of turnover is not straightforward. We therefore measure the size of the firm by using its capital base. We use the firm's market capitalization, denoted by MCAP, as our measure of size.[2]

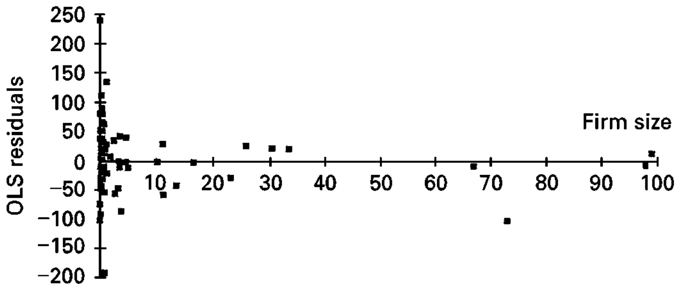

Fig. 1. *OLS residuals and firm size*

Estimation and results

In order to address our two questions, we set up the following equation for estimation

$$\text{ACROR} = f\,[\text{DIROWN}, (\text{DIROWN})^2, (\text{DIROWN})^3, \mathbf{H}, \mathbf{ALPHA}, \text{MCAP}, \text{BETA}, \text{SRISK}] + u_1 \quad (1)$$

We also estimate Equation 1 using ABROR as the dependent variable. However, the results are all in extremely close agreement with those for ACROR. Hence, in the interests of brevity, only the results relating to ACROR are presented. (Full results are available from the authors.)

We initially estimate the equations using ordinary least squares (OLS). However, examining the residual plots, we find considerable evidence of heteroscedasticity relating to firm size (Fig. 1). This is confirmed by noting that the OLS estimates conclusively fail the Breusch–Pagan test (Table 2).

[1] Ideally, we would like to know whether the largest share-holding group consists of directors of the company or not. Unfortunately, this information is not available in the data set.

[2] This methodology is open to the criticism that firms may differ in their technology, i.e. firms may use differing levels of capital intensity, so that two firms of the same size may have different levels of market capitalization. However, we find that when we compare market capitalization with another input-based measure of firm size, namely employment, the two are in close agreement. This suggests that the technology, as represented by capital–labour intensity, is roughly the same for all firms in the industry. Consequently, market capitalization is a good measure of firm size.

Table 2. *Least squares estimates of the rate of return using ownership concentration and shareholder control (Herfindahl Index and Cubbin–Leech Index)*

Regressor	OLS Estimates	WLS Estimates
Constant	− 72.355 (1.38) (*1.78*)	− 67.958 (1.94)*
ALPHA	1.1225 (1.93)* (*2.01*)*	1.1401 (2.03)*
H	− 0.34362 (1.25) (*1.39*)	− 0.45168 (3.70) *
BETA	60.579 (2.50)* (*3.07*) *	100.30 (4.51)*
SPRISK	1.4332 (2.86) * (*1.83*)*	0.006245 (0.01)
MCAP	− 0.001568 (0.32) (*2.47*)*	− 0.005631 (3.14)*
DIROWN	2.9934 (2.34) * (*2.20*)*	4.3445 (2.48)*
$(\text{DIROWN})^2$	− 0.18251 (2.00)* (*2.69*)*	− 0.28142 (2.27) *
$(\text{DIROWN})^3$	0.0025799 (2.83)* (*2.45*)*	0.005384 (2.25) *
Diagnostics		
Adj. $\mathbb{R}^2$	0.3798	0.5965
'F' Stat; (d.f)	8.424; (8,89)	17.239; (8,80)
Joint exclusion restriction on DIROWN coefficients *F* Stat; (d.f.)	31.1358; (3,86)	27.7639; (3,82)
Log-likelihood	− 524.9814	− 536.9209
Breusch–Pagan Test: $\chi^2(7)$; (*p* value)	80.8841; (0.000)	5.446; (0.374)
Akaike IC	10.8975	12.1685

Dependent variable: ACROR

Notes: (1) *t*-statistics in brackets. Those calculated using White's heteroscedasticity-consistent variance–covariance matrix are shown in *italics*.

(2) Estimates significant at the 5% level are marked with a *.

We adopt three alternative means of correcting for this problem. First, we adjust the OLS standard errors, using the White heteroscedasticity-consistent variance–covariance matrix. Second, we generate weighted least squares (WLS) estimates using firm size measured by employment as the weighting variable. It may be seen in Table 2 that using WLS ensures that the Breusch–Pagan test is passed and that the overall fit of the equation improves. Third, we estimate the model with assumed multiplicative heteroscedasticity using the method of maximum likelihood. The fit of these estimates is also an improvement on the OLS estimates (Table 3).

OLS and WLS estimates of Equation 1 are presented in Table 2, while maximum likelihood estimates are presented in Table 3. In all cases, the coefficient of the *H* index appears with a *negative* sign. In the case of the WLS estimates, this negative effect is highly significant. In the case of the maximum likelihood estimates, the *t*-statistic is quite near the critical value.

By contrast, in all cases, the coefficient of ALPHA appears with a positive sign. Further, this positive coefficient is statistically significant, with the lowest significance level observed in the case of the OLS estimates. Thus, we find that we are able to support the finding of Leech and Leahy (1991), that share ownership concentration does 'not necessarily … (have) … any implications' for the degree of control. Our estimates of the effects of ownership concentration and the degree of control are diametrically opposed.

We now proceed to examine our second question. We have allowed for the possibility of a non-monotonic relationship between managerial share ownership and performance by estimating an equation that is a standard cubic in DIROWN, i.e. it is of the form

$$\text{ACROR} = \theta_1 \cdot (\text{DIROWN})^3 + \theta_2 \cdot (\text{DIROWN})^2 + \theta_3 \cdot (\text{DIROWN}) + \Theta(.) \qquad (2)$$

where $\Theta(.)$ is the linear function containing all the remaining regressors and the constant term. Equation 2 will exhibit turning points if its derivative has real roots. These roots are the turning points of the cubic. Further, the turning points will be a local maximum followed by a local minimum if the derivative has a minimum which is negative. The derivative of Equation 2 is

$$\partial\text{ACROR}/\partial\text{DIROWN} = 3\theta_1 \cdot (\text{DIROWN})^2 + 2\theta_2 \cdot (\text{DIROWN}) + \theta_3 \qquad (3)$$

Examining the estimates of θ_1, θ_2 and θ_3 in Tables 2 and 3, we find that they are consistent in their retention of sign, and the *t*-tests indicate that they are always individually

Table 3. *Maximum likelihood estimates of the rate of return using ownership concentration and shareholder control (Herfindahl Index and Cubbin–Leech Index)*

Regressor	Linear model with multiplicative heteroscedasticity
Constant	− 88.764 (1.91)
H	− 0.35001 (1.76)
ALPHA	1.0873 (2.80)*
BETA	82.013 (3.51)*
SPRISK	1.2458 (2.56)*
MCAP	− 0.002963 (1.36)*
DIROWN	3.9381 (3.25)*
$(\text{DIROWN})^2$	− 0.19785 (4.38)*
$(\text{DIROWN})^3$	0.002929 (4.93)*
Estimates of the variance process	
$(S_u)^2$	3179.6 (6.64)*
SIZE	− 0.04085 (5.01)*
Diagnostics	
Log-likelihood	− 522.4868
Restricted log-likelihood	− 524.9814
LR Test $\chi^2(1)$; (p value)	4.9892; (0.0152)
Joint exclusion restriction on DIROWN coefficients	
LR test $\chi^2(3)$; (p value)	24.1508; (0.0000)
Iterations	28

Dependent variable: ACROR
Notes: (1) The estimated model sets the conditional variance as a linear function of firm size. OLS estimates are used as starting values.
(2) Estimates significant at the 5% level are marked with a *.

Table 4. *Estimation of turning points in the marginal effect of managerial shareholding on the rate of return*

Estimating method	Using the Cubbin–Leech Index (α) OLS	WLS	Max.L.
θ_1	0.00258	0.00538	0.00296
θ_2	− 0.18251	− 0.28142	− 0.19785
θ_3	2.9934	4.3445	3.9381
Negative root	10.5693	11.5412	14.8199
Positive root	36.5928	23.3065	30.3004
Derivative minimum	− 1.3104	− 0.5589	− 0.5254
$\theta_2^2 - 3\theta_1\theta_3$	0.05648	0.00908	0.00465
Wald Test	19.5916	4.6618	8.4034
$\chi^2(1)$; (p)	(0.0001)	(0.0400)	(0.0068)

Notes: The estimated derivative is:

$$\frac{\partial \text{ACROR}}{\partial \text{DIROWN}} = 3\theta_1 \cdot \text{DIROWN}^2 + 2\theta_2 \cdot \text{DIROWN} + \theta_3$$

The roots and minimum value of this derivative are presented in the table.
$\theta_2^2 - 3\theta_1\theta_3 > 0$ guarantees that the derivative has two real roots, i.e. that its minimum value is negative. This is a non-linear restriction on the parameters and is tested using a non-linear Wald test.

significant (even in the case of the suspect OLS estimates). Further, the joint test of inclusion for all three polynomial DIROWN terms is easily passed in all cases. An ‘F’ test is used for the OLS and WLS estimates and a likelihood ratio test is employed in the case of the maximum likelihood estimates.

All these estimates are collected in Table 4. The solutions for the roots of Equation 3 and its minimum value are also presented here.[3] The minimum value is always negative as required. However, we need to test whether these negative values are statistically significant. This is done by noting that a sufficient condition for the minimum to be negative is

$$\theta_2^2 - 3\theta_1\theta_3 > 0 \qquad (4)$$

This is a non-linear restriction on the parameters. We test this restriction using a non-linear Wald test, which generates a χ^2 statistic with one degree of freedom. The results of this test are presented in Table 4 and indicate that the restriction is always statistically significant.

Examining the solutions for the roots of Equation 2 in Table 4, it may be seen that the estimated relation between managerial share holding and firm performance is non-monotonic. This is the case even though the H index and the Cubbin–Leech index are both used in estimation. Based on our above arguments, we emphasize the estimates using the Cubbin–Leech index. Amongst these, the WLS and maximum likelihood estimates, which make an explicit correction for heteroscedasticity, are to be preferred to the OLS estimates. Hence, it appears that the relation is positive for a managerial share holding between 0 and approximately 11%. It is then negative between approximately 11% and 25% (the entrenchment effect) and positive thereafter (the convergence effect).

IV. CONCLUDING REMARKS

We conducted this study to examine two questions, using data from the UK financial services industry. The first was to assess the suitability of ownership concentration as an explanatory factor for firm performance. The second was to estimate the relationship between managerial share holding and firm performance, and test whether it is non-monotonic, as has been reported in several US studies.

[3] Sufficient conditions for the relationship in Equation 2 to have two turning points, with a local maximum followed by a local minimum are: (a) $\theta_1 > 0$, $\theta_2 < 0$ and $\theta_3 > 0$; and (b) the minimum value of the derivative of Equation 3 is negative. It may be seen from Table 4, that all of our estimates satisfy these conditions.

We find that ownership concentration and the degree of shareholder control have radically different effects on firm performance. In particular, increased control vested with the large share holding groups appears to be positively related to performance. However, increased concentration seems to be inversely related to the same performance measure. This suggests that ownership concentration *per se* may be an incomplete measure in this context.

Secondly, we find strong evidence pointing to a non-monotonic relationship between managerial share holding and firm performance. This appears to support the theory suggesting the conflicting entrenchment and convergence effects of managerial share holding.

ACKNOWLEDGEMENTS

We should like to thank Chris Paul and an anonymous referee for comments which have substantially improved this paper. The usual disclaimer applies.

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