The Influence of Board Gender Diversity on the Value of NZX Listed Firms and its Association with Growth Options

Abstract

Our study principally examines the relationship between board gender diversity and firm value and the extent to which this relationship is affected by the level of growth options relative to assets-in-place. Using a sample of 865 firm-years covered by 125 firms listed on the New Zealand Exchange during the 1998-2007 financial years, we found that board gender diversity together with the level of growth options significantly affects firm value after effectively controlling for the endogeneity and self-selection bias problem. Specifically, firms with a higher percentage of female directors on the board have higher firm value. This positive relationship between the percentage of female directors on the board and firm value is more apparent among firms with high levels of growth options. However, among firms having at least one female director on the board, this positive relationship between board gender diversity and firm value becomes less apparent among firms with higher growth options. Given the current overseas regulatory developments promoting the percentage of female directors on the board, our findings have important implications for corporate regulators.

1 Introduction

The board of directors is viewed as "the lynchpin of corporate governance" (Gillan, 2006, p. 385). Fama and Jensen (1983) characterise boards' responsibilities as including both the ratification of management decisions and the monitoring of management performance. In addition, the board of directors has the power to hire, fire and compensate the senior management team. According to agency theory the board's responsibility for monitoring managers' actions ensures that such actions are aligned with shareholders' interests and operates to mitigate managerial opportunism (Fama and Jensen, 1983). These fundamental roles of the board of directors, as a critical component of a good corporate governance system, have given rise to a great deal of research investigating the value relevance of an effective board of directors.

Despite this rich literature, there has been little research that examines the relationship between board structure and firm value and the extent to which the level of growth options relative to assets-in-place affects this relationship. Within this limited literature, the research studies have only focused on the number of independent directors on the board and board size as indicators of board structure (Matolcsy et al., 2004; Orr et al., 2005. In addition, prior relevant research studies have utilised only cross-sectional data sets. Using a sample of 306 firms listed on the Australian Securities Exchange drawn from the UTS Accenture "Who Governs Australia" database for the year 2001, Matolcsy et al. (2004) found that the market value of firms, with larger investments in growth options, increases with having more outside directors. Another research study by Orr et al. (2005) was based on a sample of 60 randomly selected firms listed on the New Zealand Exchange (NZX) during 2001. This study documents that firms with high level

of growth options were more likely to have a higher proportion of outside directors on the board than those with a low level of growth options. This in turn had a positive effect on the relationship between board independence and firm value.

Our study extends these prior research studies by investigating whether board gender diversity has an impact on firm value and whether the level of growth options relative to assets-in-place affects this relationship. Other indicators of board structure, namely the proportion of non-executive directors and the size of the board, which were examined in prior research studies, are used as control variables. The study is based on a longitudinal sample of 125 firms listed on the NZX, which covers 865 firm-years with financial reporting periods ending between 31 January 1998 and 31 December 2007. Our results provide strong evidence that board gender diversity has a significant influence of firm value. In addition, the level of growth options also has a significant influence on the relationship between board gender diversity and firm value after effectively controlling for the endogeneity and self-selection bias problem. Specifically, our findings confirm that the percentage of female directors on a board is positively associated with firm value. It also confirms previous research that firms with a higher level of growth options relative to assets-in-place have higher firm value. Our results further indicate that the positive association between the percentage of female directors on the board and firm value is more apparent for firms with higher levels of growth options. Accordingly, the benefits of board gender diversity become stronger among firms with high levels of growth options. However, among firms having at least one female director on the board, the positive relationship between board gender diversity and firm value becomes less apparent among firms with higher growth options.

Our study contributes to the literature in several ways. First, our study is the first study, which analyses the impact on firm value of board gender diversity and its association with the level of growth options relative to assets-in-place. Second, our study is based on a longitudinal data set, which provides more generalisable results than those documented in prior research studies, which only focus on a cross-sectional data sample. Third, we employ a simultaneous equations framework and two-stage Heckman procedure to control for the potential endogeneity and self-selection bias problem between board gender diversity and firm value. This has not been used in prior research studies on board structure, growth options and firm value.

A key motivation for this research is to investigate the economic value of women on boards in New Zealand in light of recent international developments. Most notably, the ASX recently amended its Corporate Governance Principles and Recommendations from 1 January 2011 to require listed companies to publish a policy concerning diversity and to annually disclose progress towards gender diversity in the firm generally and on the board. In the United Kingdom in February 2011, the Davies Report recommended that Chairs of all FTSE companies should set out the percentages of women they aspire to have appointed to their boards in 2013 and 2015. Furthermore, the Report recommended that all FTSE 100 companies should appoint a minimum of 25 percent of women directors by 2015. It also recommended that the UK Corporate Governance Code, published by the Financial Reporting Council, should be amended to require listed companies to establish a policy concerning boardroom diversity and be required to report against this policy. These initiatives are the latest in a series of international reforms and recommendations around the world to increase the number of women on boards. The “most extreme promotion of gender diversity occurs in Norway”

(Adams and Ferreira, 2009). From 1 January 2008, all publicly held firms were required to have at least 40 percent women directors or be confronted with dissolution. Other European jurisdictions, such as Spain, the Netherlands and France have passed similar quota law and other European countries have also initiated reforms in this area (Ahern and Dittmar, 2010; Campbell and Vera, 2010).

In New Zealand, the NZX's Listing Rules do not require diversity or particular skills or experience from board members. Instead, the Rules set out a number of minimum requirements, including the minimum number of directors, (Rule 3.1.1(a)), the minimum number of New Zealand resident directors (Rule 3.1.1(b)) and the rules to calculate the minimum number of independent directors. The New Zealand Securities Commission's *Corporate Governance in New Zealand – Principles and Guidelines* also do not mandate the appointment of female directors on the board. Principle 2 provides that "there should be a balance of independence, skills, knowledge, experience, and perspectives among directors so that the board works effectively". While it is arguable that implicitly a balance of perspectives demands some degree of gender diversity on a board, it needs to be recognised that the *Principles and Guidelines* are guidelines only and are not enforceable by the Commission. Thus, while in many jurisdictions there have been recent regulatory reforms or high level calls for policy changes on the number of female directors on boards, this has not happened in New Zealand. Our New Zealand data therefore allows us to analyse the effect of board gender diversity and growth options on firm value in a largely unregulated market.

The remainder of our paper is organised as follows. Section 2 summarises relevant literature on board gender diversity, growth options and firm value and develops the

research hypotheses. An overview of the research design is provided in section 3. Section 4 sets out our results and we present our conclusions in section 5.

2 Literature Review and Hypothesis Development

2.1 The Benefits of Board Gender Diversity

The board of directors with its dual responsibilities of ratifying decisions and monitoring management, underpinned by its fiduciary obligations to the company, is generally viewed as an important corporate governance mechanism (Gillan, 2006). From an agency theory perspective, the board's monitoring role operates to protect shareholders from the self-interest of management, thereby mitigating agency costs associated with moral hazard. Accordingly, the more a board is able to monitor management, the more agency costs will be reduced.

Pressure to increase the number of women on boards is based "on the view that the presence of women on boards could affect the governance of companies in significant ways" (Adams and Ferreira, 2009). Historically much of the literature on women on corporate boards can be found in the management, psychology or sociological fields focusing at a theoretical level on why, both at an individual and firm level, women are under-represented on corporate boards (Terjesen et al., 2009). Within the finance and economic literature, researchers, in recent years, have begun to investigate the economic value of board diversity in general. Cox and Blake (1991) argue that firms that deal with diversity-related issues should have economic advantages over firms that do not. In fact, according to Keys et al. (2002), firms ranked by *Fortune* as being among the "diversity elite" added more value to their shareholders compared to non-diversity promoters.

Within this debate on the value of diversity in general, there are an increasing number of research studies on the economic impact of gender diversity on a board. Research within this business case paradigm (as distinct from what can loosely be described as ethical approaches) can be divided into two broad categories. First, research which has analysed the influence of female directors on boardroom dynamics and second, research which has considered the impact of gender diversity on firm performance (Campbell and Vera, 2010).

Board room dynamics arguments are based on a belief that diversity in general, and board gender diversity in particular, promotes a better understanding of the marketplace, increases creativity and innovation as well as enhancing the effectiveness of corporate leadership (Robinson and Dechant, 1997). There are a significant number of largely intuitive, theoretical frameworks underlying research as to the benefits of board diversity in general and women on boards specifically. A recent review of research in this area divided the literature into research that has considered the characteristics and impact of female directors at an individual level, at a board level and on the firm generally (Terjesen et al., 2009). For example at a board level, social capital theorists contend that more women on a board will create a more diverse board and a more diverse board will intuitively provide a wider range of perspectives, thereby ensuring that a board will make better decisions (van der Walt and Ingley, 2003). At a firm level, resource dependence theorists contend that as boards also provide linking functions between a company and the external world, a more diverse board, including a higher percentage of women directors, will provide a greater range of network and linkage opportunities for a firm (Hillman et al., 2002). In an empirical study, Brammer et al. (2007) found that board composition in the United Kingdom varied across industry

sectors with the highest rate of female directors found in the retailing, banking, media and utilities. These sectors all have a closer proximity to final consumers. This proximity was found to have a positive effect on shaping board diversity. In contrast, sectors such as resources, engineering and business, which were characterised as being isolated from final consumers and having largely a male workforce, have fewer female directors.

In terms of firm performance, although, there have been a number of empirical research studies that have studied the relationship between board gender diversity and firm performance, the results of these studies have been inconclusive (Carter et al., 2003; Adams and Ferreira, 2009; Campbell and Vera, 2010; Carter et al., 2010). Carter et al. (2003) found significant positive relationships between the percentage of women or minorities on the board and firm value after effectively controlling for size, industry and other corporate governance measures. More recently, Campbell and Vera (2010) found that female board appointments are positively associated with firm value over a sustained period. This research is based on the short and long-term effect of the appointment of female directors prior to the decision by the Spanish government to regulate for an increase in the number of women on boards.

However, the most recent study by Carter et al. (2010), after summarising seven prior research studies which had investigated the link between gender diversity and firm performance, concluded that that the findings are inconclusive. In their own research of a sample of firms from the S&P 500 index for the five-year period from 1998-2002, Carter et al. (2010) found no effect, either positive or negative, of gender and ethnic diversity on the financial performance of the firm. One of the research studies reviewed

by Carter et al. (2010) was that of Adams and Ferreira (2009) who had found a negative relationship between gender diversity and both ROA and Tobin's Q using a sample of firms from 1996-2003. Interestingly, they found female directors attended more board meetings than male directors and were more likely to join monitoring committees such as audit, compensation, nominating and corporate governance, which led them to conclude that gender diverse boards allocate more effort to monitoring. However, they argue that over monitoring can decrease shareholder value and concluded that while firms with weak governance, as measured by an ability to resist a takeover may benefit from board gender diversity, overall the impact was negative.

In a study of Norwegian companies, following the 2003 quota of 40 percent female directors on Norwegian Boards, it was found that this event resulted in a substantial change in the characteristics of board members (including age, gender and experience) and had a significantly negative impact on firm value, However, Ahern and Dittmar (2010) suggested that this loss was not caused by the gender of the new directors, but rather by the loss of older, experienced male directors.

2.2 Board Gender Diversity and Firm Value

Where an agency problem or conflict of interests exists among stakeholders of a firm, corporate governance in general, and board structure in particular, are important. Carter et al. (2003) suggest that agency theory is the "theoretical framework most often used by investigators in finance and economics to understand the link between board characteristics and firm value". An effective corporate board ameliorates agency costs arising from the separation of ownership and control, information asymmetry and contracting costs (Hart, 1995) and where such agency problems cannot be satisfactorily

contracted away due to significant uncertainty. According to Bushman and Smith (2003), effective corporate governances mechanisms, such as corporate boards, serve two important purposes. First, they ensure that minority shareholders receive reliable information about the value of firms and that a company's managers and large shareholders do not cheat them out of the value of their investments. Second, they motivate managers to maximise firm value instead of pursuing personal objectives.

From a traditional agency theory viewpoint, effective corporate boards require the presence of non-executive and independent directors on a board. Outside directors on a board add value for shareholders if they actively monitor and challenge the insider directors and reduce the opportunity for self-dealing by the executive directors. Outside directors do not add value simply because they are independent of the company of which they are directors. According to Carter et al. (2003), this raises the central question as to the relationship between board diversity and board independence. One argument they put forward is that diversity increases board independence because people with a different gender, ethnicity or cultural values can be considered as the 'ultimate outsider'. A more diverse board (encompassing both executive and non-executive directors) may be a more activist board and ask different questions than directors with more orthodox backgrounds.

The most commonly studied aspect of board composition has been the ratio of outside directors to executive directors on a board and the relationship to firm value (Hermalin and Weisbach, 2003). These research studies focusing on the ratio of outside directors as a proxy for the level of board activism have relevance; however, a more diverse board is likely to be a more activist board. Carter et al. (2003) argue that although the

theoretical framework does not determine the role of board diversity in firm value in the corporate world, there appears to be an intuitive belief in a positive relationship between board diversity and firm value. Taking a broad view of the theoretical framework and limited directly relevant empirical evidence, we propose the following hypothesis concerning the influence of board gender diversity on firm value:

H1: A more gender diverse board is more value relevant.

2.3 The Influence of Board Gender Diversity on Firm Value and its Association with Growth Options

A firm's value is a function of its expected future cash flows, discounted for risk and time. Cash flows can be generated from assets-in-place and from the realisation of growth options. Assets-in-place represent the firm's investments in real or physical assets while growth options represent the value of the opportunity for future investments in assets (Orr et al., 2005).

Compared to assets-in-place, growth options are more firm-specific and are more difficult to trade on secondary markets as their value is mostly determined jointly by other assets held by the firm (Matolcsy et al., 2004). The nature of investments in growth options increases the need to monitor management (Smith and Watts, 1992; Skinner, 1993), because of concerns that management may use their discretion to make decisions that are in their self interest and do not maximise firm value for shareholders (Jensen and Meckling, 1976). This need is exacerbated when the proportion of a firm's growth options to assets-in-place increases. In order to mitigate this problem, the firm can introduce measures to monitor management more effectively. Measures such as

having more female directors, more independent directors and/or increasing board size may combine to create a board structure that will more effectively monitor management. Firms with a more effective board structure reduce the opportunities for management to act opportunistically and provide more experience and knowledge to ensure that growth options are exercised optimally. Therefore, our hypothesis regarding the impact of growth options on the relationship between board structure and firm value is stated as follows:

> *H2: A more gender diverse board is more value relevant for firms with higher growth options.*

3 Research Design

3.1 Study Period and Sample

The sample selection process commences with the 317 firms listed in the Events section of the NZX database as at 17 September 2008. After elimination of 113 firms for which data is not available in the NZX database, 31 firms which are listed on the New Zealand Alternative Market (NZAX) and 48 firms that not have issued at least 5 annual reports since being listed on the NZSX, the final sample comprises 125 firms. These 125 firms cover a total of 897 firm-years with financial reporting periods ending between 31 January 1998 and 31 December 2007. After deleting 17 firm-years with negative book value of equity and 15 firm-years with missing board structure indicators, the total firm-years in the final sample is 865.

Details about this sample selection process are provided in Table 1

[INSERT TABLE 1 HERE]

3.2 Data Sources

The NZX listing status was extracted from the Events section of the NZX database as at 17 September 2008. Data related to board structure was hand collected from the annual reports, which are provided in the Annual Reports section of the NZX database. Accounting and market-related data was obtained from either the NZX database or the Datastream database.

3.3 Board Gender Diversity

In the context of our study, the percentage of female directors (*BRDDIVERSITY*) is used as proxy for the level of gender diversity. According to Hermalin and Weisbach (2003), board structure characteristics including board gender diversity and firm attributes including firm value are endogenously determined. In order to address the concern about the endogenous relationship between board gender diversity and firm value and detect a one-way causal effect of board gender diversity on firm value, a simultaneous equations framework is employed.

In the first stage, board gender diversity was regressed on all the exogenous variables including book value of equity per share, earnings per share, leverage, growth, board independence, board size, firm age[1], return on assets[2], earnings volatility[3] and cross-listing status[4]; and the fitted values of board gender diversity were obtained. In the second stage, the fitted values of board gender diversity replace the original board

[1] Firm age is measured by the natural logarithm of the number of days a firm has been listed on the NZX.
[2] Return on assets is measured by the net earnings after tax divided by total assets at the end of the
[2] Return on assets is measured by the net earnings after tax divided by total assets at the end of the
financial year.
[3] Earnings volatility is measured by natural logarithm of the standard deviation of earnings per share changes in the previous four years.
[4] Cross-listing status is a dichotomous variable taking the value of 1 if the firm is cross-listed on a foreign exchange.

gender diversity in the model used, to test the impact of board gender diversity on firm value and its association with growth options. Specifically, the fitted values *BRDDIVERSITY INSTRUMENT* replace the original *BRDDIVERSITY*.

3.4 Growth Options

In consistent with Matolcsy et al. (2004), growth options represent the growth opportunities are measured by the market to book value of equities.

3.5 Control Variables

Many research studies have considered whether the proportion of independent directors and the size of the board enhance the board's ability to operate as an effective corporate governance mechanism (John and Senbet, 1998; Carter et al., 2003; Karamanou and Vafeas, 2005). Fama and Jensen (1983) argue that a larger proportion of non-executive directors on the board enhance board monitoring performance. According to Chen and Jaggi (2000), firms with a higher percentage of non-executive directors on the board were more engaged and provided more comprehensive statutory disclosures. Firms with a higher level of board independence were less likely to engage in earnings management (Klein, 2002). In addition, Matolcsy et al. (2004) and Orr et al. (2005) both document that firms with more outside directors on the board have higher firm value, especially in the presence of high level of growth options relative to assets-in-place.

Board size is argued to enhance board monitoring performance, as appointing more directors on the board would enhance board knowledge and provide greater capacity to share the monitoring responsibilities (Song and Windram, 2004; Karamanou and Vafeas, 2005). However, larger boards are posited to be less flexible and less efficient

due to higher coordination costs and less effective communication (John and Senbet, 1998; Coles et al., 2008). According to Bradbury et al. (2006), firms with a greater number of directors on the board tended to have high earnings quality. However, Yermack (1996) documents a negative relationship between board size and firm value. Given that most NZX listed firms are relatively small, the first effect could reasonably be argued to dominate the second. Also, prior studies by Matolcsy et al. (2004) and Orr et al. (2005) control for board size when examining the impact of board independence on firm value and its association with growth options.

In order to be consistent with prior research studies, we control for board independence and board size while examining the impact of board gender diversity on firm value and its association with growth options. The percentage of non-executive directors and the number of directors on the board are employed as proxies for board independence and board size, respectively. The two-stage least squares method is also employed to detect the one-way causal effect of board independence and board size on firm value.

3.6 Hypothesis Testing Procedures

To test the relationship between board structure and firm value and the extent to which this relationship is affected by growth options, we employ a form of the Ohlson's (1995) model as a basis to estimate the following regression equation:

$$MVE_{i,t} = a_0 + a_1 BVE_{i,t} + a_2 NPAT_{i,t} + a_3 LEVERAGE_{i,t} + a_4 BRDDIVERSITY\ INSTRUMENT_{i,t} + a_5 GROWTH_{i,t} + a_6 BRDDIVERSITY\ GROWTH\ INSTRUMENT_{i,t} + a_7 BRDINDP_R_{i,t} + a_8 BRDSIZE_R_{i,t} + \mu_{i,t}$$

where:

MVE =	market value of equities per share basis at the end of the current financial year
BVE =	book value of equities per share basis at the end of the current financial year
NPAT =	earnings per share at the end of the current financial year
LEVERAGE =	the natural logarithm of the book value of total liabilities divided by the book value of total equities at the end of the current financial year
BRDDIVERSITY INSTRUMENT =	the fitted value of the *BRDDIVERSITY*
GROWTH =	the natural logarithm of the market to book value of equities at the end of the current financial year.
BRDDIVERSITY_GROWTH INSTRUMENT =	*BRDDIVERSITY INSTRUMENT* multiplied by *GROWTH*
BRDINDP =	the percentage of non-executive directors on the board
BRDSIZE=	the number of directors on the board

The variable of interest in testing H1 is *BRDDIVERSITY INSTRUMENT*. A significant positive coefficient on this variable confirms this hypothesis. For H2, the variable of interest is the interaction variable between *BRDDIVERSITY INSTRUMENT* and *GROWTH*. If H2 is correct, we expect to observe significant positive coefficient on this interaction variable.

LEVERAGE is included to control for the effect that capital structure could have on equity value (Orr et al., 2005). In addition, numerous research studies suggest that leverage could confound the value relevance of outside directors (Jensen, 1986, 1989; Anderson et al., 1993; Gul and Tsui, 1998). Also, prior to estimating the model, the skewness and kurtosis statistics are checked for this variable and extreme values are winsorised to preserve the characteristics of the original data while minimising the possible distortion of results by these extreme values. The maximum number of observations winsorised is low at the level of 5 percent of the sample observations.

4 Results

4.1 Univariate Analysis

Table 2 presents the descriptive statistics for the dependent and independent variables. The mean of the market value of equity per share, book value of equity per share and earnings per share is $2.388, $1.481 and $0.109, respectively. The average leverage is relatively high at 1.850 compared to the average of 1.246 for ASX listed firms reported in Matolcsy et al. (2004). The percentage of female directors and non-executive directors is 5.2 and 82.1 percent, respectively. The percentage of non-executive directors is far higher than the 66.5 percent for ASX listed firms documented in Matolcsy et al. (2004). The average board size is 6.1, which is similar to that of 6.6 for ASX listed firms. The mean of growth options is 0.106.

[INSERT TABLE 2 HERE]

To facilitate the analysis of our hypotheses, we first divide the 865 firm-years in the entire sample into a low growth options group and a high growth options group based on the variable *GROWTH*. Untabulated descriptive statistics for the *GROWTH* variable of these two groups are as follows: (1) for the 432 firm-years in the low growth options group, the mean, median and standard deviation of *GROWTH* are -0.189, -0.088 and 0.413, respectively; and (2) for the 433 firm-years in the high growth options group, the mean, median and standard deviation of *GROWTH* are 1.084, 0.935 and 0.587, respectively. The value of growth options for the high growth options group is significantly larger for that reported for the low growth options group at the 1 percent level using both two-tailed *t*-test (t-statistic = 36.877 and p-value = 0.000) and Mann-Whitney *z*-test (*z*-statistic = 25.456 and p-value = 0.000).

Table 3 compares the dependent and independent variables (except for *GROWTH*) for low and high growth options groups. It is obvious from Table 3 that the mean *MVE* for firms with high growth options ($3.134) is significantly higher than that for firms with low growth options ($1.641) at the 1 percent level. It is interesting to observe that the mean *BVE* for firms with high growth options ($1.190) is significantly lower than the mean *BE* for firms with low growth options ($1.772) at the 1 percent level. The mean *NPAT* for high growth options group ($0.137) is far higher than that of low options group ($0.081) and the difference between the two groups is significant at the 1 percent level. The mean *LEVERAGE* for firms with low growth options is -0.719, which is significantly lower than the -0.124 reported for the high growth options group.

The mean percentage of female directors on board for firms with high growth options is 5.8 percent compared to only 4.6 percent documented for firms with low growth options. This difference is significant at 1 percent level. The percentage of non-executive directors on the board among firms with high growth options is significantly lower than that among firms with low growth options. Board size is quantitatively similar across the two groups.

Further results in Table 3 reveal that firms with low growth options have been listed on the NZX longer, tend not to be cross-listed on a foreign exchange and have higher assets value than those with high growth options.

[INSERT TABLE 3 HERE]

4.2 Multivariate Analysis

The regression results of testing our two hypotheses are presented in Table 4. The coefficient estimate on *BRDDIVERSITY INSTRUMENT* is 17.764 and is significant at the 1 percent level, which confirms H1. Firms with a higher percentage of female directors on the board are associated with higher market value of equities.

The coefficient estimate on *BRDDIVERSITY GROWTH INSTRUMENT* is significantly positive at 1 percent level (1.247). Therefore, H2 is accepted. The value of board gender diversity appears to be more apparent among firms with high growth options.

Other results in Table 4 show that the coefficient estimates on *BVE*, *NPAT*, *LEVERAGE* and *GROWTH* are all positive and are significant at the 1 percent level. Firms with larger board are more likely to have higher firm value. In addition, the regression estimated has high explanatory power, as determined by the adjusted R^2 of 0.792 and the *F*-statistic of 470.280, which is significant at the 1 percent level. The Durbin χ^2 and the Wu-Hausman *F*-statistic are both significant at 1 percent level, confirming the appropriateness of the simultaneous equations.

It is also shown from Table 4 that the coefficient on *BRDDIVERSITY INSTRUMENT* is positively significant at 1 percent level for both low and high growth options groups.

[INSERT TABLE 4 HERE]

4.3 Sensitivity Analysis

First, firms with higher firm value may choose to have more female participation on their boards. Therefore, we test for the self-selection bias by employing the two-stage Heckman procedure. For the Heckman correction, the inverse Mills ratio (*IMR*) is computed from a Profit model predicting the presence of female directors on the board.

As reported in Table 5, given the insignificant coefficient on the variable *IMR*, the self-selection bias problem is not present in our data. Among firms having at least one female director on their boards, there is still a significant positive relationship between board gender diversity and firm value. However, this positive relationship is less apparent among firms with high growth options.[5]

Second, White's heteroscedasticity standard errors are used to allow the refitting of the model that may contain heteroscedastic residuals. The results obtained from retesting the model are quantitatively similar to the main findings.

Third, the model is retested inclusive of each of the industry dichotomous variables for the six major industry categories: (1) materials, mining or energy, (2) technology, telecommunication or biotechnology, (3) financial services, (4) utilities, airports, airlines, ports or shipping, (5) manufacturing or healthcare, and (6) consumer staples. It is interesting to observe that firms in the materials, mining or energy and utilities, airports, airlines, ports or shipping industries are associated with higher market value of equities while firms in the financial services and manufacturing or healthcare industries have lower market value of equities. The other results are not significantly different from the main findings.

Lastly, the model is re-estimated including interaction variables between board independence and growth options (*BRDINDP_GROWTH*) and board size and growth options (*BRDSIZE_GROWTH*). The coefficient on *BRDINDP_GROWTH* is positive significant at 1 percent level, indicating that board independence is positively associated

[5] Untabulated results show that firms having at least one female director on their boards tend to have higher growth options.

with firm value among firms with high growth options. The other results are not significantly different from the main findings.

5 Conclusion

The objective of our study is to examine the relationship between board gender diversity and firm value, and the extent to which the level of growth options relative to assets-in-place affects this relationship in New Zealand.

Based on a sample of 865 firm-years covered by 125 firms listed on the NZX with financial reporting dates ending between 31 January 1998 and 31 December 2007, our results document significant evidence that board gender diversity together with the level of growth options significantly impact on firm value after effectively controlling for the endogeneity and self-selection bias problem. Firms with a higher number of female directors on the board have higher firm value. In addition, the benefit of board gender diversity appears to be more apparent among firms with high growth options. However, among firms having at least one female director on the board, the positive relationship between board gender diversity and firm value becomes less apparent among firms with higher growth options.

The findings with regard to board gender diversity particularly have important implications for the ongoing policy and regulatory debate as to women on boards. Our findings on board gender diversity are consistent with overseas research and with overseas regulatory developments promoting the percentage of female directors on the board. Most notably the ASX recently amended its Corporate Governance Principles and Recommendations to require listed companies to publish a policy concerning

diversity and to annually disclose progress towards gender diversity in the firm generally and on the board.

The major limitation of our study is that it focuses a small sample within a small jurisdiction of New Zealand; therefore, the generalisability of the findings reported in this study is potentially diminished. Given that the sample firms must have survived a minimum of five years since being listed in order to be included in the final sample, the findings from this study may not be representative for newly listed firms. Therefore, future research could extend the dataset to include a larger jurisdiction and/or including newly listed firms.

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Table 1
Sample Selection Procedure

Selecting Criteria	Number of Observations
Sample Firms	
Total firms listed on the Events section of the NZX database as at 17 September 2008	317
Less firms listed on the Events section of the NZX database not covered by the NZX database	(113)
Less firms listed on the NZAX	(31)
Less firms not issuing at least 5 annual reports since being listed on the NZSX	(48)
Total firms in the final sample	125
Sample Firm-years	
Total firm years for 125 firms	897
Less firm-years with negative book value of equities	(17)
Less firm-years with missing board gender diversity data	(15)
Total firm-years in the final sample	865

[1] The total number of firm-years includes all firm-years with financial reporting dates ending between 31 January 1998 and 31 December 2007.

Table 2
Descriptive Statistics

Variables	Mean/Number	Median/Percentage	Standard Deviation
MVE ($)	2.388	1.310	2.948
BVE ($)	1.481	0.976	2.086
NPAT ($)	0.109	0.080	0.478
LEVERAGE	-0.421	-0.274	1.327
BRDDIVERSITY	0.052	0.000	0.106
GROWTH	0.449	0.356	0.814
BRDINDP	0.821	0.833	0.184
BRDSIZE	6.111	6	1.885
FIRMAGE	8.383	8.341	0.757
ROA	0.004	0.043	0.202
EPSVOL	-2.759	-2.696	1.451
CROSSLIST	160	18.50%	
ASSETS	18.726	18.818	2.109

See Section 3 for definitions of variables

Table 3
Univariate Comparison between Variables for Low and High Growth Option Firm-years

	Low Growth Option N = 432			High Growth Option N = 433			Low vs. High Growth Option
Variables	**Mean Number**	**Median Percentage**	**Standard Deviation**	**Mean Number**	**Median Percentage**	**Standard Deviation**	***t*-statistic (Mann-Whitney *z*-statistic)/χ^2 statistic**
MVE ($)	1.641	0.900	2.435	3.134	2.241	3.218	7.695** (8.748**)
BVE ($)	1.772	1.042	2.518	1.190	0.819	1.486	-4.136** (-4.468**)
NPAT ($)	0.081	0.055	0.304	0.137	0.134	0.603	1.733* (6.105**)
LEVERAGE	-0.719	-0.530	1.358	-0.124	-0.035	1.226	6.767** (6.632**)
BRDDIVERSITY	0.046	0.000	0.113	0.058	0.000	0.098	1.763* (3.582**)
BRDINDP	0.827	0.857	0.194	0.814	0.833	0.173	-1.080 (-2.020*)
BRDSIZE	6.058	6	1.844	6.164	6	1.927	0.827 (1.074)
FIRMAGE	8.460	8.487	0.767	8.306	8.253	0.740	-3.009** (-2.888**)
ROA	0.010	0.030	0.119	-0.002	0.068	0.260	-0.856 (7.179**)
EPSVOL	-2.735	-2.624	1.477	-2.782	-2.770	1.426	-0.475 (-1.069)
CROSSLIST	65	15.05%		95	21.94%		6.817**
ASSETS	18.938	19.081	1.936	18.514	18.584	2.251	-2.974** (-2.822**)

^, *, ** Characteristics are significantly different at the 0.1, 0.05, 0.01 levels, respectively (two-tailed). See Section 3 for definitions of variables.

Table 4
Simultaneous Equations Analysis for the Relationship between Board Gender Diversity and Firm Value and its Association with Growth Options

Variable	Full Sample			Low Growth Options		High Growth Options	
	First-stage Dep. Var. = *BRDDIVERSITY*	Second-stage Dep. Var. = *MVE*	Second-stage Dep. Var. = *MVE*	First-stage Dep. Var. = *BRDDIVERSITY*	Second-stage Dep. Var. = *MVE*	First-stage Dep. Var. = *BRDDIVERSITY*	Second-stage Dep. Var. = *MVE*
	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)	Coefficient (*t*-statistic)
Intercept	0.179	-1.703	-1.359	0.218	-0.240	0.098	-2.087
	(3.830**)	(-6.630**)	(-5.350**)	(3.090**)	(-1.110)	(1.650^)	(-5.860**)
BVE	-0.003	1.073	1.055	-0.003	0.855	0.001	1.852
	(-1.430)	(42.840**)	(43.080**)	(-1.160)	(54.630**)	(0.390)	(39.910**)
NPAT	0.004	0.741	0.691	-0.015	0.706	0.006	0.256
	(0.520)	(7.340**)	(7.020**)	(-0.680)	(5.450**)	(0.750)	(2.530**)
LEVERAGE	-0.005	0.138	0.111	-0.009	0.090	0.000	0.094
	(-1.620)	(3.730**)	(3.070**)	(-2.220*)	(3.090**)	(-0.080)	(1.970^)
BRDDIVERSITY INSTRUMENT		17.764	7.764		5.788		13.882
		(8.890**)	(3.240**)		(2.970**)		(8.280**)
GROWTH	0.005	1.247	0.578	-0.025	1.191	0.018	1.535
	(0.990)	(20.670**)	(5.230**)	(-1.850^)	(11.870**)	(2.070*)	(14.340**)
BRDDIVERSITY_GROWTH INSTRUMENT			13.27				
			(7.150**)				
BRDINDP	0.006	-0.118	0.090	-0.008	-0.137	0.031	-0.500
	(0.310)	(-0.460)	(0.360)	(-0.270)	(-0.720)	(1.200)	(-1.490^)
BRDSIZE	0.001	0.179	0.172	-0.003	0.074	0.005	0.150
	(0.680)	(6.420**)	(6.370**)	(-0.840)	(3.330**)	(1.820^)	(4.070**)
FIRMAGE	-0.016			-0.014		-0.017	
	(-3.330**)			(-2.000*)		(-2.750**)	
ROA	0.046			0.004		0.052	
	(2.300*)			(0.090)		(2.560*)	
EPSVOL	0.005			0.012		-0.003	
	(1.830^)			(2.850**)		(-0.830)	
CROSSLIST	0.042			-0.009		0.071	
	(4.440**)			(-0.600)		(6.270**)	
Durbin χ^2		56.264**			7.529**		37.835**
Wu-Hausman *F*-statistic		59.553**			7.503**		40.595**
Adjusted R^2	0.045	0.792	0.803	0.028	0.909	0.156	0.869
F-statistic	5.040**	470.280**	441.990**	2.260*	613.990**	8.980**	411.550**
Number of observations		865			432		433

^, * and ** denotes significance at the 0.1, 0.05 and 0.01 levels, respectively. See section 3 for definitions of variables.

Table 5
Two-stage Heckman Analysis for the Relationship between Board Gender Diversity and Firm Value and its Association with Growth Options

Variable	Full Sample		Low Growth Options	High Growth Options
	Coefficient (*z*-statistic)	Coefficient (*z*-statistic)	Coefficient (*z*-statistic)	Coefficient (*z*-statistic)
First-stage				
Dep. Var. = *BRDDIVERSITY*				
Intercept	-2.891	-2.891	0.105	-8.149
	(-3.070**)	(-3.070**)	(0.080)	(-4.990**)
GROWTH	0.224	0.224	-0.255	0.560
	(3.240**)	(3.240**)	(-1.530)	(3.710**)
LEVERAGE	-0.092	-0.092	-0.006	-0.261
	(-1.980*)	(-1.980*)	(-0.100)	(-3.350**)
EPSVOL	-0.017	-0.017	0.106	-0.218
	(-0.460)	(-0.460)	(2.050*)	(-3.350**)
ROA	0.640	0.640	-0.799	1.802
	(1.760^)	(1.760^)	(-1.270)	(2.540*)
FIRMAGE	-0.178	-0.178	-0.151	-0.234
	(-2.680**)	(-2.680**)	(-1.640)	(-2.210*)
ASSETS	0.127	0.127	0.011	0.332
	(3.290**)	(3.290**)	(0.200)	(4.660**)
CROSSLIST	0.468	0.468	0.080	0.481
	(3.410**)	(3.410**)	(0.390)	(2.130*)
BRDINDP	0.296	0.296	-0.445	1.363
	(1.060)	(1.060)	(-1.200)	(2.920**)
BRDSIZE	0.131	0.131	0.121	0.132
	(4.100**)	(4.100**)	(2.720**)	(2.530*)
Second-stage				
Dep. Var. = *MVE*				
Intercept	-1.564	-1.344	-0.210	-3.815
	(-1.470)	(-1.270)	(-0.230)	(-2.910**)
BVE	1.282	1.282	1.120	2.187
	(25.020**)	(25.190**)	(36.47**)	(24.420**)
NPAT	0.897	0.882	0.153	0.493
	(4.330**)	(4.280**)	(0.680)	(2.560**)
LEVERAGE	0.119	0.143	-0.032	0.177
	(1.710^)	(2.020*)	(-0.660)	(2.090*)
BRDDIVERSITY	3.137	3.049	0.716	2.762
	(3.560**)	(3.480**)	(1.210)	(2.330*)
GROWTH	2.202	2.501	1.046	3.530
	(14.820**)	(11.400**)	(5.940**)	(13.610**)
BRDDIVERSITY_GROWTH		-1.638		
		(-1.840*)		
BRDINDP	-0.009	-0.067	-0.003	-0.587
	(-0.020)	(-0.130)	(-0.010)	(-0.680)
BRDSIZE	0.154	0.139	-0.022	0.141
	(2.170*)	(1.960*)	(-0.360)	(2.280*)
IMR	-0.133	-0.187	0.064	-0.040
	(-0.360)	(-0.510)	(0.140)	(-0.140)
Wald χ^2	746.120**	759.670	1728.490**	772.020**
Number of observations	865	865	432	433
Censored observations	630	630	340	290
Uncensored observations	235	235	92	143

^, * and ** denotes significance at the 0.1, 0.05 and 0.01 levels, respectively. See section 3 for definitions of variables.