CORPORATE OWNERSHIP AND TECHNICAL EFICIENCY ANALYSIS IN THE SPANISH REAL ESTATE SECTOR

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Abstract

The real estate sector keeps contributing significantly to the Spanish economy. A recent news article reports the existence of inefficiencies in the nature and delivery of new properties. We investigate the technical efficiency of this sector using a non-parametric "reasonable" benchmarking frontier, acknowledging the marked influence of the sector's shadow economy. We then relate the results applying a panel data analysis to the shareholding concentration and identity of firm ownership. We find no systematic support for the effect of corporate ownership on technical efficiency.

Keywords: Corporate Ownership; Data Envelopment Analysis

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Introduction

The twin motors of tourism and construction have been argued to be current driving contributors of the Spanish economic engine. In recent years, Spain has recorded more new houses than in France, Germany and Italy combined, with a result that 20% of all houses in Spain have been built within a decade. The increasing demand for both domestic and foreign buyers has led to speculations that this property market boom will not crash soon. This has also led to significant increases in purchasing and rental properties. The low interest rates and significant lowering of unemployment rates are some factors for the increased demand.

Research on the real estate sector has mostly focused on the demand side with little importance given to the internal processes of product supplying firms to meet this ever-increasing demand. According to a recent report (Stucklin, 2004), a sample of 82 properties in Valencia, Madrid and Barcelona that had recently been constructed revealed that more than half of these had either being delivered late or with construction faults. Because of the dynamic nature of this sector, illegal workers mostly without appropriate skills tend to be employed.

Poor finishes and workmanship seem to be the worst complaints of clients. There is therefore the need for firms in this sector to analyse their productive processes in order to be more efficient with their outputs, as increasing the efficiency of an organisation is also a desired output when enhancing product delivery. Firms with more efficient productive processes are seen to be more associated with profitable outputs than inefficient counterparts.

The construction industry of which the real estate sector is a very important part is the most dynamic of the basic sectors in terms of job creation and activity. The contribution of the construction sector as a percentage of total gross value added in 2000 was 8.5% as opposed to 5.3% for the EU-15 average. It employs 11% of the working population but three-quarters of this are workers hired on a temporary basis. Because of the temporary nature, illegal employment (shadow economy) continues to thrive although since 2001, the law imposes heavy penalties against companies employing illegal labour. From the government side too, corruption and time wastage continue to thrive when acquiring land for new properties. There are irregular sales of properties in a bid to avoid company taxation that serves to fuel the shadow economy as well.

In terms of the labour force in Spain, even the indigenous youth still hover between a "fixed term, precarious job; the shadow economy; and, now increasingly, a stable job" (Chislett, 2002: 39). Spain can boast of the third largest shadow economy after Greece and Italy fuelled on by the increased tax and social security contributions putting its size at about 22.5% of GDP. In the real estate sector, house prices increased in 2001 because of the flushing of "black" money due to the single EU currency switch pushing it up to 11.4% in real terms. Between 1980 and 2001, the real price increase was 124% compared to a 19% global index. 86% of Spanish households own a house as compared to 61% of the EU average (Chislett, 2002).

Despite the drain in this sector's shadow economy it still contributes significantly to the main economy. When a sector experiences a boom, it attracts new investors. Other existing investors would like to purchase more shares to be able to control the performance of the firm. Therefore, the ownership structure in this sector is also worth investigating. Studies on ownership structure, usually analysed in an agency theoretical framework, have usually been carried out as to the effect of insider ownership or ownership concentration on performance. Although, several studies report the positive (but sometimes non-monotonic) effect of insider ownership on performance, the literature on ownership concentration has seen conflicting results as to its effect. Very few studies have looked at the effect of ownership identity on performance.

In the Spanish real estate sector, the variables that are used to determine performance need to be examined for all the firms and those that serve as influential outliers removed before any statistical inferences can be deduced as a way of reducing the impact of the illegal employment in this sector. An outlier is an atypical observation in that its movement is out of pattern with other observations in dataset analysis. Most nonparametric models for determining productive efficiency do not distinguish between influential and non-influential outliers.

The rest of the paper is organised as follows: in the next section, the theoretical background and state-of-the art in corporate ownership is discussed to examine the problems to be analysed followed by an explanation of technical efficiency achieved through data envelopment analysis, our proxy for firm performance. The data is then defined and variables selected. After getting the technical efficiency scores using the reasonable frontier approach which is explained prior to its application, we perform a panel regression analysis, present the results with discussions and conclude within the limitations of the paper.

Background Literature

Ownership Structure

Corporate ownership refers to residual claimants of a firm. The fewer owners a firm has, the more concentrated the shares. Shleifer and Vishny (1986) find large shareholders to increase firm performance. Ownership concentration is the share of the largest owner (Pedersen and Thomsen, 1999). Contrary to the classical publication by Berle and Means (1932) about dispersed ownership in the public corporation, empirical findings over the past twenty years point to the issue of concentrated ownership (see for example Shleifer and Vishny, 1986; Holderness and Sheehan, 1988; Morck, Shleifer and Vishny, 1988; La Porta, Lopez-de-Silanes and Shleifer, 1999).

The theoretical argument by Demsetz (1983) that ownership concentration was endogenous to the owner's risk propensity and the benefits obtained from monitoring managers has sparked an interesting debate. Demsetz and Lehn (1985) having controlled for some variables did not find a significant relationship between ownership and accounting profitability. Still treating ownership as an endogenous variable but multi-dimensional, Demsetz and Villalonga (2001) found no statistically significant relationship between ownership structure and corporate performance. Thereby in their view, whether the ownership is dispersed or concentrated does not matter. This result was also reported in Pedersen and Thomsen's (1999) multi-national European survey testing a model initially developed using U.S. data. Cho (1998) applies ordinary least squares (OLS) regression where ownership structure affects investment and consequently corporate value. But, in applying simultaneous regression, the endogenous nature of ownership comes into play. Corporate value is seen to affect ownership structure while ownership structure has no effect on corporate value, in support of Demsetz and Lehn (1985). Morck, Shleifer and Vishny (1988) however argue that Demsetz and Lehn's (1985) inability to find a significant relationship between ownership concentration and performance may be due to their use of a linear specification, which failed to capture any non-linear relationship. Leech and Leahy (1991) however report significant results using a linear specification of ownership concentration. In other studies, Gorriz and Fumas (1996 & 2005), and Lee (2004) look at the effect of family ownership and management on firm performance. Short, Keasey and Duxbury (2002) argue that large external shareholders have incentives to monitor and curb the self-serving behaviour of managers because of their economic interests. These monitoring and curbing costs all generate costs of agency. The nature of agency cost-reducing mechanisms in terms of being complementary or substitutable as regards to shareholder/managerial equity and debt is still a subject of academic debate. Dispersed ownership is still of significance for very obvious financial reasons. Firms with funds acquired through dispersed ownership can assume larger scale operations, even diversify and thus make use of scale and scope economies. Lauterbach and Vaninsky (1999: 189) suggest it "facilitates complex-operations allowing the most skilled or expert managers to control the business […..] even when they do not have enough funds to own the firm." This leads diversified ownership firms to compensate for agency costs with improved efficiency and profitability. These developments discussed above have led to inconclusive results that either support or do not support the ownership concentration-economic performance relationship. Perdersen and

Thomsen (1999) and Gedajlovic and Shapiro (1998) have attributed this development to "system effects". Stock market data however continue to lend support to the positive association between ownership concentration and performance (Leech & Leahy, 1991; Zeckhauser & Pound, 1990; McConnell & Servaes, 1990, 1995; Smith, 1996; Short, Keasey & Duxbury, 2002). Highly concentrated ownership can however generate operational inefficiencies when these owners are interested in short term gains rather than long term profit maximisation. This is because they may encourage managers to engage in risky short- term strategies not aimed at cost maximisation (Kohler, 1990). Large controlling shareholders may collude with managers to siphon resources from small shareholders (Short, 1994). The exercise of control to expropriate firm value, at the detriment of minority shareholders, has been referred to as the expropriation hypothesis (Lange and Sharpe, 1995).

Ownership Identity

A controlling shareholder or ultimate owner is regarded as having more than 20% direct and indirect voting rights (La Porta, Lopez-de-Silanes and Shleifer, 1999). Applying this cut-off point to their empirical survey on medium-sized publicly traded firms in Spain, only family, State, and widely-held institutions /corporations are ultimate owners in Spain. Widely-held financial and miscellaneous ultimate owners are under 1%.[1] Cross-shareholdings and pyramids are not frequent in their study, a viewpoint supported by Gorriz and Fumas (2005). While empirical studies lend support to the managerial hypothesis that owner controlled firm have higher profitability than manager controlled firms, these results have often been highly statistically insignificant (Short, 1994). Her surveys (1994: 208-215) covers studies where in some cases manager controlled firms outperform owner controlled firms. With this as a factor, controlling for insider ownership is not expected to have any effects on ownership identity/ concentration and performance (Cho, 1998). Thomsen and Pedersen (2000) argue that the identity of the owners has objective performance implications through how they exercise their franchises. The categories of ownership identity are discussed below:

Institutional Ownership

With institutional ownership (for example insurance companies and pension funds), firms tend to have a long-term planning horizon, adequate financial outlays and a low aversion towards risk (Thomsen and Pedersen, 2000). They also tend not to interfere too much with the daily management of the firm as characterised by their arms-length relationship (Sarkar and Sarkar, 2000). They pursue firms that share similar goals and objectives (Li and Simerly, 1998). Mostly however, they have minority shares in companies that do not encourage them to monitor managerial discretion. But for a given shareholding value, McConnell and Servaes (1990, 1995) and Smith (1996) have argued that they tend to have a performance impact.

The empirical results from studies on the effect of institutional ownership on firm performance are very mixed. Goergen, Renneboog and Correia da Silva (2005), Hellwig (1998), and Morck, Nakamura and Shivdasani (2000) find a negative relationship. Boehmer (2000) and Gorton and Schmid (2000) find a positive relationship. Prowse (1992) and Zoido (1998) find no systematic relationships which leaves the subject still open to empirical debate.

Family/personal ownership

Family ownership has similar characteristics to owner-managed firms in that they tend to have a disproportionate share of their wealth invested in the company. They tend to be risk-averse and suffer from capital rationing. Nickel, Nikolitsas and Dryden (1997) find no relationship of family ownership on productivity. This category is however argued to have the best positive influence on firm performance from the agency theoretical framework.

Bank ownership

Several studies group banks with institutional ownership. In Spain, banks especially savings banks play a key role in firm ownership. It is worthy to note that saving banks have no shareholders to restrict their interest in becoming shareholders in other firms. When banks are part owners of a firm, they can internalise financial relationships. These firms are therefore less likely to be credit rationed by their banks (Ramirez, 1995) and hence bank-owned firms have the necessary capital to improve productivity (Cable, 1985).

Corporate/ industrial company ownership

Corporate ownership is when other firms are also shareholders in other firms. Specific assets (Williamson, 1985) lead to related firms acquiring shares in a company so as to be able to monitor managerial discretion. Kester (1992) however argues that there could be a significant loss of flexibility as well as the risk of inadequate mutual monitoring. Aside from financial capital outlays, this ownership form also facilitates knowledge transfer (Thomsen and Pedersen, 2000).

[1] This is even the case when applying a 10% cut-off measure (The authors employed data from 1995).

Government ownership

Hart, Shleifer and Vishny (1997) suggest they are more interested in welfare economics like low prices for outputs, higher employment goals and other objectives that drain profitability. In terms of financial profitability, government-owned firms are argued to be the worst performers. Government ownership however leads to increased financial capital "in terms of credit, liquidity, or costs of capital" (Thomsen and Pedersen, 2000 :694).

In another study, Thomsen and Pedersen (1996: 153; 1998: 388-390) identify six classes of ownership based on the identity and share of the largest owner and the type of ownership contract. Table 1 shows the different classifications according to these researchers. This classification has also been used by Leech and Leahy (1991).

La Porta, Lopez-de-Silanes and Shleifer, (1999: 476) also classify ownership by voting rights with firms that are widely held or have ultimate owners. They have come up with five types of ultimate owners which are: a family or an individual, the State, a widely held financial institution such as a bank or an insurance company, a widely held corporation, and miscellaneous which include cooperatives, voting trust or a group with no single controlling investor.

Studies on Ownership in Spain

Martínez and Giné's (2005) empirical study of shareholders in Spain show that 80% of firms have the largest shareholder usually commanding 69% of the shares, while the second largest commands 12%. Therefore only the largest two shareholders have reasonable control of the firm. Demsetz and Villalonga (2001) have however argued the importance of the first five largest shareholders in their U.S. study. This is thus applicable in a different institutional regime.

Martínez and Giné (2005) also find a significant number of the largest shareholders being families and individuals. For financial institutions as shareholders, they report only 2% in their sample and 5% as second largest shareholders. They however admit that 42% of the firms in their sample are small firms. What they conclude is that financial institutions are keen on having controlling shares in their target firms as in 70% of the cases; where the first 10 largest shareholders are considered, they are either the largest or second largest.

La Porta, Lopez-de-Silanes and Shleifer (1999) in their global empirical study also find that, in Spanish firms, the probability of control by a single shareholder in a family firm, State, and widely-held financial firms are all 1.0 while widely-held corporation is 0.5. Górriz and Fumas (2005) using listed Spanish firms discuss the highly concentrated ownership even among very large listed firms (see also Crespi & Garcia-Gestona, 2001; Górriz & Fumas, 1996). They highlight the importance of the institutional environment in shaping ownership and performance. Table 2 is a sample of some studies in ownership.

Inference from Literature Review

Based on the literature on corporate ownership as discussed above, two key issues that need to be investigated further are the concentration and identity of ownership. Studies on ownership concentration employing stock market and profitability measures as performance proxies have been seen to have a positive impact on performance. Other studies have shown a negative or no relationship but most of the studies have revealed this positive (but sometimes non-monotonic) relationship.

We expect to follow that trend; *the more concentrated the ownership, the better the firm's performance*.

Following an agency theoretical perspective and extending it to the relationship that exists between the identity of the owner(s) and the external manager, family and individual firm owners usually with a lot of personal financial commitment would find better ways of aligning their interests to that of managers and by so doing seek to increase the performance of their ventures.

We thus expect individual/family-owned to have the most positive influence on performance followed by firms owned by industrial companies, while State-owned firms will be the worst performers.

Performance and Control Variables

For our proxy of performance, we adopt technical efficiency computed through data envelopment analysis (DEA).

The concept of DEA is explained after reviewing the usual proxies used to measure performance on ownership studies. A shortcoming of most of the papers on ownership and performance is the use of financial performance mostly stock valuation data. Lee (2004) argues that they are indirect measures of firm productivity.

Short (1994) argues that ownership concentration does not necessarily lead to control and that debt holders play an important role. Hence it is necessary to control for a firm's financial structure.

Most studies control for firm financial risk with gearing ratios. The most commonly used is the debt-to-equity ratio. Gearing is a measure of financial leverage, demonstrating the degree to which a firm's activities are funded by owner's funds versus

creditor's funds. Firm leverage and liquidity are used to control for firm's financial structure.

Leverage is measured as the ratio of the aggregate of short-term and long-term debt to net worth. Liquidity is defined as the ratio of working capital to total assets.

Anderson and Reeb (2003) use the ratio of long-term debt to total assets as leverage. Dimelis and Louri (2002) controls for financial structure with leverage and liquidity while equating performance as return on assets (ROA) divided by total assets.

Data Envelopment Analysis

DEA compares decision-making units (DMUs) that use the same inputs to generate outputs to get the relative (technical) efficiency measures of individual DMUs.

Technical efficiency is when a firm uses minimum input(s) to have maximum output(s). DEA uses a mathematical programme to estimate the efficiency frontier. It does not need a pre-specification of the production function coefficients. DEA models thus construct a non-parametric frontier over data points so that observations may lie below the frontiers (Charnes, Cooper & Rhodes, 1978; Färe, Grosskopf & Lovell, 1994; Thiele & Brodersen, 1999).

Unlike parametric approaches, DEA makes no assumption of the distribution of the underlying data, and all deviations are assumed to be due to inefficiency (Banker et al., 1989).

For our analysis, we adopt an input-oriented radial measure where $A = \{(x, y)| x \text{ can produce } y\}$ under free disposability, convexity and variable returns to scale technology.

The relationship between agency theory and DEA

Some authors such as Bogetoft (1994, 1995) and Agrell, Bogetoft and Tind (2002) have modelled a relationship between DEA and agency theory by assuming that the best production function of a firm is not certain a priori, although the production possibility set is known.

DEA is therefore a useful tool of solving this problem based on firms that use a similar production function to minimise the extent of uncertainties.

Data Analysis

Data Selection, DEA Input and Output Specifications

The sample we employ in the analysis is selected from the SABI database which is managed by Bureau Van Dijk. The Activity NACE Rev. 1.1 Code 7011 (4 digits) involves firms engaged in the development and selling of real estate. There are 63,329 firms with 56,474 currently active. Restrictive criteria that involve firms employing between 30 and 50,000 people and formed between 1900 and 1996 (2005 data) have been used in selecting private firms. Firms that lack data on selected variables for at least one year are eliminated leading to 530 firms for further analysis. We then checked the input and output variables for data usefulness, concentrating on dropping out firms with very low employee costs, material costs and operating turnover (the first stage of potential outlier detection process) resulting in 486 firms for benchmarking frontier analysis.

The total number of the final unbalanced panel for the technical efficiency analysis is 346 (1998), 360 (2000) and 391 (2002). Data has been taken for the 1998 to 2003 period but the years 1998, 2000 and 2002 are utilised because of the iterative nature of the analysis. The variables selected from unconsolidated accounts (in thousands of Euros) are; fixed assets, material costs, employee costs and other costs as inputs, and operating turnover as an output. These are shown in table 3. Due to the effect of the shadow economy on accounting data, we use cost of employees rather than number of employees as an output variable. One reason for this is because most of the employment in this sector is temporary making the number of employees unsuitable. The effect of the shadow economy is also reflected in some extremely low employee costs for some firms. These firms together with those with very low material costs and operating turnovers have been omitted from the sample even before running frontier analyses since they serve to be potential outliers. This serves to limit the effect of the shadow economy on data input as well as sub-normal firm conditions.

DEA Results and the Use of a Reasonable Frontier

Outlier detection with technical efficiency scores has been investigated (see Wilson, 1995 for a comprehensive analysis and Simar, 2003). We perform Andersen-Petersen (Andersen & Petersen, 1993) super-efficiency tests for the period to rank efficient units and detect outliers. These outliers may be either influential or non-influential. To determine which outliers are non-influential so that we keep them in the sample, we perform a systematic super-efficiency test beginning with the outlier with the biggest score. In this case, we omit that DMU and perform another Andersen-Petersen super-efficiency test. We iteratively repeat the procedure for all outliers. We then run *Wilcoxon's matched pairs signed-ranked* tests on the results with and without the reference outliers. This is because we do not make assumptions on the efficiency distribution. The

Wilcoxon test *z* checks for the same median in two probability distributions as shown below.

$$z = \frac{K_{+} - \frac{n.(n+1)}{4}}{\sqrt{\frac{n \cdot (n+1) \cdot (2n+1)}{24}}}$$

where *n* is the number of *DMUs* under investigation, K_+ is the lower of two values given as the sum of positive ranks or sum of negative ranks If the differences in means are significantly different , we remove those outliers. We keep the outliers that have statistically insignificant differences in means. As can be seen in table 4, three more outliers are influential in 1998 while four are influential in 2000 and 2002 (when compared to that achieved using the procedure proposed by Wilson, 1995). We then perform a normal technical efficiency test in VRS technology to achieve our reasonable contemporaneous frontiers. The concept of a reasonable frontier has already been applied by Prior and Surroca (2004) where the theoretical explanation and its comparison to Wilson's (1995) procedure has been given in detail.

In applying this reasonable frontier, we solve for two problems usually encountered with DEA models; the presence of a firm whose performance cannot be matched and a firm whose presence masks the performance of others.

Variables and Measures

The pure technical efficiency values, European ratios, and ownership for 1998, 2000 and 2002 are applied in the analysis. These are:

- Pure technical efficiency measure – VRS (performance measure)
- Liquidity ratio – Liquidity (controls for financial structure)
- Gearing ratio – Gearing (controls for financial structure)
- Independence indicator (A, B, C and U) – Ownership concentration
- Identity of ultimate firm owner – Ownership identity
- Date of establishment of the firm – Age (controls for firm size)
- Natural logarithm of total assets – Control for firm size

We are unable to control for insider ownership due to the use of a database that does not include this. In any case, Cho (1998) found no significant impact of insider ownership on ownership structure and performance relationship. Tables 5 and 6 describe statistics of the quantitative and qualitative variables used. The pure technical efficiency score is used as a proxy for performance. We use gearing ratio (debt-to-equity ratio and indicating a firm's leverage) and liquidity ratio (liquidity) to control for a firm's financial structure. Firm age and the natural logarithm of total assets are used to control for firm size. The variables that are related to ownership structure is the independence indicator. The ownership identity is measured by shareholder type. With this, we have as an ultimate owner: individual or family shareholders, an industrial company or a State or public organisation. For banks, a financial companies (investment companies, insurance companies, mutual and pension funds, trusts, and trustees), foundations or research institutions, the database has very few of these types necessitating their omission from the analysis as already observed in other studies in Spain. About half of the firms in the sample do not provide information on the identity of the ultimate owner. As regards to independence indicator, we use the measure applied by Bureau Van Dijk where A^+, *A* and A^- are denoted by *A* and imply no shareholder has more than 24.9% direct or total ownership. B^+, *B* and B^- are denoted by *B* and imply a shareholder has more than 24.9% but not more than 49.9% direct or total ownership. *C* implies a shareholder has more than 49.9% direct or total ownership. *U* is the situation where there is an unknown degree of independence.

Ownership Analysis and Results

Because DEA provides comparison to extreme as opposed to average observations, there is no assumption of normal distribution necessitating the use of regression techniques that are not based on this assumption. It is also very important to remove influential outliers from the sample since these observations serve as wrong yardsticks.

A Tobit regression analysis (for panel dataset) is used with technical efficiency (VRS) scores obtained through the reasonable frontier approach as a dependent variable to test the effect of *ownership concentration* and *identity* on *performance*.

We perform the regression in stages, by introducing each of the independent variables with the control variables and checking for the magnitude and sign of coefficients. We then perform a multivariate regression with both independent and control variables. The regression results are presented in table 7.

Table 1. Ownership classification

Dispersed ownership	No single owner owns more than 20% of the firm's shares
Dominant ownership	One person/family/firm owns a sizeable share between 20% to 50% of the firm
Personal/family ownership	One person/family owns a majority of the company
Government ownership	Government owns a majority of the company
Foreign ownership	Foreign firm owns a majority of the company
Cooperatives	The firm is registered as a cooperative or owned by a group of cooperatives

Source: Adapted from Thomsen and Pedersen (1996: 153).

Table 3. Descriptive statistics for DEA variables in 1000s of Euros

Variables	Minimum	Maximum	Mean	Standard deviation
Year = 1998: N = 346				
Operating turnover	87.38	108360	7991.19	12516.72
Fixed assets	1.70	469369.6	6848.71	29603.04
Other costs	24.16	31476.04	2114.58	3274.50
Material cost	11.35	70537	4919.97	8586.78
Employee cost	17.33	11392.07	1005.56	1385.29
Year = 2000: N = 360				
Operating turnover	100.06	236365	10232.31	17967.35
Fixed assets	16.74	615364.5	8063.47	35985.56
Other costs	59.54	33834.9	2641.47	3595.91
Material cost	8.96	150979	6054.58	12042.46
Employee cost	18.03	11755.02	1268.99	1570.35
Year = 2002: N = 391				
Operating turnover	239.03	363731	15145.63	27020.06
Fixed assets	2.507	646992.7	10873.91	39187.11
Other costs	24.54	43190.68	3684.832	5141.86
Material cost	8.604	256866	9187.46	19111.16
Employee cost	9.38	16588.62	1660.26	1982.74

Table 4. Wilcoxon tests with Andersen-Petersen super-efficient units with and without ranked reference outliers

1998		2000		2002	
DMU	*Z*	*DMU*	*Z*	*DMU*	*Z*
F236	-3.22***	F39	-5.21***	F70	-3.08***
F334	-3.51***	F183	-10.02**	F114	-1.68*
F340	-2.79***	F208	-1.99**	F274	-9.67***
		F351	-2.15**	F352	-2.43***
5 2outliers; 3 more influential		*36 outliers; 4 more influential*		*35 outliers; 4 more influential*	

*|**|*** => significant at 10%| 5%| 1% levels respectively. This test is carried out based on the assumption that the DEA efficiency is a random variable with a statistical distribution function. The reasonable frontier identifies non-influential outliers which are maintained in the sample for VRS efficiency analysis. We identify more influential outliers than with the procedure proposed by Wilson (1995).

Table 5. Descriptive statistics of variables used in analysis

Variable	N	Minimum	Maximum	Mean	Standard deviation
Year = 1998					
Technical efficiency	297	0.3022	1	0.84	0.14
Firm age	530	2	57	12	9.22
Total assets*	472	2.76	1126910	20766.64	73845.11
Liquidity ratio	466	0	3902	10.84	181.18
Gearing ratio	412	-819.29	994.95	123.19	221.53
Year = 2000					
Technical efficiency	329	0.123	1	0.61	0.23
Firm age	530	4	59	14	9.22
Total assets*	483	3.005	1644346	26785.63	93799.69
Liquidity ratio	477	0	141.07	1.91	8,69
Gearing ratio	437	-640.74	981.29	126.85	215.41
Year = 2002					
Technical efficiency	362	0.056	1	0.62	0.21
Firm age	530	6	61	16	9.22
Total assets*	505	23.1	1051358	33045.45	78191.05
Liquidity ratio	502	0.004	626.42	3.92	34.87
Gearing ratio	465	-855.03	962.63	130.76	198.12

* Total assets is in thousand of Euros

Table 6. Statistics of qualitative variables

Ownership type	N	Independence indicator	N
Individual/family firm	90	A	25
Industrial company	101	B	49
State or public entity	7	C	181
Others*	7	U	275

* Others includes banks, financial and insurance firms, and foundations
A denotes no shareholder has more than 24.9% of total shares
B denotes ultimate shareholder has between 25% and 49.9% of total shares
C denotes ultimate owner has 50% or more shares
U denotes an unknown degree of independence

Table 7. The relationships between technical efficiency vs. ownership concentration and identity

M1: Ownership concentration and identity		M2: Ownership identity		M3: Ownership concentration	
Tech efficiency	Coef.	Tech efficiency	Coef.	Tech efficiency	Coef.
Individual/Family	-0.2639**	Individual/Family	-0.2516**	A	-0.0265*
Industrial Co.	-0.1668	Industrial Co	-0.1628	B	-0.0265
State	-0.3173	State	-0.2961	C	0.0667***
A	-0.4677	Ln Total Assets	-0.0245**	Ln Total Assets	-0.0337***
B	-0.1354	Liquidity	0.0093**	Liquidity	0.0126***
C	-0.0584	Gearing	-0.0002***	Gearing	-0.00002
Ln Total Assets	-0.0242**	Constant	1.3062***	Constant	1.1095***
Liquidity	-0.0095**				
Gearing	-0.0002**				
Constant	1.382***				
Prob > chi2	*0.0005*	Prob > chi2	0.0006	Prob > chi2	0.0000

*| **| *** => *significant at the 10%, 5% and 1% levels*

Ownership Identity

To test for the effect of ownership identity on performance, we create dummies for individual/family firm owners, firms with ultimate owners as industrial companies and State-owned firms. The agency view argues that individual/family firm owners should perform better than those owned by industrial companies while State-owned companies will be the least performers. Controlling for firm financial structure and size, the regression model M2 (table 7 above) gives negative values for the variables used apart from liquidity which has a positive sign. Total assets, liquidity and a firm's gearing as expected are all significant with coefficient magnitudes of 0.0245, 0.0093 and 0.0002 respectively. Only individual/family owned firms systematically affects technical efficiency, although in a negative way. In the sample used however, industrial companies seem to have the least negative influence while State-run firms negatively affect technical efficiency the most.

Ownership Concentration

Similar to the analysis of ownership identity, we create dummy variables for the ownership concentration variable as seen in model M3 (table 7 above). From the agency theoretical perspective, the more concentrated the ownership, the lesser the agency costs and hence better firm's performance. To this extent, the coefficient of *C* should be lower than that of *B*, and *A* should be the least. We find partial support for this as the coefficient of *C* is positive and significant. *A* is negative and significant while *B* is negative and not significant. The effect of the control variables are the same as in ownership identity.

Corporate Structure

In model M1 (table 7 above), we run a multivariate regression with both independent variables with the control variables for financial structure and size. All the coefficients in this case are negative. Of the two independent variables, only individual/family owned firms have a systematic negative effect. Industrial firms have a better effect on technical efficiency than individuals though the effect is not systematic. State-run firms have the least influence albeit, unsystematically. Looking at the statistically insignificant coefficients of ownership concentration, *C* has the best influence on technical efficiency, followed by *B* and *A* as hypothesised.

Discussion

The technical efficiency results in table 5 indicate an average of 69% technical efficiency over the period but under contemporaneous frontier considerations. Reductions in these inefficiencies can lead to significant improvements in outputs reflecting in improved profitability since technical efficiency is argued to be positively associated with performance. The reasonable frontier helps identify firms whose productive efficiency can distort the frontier with which other firms can be compared to. Detecting and

removing these outliers that do not fit in the pattern (or are atypical) of the remaining observations make DEA efficiency scores more reliable.

In the 1998 contemporaneous reasonable frontier, the average technical efficiency of the firms was highest at 84%, declining to 61% in 2000 and a marginal increase in 2002 at 62% (and increasing just below 80% in 2003, although results for this year is not reported in this paper). During this period where firms experienced reductions in technical efficiency, profitability also increased due to an increasing demand for new properties, due in part to the freeing of "black" money because of a monetary currency switch. The real estate market was booming in this period so as long as firms became increasingly profitable due to demand factors, productive efficiency was not taken seriously. Firms in the real estate sector can become more profitable by becoming more technically efficient by up to a potential average of 31%.

The effect of ownership structure on performance as regards to ownership concentration measured by the independence indicator has not been fully supported and thus cannot be statistically generalised. Kohler (1990), Lange and Sharpe (1995) and Short (1994) have all given their perspectives as to why concentrated ownership might fail to give the expected results. The Tobit regression model yields both significant and insignificant differences (as observed also by Prowse, 1992 and Zoido, 1998) contributing to the debate on the mixed effect of ownership structure on performance.

As already pointed out earlier in the literature review, most studies that have had a positive association between ownership concentration and performance relate to stock market data (Leech & Leahy, 1991; Zeckhauser & Pound, 1990; McConnell & Servaes, 1995; Smith, 1996). Lauterbach and Vaninsky (1999) in their use of both profitability and DEA proxies of firm performance gave similar results in ownership evaluations.

The hypothesis on the effect of ownership identity is not supported. Although not statistically significant, the regression models M1 and M2 put firms with industrial companies as ultimate owners to have better technical efficiency than individual/family owned firms. The State-owned firms are seen as the worst performers.

This statistically insignificant result is not too surprising, given the mixed outcomes of studies on this subject. The effect of individual/family owned firms and those owned by industrial companies is worth investigating though as some non-parametric Kruskal-Wallis tests (not reported here) yielded similar results of the latter being more technically efficient, but then of course this study is only limited to the real estate industry in Spain and a significant number of firms do not report their ownership identity in the database employed.

Conclusion

The reasonable frontier approach has been useful in ameliorating two of the problems usually encountered with DEA models; the presence of firms whose performance cannot be matched and firms whose presence mask the performance of others. In this case, only firms in the real estate sector whose patterns follow a general trend are used in computing the frontier and thus a useful benchmark for inefficient firms.

The general observation has been that firms in the real estate sector are only 69% efficient in their productive efficiency. However, there has been a downward trend in technical efficiency recorded from 1998 to 2002 attributable to the increasing demand for new property. State-owned firms have been observed to be the most inefficient while companies with industrial companies as ultimate shareholders tend to be more productively efficient than individuals/families-owned firms although only at the sample level. It goes to buttress the now increasing literature on the endogenous nature of ownership structure and the consideration of more sophisticated techniques and more managerial variables to achieve practical outcomes.

The ownership concentration is seen to affect the technical efficiency when this is considered alone but in the presence of ownership identity too, this assertion becomes statistically insignificant necessitating the concomitant analysis of these and other variables rather than carrying out individual research.

As a final remark, of implication to policy is the 31% technical inefficiency that exists in the real estate sector. The reports of poor workmanship and finishes as well as delays in delivery of finished products can be traced in part to these inefficiencies and the demand for new property. As a major driver in the Spanish economic progress in recent times, firms in this sector when made aware of the levels of technical inefficiencies (and recommendations given for practice) will give shareholders the right value for their investments.

Limitations

We do not distinguish between individual and family owned firms that have an insider or outsider manager because of data limitations. We also assume from the agency theoretical framework that a single owner is able to align his interests with the manager more than several owners because of the increased costs due to opportunism. Then also, the use of a panel censored regression limits the use of more sophisticated models that have been applied in examining the ownership-performance relationship. The use of a database also denies the use of some managerial variables that could be used in the DEA

specifications or as control variables in the regression analysis to adequately control for ownership structure, and the effects of the shadow economy. We have only used *contemporaneous* frontiers and thus can only comment on average efficiencies for single time periods. The use of *intertemporal* frontiers can show the relative changes in efficiency across time periods.

Directions for future research

We presented a table based on some corporate ownership studies that showed many different analytical tools, techniques and variables used to moderate the relationship between ownership structure and performance. Applying these to the same sample can be a useful indication of which one explains the variability of performance best. In the field of DEA, recent studies have employed techniques for statistically generalising technical efficiency results as for example through bootstrapping as proposed by Simar and Wilson (2000). Its use can help in giving some global credibility to technical efficiency levels by estimating the sample variation of efficiency estimators. The idea of a reasonable benchmarking frontier also needs to be simplified computationally to handle very large datasets.

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Appendix

Table 2. Previous studies on the effect of ownership structure on performance

Author / Year	Theoretical framework	Hypothesis	Data	Techniques and measures	Results
Cho M.H. (1998)	Agency theory	The effect of ownership structure on investment. The endogenous nature of ownership structure.	1991 data of 230 Fortune 500 firms.	Piecewise linear OLS and 2SLS regressions. Dependent variables: Corporate value (Tobin's Q-ratio), Investment (capital and R&D expenditures), Insider ownership. Control variable: Market value of the firm's common equity to control for managerial wealth constraints and risk aversion. Investment and liquidity to control for financial structure.	Significant relationship between insider ownership and corporate value. Non-monotonic relationship between insider ownership and investment. Positive for <7% and >38%. Negative for 7%-38%.
Demsetz H. & Villalonga B. (2001)	Agency theory	Ownership structure is endogenous. The fraction of management shares and that of the 5 largest shareholders might represent conflicting interests.	5 years of data on 223 US firms.	OLS and 2SLS regressions. Equation 1: Dependent variables; Firm performance measured by Tobin's Q. Predictor variables: % of shares owned by management; % of shares owned by the 5 largest shareholders; Advertising expenditures as a fraction of sales; R&D as a fraction of sales revenue (FoSR); Fixed plant & equipment expenses as a FoSR; Value of debt as a fraction of book value of assets, Four-firm market concentration ratio; Indicator variables for industries. Equation 2: Dependent variable; Fraction of shares owned by management. Predictor variables: Firm performance (Tobin's Q); Market risk of stock; Firm-specific risk; Firm size measured by book value of assets; Indicator variables for industries.	Ownership structure is endogenous. Biases in previous empirical study might be due to failing to account for the complexity of interest in ownership structure. Markets succeed in bringing out ownership structures in different kinds of firms such as scale economies, regulation and environmental stability.
Earle J.S., Kucsera C. & Telegdy A. (2005)	Agency theory	A group of block holders decrease firm performance as opposed to a single large block holder.	6 years of data on 168 Bulgarian publicly listed firms.	Piecewise linear logit regression. Dependent variables: ROE, and operational efficiency (ratio of sales to number of employees). Explanatory variables: Largest block holder, largest 2 block holders, largest 3 block holders, all block holders, second largest block holder, third largest block holder	Only the largest block holder has a systematic effect on improved corporate performance. Effects of total block holdings are much smaller and statistically insignificant.
Frick B. (2004)	Agency theory	Owner-managed firms are more efficient than outsider-managed firms because of monitoring. In terms of knowledge and skills, managers of private firms are more successful than those of public firms. Organizational form has no impact on performance.	3 years of non-financial data for 305 German wineries.	OLS, SE and 2SLS regressions. Dependent variables: Price per bottle of wine and Jury grade. Predictor variable: Ownership type Control variables: Annual production, geographic region, membership in professional associations, acreage, and firm size.	The higher the foreign ownership, the higher the efficient production of the firm. Employee-managed firms are more efficient than owner-managed firms attributable to human capital advantage.

Table 2. continued: Previous studies on the effect of ownership structure on performance

Author / Year	Theoretical framework	Hypothesis	Data	Techniques and measures	Results
Gedajlovic E., Yoshikawa T. & Hashimoto M. (2005).	Agency theory	6 distinct categories (or 3 classes) of shareholders in the Japanese context according to investment objectives	3 years of data for the largest 247 Japanese manufacturing firms listed on the Tokyo Stock Exchange	GLS regression. Independent variables: 6 shareholder categories. Dependent variables: ROA, dividend payout ratio and the beta of a firm's stock. Control variables: age, firm size, ratio of bank-mediated debt to total outstanding debt and industry dummies.	Japanese corporations are sensitive to investment objectives of shareholders. The influence of ownership on performance is complex when shareholders with different investment objectives are considered.
Gorriz C.G & Fumas S.V. (1996).	Agency theory, classical managerial theory.	Family-owned firms are smaller than non-family owned firms. They are more efficient but not more profitable.	2 yeas of data for 81 non-financial firms quoted on the Spanish stock market.	OLS regression. Dependent variable: Size (value added per worker, capital stock and sales). Independent variables: Capital to labour ratio, ownership type. Control variables: Debt-to-equity ratio, scale economies and market power.	Family-owned firms have higher productive efficiencies than non-family owned firms. Family-owned firm sizes are smaller. Family-owned firms are not more profitable due to their size constraints.
Gorriz C.G & Fumas S.V. (2005).	Institutional theory, transaction cost theory	Family firms grow at a slower rate, choose less capital-intensive production technologies and more technically efficient. Economic profits, financial structure and cost of capital is however the same.	15 years of data on 53 of both Spanish publicly listed family- and non-family-owned firms	Parametric estimation of productivity. Dependent variables: TFP (ratio of assets to employees), Growth/size constraint (asset, age and average growth – ROA and invested capital), Profitability – ROA (controlling for debt structure), Tobin's Q-ratio. Predictor variable: Listed family and non-family-owned firms. Control variables: Long-term debt to total debt ratio, debt to assets ratio.	Differences in family and non-family owned firms are as a result of the objective function of decision-makers and constraints in productive efficiency.
Lauterbach R. & Vaninsky A. (1999).	Agency theory	Diffused ownership firms perform better than closely held firms.	3 years of data for 280 Israeli public firms	Regression and DEA. Input variables: Ratio of equity to total assets, Total firm assets, CEO pay, pays of four other top managers. Output: Net income	Owner-managed firms are less efficient in generating net income than outsider-managed firms. Concentrated ownership is less efficient than diffuse ownership. DEA and regression gave similar results.
Li M. & Simerly R.L. (1998).	Agency theory	Environmental dynamism moderates positively on the insider-ownership performance relationship.	4 years of data for 90 large companies in the US IT and Food and Beverages sectors.	Multiple regressions. Dependent variables: ROA, ROI, OROA, ROE. Predictor variables: CEO stock ownership. Control variables: Market value of CEO's stockholdings, long-term debt to total equity (leverage), Herfindahl index to control for diversification, degree of institutional ownership, size, firm age, CEO duality (as a board chairman).	Increased insider ownership may lead to better returns under conditions of greater environmental dynamism.

Table 2. continued: Previous studies on the effect of ownership structure on performance

Author / Year	Theoretical framework	Hypothesis	Data	Techniques and measures	Results
Nickell S., Nicolitsas D. & Dryden N. (1997).	Agency theory	External shareholder with a high degree of control can enforce a higher productivity performance.	13 years of published accounts of 582 (125 have appropriate shareholder control data) companies.	Use of Cobb-Douglas production function for firm productivity growth. Variables: Profits less capital costs normalised on value added, Shareholder control. 22 industry dummies to control for industry-specific technological factors.	Firms with a dominant external shareholder from the financial sector have higher productivity growth rates.
Sarkar J. & Sarkar S. (2000)	Agency theory	Block holder activism increases corporate performance but depends on the identity of the shareholder.	2 years of data for 1567 private and foreign manufacturing firms.	OLS regression. Dependent variables: MBVR and a proxy for Tobin's Q ratio. Predictor variables: fraction of equity share by directors and relatives, corporate bodies, government, and foreign entities. Control variables: leverage, size, capital intensity, intangible assets, diversification and age.	All categories of large shareholders increase firm performance. Institutional investors do not take active part in corporate governance.
Seifert B., Gonenc H. & Wright J. (2005)	Agency theory	Positive relationship between managerial ownership and performance at low levels of managerial ownership occurs across difference governance regimes. The relationship at higher levels of managerial relationship will be unclear. Block holders or institutional ownership should improve performance.	5 years of data for 2198 firms from US, 319 firms from Germany, 674 firms from UK, and 1015 firms from Japan.	OLS and 2SLS regressions. Equation 1: Dependent variable; Performance (Tobin's Q). Explanatory variables: Ownership, Leverage, Capital expenditures, Sales growth, and Industry. Equation 2: Dependent variable; Ownership. Explanatory variables: Performance, Leverage, Capital expenditures, Size, Cash flow, and Risk.	There is no universal relationship between ownership equity by insiders and performance. Positive for UK and Germany, negative for US and UK. Ownership structure therefore matters with specific local laws, i.e. good minority shareholder protection. Ownership does not appear to be an endogenous variable. No significant differences between OLS and 2SLS regression results.[2]
Thomsen S. & Pedersen T. (2000).	Agency theory Transaction cost theory	Institutional ownership increases profitability (but lower sales growth) than family, bank, government and corporate ownership types.	6 years of data for 435 of the largest European non-financial companies in 12 countries.	Duncan grouping and regression. Dependent variables: MBV, ROA and sales growth. Control variables: nation industry and debt-to-equity ratio. Predictor variables: the ownership types.	Ownership structure is seen as an exogenous variable with economic performance. Evidence of a bell-shaped effect of ownership share on MBV and ROA but not sales growth (particularly strong MBV for institutional investors).

[2] The effect of control variables on performance is fairly consistent across different countries in the study. Leverage has a negative effect, sales growth (investment proxy) has a positive effect, capital expenditures has mixed effect, Block holders and institutions have a very mixed effect on performance, with only a positive impact in Germany. Foreign ownership has a positive influence in Japan while employee ownership is negative. Risk has a negative effect, size has a negative effect, and the higher the insider ownership, the higher the performance (Seifert et al., 2005).