

DYNAMIC PANEL DATA ESTIMATIONS IN CORPORATE CONTROL SYSTEMS

J. Bonet Madurga * and **S. Gómez Ansón** **

* *Departamento de Ingeniería Eléctrica, Universidad de Oviedo, ETSIMO, c/ Independencia 13, 33004 Oviedo, Spain, jaime@isa.uniovi.es*

** *Departamento de Administración de Empresas y Contabilidad, Universidad de Oviedo, Campus del Cristo, 33071 Oviedo, Spain, sgomez@correo.uniovi.es*

Abstract: In this paper a dynamic model of the firm's corporate control structure and its influence on the firm's market value is presented. The model takes account of the influence of unobservable individual or firm effects and of the endogeneity of the firm's corporate control structure, when analyzing how a firm's monitoring mechanisms may influence managerial opportunistic behavior. The results suggest the dynamic behavior of firm's corporate control structures. *Copyright* © 2002 IFAC

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1. INTRODUCTION

The firm's corporate control has become an issue of considerable interest in the economic literature. It deals with the relations between the firm's different stakeholders and how these relations may influence the firm's main objective, i.e., the maximization of firm's value (Shleifer and Vishny, 1997). Two decades of theoretical and empirical research have achieved a greater knowledge on firm's corporate control and its influence on firm's efficiency. Nevertheless, there are still open questions. One of the problems that arises when doing empirical research in this line is the possible correlation among all the variables (Denis and Sarin, 1999; Himmelberg and Palia, 1999). This fact hinders the identification of cause and effect.

This paper aims to contribute to the analysis of firm's corporate control and its relation to the firm's market value. Corporate control is modeled applying dynamic panel data estimators. The results support the dynamic behavior of corporate control structures, the necessity to consider this aspect and individual or firm unobservable heterogeneity, when analyzing the relation

between managerial monitoring mechanisms and the maximization of shareholder's value.

The paper is organized as follows: In Section 2 the models and empirical evidence linking firms' corporate control characteristics and firm's market value are analyzed. Section 3 describes the methodology used, the sample and the variables employed to test the theoretical predictions. Section 4 examines the relation between a firm's corporate governance structure and its market value. Finally, Section 5 summarizes and concludes the paper.

2. THE FIRM'S CORPORATE CONTROL

A firm can be defined as a nexus of contracts between multiple parties whose interests may not converge. Among these parties, the economic literature identifies the shareholders, creditors, employees, suppliers of goods and services, clients of the firm, the government and the managers of the firm, figure 1.

In the financial and organizational literature, since the seminal work of Jensen and Meckling (1976), the

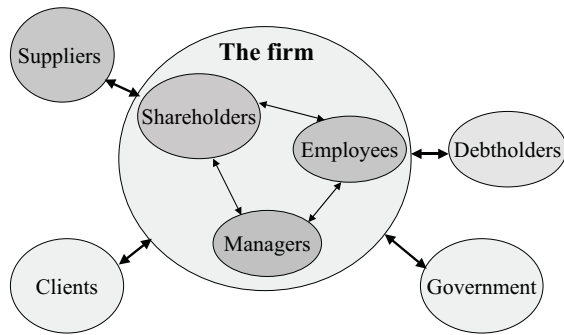


Fig. 1. The firm as a nexus of contracts.

contracts and relations among the parties shareholders and the managers have been studied in depth. In this sense, the firm can be viewed as a system in which the shareholders (the principal) delegate the task of managing the firm to the managers (the agent). The agent may not always pursue the principal's interests, which are to maximize the firm's value, consuming perquisites at the expense of the principal. In this case, an agency problem arises.

The agency theory stresses that different mechanisms may align managers' interests with those of the shareholders. Among these mechanisms are managerial ownership and manager's compensation systems. Managerial ownership may affect positively a firm's value, as it ties manager's wealth to that of shareholders. Nevertheless, managerial stock ownership may also allow managers to isolate themselves from the firm's control devices, i.e., the Board of Directors. Consequently, it is possible to establish a non-linear relation between the proportion of a firm's shares held by managers and its market value (Morck *et al.*, 1988). Managerial compensation systems based on incentives and stock plans may also reduce managerial opportunistic behavior as they tie managerial remuneration to firm value (Jensen and Murphy, 1990). Besides the above reported aligning mechanisms, other factors may reduce managerial consumption of perquisites. These monitoring mechanisms include internal mechanisms, such as the presence of large shareholders or the Board of Directors, and external mechanisms, such as the level of debt, the market for corporate control, the labor market and the market of products and services, figure 2.

Large shareholders are expected to monitor more closely managers' actions. For example, banks or institutional investors are expected to play a special role (Shleifer and Vishny, 1986). On the contrary, small shareholders will not monitor effectively manager's actions. Their stake in the firm is not high enough to assume the costs of monitoring and therefore a free-rider problem arises (Grossman and Hart, 1980). Shareholders delegate on the Board of Directors the task of controlling and disciplining managers. The Board of Directors represents an internal governance system, whose task is to control the possible diver-

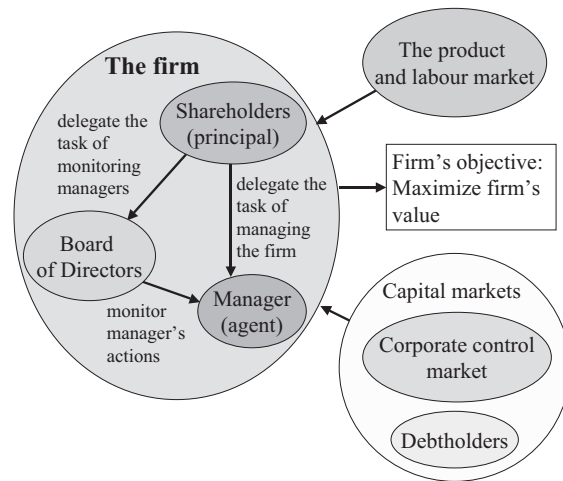


Fig. 2. Managerial aligning and monitoring mechanisms.

gences between the manager's and the shareholders' interests, and to discipline managers that incur in opportunistic behaviors. Thus, its efficiency is crucial for the firm. The empirical literature during the last decades has aimed to prove the efficiency of the Board of Directors in its monitoring role, as well as the factors that influence its efficiency. Different authors argue that the Board does not always act efficiently (Jensen, 1993). Among the factors that may influence its supervisory role are the proportion of outside directors (Weisbach, 1988) and its size (Yermack, 1996). These and other factors are stressed by the different Codes of Best Practices adopted around the World after the Cadbury Code of the U.K.

Debt is also expected to play a monitoring role on managers' opportunistic behavior. It commits the firm to pay out cash, reducing the level of cash flows that can be invested freely by managers in non-value maximizing projects. Debt also reduces the proportion of the firm's capital, allowing managers to hold a higher proportion of the firm's shares for a given personal money investment. Finally, external mechanisms, such as the market for corporate control or the product and labour market may also discipline managers, when the Board of Directors fails to be an active monitoring device (Shleifer and Vishny, 1997).

Therefore, the corporate control of a firm depends on all these aligning and monitoring mechanisms. Assuming that the firm's objective is to maximize its market value, the expected relations between the factors that reflect its corporate governance structure and its market value should be, according to agency theory models, as in table 1.

3. DEFINITION OF THE CORPORATE CONTROL MODEL

This study aims to analyze the relationship between the firm's corporate control structure and its market

Table 1. Factors affecting a firm's corporate control and their relation to firm's market value

Corporate control mechanism	Expected relation to firm's market value
Managerial ownership (linear specification)	+
Managerial compensation systems based on incentives	+
Large shareholders' presence	+
Banks as shareholders	+
Institutional investors	+
Proportion of outsiders in the Board of Directors	+
Board size	-
Debt level	+
Existence of an active corporate control market	+

value. That is, it tries to examine to what extent the different aligning and monitoring mechanisms reduce managerial opportunistic behavior, which is reflected in the firm's objective of maximizing its market value. In this sense, a corporate control model can be expressed as follows:

$$Y_{it} = \beta X_{it} + \varepsilon_{it} \quad (1)$$

where

Y_{it} is the firm's market value,

X_{it} is the vector of explanatory variables,

ε_{it} is the disturbance term,

β is the vector of parameter estimates,

subscript i is for an individual or a firm and

subscript t is for the year of observation.

3.1 Variables of the study

The dependent variable is the firm's market value, i.e., the market to book value of common equity, an approximation of Tobin's q ratio. The firm's market to book value of common equity adjusted to the firm's industry mean was also considered as the dependent variable, and the obtained estimates were similar as in the first case. The vector of explanatory variables include both corporate governance variables and control variables. These variables and their meaning are the following:

MB	market to book value of common equity
MAN	ownership held by firm's managers and their families
OWN	ownership held by the three largest shareholders
DBANKS	dummy variable that takes value 1 if a bank owns more than 5% of the firm's shares
DINST	dummy variable that takes value 1 if an institutional investor owns more than 5% of the firm's shares
BINS	proportion of insiders seated on the Board of Directors

Table 2. Summary statistics

Variab.	MIN	MEAN	MAX	Std. dev.
MB	0.001	1.403	8.266	1.168
MAN	0.000	3.919	48.486	8.801
OWN	0.000	52.414	99.990	27.183
BSIZE	1.000	10.586	36	5.289
BINS	0.000	0.366	1.000	0.201
DEBT	0.005	0.410	1.139	0.216
SIZE	558	107,389	1,913,865	217,452
RISK	-0.664	0.046	1.496	0.203

*** Significant at 1%, ** significant at 5%, * significant at 10%

BSIZE is expressed in absolute figures

SIZE is expressed in millions pesetas

BSIZE	logarithm of the number of Directors seated on the Board
DEBT	ratio of total debt to total assets
SIZE	logarithm of a firm's total assets
RISK	variability of the firm's operating income
DYEAR	dummy variables representing the year of the observation
DIND	dummy variables representing the firm's industry.

3.2 Database

The database used in this study is composed of all the firms listed in Madrid Stock Exchange during the period 1991-1997. Due to their differential aspects regarding governance structure and leverage, financial firms are excluded from the sample. The selection rule requires each company to be quoted at least four years over the period 1991-1997, and that the different variables employed present coherent signs. The final sample after applying these filters consists of 92 firms over eight years, with a total number of 593 observations.

3.3 Summary statistics

Table 2 shows the summary statistics of the variables employed in the study. Managerial ownership (MAN) presents a low figure, with only 4% as a mean of the firm's shares. Ownership concentration (OWN), on the contrary, is fairly high. It presents a mean value of more than 52% of the firm's shares. Although not shown, banks as large shareholders (DBANKS) are present in 36% of the observations, while institutional investors (DINST) are fairly rare, with only 3% of the observations. The proportion of inside directors amounts to 36%.

3.4 Estimation of the model using dynamic panel data

A panel data consists of a time-series observations of cross-sectional individuals. The use of the panel data methodology allows to overcome two fundamental econometric issues (Hsiao, 1996):

- (1) the possibility to control unobservable heterogeneity and
- (2) the possibility to model dynamic responses when using microdata.

The first issue refers to a key econometric problem that arises often in empirical studies. The consideration of the possible influence of unobservable individual's or firm's heterogeneity on the estimates of the model means that there may be some unobservable characteristics, not included in the model, that may be correlated with the explanatory variables. In that case, the explanatory variables may spuriously appear to determine the dependent variable and the estimates will be biased (Arellano and Bond, 1991). To overcome this problem, the model may be represented as follows:

$$Y_{it} = \beta \mathbf{X}_{it} + \mu_i + v_{it} \quad (2)$$

where

μ_i is the individual effect,
 v_{it} is the disturbance term.

If the explanatory variables are uncorrelated with the unobservable heterogeneity, then μ_i is a random unobservable variable independent of the vector of explanatory variables \mathbf{X}_{it} that becomes part of the disturbance term (random effects). Then OLS (ordinary least squares) estimates in levels of Y_{it} over \mathbf{X}_{it} are consistent, although GLS (generalized least squares) regressions result in a more efficient estimate than OLS (Arellano and Bond, 1991). On the contrary, when the unobservable heterogeneity μ_i is correlated with the vector of explanatory variables \mathbf{X}_{it} , OLS in levels estimates are not consistent and "within" estimates should be applied (fixed effects). Then μ_i can be treated as a group specific constant.

It is important to note that the level estimates and the "within" estimates may differ. If this is the case, unobservable heterogeneity exists that bias the estimates and "within" estimates should be applied. Another way to know whether "within" estimates should be applied is by means of some tests (Hausman, 1978).

The second problem that panel data allows to overcome is the possibility to model dynamic responses when using microdata. When estimating the corporate control model, a difficulty arises if the possibility of endogeneity of the regressors is considered, which does not allow to differentiate the cause and the effect. A possible solution could be to use instrumental variables for the independent variables, but identifying valid instruments is difficult in practice. The variables that may be used as instruments for the explanatory variables may also determine the dependent variable. Nevertheless, if the number of periods T is large enough, lagged endogenous variables may be employed as instruments. In this case, GMM (generalized method of moments) estimators allow the use of endogenous (and predetermined) variables as

estimates (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). It should also be noticed, that when there are no instrumental variables uncorrelated with the individual effects μ_i , the transformation must eliminate this term from the error term. One possibility is to use first difference transformations that eliminate the unobservable heterogeneity.

When applying the proposed corporate control model, first, the OLS estimates in levels are compared with the "within" estimates. Afterwards, using some of the explanatory variables as instruments, the dynamic model is estimated using first differences.

To test the significance of the estimated coefficients, the Wald test is applied. To test if the instruments used in the dynamic model estimation are valid, the Sargan test is used. Both tests follow a Chi square distribution.

Calculations are made using the DPD software package (DPD, 2001).

4. RESULTS

Table 3 presents the results of the estimates of the proposed corporate control model. All the estimated models are statistically significant according to the Wald tests.

As can be observed, the results are different for the OLS and for the "within" estimates (see column 1 and 2). For example, in the static model, the variable BSIZE is significant when estimating the model using OLS, but it does not turn out to be significant when the "within" estimates are considered. The same holds for variable RISK. On the contrary, variables DEBT and SIZE, which were not significant for the OLS model, turn out to be statistically significant for the fixed effects model. These results suggest that unobserved heterogeneity bias the estimates of the OLS model, and that variable μ_i should be treated as a constant. Similar conclusions are obtained when applying the Hausman's test to the static model.

Next, the corporate control dynamic model is estimated considering the possible endogeneity of the regressors. For that purpose, certain variables are considered endogenous: ownership structure variables and debt. GMM estimators are applied which allow the use of endogenous (and predetermined) variables as estimates. In order to eliminate μ_i from the error term, first difference transformations that eliminate the unobservable heterogeneity are employed (column 3). The estimates of the model turn out to be significant (see the Wald test). The Sargan test validates the restrictions for over-identification.

The obtained estimates are to some extent different to those for the static model (see columns 2 and 3). When considering a dynamic corporate control model, debt does not influence significantly the firm's market value. The only variables that influence significantly

Table 3. Estimation of the corporate control model

Variables	OLS	WITHIN	IV (1 st diff.)
MAN	0.004 (0.492)	0.016 (1.08)	-0.005 (-0.189)
OWN	-0.001 (-0.172)	0.004 (1.11)	0.009 (0.563)
DBANKS	0.372 (2.35) **	0.178 (1.69) *	0.185 (1.89)*
DINST	0.165 (0.669)	-0.158 (-0.732)	0.046 (0.385)
BSIZE	-0.315 (-1.89) *	-0.106 (-0.512)	-0.025 (-0.109)
BINS	0.084 (0.223)	-0.883 (-1.46)	-0.411 (-0.896)
DEBT	-0.196 (-0.490)	1.344 (3.19) ***	-0.129 (-0.055)
SIZE	0.102 (1.59)	-0.496 (-2.56) **	-0.745 (-2.64) ***
RISK	0.578 (2.43) **	0.162 (0.768)	-0.012 (-0.078)
DYEAR	YES	YES	YES
DIND	YES	NO	NO
Observations	593	593	497
Wald (joint) (p-value)	0.000 ***	0.001 ***	0.066 *
Wald (year) (p-value)	0.000 ***	0.000 ***	0.000 ***
Wald (dummy) (p-value)	0.000 ***	0.000 ***	0.000 ***
Sargan test (p-value)			0.276

*** Significant at 1%, ** Significant at 5%, * Significant at 10%.

firm's value are the presence of banks as large shareholders (significant at a 10% level) and firm's size. It was also checked that the presence of the state as large shareholder did not influence significantly firm's market value. The fact that Spain has witnessed an extensive privatization program during the 90's determined that the State was present as shareholder only for a small number of observations.

These results suggest that the proposed internal aligning and monitoring mechanisms, i.e. managerial shareholdings, ownership concentration, and the characteristics of the Board of Directors do not influence significantly the firm's market valuation. Debt, as an external monitoring mechanism, seems to be endogenously determined. Calculations have also been done considering the lagged valued of the firm's market value (one period lagged) as explanatory variable. The obtained results were similar, being the joint estimates of the model more significant.

Therefore, two different issues have arisen:

- (1) when studying the firm's corporate control structure and its relation to the firm's maximization of value, econometric studies should consider the influence of unobserved heterogeneity and of the endogeneity of the corporate governance variables.
- (2) A firm's corporate control structure may not only limit managerial behavior, therefore influencing the firm's value, but may also be a consequence of the firm's characteristics and may evolve over time. In this sense, the obtained results corroborates the work of Himmelberg and Palia (1999), that show the necessity to consider unobserved

heterogeneity when analyzing corporate control models. Other studies also support that ownership and Board of Directors' structure are not static, but dynamic, and that they evolve over time and depend on firm's characteristics (Denis and Sarin, 1999).

5. CONCLUSIONS

In this paper a model of the firm's corporate control and its influence on the firm's objective, i.e., the maximization of the firm's market value, is presented. The model is derived considering both internal and external monitoring mechanisms of managerial opportunistic behavior. Monitoring mechanisms established by the firm include managerial ownership, the presence of large shareholders and the characteristics of the Board of Directors, i.e. the proportion of inside directors and Board size. External mechanisms include those related to the capital markets, such as debt, and the product and labour markets.

The relationship between these internal and external mechanisms with managerial opportunistic behavior and its consumption of perquisites is estimated using a dynamic panel data model. This model takes account of unobservable heterogeneity and of the possible endogeneity of the regressors. The results of the study show the necessity to consider these aspects in the analysis of the firm's corporate governance system. Most of the different internal mechanisms do not seem to play an important role nor to influence firm's value significantly, once unobserved heterogeneity and possible endogeneity of the regressors are taken into ac-

count. These results contribute to the open debate about the efficiency of the public corporation and its monitoring mechanisms in a situation of separation of ownership and control.

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