

Firms' performance and board size: A simultaneous approach in the European and American contexts

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Abstract

The relation between performance and board size is analyzed in the American and European contexts. It is found that return on assets (ROA) depends on board size (BS) defined as an endogenous explanatory variable. This potentially non-monotonous effect is modeled by introducing firm size and number of segments by board member as explanatory variables for ROA. BS net effect after accounting for the indirect effect resulting from these variables is negative. Differences in the results obtained for Tobin's Q, strategic investors' weight, and equity to total assets, between America and Europe, suggest a more preventive management control in Europe.

Keywords: Board size; board structure; firms' performance; firms' complexity; management control.

JEL classification: G30, G34, G39, C30.

1. Introduction

Studying the factors which either influence firm performance and/or board characteristics, especially board size (BS), it is acknowledged that their behavior may be intertwined. Firstly, the literature includes BS among the variables explaining the behavior of a performance measure such as return on assets (ROA) or Tobin's Q (e.g., Coles et al., 2008; Ghosh, 2006). Secondly, an endogenous behavior for BS is recognized and it is acknowledged its potential dependence on some performance measure (e.g., Boone et al., 2007; Min, 2018).

Increasing BS may have an effective improvement in performance as an answer to a complex environment, until a certain level, but monitoring difficulties may reverse the signal of the effect of this increment (e.g., Coles et al., 2008; Foss, 2015). A non-monotonous effect of BS in the performance measure follows, even after accounting for the influence of other variables such as volatility or leverage. This may explain divergent results found in literature concerning the effect of BS in performance: while Dalton et al.

(1998) and Jackling and Johl (2009), among others, find a positive effect; De Andres et al. (2005) and Drakos and Bekiris (2010), empirically support a negative effect.

In this paper, an empirical study is performed on a sample of American and European firms, to analyze the determinants and mutual dependence of both BS and firm performance and checking for differences between the two continents, considering non-monotonous effect of BS on firm performance. Non-monotonicity is modeled by stating the conflicting aspects underlying this effect. In departure from the existing literature, we consider that BS attenuates the effect of these aspects (e.g., firm size, FS, and number of segments of the firm, Sg), that turn coordination more complex, limiting performance. Consequently, firm size by board member (FSBS) and number of segments by board member (SgBS) are added as performance determinants. The BS coefficient represents the marginal effect of this variable after accounting for its indirect effect in compensating different complexity levels between firms (through the joint effect of FSBS and SgBS). This coefficient may turn out to be negative after accounting for FSBS and SgBS, while the overall effect, if monotonous, should be positive. Therefore, some light is shed on the referred disparity of results in literature.

As Foss (2015) remarks, firms allow coordinating disperse knowledge owned by different firm members, which otherwise would implement their activities in the market. Firm's expansion is limited by the accrued difficulty of assembling knowledge. A greater BS may be required to deal with the knowledge dispersion. BS enlargement is limited by the coordination of the knowledge inside it (Ferris and Jagannathan, 2001). Remark that also the FS and Sg coefficients signals on ROA may be reverted and become positive when FSBS and SgBS are considered. Complementarily, the monitoring hypothesis states that BS is likely to increase because of the effectiveness of its actions in cases such as industry concentration. Conversely, BS is likely to be limited in an environment of fuzziness and incertitude, features measured by Tobin's Q or a volatility measure such as variance of returns.

The rest of the paper is organized as follows. Section 2 presents the model specification, the sample, and data used. Results are presented and discussed in Section 3 and last Section summarize the conclusions.

2. Research design

2.1 Model specification

Estimation is implemented on a system of two equations. In the first equation, ROA depends among other variables, on BS, as an endogenous explanatory variable, which is studied in the second equation. In addition to FS, Sg, FSBS, and SgBS, additional explanatory variables are exposed in the next paragraphs. The criterion for including these explanatory variables is the dichotomy between the need of BS to address complexity and the limitation of on effectiveness of BS acting in some environments.

Measures of complexity, such as FS and the Sg, are expected to have a positive impact on BS. However, as a result of response to complexity, BS may become relatively over-dimensioned leading to positive net effect of FS or Sg on ROA.

Variables such as Tobin's Q and Volatility (Vol) are included, in explaining BS, to represent additional environmental uncertainty on acting effectiveness, which inhibits BS from becoming very large. Volatility, as a measure of risk may have an ambiguous effect on performance: while there is a positive equilibrium relation between expected profitability and risk, risk may sporadically have lasting negative impact on effective return attained.

There is no theoretical support for a direct effect of Tobin's Q on ROA. In fact, Tobin's Q and ROA are common proxies of performance measure (Maury, 2006). While ROA is often used as a profitability indicator, Tobin's Q as a proxy for firm value (Cho et al., 2019). Tobin's Q is associated with firm future expectations considering its prospective nature (Gennaioli et al., 2016). Thus, to the best of our knowledge, there is no evidence of any causality from Tobin's Q to ROA which leads to the absence of integration of this variable as an explanatory variable of ROA. However, one cannot exclude the possible endogeneity of the Tobin's Q which may eventually be due to a dependence of Tobin's Q on ROA or some of its covariates.

Explanatory variables associated to board characteristics impact primarily on BS. Board experience (BExp) is expected to impact negatively on BS, since experience of existent members may somehow overcome the need for additional members. Proportion of non-executive members (NEx) improves monitoring and complements the answer to complexity; since nonexecutive don't substitute, only complements, executive decision, increasing their weight most likely increases BS. As for these variables related to the board, the following general statement is made which may be pointwise corrected next. It is assumed that the variables related to board characteristics (NEx and BExp) have a "substitution" effect on BS and don't intend to have an impact in mean on performance, they just allow for approximately the same result with a lesser number of managers.

A body of literature (e.g., Vafeas and Theodorou, 1998; Cui and Mak, 2002; Mahadeo et al., 2012) analyses the relation between NEx and a performance measure such as ROA or Tobin's Q. Some common points referred are: a) the generally negative influence of NEx on ROA but exerted indirectly through the control function which limits the efficiency of managerial board members and, b) the potentially positive effect of NEx on future growth expectations which results from the fact that NEx allows to conceal conflicting interests of managers and shareholders. We took into account this indirect nature of the effect of NEx on ROA, which lead to not include it explicitly but instead assume it is "absorbed" in the influence of BS on ROA, hence contributing to its non-linearity.

Regarding BExp, the existence of many kinds of different firms should be accounted for, in special those that have more limited BS but with significant experience and still achieves a good performance. In this context, it may be asserted that the firm's profile depends on several aspects, such as its sector and degree of complexity, that may be identified as other explanatory variables (on the role of complexity on the relation between BExp and ROA, see, for example, Hillman and Dalziel, 2003). This may justify the prevalence of the substitution argument presented above.

A leverage measure or a function of its inverse such as equity to total assets (EA) may have an ambiguous influence on performance. Leverage can potentially increase firm returns. However, it may spark an uncontrolled deterioration of its financial situation seriously compromising the flow of future returns. A positive effect on BS holds since an excessive level of debt often triggers the need of additional monitoring. The role of age (Age) on firm performance combines an improved ability to integrate in the environment with the difficulty to adapt to novelties and increasing complexity. This last aspect determines its positive effect on BS.

Finally, another explanatory variable is the strategic investors weight (StIW). Strategic investors in a firm are characterized for pursuing long term aims or the control of the firm, in detriment of more immediate profitability goals. Their effect on BS and ROA depends on the context they release their appearance. Within the regular activity of the firm, it may be expected a positive influence on the BS, as a result of an improved monitoring function. If, otherwise, StIW increment emerge in the firm as a consequence of late difficulties in its financial situation, their influence may be external and exist mainly in firms with reduced BS, and may not be visible on ROA if the priority is long term recovery or simply firm control.

In summary, the proposed model is:

$$ROA_i = \alpha_0 + \alpha_1 BS_i + \alpha_2 FS_i + \alpha_3 Sg_i + \alpha_4 Age_i + \alpha_5 EA_i + \alpha_6 Vol_i + \alpha_7 StIW_i + \alpha_8 FSBS_i + \alpha_9 SgBS_i + u_i$$

$$BS_i = \beta_0 + \beta_1 \ln QT_i + \beta_2 FS_i + \beta_3 Sg_i + \beta_4 Age_i + \beta_5 EA_i + \beta_6 Vol_i + \beta_7 StIW_i + \beta_8 NEx_i + \beta_9 BExp_i + v_i$$

where ROA=earnings/total assets, BS=number of board members, FS=total assets, EA=equity/total assets, Age=age in years, StIW=Strategic investors weight in share capital, Vol=volatility; Sg=number of segments, FSBS=firm size/board size, SgBS=number segments/board size, lnQT=ln(Tobin's Q), NEx=non-executive board members/number of board members, and BExp=average board members experience in years.

The estimation is made by two stages least squares (Wooldridge, 2013).

2.2. Sample and data

The sample was collected from Datastream, ignoring the firms without information regarding the variables of interest. Excluding financial institutions, the final sample encompass 858 American and 560 European firms, in the year 2016. In Table 1, a test is performed for the variables means differences between America and Europe to assess their significance.

Table 1: Test on the mean difference between America and Europe

Variables	<i>t-test</i>
ROA	-.086
BS	-1.115
FS	.286
EA	-5.639***
Age	-9.153***
StIW	-11.262***
Vol	-5.189***
Sg	-3.515***
FSBS	.682
SgBS	-3.901***
lnQT	6.250***

NEx	-1.200
BExp	9.784***

Note: */**/***: Significant at the 10%/5%/1% nominal level.

Means in America are, with statistical significance, superior for lnQT and BExp and inferior for EA, Age, StIW, Vol, Sg, and SgBS. The difference is not significant for the remaining variables. We expect that significant differences can lead to different outcomes in BS and in performance.

3. Results and discussion

Table 2 summarize the estimations results for America and Europe data.

Table 2: Estimation results

Variables	Coefficients estimate	
	America	Europe
ROA		
constant	.416***	.421***
BS	-.036***	-.036***
FS	7.26e ⁻¹³ ***	1.25e ⁻¹² ***
EA	.045***	.034*
Age	.0002*	6.03e ⁻⁷
StIW	.019	.036**
Vol	-.001**	-.001**
Sg	.053***	.051***
FSBS	-9.09e ⁻¹² ***	-1.63e ⁻¹¹ ***
SgBS	-.524***	-.475***
BS		
constant	8.560***	8.607***
lnQT	-.104	-.458**
FS	5.95e ⁻¹² ***	7.60e ⁻¹² ***
Sg	.124***	.220***
NEx	.025***	.028***
BExp	-.009	≈ 0.000
Age	.009***	.006*

EA	-.761***	-2.416***
StIW	-1.240***	2.112***
Vol	-.026***	-.032**

Note: */**/***: Significant at the 10%/5%/1% nominal level.

In both continents, the influence of FS and Sg on performance is positive after accounting for the cross effects of FSBS and SgBS for which negative signal is confirmed. The marginal effect of BS on performance is negative, while the BS effect implicit in FSBS and SgBS coefficients is positive, configuring an overall non-monotonous effect. The negative coefficient of volatility on ROA reflects the lasting predominance of non-systematic consequences of risk. The positive coefficient of EA on ROA confirms the idea that additional financial dependence can decisively compromise the ability to generate profits. The coefficient of Age on ROA is marginally significant in America and non-significant in Europe, revealing a balance between age conflicting effects in performance.

Next variables effects support the conjecture that in Europe there may be a tighter control of strategic investors on firm accounts to avoid over-budgeting while in America this control is made in *a posteriori* market penalization. This is visible in EA which impacts more in ROA in America, being the corresponding effect in Europe almost not significant (see Table 2). In Europe, EA is higher (see Table 1).

StIW has a positive influence on ROA in Europe, but no significant effect in America. On the other hand, its influence on BS is negative in America and positive in Europe. StIW have a bigger weight in Europe (see Table 1), fact which seem to exert pressing to rise BS there, while in America, firms with higher weight of StIW seem to have associated smaller BS, which may be due to *a posterior* intervention on firms having unpaired financial situation. This suggests a different nature of the function played by these investors in America and Europe leading to a more effective effect on ROA in Europe.

As for lnQT, it has the expected signal on BS in Europe but is not significant in America. BS mean is slightly greater in Europe (although not statistically different) while lnQT mean is higher in America, which means that European firms are comparatively undervalued in the market. Under this constraint, the differences in Tobin's Q between European firms are bound to have relevant impact on BS (see Table 1). In Europe, agency

costs resulting from accrued opportunities as represented by Tobin's Q seem to be more relevant.

In both continents, the variables FS, Sg, NEx, Age, EA, and Vol have the expected effect on BS, conforming their identified theoretical role. No significant influence of BExp was noticed in alleviating the charge on BS.

4. Conclusions

The relation between BS and performance was studied using a sample of American and European firms where a systematic influence of BS on ROA was found, while in Europe (but not in America) Tobin's Q has a role on BS as a dissuasive signal of monitoring limitation.

The influence of explanatory variables is analyzed in the samples considered, accounting for the complexity/effectiveness dichotomy.

The importance of the explanatory variables (FSBS and SgBS) considered to account for the cross effect of level of complexity in firm's activity and of BS is confirmed. The specific effect of BS on ROA, after discounting BS influence through those cross effects, is negative.

As for the distinction between European and American firms, the divergent influence, in the two continents, of the Tobin's Q, equity to total assets, and the weight of StIW suggest, with respect to management control, a more preventive attitude in Europe as opposed to a more liberal attitude with *a posteriori* correction in America. Additionally, we cannot exclude the potential endogeneity of Tobin's Q that is not addressed in the current study. These issues would be an interesting subject for future research.

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