ASSESSING THE IMPACT OF DIVERSITY, GOVERNANCE AND MANAGEMENT DEMOGRAPHICS ON FIRM PERFORMANCE: A PANEL ANALYSIS

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Assembling the right management team is a challenging and complex process in today's global economy. The recent worldwide financial meltdown has simply underscored the importance of a far-sighted and balanced management organisation. The characteristics and composition of the management team along with effective corporate governance policies can also play a role in addressing these challenges. The purpose of this paper is to illustrate how analytical modeling can be used in helping shape organisational teams. A panel data analysis of S&P 1500 firms for the period 2004 to 2007 was performed. The results from the analysis show that management team diversity and commitment to good corporate governance both have a positive impact on firm performance as measured by Tobin's Q.

INTRODUCTION

The ongoing financial and economic crisis has spotlighted a number of significant deficiencies in corporate governance. For example, questionable decision-making and execution has led the United States automotive industry to the brink of extinction. Similar patterns, if not worse, have emerged in many of the staid financial investment houses. The recent oil spill in the Gulf of Mexico is simply the latest entry. Why have these corporate disasters occurred and equally important what can be done to assuage them from reoccurring? Do the nature and characteristics of the management team play a role in organisational performance? If so, what specific factors affect corporate performance and how can they be used in designing a winning organisation? Interestingly enough professional sports have paid much more attention to these questions compared to most non-sport enterprises (McManus, 2003). In this regard, professional sports managers have led the way in utilising the so-called balanced scorecard approach to management decision-making (Denton, 2006). To be successful, whether in baseball or business in general, management teams should have a common mission and vision. The data from major league baseball suggests that overall team performance appears to be directly correlated with the coinciding of player and owner interests including mission (Yimaz, 2003). Along these same lines the integration of entrepreneurship spirit, team composition and group processing have been found to contribute collectively to winning performance in business (Ensley, 2003).

Diversity and corporate governance are two other factors that may have an impact on firm performance (Allen, 2008; Carter, 2002). Specific metrics often considered in this regard are women and minority participation on boards, as suppliers and as CEOs (Smith, 2006; Erhardt, 2003). The results of a meta-analysis shows that there is a small, positive relationship between corporate social behavior and company financial performance (Peloza, 2009). Management demographics like age, tenure and education may also influence firm performance (Goll, 2005; Carmen, 2005). However, little attention has been given to assessing in an integrated way the impact of diversity, corporate governance and management demographics including executive compensation on firm performance. The simultaneous examination of these three factors has the potential for providing new awareness into the relationship between organisations and outcomes.

A panel data analysis approach was used in the present study. Panel data analysis has seen extensive application in the analysis of organisational performance (Azim, 2010; Goll, 2008, Cordeiro, 2003). Panel data analysis, often characterised as time-series cross-sectional (TSCS) modeling, can provide more insights than either time series or cross-sectional taken separately. The developed database was examined using both pooled and panel regression techniques. As an additional step, a neural net model was used to calibrate the results. This paper is organised as follows: 1) a review of the relevant literature and a brief overview of the modeling approach used in this study; 2) an analysis of data derived from the S&P1500 for the period 2004–2006; 3) a forecast of firm performance for 2007; and 4) a discussion on how the modeling approach can be used in designing high performance organisations.

LITERATURE REVIEW AND BACKGROUND

Designing performance-based corporate management teams is both a complex and dynamic process. To capture the essence of these complex relationships calls for an integrated modeling approach that takes into account such modalities as diversity, corporate governance and management team characteristics. For example, it has been found that diversity in the management team, on the board of directors and with suppliers improves creativity and innovation and increases the variety of perspectives (Campbell, 2008). Another benefit of increased diversity is the improvements it can make to flexibility in organisational processes and better problem-solving which can lead to higher quality decisions (Maxfield, 2008). To date, most board and management team-based diversity studies have focused on individual numbers and not on a minimum critical mass that is sufficient to sway corporate policies and procedures. The nature of the relationship between diversity and firm performance is also somewhat uncertain. In terms of gender diversity, recent evidence suggests that this relationship is highly non-linear and thus would be difficult to detect using classical linear regression techniques. A recent study using a curvilinear inverted U-shaped relationship between diversity and firm performance found that there may be a crucial threshold in the extent of gender

diversity beyond which the benefits of additional gains in firm performance are not accrued (Luis, 2008). Furthermore, the study outcomes suggested that firms that simultaneously have greater gender diversity in executive boards and top management teams may perform better than firms with more diversity in just one of the two groups of executives. In a similar study the data also showed a curvilinear U-shaped relationship between leader diversity and revenues, net income and book-to-market equity (Roberson, 2006). These findings further indicate that being recognised as one of the top firms practising diversity management may serve as an effective signal to investors about the prospects of future earnings.

The quality of corporate governance can also impact firm outcomes. Recent findings suggest that the market is positively influenced by corporate social responsibilities and that the market values firms that satisfy minimum requirements in the area of environmental protection (Bird, 2008). At a more detailed level it has been discovered that firm value is an increasing function of improved governance quality among firms with high free cash flow. In contrast, governance benefits are lower or insignificant among firms with low free cash flow — not controlling for this conditional relationship can lead to erroneous conclusions that governance and firm value are unrelated (Chi, 2010). Furthermore, the empirical evidence shows that there is a positive relationship between corporate social behavior and company financial performance (Wu, 2006). A number of metrics have been suggested for quantifying corporate responsibility/governance including environmental and affirmative action violations (Hutchins, 2008).

Characterising the relationship between firm performance and executive demographics in general (for example, age and tenure), and CEO compensation in particular, continues to receive considerable attention. A number of studies have attempted to explain the relationship between CEO compensation and firm performance (Chen, 2010; Hallock, 2008; Devers, 2007; Conyon, 2006). The general consensus is that the relationship between pay and performance is very complex. More specifically, recent findings suggest, for example, that the relationship between executive compensation and firm performance is non-linear and asymmetric (Canarella, 2008). A study on both the direct and indirect effects of CEO tenure and age on CEO compensation found that the positive relationship between shareholder return and the increase in value of executive options held decreases with CEO tenure (McKnight, 2004). It has also been found that CEO tenure is directly related to risk-taking and ultimately to firm performance (Simsek, 2004). Furthermore, the same study revealed that the positive association between changes in salary and sales increased with CEO tenure. As an interesting age-related issue, it has been discovered that there is a positive relationship between management team age heterogeneity and sales growth (Richard, 2002).

The primary hypotheses for this study, based on the forgoing literature review are as follows:

H1: Revenues are correlated with firm performance

H2: Industry sector is correlated with firm performance

H3: CEO age is correlated firm performance

H4: CEO tenure is correlated with firm performance

H5: CEO total compensation is correlated with firm performance

H6: CEO diversity is correlated with firm performance

H7: Board diversity is correlated with firm performance

H8: Supplier diversity is correlated with firm performance

H9: Corporate governance is correlated with firm performance

PANEL REGRESSION

Panel data analysis is a methodology for studying a cross-section of factors over time periods. The integration of time series with cross-sectional panels can improve the quality of the results compared to using either time or cross-sections alone. Panel data analysis allows controlling for variables that cannot be observed or measured like organisational cultural factors or business practices across firms. Panel data analysis also helps control for unobservable variables that change over time but not across firms like

federal regulations. Additionally, when the product of the number of firms (N) and the number of time periods (T) is large, there is an opportunity for improved reliability and precision in the statistical estimates. However, statistical misspecification, the probabilistic assumptions comprising these models being invalid for the data in question, can negate the advantages of panel data modeling. The database is referred to as a balanced panel when there are no missing data values. However, when there are missing data values, the database is referred to as an unbalanced panel. The present study involved an unbalanced panel data application since data for some firms was not available for all three years. Three of the more widely-used panel data models are highlighted below (Baltagi, 2005):

Pooled Data Model: This model assumes that there is neither significant firm nor temporal effects. In this case the database is pooled and analysed using ordinary least squares regression (OLS). On some occasions there may be neither firm nor temporal effects.

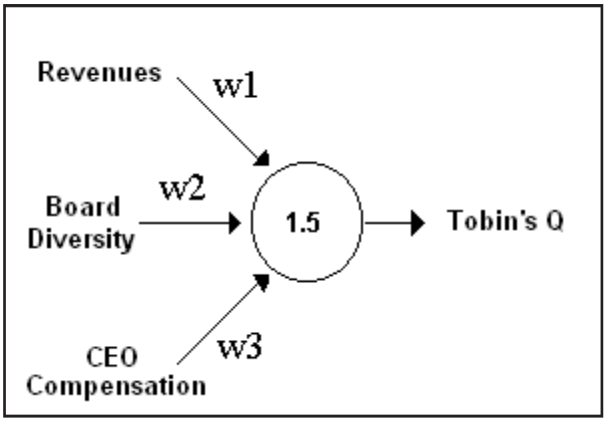
Fixed Effects Model: There are several versions of the fixed effects model. One version assumes that there are no significant temporal effects but there are significant differences among firms. This model consists of constant slopes with intercepts that differ according to the firms. This model format is not effective if there are significant variates that are invariant over time (for example, firm industry). A variation of this model is one that may have significant temporal effects but no significant differences among firms. Another variation assumes that there are both significant temporal and panel effects. The fixed effects models are often plagued with too many cross-sectional units of observations requiring too many dummy variables for their specification which can reduce the statistical power of the results. This is the case for the present study which consists of over 1,000 individual firms.

Random Effects Model: This model is based on a random constant term (i.e. the intercept is a random variable). The random outcome is a function of a mean value plus a random error. The cross-sectional error term should be uncorrelated with the errors of the predictor variables to be effective. For a one-way cross-sectional analysis.

One basic issue in panel data analysis is which model format (fixed or random) provides the best results. Often the Hausman specification test is used to select between the two formats. The question is whether there is significant correlation between the unobserved firm-specific random effects and the predictor variables. When there is no correlation, the random effects model can be more powerful and parsimonious. However, if a significant correlation exists, the fixed effects model should be used. Nevertheless, if across firm differences appear to have an impact then the random effects model should be selected. Given the above discussion the database was analysed using Stata's OLS and random effects models.

NEURAL NETS

Neural networks (NNs) have been characterised as 'computing devices that use design principles similar to the information processing system of the human brain' (Bharath, 1994). NNs use complex network relationships to mimic the connections between sets of data. Among other things, NNs have the advantage of not requiring prior assumptions about the data or about possible relationships within the data, as is often the case with traditional analysis methods, for example, regression. In the most common schema, each neuron in one layer is connected to each neuron in the preceding layer as is illustrated in Figure 1. In this example, the prediction of Tobin's Q is derived as a function of input states and a set of weights. The specific input states in Figure 1 are the following: 1) Firm Revenues, 2) Board Diversity and 3) CEO Compensation. The values for the input states may come from the activation of other neurons or specific environmental factors. The example numerical value inside the node represents the threshold value for firing or activating the neuron. In this case, if the sum of the weights exceeds 1.5, then the neuron is 'fired' which suggests a certain level of change in final course grade. The values for the weights and thresholds are determined through an iterative process with the goal of minimising the aggregate error.



The architecture of an NN consists, at a minimum, of three layers: an input neuron or neuron layer, a 'hidden' layer and an output neuron. The hidden layers are designed to pick up the non-linear relationship between variables. In some applications there can be more than one intermediate or 'hidden' layers of neurons. Neural net models, like various regression techniques, are impacted by degrees of freedom. In some instances adding more hidden layers can increase the degrees of freedom for a given database. Neural networks have seen increased use in financial applications (Zhang, 2005; Baesens, 2003). Specifically, neural nets often appear as the analytical tool of choice when the underlying relationships between variables are somewhat ill-defined as is the case with organisational performance (Zaho, 2010; Okamoto, 2009). The neural net model used in the current study was Ward's Neuroshell predictor which consisted of one input, one hidden and one output layer.

MODEL VARIABLES

The variables used in this study, based on the forgoing literature review, are listed in Table 1. The target variable (firm performance) is measured by Tobin's Q. The variable set consisted of financial, diversity, corporate governance and CEO demographics. To control for various industry effects, dummy variables were used to characterise manufacturing, financial/insurance, wholesale/retain, information services, utilities and energy/mining (Chava, 2004). These six sectors alone constituted over 90 per cent of the S&P 1500 firms.

Table 1: Variable Mnemonics and Definitions

Variable Mnemonic	Definition
Q	Tobin's Q (Market value / replacement value)
ROE	Return on equity
REV	Total gross income
CEO (1/0)	Woman or minority CEO
BOD (1/0)	Women & minorities constitute at least 30% of board of directors
SUP (1/0)	Women & minorities constitute at least 5% of suppliers
AFF (1/0)	Substantial affirmative action violations for the firm
ENV (1/0)	Substantial environmental violations for the firm
MAN (1/0)	Manufacturing sector firm
FIN(1/0)	Financial/Insurance sector firm
WHR (1/0)	Wholesale/Retail sector firm
INF (1/0)	Information Systems sector firm
UTL (1/0)	Utilities sector firm
EMI (1/0)	Energy/Mining sector firm
TCOMP	CEO total compensation
AGE	CEO age
TENURE	CEO tenure at firm

The analysis also controlled for firm size using total revenues. In terms of diversity the variables considered were the level of women and minority participation on boards, as suppliers and as CEOs. Corporate social responsibility and firm outcomes are also receiving increased attention. For the current study the extent of affirmative action problems and environmental issues surrounding the firm were used as a measure of corporate responsibility/ governance. More specifically, companies that were so characterised had either paid substantial fines or civil penalties as a result of affirmative action or environmental controversies, or had otherwise been involved in major controversies related to affirmative action or environmental issues. This study also examined the effects of CEO demographics on firm performance. Specifically, both CEO age and tenure with the firm were considered. This analysis also included CEO total compensation.

TOBIN'S Q

Tobin's Q is often used as an indicator of firm performance (Morgan, 2009; Fang, 2008). Tobin's Q is a forward-looking measure of company performance and represents investors' expectations about the risk-adjusted future cash flows. Average Tobin's Q compares a firm's market value with the replacement cost of its assets. It is often used as a proxy for the more technically-correct marginal Q. Because Tobin's Q is based on stock prices, it is less easily manipulated by managers compared to other performance measures. A simple estimate of Tobin's Q was developed as follows (Chung, 1994):

$$Q = (MVE + PS + INV + DEBT)/ TA$$

Where:

1) MVE equals the product of a firm's share price and the number of common stock shares outstanding
2) PS equals the liquidating value of the firm's outstanding preferred stock
3) INV equals the book value of the firm's inventories
4) DEBT equals the value of the firm's short-term liabilities net of its short-term assets, plus the book value of the firm's long-term debt
5) TA equals the book value of the total assets of the firm

On the one hand, a Q above one indicates that the market value of the firm's assets is greater that their replacement value, which suggests that the company should increase capital expenditures as a means of driving Q towards one. On the other hand, a Q below one reveals that the firm's assets is less than their replacement costs which implies that the firm should consider acquisitions or selling current assets rather than engaging in capital expenditures. Again the CEO's goal, in either case, is to move Q towards one. In terms of using Q as a measure of corporate performance, a firm with an above average Q typically indicates excess profits which should provide a competitive advantage. Thus, a firm with a Q above one suggests superior growth opportunity compared with a Q below one, ceteris paribus.

DATABASE

The overall database consisted of corporate performance, organisational characteristics and CEO demographics extracted from the S&P 1500 for 2004 through 2006. The database was developed using the Wharton Data Research Service (WRDS). More specifically, the KLD component of WRDS was used to extract the firm level social responsibility and governance data (for example, proportion of women and minority CEOs). Individual CEO data (for example, total compensation) was acquired from the ExecuComp data file. Normality was checked for each of the continuous variables. The distributions for firm revenue, total executive compensation and Tobin's Q were significantly skewed to the right. Accordingly, these variables were 'normalised' by taking the log of the raw measurements. The database was also purged of extreme outliers (Dehon, 2009). Missing data was supplied using standard imputation procedures (Walton, 2009). The resultant sample size was 1798. A hold-out data set consisting of 481 observations was also developed for 2007 using the same data processing procedures.

Table 2 provides selected descriptive statistics for the training database (2004–2006). For example, approximately 5 per cent of the firms had women or minorities as CEOs and 20 per cent had at least 30 per cent of the board seats held by women or minorities. Approximately 6 per cent of the firms had experienced serious environmental violations (ENV) over the reporting period. The average CEO tenure with the current firm was nearly 12 years. Total compensation was calculated based on the 1992 reporting format and consists of: Base Salary, Bonus, Other Annual, Total Value of Restricted

Stock Granted, Total Value of Stock Options Granted (Black-Scholes), Long-Term Incentive Payouts, All Other Total and Value of Options Grants.

Table 2: Database Descriptive Statistics (2004–2006)

Variable	Mean	SD	Min	Max
Q	1.55	1.18	0.08	10.21
ROE (%)	13.40	16.27	-152.42	146.04
REV(MM)	7,472	2,195	41	324,231
CEO (%)	0.05	-	0	1
BOD (%)	0.20	-	0	1
SUP (%)	0.09	-	0	1
AFF (%)	0.08	-	0	1
ENV (%)	0.06	-	0	1
MAN (%)	0.42	-	0	1
FIN (%)	0.13	-	0	1
WHR (%)	0.10	-	0	1
INF (%)	0.07	-	0	1
UTL (%)	0.06	-	0	1
EMI (%)	0.03	-	0	1
TCOMP (M)	4,835	6,665	114	92,199
AGE	54.79	6.77	34	90
Tenure	11.82	8.47	1	56

Table 3 reported the zero order correlation coefficients for the continuous model variables. The largest correlation is between revenue and total executive compensation (r = 0.514, p=0.000). This result simply reaffirms the generally held view that firm size and executive pay are strongly linked (Geiger, 2007).

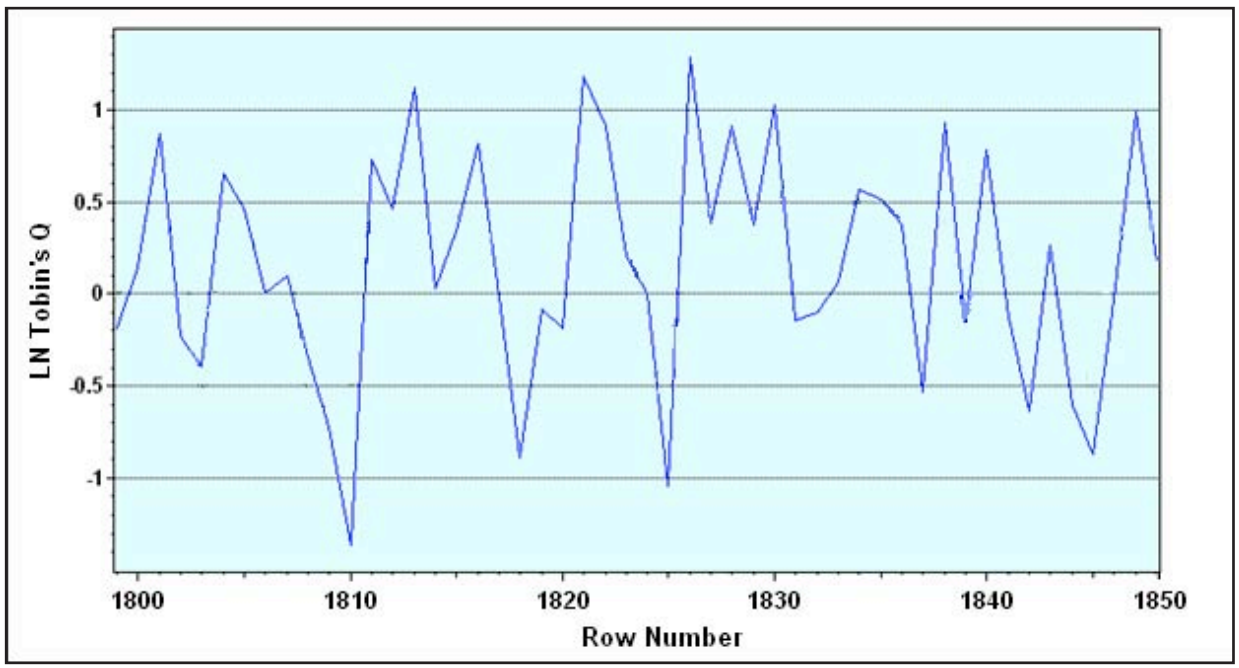
Table 3: Zero order correlation coefficients

	ROE	LNREV	LNTC	AGE	TENURE	LNQ
ROE	1					
LNREV	0.131**	1				
LNTC	0.114**	0.514**	1			
AGE	0.021	0.011	0.076**	1		
TENURE	0.026	0.074**	0.149**	0.364**	1	
LNQ	0.305**	-0.083**	0.044	-0.062**	-0.002	1

** Significant at the 1% level

Figure 1 features a plot of the target variable (LNQ) for a sample range. As can be seen the target variable is very noisy even after it has been transformed using the log of the actual measurements. This condition making the modeling task extremely challenging.

Figure 1: Plot of LNQ for Selected Database Rows



RESULTS ANALYSIS

The database was further analysed using OLS, panel random effects and neural net modeling*. Table 4 highlights the analytical results. The data shows that the performance of the OLS, random effects and neural net models were approximately the same both with respect to R-square and RMSE.

Table 4: Comparison of training model performance (N=1798) *

Model/Statistic	R-Square	RMSE
Pooled (OLS)	0.336	0.567
Random Effects	0.328	0.572
Neural Net	0.343	0.560

The fixed effects model was dropped due to the very large number of firms and the fact that many of the predictor variables were invariant over time.

A comparison of the importance of each of the predictor variables is given in Table 5. The predictor variables are ranked based on the neural net model importance factors since the neural net model had a slightly higher accuracy level. The OLS and random effects values are standardised regression coefficients. As can be seen FIN (finance/insurance sector) is by far the most important variable across each of the three models. The utilities sector was also found significant but to a much lesser degree. Environmental regulatory problem, firm revenues, a measure of size, and CEO compensation were also found to be significant. CEO age or tenure was not found to be significant, which is consistent with the observations reported by Nelson (2005).

Table 5: Comparison of variable importance (N=1798)

Variable	Neural Net	OLS*	Random Effects*
FIN	0.361	-0.563 (a)	-0.571 (a)
INF	0.200	-	-
UTL	0.187	-0.159 (a)	-0.180 (a)
ENV	0.090	-0.086 (a)	-0.060 (a)
LNREV	0.072	-0.106 (a)	-0.075 (a)
LNTC	0.056	0.126 (a)	0.028 (b)
TIME	0.029	0.054	-
AFF	0.006	-	-
BOD	0.002	0.043	-

*** Standardised regression coefficients (p-value < 0.05)**

The results from the Breush-Pagan test indicate that the null hypothesis, variance of the random effects is zero, should be rejected. Therefore, the random effects estimator is preferred over then pooled OLS. In terms of individual variable comparisons a t test approximate procedure was performed to determine if the OLS and random effects coefficients were statistically the same. The subscripts (a, b) in Table 5 indicate whether the standardised slopes, for a given row, were found to be different at $p < 0.05$. For example, for the variable LNREV the slopes for the OLS and random effects models are the same while the slopes for LNTC are statistically different. The data in Table 5 also reveals the general consistency between the TSCS regression model results and the neural net model in terms of variable importance. This observation is consistent with that reported by Pao (2006). Pao also found that a one-year lagged neural net model significantly outperformed the TSCS models as measured by RMSE, which is not the case in this study.

Table 6 presents a summary of hypothesis testing process using the regression model results highlighted in Table 5. Hypothesis #1 which predicted a correlation between the size of the firm, as measured by total annual revenue, and firm performance is supported. This result is consistent with those reported in the literature (Lee, 2009). The analysis also revealed that the financial/insurance and utilities sectors have a positive statistically significant correlation with firm performance while the manufacturing, information, wholesale/retail, and mining/energy sectors were not statistically significant when taken collectively (Hypothesis #2). Neither the age nor tenure of the CEO was discovered to be statistically significant (Hypotheses #3 and #4). Total executive compensation was found to be positively correlated with firm performance (Hypothesis # 5).

With respect to board diversity the findings are mixed (Hypothesis #6). The OLS model showed a statistically significant coefficient while the random effects model did not. The relative importance factor for the neural net model was very small. This lack of a consistent analytical pattern between board composition and firm performance is similar to that reported by Francoeur (2007). Regarding supplier diversity and CEO diversity there is little evidence to support a relationship with firm performance (Hypotheses #7, #8). Perhaps this is because of the relatively small proportion of women and minorities in each of these categories. For example, for the 2004 database women and minorities constituted approximately 5 per cent of the total supplier base. Regarding good governance, substantial affirmative action violations were not found to be linked to firm performance while environmental violations were discovered to be negatively correlated with firm performance (Hypothesis #9). This outcome is consistent with that reported by Wagner (2010). Wagner reported that environmental performance had a negative effect on Tobin's Q, with the effect being stronger for toxic chemicals disclosures than for the number of lawsuits pending against a firm.

Table 6: Hypothesis summary (P < 0.05)

Hypothesis	Conclusion
H1*:* Total revenue is correlated with firm performance	Supported
H2: Industry sector is correlated with firm performance	Supported[1]
H3: CEO age is correlated with firm performance	Not Supported
H4: CEO tenure is correlated with firm performance	Not Supported
H5: CEO total compensation is correlated with firm performance	Supported
H6: CEO diversity is correlated with firm performance	Not Supported
H7: Board diversity is correlated with firm performance	Supported
H8: Supplier diversity is correlated with firm performance	Not Supported
H9*:* Corporate governance is correlated with firm performance	Supported[2]

[1] Financial and utilities sectors
[2] Substantial environmental violations

Table 7 presents a comparison of out-of-sample model performance for 2007. The sample size was 481. As a general proposition the comparison of different forecasting models should be based on out-of-sample data. Often complex models, like the ones used in this study, provide good within-sample results but rather poor out-of-sample outcomes. This condition has to do with the so-called 'optimisation' principle — that is, a model based on within sample data tends to generate over optimistic performance (Picard, 1984). These results are generally consistent with those reported in Table 5 albeit with lower R-squares.

Table 7: Comparison of out-of-sample model forecasting performance (N=481)

Model/Statistic	R-Square	RMSE
Pooled (OLS)	0.214	0.603
Random Effects	0.291	0.573
Neural Net	0.287	0.570

As indicated above, one of the challenges associated with gleaning insights in the impact of diversity on firm performance is the low proportion of women and minority representation. Table 8 reports the percentage of women and minority across three key diversity categories (CEO, BOD, WMS). This data shows a modest increase in diversity representation over the four-year period. These positive trends could be in jeopardy as a result of the worldwide recession of 2008–2009 (Adam, 2010).

Table 8: Comparison of diversity composition between 2004 and 2007 (%)

Category	2004	2007
CEO	0.04	0.05
BOD	0.13	0.19
WMS	0.06	0.13

The analytical process outlined in this paper can be used to help design performance-based corporate management teams. The modeling approach could be expanded to incorporate a number of senior management positions in addition to the CEO. In that regard, specific attention should be given to drafting long-term compensation packages that align the goals of the management team with those of the firm (Jarque, 2008). In terms of operationalising the process outlined in this paper the model could be designed around the specific sub-industry sector of interest and more detailed governance factors. This approach should help reduce the large variance in the target variable (Tobin's Q) and thus improve model performance. Another area of potential interest is the impact of CEO turnover on organisational makeup. Recent data suggests that the probability of non-CEO top manager turnover increases significantly during the CEO transition period. The magnitude of this turnover depends, in part, on the relations between the tenure of the manager and tenures of the departing and incoming CEOs (Hayes, 2006).

CONCLUSIONS

The ongoing worldwide financial and economic crisis has spotlighted a number of significant deficiencies in corporate management. Corporations are examples of hierarchical structures consisting of individual managers, teams, the decision-making process and overall organisational performance. The relationship between the management team composition and firm performance is both complex and dynamic which calls for an in-depth assessment. The purpose of this paper was to highlight the results of a panel analysis on the relationship between governance, diversity and CEO characteristics on firm performance using the S&P 1500 for the period 2004 to 2006. The results show that both corporate governance, as measured by environment violations, and CEO characteristics, as measured by total composition, impact firm performance. Board diversity was found to have a very marginal effect on firm performance although not across all models. The analysis also revealed that firm performance was affected by firm size and industry sector. These later results are consistent with those reported in the literature. The performance of the various models, as measured by R-square and RMSE, was similar. The forecasts developed for 2007 were also consistent between the models although there was some degradation in both R-square and RMSE. The results do suggest that neural nets can be an effective substitute for classical regression techniques in the study of TSCS databases.

One of the analytical challenges in assessing the impact of board, management and supplier diversity on firm performance is the relatively small proportions of women and minorities in each of these three diversity categories. For example, while the number of women and minorities on boards has increased over the past decade the proportion meeting the critical mass of 35 per cent associated with the KLD database definition remains low compared to general population demographics. One can argue that having token representation on the board or on the management team or as a supplier is not the same as having a critical mass. Examining a broader range of governance dimensions should also be added to the predictive power of the modeling approach. Furthermore, the study of the effect of executive characteristics can be expanded into a variety of areas. One improvement would be to collect additional data on senior executive characteristics such as level of education and diversity.

In summary, the results of this study show that diversity, good governance and CEO characteristics can all contribute to improving firm performance which should be viewed positively in light of ongoing corporate challenges. The slow but general trend towards increased diversity suggests that managers and firms should develop organisations that maximise the benefits of diverse human capital and governance policies, both of which can lead to increased competitive advantage.

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