Using geographic density of firms to identify the effect of board size on firm value and corporate policies

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Abstract

Prior research shows that firms tend to recruit directors from the geographically-proximate area. Due to a limited supply of qualified individuals in a given area, firms located in close proximity have to share a limited pool of talented individuals. As a result, the larger the number of firms in the same area, the fewer directors each firm in the area is able to obtain on average. Consistent with this notion, our results show that firms located in a zip code with a larger number of other firms exhibit significantly smaller board size. We then exploit the variation in the numbers of firms across the zip codes and estimate the effects of board size on various corporate outcomes. Our results show that larger board size leads to lower firm value, lower accounting profitability, higher leverage, higher dividend payouts, and a stronger propensity to be an acquirer.

JEL Classification: G14, G32, G34

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I. Introduction

The board of directors is crucially important as it serves as the paramount governance mechanism that safeguards shareholders' interests. Not surprisingly, the academic literature is replete with studies that examine the board of directors in the past few decades. The significance of the board, however, transcends academics. Legislators and regulators also pay close attention to the board, as evidenced by the Sarbarnes-Oxley Act and the associated exchange requirements requiring public firms to have a majority of independent directors on the board. Board quality has been traditionally measured by two dominant attributes (i.e., board independence and board size). One important challenge that has plagued empirical research in this area is the issue of endogeneity. Many earlier studies did not fully account for endogeneity. The more recent literature has recognized that board independence and size are endogeneously determined.

A large number of studies in the literature have explored the effects of geography on corporate outcomes and policies.[1] In spite of such a large number of studies in this area, the effect of geographic location on board size has not been examined in the literature. We intend to fill this void in the literature. Our study is the first to explore the effect of geography on board size and estimate the effects of board size on various corporate outcomes.

In this paper, we hypothesize that board size is partly determined by the number of firms in the geographically-proximate area. Knyazeva, Knyazeva, and Masulis (2013) suggest that firms tend to recruit directors from geographically-proximate areas. It also makes practical sense for prospective directors to accept appointments more from firms located close by than

[1] For instance, geographic location has been found to influence stock ownership (Becker, Cronqvist, and Fahlenbrach, 2011), dividend policy (John, Knyazeva, Knyazeva, 2011), venture capital financing (Gupta and Sapienza, 1992; Norton and Tenenbaum, 1993; Sorenseon and Stuart, 2001), equity financing (Loughran , 2008), mergers and acquisitions (Uysal, Kedia, and Panchapagesan, 2008), bond markets (Butler, 2008; Francis, Hasan, and Waisman, 2008), systematic risks of stocks (Pirinsky and Wang, 2006), stock liquidity (Loughran and Schultz, 2005), capital structure and dividend policy (Gao, Ng, and Wang, 2011), managereial entrenchement (Chintrakarn, Jiraporn, Tong, and Chatjuthamard, 2015), and corporate social responsibility (Jiraporn, Jiraporn, Boepraset, and Chang, 2014; Chintrakarn, Jiraporn, Jiraporn, and Davidson, 2017).

from firms much further away, both for travel convenience and for reduced information asymmetry. In general, directors are appointed from individuals with exceptional qualifications and professional experiences. Given a limited supply of such qualified individuals in a specific area, firms in the same area have to share them. In an area with a large number of firms, each firm is able to get fewer such individuals, making their board size smaller on average. On the contrary, in an area with only a few firms, each firm is able to appoint more directors, making board size larger. Thus, we predict that the number of firms in the geographically-proximate area is a significant determinant of board size.

Based on a sample of nearly 9,500 observations across 15 years, our empirical evidence shows that firms located in an area with a larger number of other firms have significantly smaller board size, consistent with our prediction. The results remain after controlling for a large number of firm-specific characteristics, for board-related attributes, and for variations across time and industries. For robustness, we employ various alternative means to define an area. In particular, we define an area using the 3-digit zip code, the 5-digit zip code, the phone number area code, and the state where the firm is located. Regardless of how an area is defined, the results remain consistent. We also control for board size in the previous period to account for unobservable characteristics that remain constant over time. Further, we control for the average board size in the area to account for area-specific characteristics. In one regression, the R-squared is over 80%, suggesting that our model is well-specified and capture the vast majority of the variance of board size.[2]

Firm location is largely fixed and was determined by factors in the distant past. Thus, it is unlikely related to contemporaneous corporate outcomes or policies. Our primary definition of an area is based on the 3-digit zip code. Zip codes are assigned to maximize mail

[2] Unlike Knyazeva, Knyazeva, and Masulis (2013), we do not find that the number of firms in the geographically-proximate area is a significant determinant of board independence. Rather, we document that is a significant determinant of board size.

delivery and are unlikely correlated with firm policies. Zip code changes are also rare and usually reflect macroeconomic factors, such as demographics and urban development, which are beyond any one firm's control. Zip codes assignments are thus likely exogenous (Jiraporn et al, 2014: Chintrakarn, 2015). Using this insight, we exploit the variations in the number of firms across the zip codes and estimate the effect of board size on firm value. Our study is the first to employ geographic identification to investigate this issue.

It can be argued that large boards can be beneficial because larger boards provide greater access to outside resources, expertise, industry experience, and better advice (Dalton, Daily, Johnson, and Ellstrand, 1999; Coles, Daniel, and Naveen, 2008). On the contrary, several previous studies argue against large boards. For instance, Lipton and Lorsch (1992) and Jensen (1993) criticize the performance of large boards, arguing that problems of poor communication and decision making overwhelm the effectiveness of such groups. Jensen (1993) argues that "when boards get beyond seven or eight people, they are less likely to function effectively and are easier for the CEO to control. Consistent with these arguments, later studies find that smaller boards are associated with higher firm value (Yermack, 1996, Eisenberg, Sungren, and Wells, 1998).

Using the number of firms in the geographically-proximate area as our instrumental variable, we investigate the effect of board size on corporate outcomes. First, our results show that larger board size leads to significantly lower firm value, represented by Tobin's q. While similar findings have been documented in prior research, our empirical strategy allows us to draw much more robust conclusions. Prior research does not control for endogeneity or employs empirical methods that are much more vulnerable to endogeneity. Wintoki et al. (2012) note that the specific effect of endogeneity arising from the dynamic relation between board structure and performance. Second, in addition to Tobin's q, we also find that larger board size leads to significantly lower accounting profitability. In particular, larger boards reduce the EBIT ratio, ROA, and ROE.

We execute a number of robustness checks. For instance, to control for unobservable firm-specific characteristics that may be omitted in the model, we control for Tobin'q in the previous year. Because both Tobin's q at time t and Tobin's q at time t-1 are influenced by the same time-invariant factors, including lagged Tobin's q reduces the omitted-variable bias. Second, we control for the average Tobin's q of firms in the same area. In so doing, we account for any area-specific factors that influence all firms in the same area. The results remain robust after being subject to the above tests. Moreover, it can be argued that factors that originally determined firm location in the past may somehow be related to contemporaneous variables, making firm location endogenous. We execute an analysis using only firms that have been in existence for at least 25 years, which is the median firm age in our sample. For these firms, factors that determined firm location were in the distant past (at least 25 years earlier) and are highly unlikely to influence any current corporate outcomes. Using this sample of older firms, we obtain consistent results.

In addition, we examine the effect of board size on capital structure using our geographic identification strategy. Leverage plays a governance role by reducing the free cash flow that may be exploited by self-interested managers. Moreover, interest payments motivate managers to work harder to avoid bankruptcy (Jensen and Meckling, 1976; Jensen, 1986, Grossman and Hart, 1982). Thus, we hypothesize that there would be a relationship between board size and capital structure choices. Consistent with this notion, we find that larger board size leads to significantly higher leverage. Board size and leverage appear to be substitute governance mechanisms. As one mechanism is weak (i.e. larger board size), the other mechanism has to be stronger (higher leverage).

A similar argument can be made regarding dividend policy. Dividends play a governance role by alleviating the free cash flow problem. Furthermore, paying dividends increases the probability that firms have to raise capital in the capital markets more often, thereby exposing the firm to monitoring from outside parties (Grossman and Hart, 1980; Easterbrook, 1984; Jensen, 1986; DeAngelo, DeAngelo, and Stulz, 2006). Using geographic identification strategy, we investigate the effect of board size on dividend policy. Our results show that larger board size leads to a stronger propensity to pay dividends (of any size). Moreover, we find that larger board size brings about larger dividend payouts. It appears that board size and dividends function as substitute governance mechanisms. As one mechanism is weak (larger board size), the other mechanism needs to be strong (larger dividend payouts).

Finally, we investigate the role of board size on M&A activity. Prior research shows that acquisitions are on average value-destroying. Acquisitions are likely motivated by managers' desires for empire building (Moeller, Schlingmann, and Stulz, 2005). We hypothesize that board size should be related to the propensity for firms to engage in mergers and acquisitions. Our results reveal that larger board size leads to a stronger propensity to be an acquirer. This is consistent with the prediction of agency theory. Larger board size is less effective, thereby allowing firms to engage in acquisitions. We further investigate whether board size is related to the quality of acquisitions, as indicated by the announcement period returns. However, we do not find that larger board size leads to significantly poorer acquisitions.[3]

Our study contributes to several areas of the literature. First and foremost, we contribute to the literature on the determinants of board structure. We identify a new geographic variable

[3] Boone, Field, Karpoff, and Raheja (2006), Coles, Daniel, and Naveen (2006), and Linck, Netter, and Yang (2009) find a positive relation between board size and firm size. Information requirement of more complex and larger firms will require larger boards. Since the board structure is related to these firm characteristics and past performance, the overall effects might be mixed in our results on announcement effect.

that significantly influences board size, i.e. the number of firms located in the geographically-proximate area. To the best of our knowledge, this study is the first to document the effect on board size of the geographic density of firms. Therefore, our study contributes to the literature that investigates the effects of geographic location on corporate outcomes and policies.[4]

Second, our study contributes to the literature in corporate governance. Prior research does not address endogeneity in a rigorous manner. Our study explicitly regards board size as endogenous and adopts a novel identification strategy that alleviates the endogeneity bias. Third, our results contribute to the literature on capital structure. We find that board size is a significant determinant of leverage. In particular, larger boards lead to higher leverage. This can be attributed to the role of leverage as a governance mechanism and its substitution effect when board size is large and less effective.

In addition, our study also makes contributions to the literature on dividend policy. Firms with large boards are more likely to pay dividends. Among the dividend-paying firms, large boards lead to significantly larger dividends. Our study contributes to the strand of the literature that explores agency theory as an explanation of dividend policy. Larger dividends help mitigate the free cash flow problems when boards are larger and less effective. Finally, we contribute to the literature on mergers and acquisitions. We show that larger board size increases the likelihood that firms engage in acquisitions. We therefore contribute to the strand of the literature that investigates the role of corporate governance in mergers and acquisitions.

II. Literature Review

[4] For example, Becker, Cronqvist, and Fahlenbrach, 2011, John, Knyazeva, Knyazeva, 2011, Gupta and Sapienza, 1992, Norton and Tenenbaum, 1993, Sorenseon and Stuart, 2001, Loughran, 2008, Uysal, Kedia, and Panchapagesan, 2008, Butler, 2008, Francis, Hasan, and Waisman, 2008, Pirinsky and Wang, 2006, Loughran and Schultz, 2005, Gao, Ng, and Wang, 2011, Jiraporn, Jiraporn, Boepraset, and Chang, 2014, and Chintrakarn, Jiraporn, Jiraporn, and Davidson, 2017.

The finance literature has witnessed a large volume of research on the effects of geographic location on corporate outcomes and policies. In this section, we offer a brief review of the literature in this area, with an emphasis on the more recent studies. Becker, Crongvist, and Fahlenbrach (2011) document the effect of geography on stock ownership. In particular, they find that individuals tend to hold blocks in public firms located close to where they reside. John, Knyazeva, and Knyazeva (2011) investigate the impact of geography on dividend policies. They report that firms in central locations have lower dividend yields and a preference for repurchases and special dividends. Several studies find that geography is significantly related to venture capital financing. Venture capitalists often invest locally (Gupta and Sapienza, 1992; Norton and Tenenbaum, 1993; Sorenson and Stuart, 2001) and participate in strong syndication networks with other local venture capitalists.

Loughran (2008) argue firms located in a rural area experience more information asymmetry. Consistent with this argument, they find that rural firms are less likely to rely on external equity financing. Uysal, Kedia, and Panchapagesan (2008) study the impact of geographic proximity on the acquisition decisions of US public firms. The authors report that acquirer returns in local transactions- where the acquirer and target firms are located within 100 km of each other) are more than twice the returns in non-local transactions. The value premium of local acquisitions can be ascribed to the information advantages of bidding firms.

Butler (2008) focuses on the information advantages of proximity on the municipal bond market. He reports that local investment banks charge lower fees and sell bonds at lower yields relative to non-local banks. Francis, Hasan, and Waisman (2008) show that bondholders prefer local firms and firm located in remote rural areas exhibit significantly higher costs of debt in comparison to their urban counterparts. Pirinsky and Wang (2011) find that municipal bond yields are highly influenced by local demand and supply. Pirinsky and Wang (2006) document strong co-movement in the stock returns of firms located in the same geographic area. Their results suggest that price formation in equity markets has a significant geographic component that is associated with the investment decisions of local investors.

Loughran and Schultz (2005) investigate the impact of geography on stock liquidity. Because rural firms tend to have greater cost of information acquisition than firms in large urban areas, rural stocks attract less analyst coverage. In addition, institutions hold fewer rural stocks than urban stocks. Rural stocks trade much less than urban stocks. Finally trading costs are higher for companies headquartered in rural areas. Gao, Ng, and Wang (2011) demonstrate the local effects of corporate financial policies. In particular, they show that corporate geographic location helps explain the cross-sectional variations of capital structure and payout policies. Chintrakarn, Jiraporn, Tong, and Chatjuthamard (2015) find that firms located geographically close to one another share a similar probability of having staggered boards (or classified boards), an effect probably due to investor clientele, local competition, and social interactions.

A few recent studies have examined the effect of geographic location on corporate social responsibility (CSR). Jiraporn, Jiraporn, Boeprasert, and Chang (2014) show that firms located in the same zip code exhibit a similar degree of corporate social responsibility (CSR). They exploit the variations in CSR across the zip codes and show that CSR significantly improves credit ratings. Similarly, Chintrakarn, Jiraporn, Jiraporn, and Davidson (2017) employ a similar identification strategy based on geography and show that more socially responsible firms enjoy significantly higher firm value.

Our study is related to the above literature that investigates the effects of geographic location on corporate outcomes and policies. In particular, we examine the effect of geographic density of firms on board size. Our study is the first to provide empirical evidence on the impact of geographic location on board size.

III. Sample construction and data description

a. Sample construction

The data on the board of directors are from the ISS database (Institutional Shareholders Services). Firm characteristics are from COMPUSTAT. We exclude financial and utilities firms because they are regulated and exhibit unique financial characteristics. The data on firm locations are from COMPUSTAT. We define an area using several alternative definitions, i.e. the 3-digit zip code, the 5-digit zip code, and the state in which the firm is located. The data on mergers and acquisitions (M&A) are from the SDC database (Thompson Reuters). The final sample consists of 9,462 observations from 1996 to 2010.

b. Empirical strategy

We employ a two stage regression analysis. We first execute a regression analysis by regressing board size on the number of firms in the same area, controlling for other firm characteristics. Then, in the second stage, we regress the dependent variable, which represents one of the firm outcomes, on board size instrumented from the first stage. Essentially, we exploit the distribution of the numbers of firms across geographic locations to generate an exogenous shock to board size and then employ the instrumented board size in the second stage. This two-stage analysis is advantageous because 1) it alleviates measurement errors 2) it mitigates reverse causality and 3) it reduces the possible omitted-variable bias.

Following the literature, we include a number of firm characteristics as control variables, i.e. firm size (Log of total assets), leverage (total debt/total assets), investments and growth (capital expenditures/total assets), profitability (EBIT/total assets), intangible assets (R&D and advertising expenses/total assets), dividend payouts (dividends/total assets), and free cash flows (free cash flows/total assets). In addition, we include board-related variables as well, i.e. percentage of independent directors, average director age, CEO age, and average director tenure. Finally, to account for variations over time and across industries, we include year and industry dummies (based on the first two digits of SIC).

c. Summary statistics

Table 1 shows the summary statistics. A few statistics are noteworthy. The average number of firms in the same 3-digit zip code is 8.355. The average number of firms in the same 3-digit phone number area code is 9.253. The average number of firms in the same state is 43.289. The average board size has 10.319 directors. The percentage of independent directors on the board averages 72.529%. The average director is 61.633 years old. The length of tenure is 9.844 on average. Table 1 also shows the descriptive statistics for a number of firm characteristics such as total assets, the EBIT ratio, leverage, R&D, advertising etc.

IV. Results

a. Board size and the geographic density of firms

We first test the hypothesis that board size tends to be smaller where the number of firms in the same area is larger. Table 2 shows the regression analysis. The standard errors are clustered at the firm level. Model 1 has board size as the dependent variable. The coefficient of the number of firms in the same 3-digit zip code is negative and highly significant. In Model 2, we transform board size by taking the natural logarithm, which is commonly done in the literature. Again, the number of firms in the same zip code still carries a negative and significant coefficient. In Model 3, we control for time-invariant unobservable characteristics by including the lagged value of board size as an independent variable. Still, the coefficient of the number of neighboring firms remains negative and significant, showing that our results are not principally driven by the omitted-variable bias. It is crucial to note that the R-squared for Model

3 is over 80%, indicating that our model is well-specified and captures more than 80% of the variance in board size.[5]

Conceivably, it can be argued that certain area-specific factors may drive the results. To control for area-specific characteristics, in Model 4, we include the average board size of all firms in the same area. Because all firms in the same area are influenced by the same area-specific characteristics, including this variable helps reduce the possible bias. In Model 4, the number of firms in the same area still carries a negative and significant coefficient. Thus, all the results so far strongly reinforce the argument that a larger number of firms in the same area have to share a limited supply of qualified individuals, resulting in smaller board size.

A fixed-effects regression may not be appropriate in our context as the number of firms in the same area does not change much over time. In any case, as a robustness check, we execute a fixed-effects regression in Model 5 and find that the coefficient of the number of firms in the same area continues to be negative and significant. The R-squared for Model 5 is very high, more than 80%. The fixed-effects controls for unobservable characteristics that remain constant over time. So, it does not appear that our results are driven by the omitted-variable bias. Model 6 is a random-effects regression. The result still remains similar. We obtain consistent results from various model specifications, suggesting that our results are quite robust.

Table 3 shows the results of the additional robustness checks. So far, we define the number of firms in the same area using the 3-digit zip code. For robustness, we employ alternative definitions. First, instead of the 3-digit zip code, we use the 5-digit zip code, which

[5] Knyazeva, Knyazeva, and Masulis (2013) report that the number of firms in the geographically-proximate area is a significant determinant of board independence. We examine this effect in Table A3 in the Appendix, where the dependent variable is board independence. The coefficient of the number of firms in the geographically-proximate area is not significant in any of the models. In spite of our best efforts, we do not find the effect documented in Knyazeva, Knyazeva, and Masulis (2013). Rather, we find that the number of local firms is a significant of board size.

is narrower. The regression result in Model 1 shows that the number of firms in the same 5-digit zip code carries a negative and significant coefficient. Second, instead of zip codes, we employ the telephone number area code to define an area. In Model 2, the coefficient of the number of firms in the same 3-digit phone number area code is negative and significant. Finally, we use a broader definition of an area, i.e. the state in which the firm is located. In Model 3, the coefficient of the number of firms in the same state is negative and significant. Thus, regardless of how an area is defined, we also obtain consistent results.

To further minimize reverse causality, we identify the first year when each firm appears in our sample. Then, we replace the number of firms in the same zip code in each given year by the number of firms in the same zip code in the earliest year. Obviously, the number of firms in an area in the earliest year could not have resulted from board size in any of the subsequent year, making reverse causality unlikely. We execute an instrumental-variable analysis using as our instrument the number of firms in the earliest year. The results are shown in Table A2 in the Appendix. Model is the first-stage regression. Model 2 is the second stage. The results remain similar, i.e. the larger number of firms in the same zip code leads to significantly smaller board size.

In addition, it is conceivable that factors that originally determined firm location in the past may somehow be related to contemporaneous variables, making firm location endogenous. We perform two additional tests to address this issue. First, we execute an analysis using only firms that were founded before the sample period. Our sample period starts in 1996. So, our subsample includes only those firms established before 1996. Clearly, factors that originally determined firm location precede the sample period and could not resulted from any variables in the sample period. The regression result is shown in Table A1 in the Appendix. Model 3 includes only those firms founded before the sample period. The result remains consistent.

Second, we perform a regression analysis using only firms that have been in existence for at least 25 years, which is the median firm age in our sample. For these firms, factors that determined firm location were in the distant past (at least 25 years earlier) and are extremely unlikely to influence any current corporate outcomes. Using this sample of older firms, we obtain consistent results (results not shown but available upon request). Finally, to ensure further robustness, we employ a dynamic panel data analysis using the Arellano-Bond GMM estimator. The results are shown in Table A2 in the Appendix. The GMM results are consistent, indicating that firms located in an area with a larger number of firms exhibit significantly smaller board size.[6]

To further ensure that our results are robust, we employ propensity score matching. The number of firms in the same zip code is in the highest quartile if it is more than 11. So, we classify firms located in such a dense area (with at least 11 firms) as our “treatment” group. The rest of the firms are considered our “control” group. Then, for each firm in the treatment group, we identify a firm in the control group that is most similar using propensity score matching based on 11 firm and board characteristics (the 11 control variables in the regression analysis). Thus, our treatment and control firms are virtually identical in terms of observable characteristics, except along one dimension, i.e. the number of firms in the same zip code. We then run a regression using the propensity-score matched sample. The result shows that firms

[6] COMPUSTAT reports only the current location of the firm. So, to the extent that some firms may have moved their headquarters, there may be some measurement errors. To deal with this issue, we execute a number of additional tests. First, it has been documented that firms that move their headquarters are primarily smaller firms. Relocations are very rare among large firms. We divide our sample into three groups based on total assets. Then, we run a regression on the group with the largest firms and obtain a similar result. Because relocations are rare for this group of large firms, it does not appear that our results are significantly driven by firms that relocate their headquarters. Second, we run a number of error-in-variables regression, where possible measurement errors are recognized. We assume that our data on the number of firms in the same zip code is only 80% accurate (20% measurement errors). Even with the assumption, we still obtain a consistent result. So, measurement errors do not appear to be a serious problem. Finally, we include only observations in the most recent year of each firm. This is to ensure that the headquarter locations are current and accurate. Again, the results are consistent.

in the treatment group (located in a dense area) exhibit significantly smaller board size (result not shown but available upon request).

Furthermore, we explore the possible omitted-variable bias by exploiting the insight in Altonji, Elder, and Taber (2005). This potential bias can be estimated in the following way. Consider two regressions: one with a restricted set of controls and the other with a full set of control variables. Denote the estimated coefficient for the variable of interest from the first regression β^R (where R stands for Restricted) and the estimated coefficient from the second regression β^F (where F stands for Full). Then the ratio can be computed as $\beta^F/(\beta^R - \beta^F)$. The intuition behind the formula is straightforward. First, consider why the ratio is decreasing in $(\beta^R - \beta^F)$. The smaller the difference between β^R and β^F, the less the estimate is affected by the selection of observables, and the stronger the selection on unobservables needs to be (relative to observables) to explain away the entire effect. Then consider the intuition behind β^F in the numerator. The larger β^F, the greater is the effect needs to be explained away by the selection on unobservables, and therefore the higher the ratio.

We apply this estimation method to our sample. We obtain the restricted model by regressing Ln (Board Size) on the number of firms in the same area and no other variables. We use Model 1 in Table 2 as our full model. The ratio turns out to be 2.01, suggesting that selection from unobservables would have to be over 2.01 times stronger than selection on observables. Although not impossible, it is unlikely that our conclusion is primarily driven by unobservables. Overall, the results show that one significant determinant of board size is the number of firms in the same area. This is consistent with the notion that, given a limited supply of qualified individuals in a specific area, firms in the same area have to share these individuals. That is why, in an area with a larger number of firms, each firm has smaller board size. Our results are robust to controlling for a number of firm-specific and area-specific characteristics. The fixed-effects analysis also suggests that our results are not driven by omitted variables that remain constant over time.

b. The effect of board size on firm value and performance

So far, we have shown that the number of firms located close by (i.e. in the same 3-digit zip code) is a significant determinant of board size. Firm location is largely fixed and was determined by factors in the distant past. Thus, it is unlikely correlated with contemporaneous corporate outcomes or policies. Our primary definition of an area is based on the 3-digit zip code. Zip codes are assigned to maximize mail delivery and are not likely correlated with firm policies. Zip code changes are also rare and usually reflect macroeconomic factors, such as demographics and urban development, which are beyond any one firm's control. Therefore, zip codes assignments are likely exogenous (Jiraporn et al, 2014: Chintrakarn et al, 2015). Using this insight, we exploit the variations in the numbers of firms across the zip codes and estimate the effect of board size on firm value.

The regression results are shown in Table 4. We follow the literature and employ Tobin's q as our proxy for firm value. Our variable of interest is board size instrumented from the first-stage regression. We use Model 1 in Table 2 to estimate the first-stage regression. Then, we save the fitted value of board size. Essentially, we use the distribution of firms across the zip codes to introduce an exogenous variation to board size.

In Table 4, in Model 1, the coefficient of instrumented board size is negative and significant, indicating that large boards lower firm value. In Model 2, we attempt to control for unobservable characteristics that remain constant over time by including the lagged value of Tobin's q. Because both Tobin's q at time t and at time t-1 are influenced by the same time-invariant unobservable factors, including the lagged value reduces the omitted-variable bias. The coefficient of instrumented board size continues to be negative and significant in Model

2. Please note that the R^2 for Model 2 is high, 74.1%, suggesting that our model captures most of the variance in board size.

Finally, it is possible that some area-specific factors may be omitted in the model. To help alleviate this concern, we include the average Tobin's q of all firms in the same 3-digit zip code as an independent variable. All firms in the same zip code are influenced by the same area-specific factors. Again, the coefficient of instrumented board size remains significantly negative. So, our results are consistent with those in prior research that finds large boards detrimental to firm value. However, our approach is more robust to endogeneity and is more likely to show causality, rather than merely an association.

For robustness, we also explore the effects of board size on firm performance using accounting performance measures. The regression results are shown in Table 5. In Model 1, the dependent variable is the ratio of EBIT to total assets, a measure of profitability. Instrumented board size shows a negative and significant coefficient, showing that large boards lead to lower profitability. To control for possible omitted variables that remain constant over time, we include the lagged value of the EBIT ratio as an independent variable. Again, instrumented board size still carries a significantly negative coefficient. The R^2 of Model 2 is extremely high, 96.1%, indicating that our model captures nearly all the variance in board size.

In Model 3, we control for area-specific unobservable factors by including the area-average value of the EBIT ratio. The coefficient of instrumented board size remains significantly negative. As further robustness checks, we employ two alternative measures of profitability, i.e. ROA and ROE. The results are shown in Models 4 and 5 respectively. Again, the coefficient of instrumented board size remains significantly negative. Regardless of how we measure firm performance, we consistently find that large board size leads to poor performance. Finally, we explore the possibility that board size may have a non-monotonic effect on firm performance. We include a quadratic term of board size in the analysis to capture any possible non-linearity. We, however, do not find any evidence on any non-linearity.

c. *The effect of board size on capital structure*

In addition to firm performance, we also investigate the effect of board size on capital structure choices. Leverage has been argued to play a governance role and thus help alleviate the agency conflict in a number of ways. First, one way to reduce the agency conflict is to cause managers to increase their ownership in the firm (Jensen and Meckling, 1976). By increasing the use of debt financing, effectively displacing equity capital, firms shrink the equity base, thereby increasing the percentage of equity owned by management. Second, the use of debt increases the probability of bankruptcy. This additional risk may further motivate managers to decrease their consumption of perks and increase their efficiency (Grossman and Hart, 1982). Finally, the obligation of interest payments resulting from the use of debt helps resolve the free cash flow problem (Jensen, 1986). Because leverage plays a governance role, we hypothesize that it is related to board characteristics, such as board size.

The regression results are shown in Table 6. The ratio of total debt to total assets is the dependent variable. The coefficient of instrumented board size is positive and significant in Model 1. In Model 2, we include the one-year lagged value of leverage to control for unobservable heterogeneity. The result remains similar. Finally, in Model 3, we include the zip-code-average leverage to control for area-specific factors. Again, the result remains consistent. Larger board size leads to significantly more debt in the capital structure. It appears that board size and leverage are substitute mechanisms in mitigating the agency conflict. When board size is larger and thus less effective, higher leverage is required to control the agency conflict.

d. *The effects of board size on the propensity to pay dividends and dividend payouts.*

We also investigate the effects of board size on the propensity to pay dividends and on dividend payouts. Like leverage, dividends play a governance role in reducing the free cash flow problem and the agency conflict. Dividend payouts are argued to reduce the agency conflict by reducing the amount of free cash flow, which could be used by managers for their private benefits rather than for maximizing shareholders' wealth (Grossman and Hart, 1980; Easterbrook, 1984; and Jensen, 1986; DeAngelo, DeAngelo, and Stulz, 2006). Furthermore, dividends help mitigate agency conflicts by exposing firms to more frequent monitoring by the primary capital markets as paying dividends increases the probability that new equity has to be issued more often (Easterbrook, 1984). Because dividends play a governance role, they are likely related to board characteristics such as board size.

Table 7 shows the regression results. In Model 1, the dependent variable is the dividend-paying dummy, which is equal to one if the firm pays dividends of any size and zero otherwise. Model 1 is a logistic regression predicting the propensity to pay dividends. The coefficient of instrumented board size is significantly positive. In Model 2, we control for unobservable heterogeneity by including the lagged value of the dividend dummy. The result remains similar. In Model 3, to capture unobservable area-specific factors, we include the area-average value of the dependent variable. Again, the result remains consistent. Firms with larger board size are more likely to pay dividends.

In Models 3, 4, and 5, we take into account the size of the dividend payouts. The dependent variable is total dividends divided by total assets. The results in Model 3, 4, and 5 are all consistent. Larger board size leads to larger dividend payouts. Our results lend support to the substitution hypothesis. Both board governance and dividend payouts help alleviate the agency conflict. When one governance mechanism is strong, the other one does not need to be as strong. In firms with large board size, board governance is weak. As a result, dividend payouts in these firms are higher. In other words, larger dividends substitute for the effectiveness of smaller board size.

e. The effects of board size on the propensity to be an acquirer and on the announcement returns.

It has been documented in the literature that acquisitions can be motivated by the agency conflict. As part of their empire building, managers engage in acquisitions that raise their private benefit, but do not necessarily provide shareholders with adequate returns (Moeller, Schlingmann, and Stulz, 2005). Smaller boards are more effective and should make agency-driven acquisitions less likely. The results are shown in Table 8. In Model 1, the dependent variable is a dichotomous variable, equal to one if the firm is an acquirer and zero otherwise. The coefficient of instrumented board size is positive and significant. Consistent with our expectations, larger boards are less effective and are more likely to approve acquisitions.

Among firms that engage in acquisitions, we calculate the announcement period returns using the standard event study methodology. In Models, 2, 3, 4, the dependent variables are the stock market reactions to the acquisition announcement. Instrumented board size does not carry a significant coefficient in any of the three models. Thus, while larger boards lead to a stronger propensity to engage in acquisitions, it is not clear if these acquisitions are value-destroying, at least, as judged by the short-term stock market reactions.

V. Concluding Remarks

We study the effects of board size on corporate performance and policies using a novel identification strategy. Prior research shows that firms tend to recruit directors from the geographically-proximate area. Given a limited pool of qualified individuals in a given area, firms located in the same area have to share the limited pool of talented individuals. As a result, the larger the number of firms in an area, the fewer directors each firm is able to recruit on average. Our empirical evidence is consistent with this hypothesis. We find that the number of firms in a given location is a significant determinant of board size, the larger the number of firms, the smaller board size. Using alternative definitions of an area yields similar results. The results remain even when controlling for unobservable heterogeneity. Our results contribute to the literature that examines the effects of geographic location on corporate outcomes and policies.

We then exploit variations in the numbers of firms across geographic locations and estimate the effects of board size on firm performance and policies. First, we document that smaller board size is beneficial to firm value and performance. Second, we find that board size has significant effects on capital structure and dividend policy. In particular, larger board size leads to higher leverage, a stronger propensity to pay dividends, and larger dividend payouts. Finally, our results show that smaller board size significantly reduces the propensity to be an acquirer, although board size is not found to be related to the announcement period returns. Our study contributes to the literature by using a novel identification strategy based on geography, which is easy to implement and can be adopted by future studies. Our results also contribute to several areas of the literature including corporate governance, capital structure, dividend policy, and M&As.

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Table 1: Summary statistics

	Mean	Median	Std. Dev.	25th	75th
Geographic Density of Firms					
No. of firms in the same 3-digit zip code	8.355	5.000	9.450	2.000	11.000
No. of firms in the same phone area code	9.253	3.000	9.498	3.000	11.000
No of firms in the same state	43.289	30.000	39.280	15.000	56.000
Board Characteristics					
Board size	10.319	10.000	2.416	9.000	12.000
Percentage of independent directors	72.529	75.000	15.218	62.500	84.615
CEO age	55.933	56.000	6.896	51.000	60.000
Average director age	61.633	61.750	3.813	59.286	64.077
Average tenure	9.844	9.000	14.183	7.222	11.500
Firm Characteristics					
Total Assets	9,689	2,268	33,927	802	7,065
EBIT/Total Assets	0.106	0.098	0.092	0.060	0.148
Total Debt/Total Assets	0.216	0.213	0.168	0.067	0.328
Capital expenditures/Total Assets	0.055	0.039	0.052	0.022	0.069
R&D/Total Assets	0.029	0.001	0.050	0.000	0.039
Advertising/Total Assets	0.013	0.000	0.035	0.000	0.009
Dividends/Total Assets	0.014	0.070	0.026	0.000	0.020
Free cash flow/Total Assets	0.094	0.090	0.094	0.048	0.140

Table 2: The effect of the number of firms in the geographically-proximate area on board size

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Robust t-statistics in parentheses. *** p< 0.01, ** p< 0.05, * p<0.1

	(1)	(2)	(3)	(4)	(5)	(6)
			Controlling for lagged board size	Controlling for area-average board size	Fixed-effects	Random-effects
	Board Size	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)
No. of Firms in the Same 3-digit Zip Code	**-0.015*** **	**-0.001*** **	**-0.000*** **	**-0.001*** **	**-0.001** **	**-0.001*** **
	(-3.002)	**(-3.004)**	**(-3.156)**	**(-2.746)**	**(-1.914)**	**(-3.740)**
% of Independent Directors	0.006*	0.001**	0.000	0.001**	0.000	0.000*
	(1.790)	(2.238)	(0.654)	(2.197)	(0.770)	(1.739)
CEO Age	-0.003	-0.000	0.000	-0.000	0.000	0.000
	(-0.430)	(-0.492)	(1.312)	(-0.319)	(0.929)	(1.028)
Average Director Age	1.813**	0.129	0.016	0.096	-0.006	0.057
	(2.232)	(1.418)	(0.592)	(1.084)	(-0.126)	(1.310)
Average Director Tenure	0.160	0.022	-0.022***	0.019	-0.023***	-0.012**
	(1.309)	(1.645)	(-4.859)	(1.432)	(-3.349)	(-2.041)
Ln(Total Assets)	0.823***	0.081***	0.016***	0.079***	0.083***	0.085***
	(23.121)	(21.907)	(12.809)	(21.630)	(17.434)	(29.969)
EBIT/Total Assets	-2.353*	-0.228	0.079	-0.238*	-0.247**	-0.158*
	(-1.646)	(-1.541)	(1.352)	(-1.719)	(-2.065)	(-1.831)
Total Debt/Total Assets	0.220	0.032	0.015*	0.021	-0.019	-0.011
	(0.789)	(1.149)	(1.771)	(0.780)	(-1.160)	(-0.727)
Capital Expenditures/Total Assets	-0.114	-0.021	-0.020	0.031	0.108	0.008
	(-0.069)	(-0.118)	(-0.351)	(0.184)	(0.828)	(0.086)
R&D/Total Assets	-2.960***	-0.320***	-0.069**	-0.191**	0.062	-0.046
	(-3.077)	(-3.097)	(-2.257)	(-1.962)	(0.917)	(-0.783)
Advertising/Total Assets	0.509	0.006	-0.001	0.041	-0.011	0.007
	(0.396)	(0.042)	(-0.023)	(0.293)	(-0.110)	(0.084)
Dividends/Total Assets	6.354***	0.544***	-0.007	0.454***	0.117	0.196***
	(3.664)	(2.992)	(-0.135)	(2.614)	(1.634)	(2.861)
Free Cash Flow/Total Assets	2.110	0.190	-0.027	0.195	0.256**	0.170*
	(1.402)	(1.199)	(-0.468)	(1.309)	(2.071)	(1.891)
Ln(Board Size) (t-1)			0.772***			
			(65.945)			
Ln(Board Size) (zip code-average)				0.443***		
				(9.112)		
Constant	-3.731	1.109***	0.358***	0.161	1.801***	1.420***
	(-1.156)	(3.101)	(3.381)	(0.457)	(9.297)	(6.813)
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	No	Yes
Observations	9,462	9,462	7,879	9,462	9,462	9,462
R-squared	0.451	0.424	0.804	0.446	0.807	0.446

Table 3: The effect of the number of firms in the geographically-proximate area on board size using alternative definitions of the geographically-proximate area

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)
	5-Digit Zip Code	3-Digit Phone Number Area Code	State
	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)
No. of Firms in the Same 5-digit Zip code	**-0.000*** **		
	(-2.681)		
No. of Firms in the same 3-digit Phone Number Area Code		**-0.001** **	
		(-2.552)	
No. of Firms in the Same State			**-0.001*** **
			(-4.649)
% of Independent Directors	0.001**	0.001**	0.001**
	(2.347)	(2.284)	(2.262)
CEO Age	-0.000	-0.000	-0.000
	(-0.488)	(-0.474)	(-0.454)
Average Director Age	0.090	0.118	0.123
	(1.021)	(1.299)	(1.370)
Average Director Tenure	0.019	0.023*	0.022*
	(1.421)	(1.732)	(1.657)
Ln(Total Assets)	0.077***	0.081***	0.081***
	(20.654)	(21.922)	(21.987)
EBIT/Total Assets	-0.241*	-0.234	-0.219
	(-1.721)	(-1.592)	(-1.502)
Total Debt/Total Assets	0.025	0.030	0.021
	(0.953)	(1.060)	(0.769)
Capital Expenditures/Total Assets	0.024	-0.018	-0.039
	(0.143)	(-0.102)	(-0.225)
R&D/Total Assets	-0.184*	-0.297***	-0.262***
	(-1.914)	(-2.861)	(-2.592)
Advertising/Total Assets	0.030	0.022	0.037
	(0.216)	(0.153)	(0.252)
Dividends/Total Assets	0.426**	0.537***	0.515***
	(2.456)	(2.966)	(2.892)
Free Cash Flow/Total Assets	0.188	0.192	0.178
	(1.248)	(1.220)	(1.146)
Constant	0.212	1.146***	1.115***
	(0.602)	(3.201)	(3.143)
Year Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Observations	9,462	9,462	9,462
R-squared	0.445	0.423	0.427

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: The effect of board size on firm value

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)
		Controlling for Lagged Tobin's q	Controlling for zip code-average Tobin's q
	Tobin’s q	Tobin’s q	Tobin’s q
Ln(Board Size) (Instrumented)	**-4.109*** **	**-1.173** **	**-1.311***
	(-4.918)	**(-1.983)**	**(-1.837)**
% of Independent Directors	0.001	0.000	-0.001
	(0.644)	(0.540)	(-0.982)
CEO Age	-0.005***	-0.001	-0.004**
	(-2.960)	(-0.414)	(-2.556)
Average Director Age	-0.469*	-0.104	-0.499**
	(-1.905)	(-0.571)	(-2.380)
Average Director Tenure	0.139***	0.079***	0.116***
	(3.759)	(2.814)	(3.669)
Ln(Total Assets)	0.330***	0.099**	0.090
	(4.880)	(2.057)	(1.562)
EBIT/Total Assets	5.670***	1.673***	4.786***
	(11.514)	(3.869)	(11.397)
Total Debt/Total Assets	-0.855***	-0.373***	-0.527***
	(-10.270)	(-6.119)	(-7.407)
Capital Expenditures/Total Assets	1.585***	0.429	1.114***
	(3.588)	(1.178)	(2.957)
R&D/Total Assets	7.546***	2.740***	4.770***
	(19.406)	(9.632)	(14.254)
Advertising/Total Assets	1.468***	1.306***	1.489***
	(4.138)	(4.690)	(4.925)
Dividends/Total Assets	6.001***	2.339***	3.885***
	(9.300)	(5.031)	(7.049)
Free Cash Flow/Total Assets	1.455***	1.156***	0.564
	(2.941)	(2.750)	(1.338)
Tobin’s q (t-1)		0.602***	
		(81.796)	
Tobin’s q (zip code-average)			0.691***
			(59.449)
Constant	10.061***	3.094***	4.334***
	(7.571)	(3.225)	(3.813)
Year Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Observations	9,462	7,879	9,462
R-squared	0.471	0.741	0.615

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: The effect of board size on accounting profitability

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)	(4)	(5)
		Controlling for Lagged EBIT Ratio	Controlling for zip code-average EBIT Ratio		
	EBIT/Total Assets	EBIT/Total Assets	EBIT/Total Assets	ROA	ROE
Ln(Board Size) (Instrumented)	**-0.666*****	**-0.427*****	**-0.647*****	**-1.252*****	**-0.690*****
	(-41.353)	**(-29.761)**	**(-40.385)**	**(-20.015)**	**(-4.053)**
% of Independent Directors	0.001***	0.000***	0.001***	0.001***	0.001***
	(23.213)	(16.099)	(22.646)	(13.473)	(5.168)
CEO Age	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***
	(-6.115)	(-5.051)	(-6.204)	(-3.128)	(-2.626)
Average Director Age	0.099***	0.067***	0.096***	0.150***	0.004
	(19.578)	(14.525)	(19.124)	(7.656)	(0.084)
Average Director Tenure	0.017***	0.011***	0.016***	0.039***	0.038***
	(21.760)	(15.205)	(21.460)	(13.342)	(4.708)
Ln(Total Assets)	0.055***	0.036***	0.053***	0.105***	0.077***
	(41.985)	(30.670)	(41.018)	(20.705)	(5.631)
Total Debt/Total Assets	0.013***	0.006***	0.012***	-0.036***	-0.075***
	(7.349)	(3.703)	(7.141)	(-5.315)	(-4.077)
Capital Expenditures/Total Assets	0.625***	0.595***	0.612***	0.368***	0.849***
	(94.106)	(92.095)	(91.978)	(14.255)	(12.093)
R&D/Total Assets	-0.258***	-0.167***	-0.254***	-0.801***	-0.763***
	(-33.447)	(-24.249)	(-33.249)	(-26.775)	(-9.374)
Advertising/Total Assets	-0.011	-0.013*	-0.008	-0.071**	-0.094
	(-1.479)	(-1.768)	(-1.074)	(-2.474)	(-1.190)
Dividends/Total Assets	0.359***	0.226***	0.347***	0.668***	0.771***
	(27.563)	(19.447)	(26.841)	(13.228)	(5.606)
Free Cash Flow/Total Assets	0.964***	0.886***	0.941***	0.755***	1.201***
	(330.743)	(231.775)	(283.438)	(66.725)	(39.011)
EBIT/Total Assets (t-1)		0.098***			
		(25.973)			
EBIT/Total Assets (Zip code-average)			0.071***		
			(13.751)		
Constant	0.661***	0.385***	0.637***	1.355***	0.870***
	(24.483)	(15.969)	(23.756)	(12.924)	(3.048)
Year Dummies	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes
Observations	9,462	7,879	9,462	9,461	9,462
R-squared	0.945	0.961	0.946	0.477	0.251

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: The effect of board size on leverage

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)
	Total Debt/Total Assets	Total Debt/Total Assets	Total Debt/Total Assets
Ln(Board Size) (Instrumented)	**3.409*** **	**0.887*** **	**2.391*** **
	(11.004)	**(9.455)**	**(9.017)**
% of Independent Directors	-0.003***	-0.001***	-0.002***
	(-8.240)	(-8.153)	(-6.992)
CEO Age	0.001***	0.000	0.001
	(2.801)	(1.536)	(1.612)
Average Director Age	-0.480***	-0.117***	-0.282***
	(-6.703)	(-5.214)	(-4.477)
Average Director Tenure	-0.097***	-0.029***	-0.076***
	(-9.143)	(-8.457)	(-8.538)
Ln(Total Assets)	-0.252***	-0.067***	-0.177***
	(-9.957)	(-8.903)	(-8.145)
EBIT/Total Assets	0.447***	0.203***	0.326***
	(3.300)	(3.713)	(2.707)
Capital Expenditures/Total Assets	0.040	0.025	-0.052
	(0.322)	(0.497)	(-0.456)
R&D/Total Assets	0.690***	0.225***	0.604***
	(4.670)	(4.911)	(4.823)
Advertising/Total Assets	-0.042	-0.024	-0.016
	(-0.430)	(-0.686)	(-0.192)
Dividends/Total Assets	-1.836***	-0.200***	-1.243***
	(-9.209)	(-2.603)	(-7.261)
Free Cash Flow/Total Assets	-0.504***	-0.261***	-0.370***
	(-3.621)	(-4.898)	(-2.966)
Total Debt/Total Assets (t-1)		0.829***	
		(87.772)	
Total Debt/Total Assets (Zip code-average).			0.702***
			(30.051)
Constant	-3.635***	-0.924***	-2.849***
	(-8.357)	(-7.043)	(-7.727)
Observations	9,462	7,879	9,462
R-squared	0.416	0.841	0.550

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table: 7: The effects of board size on the propensity to pay dividends and on dividend payouts.

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Dividend-paying Dummy	Dividend-paying Dummy	Dividend-paying Dummy	Dividends/ Total Assets	Dividends/ Total Assets	Dividends/ Total Assets
Ln(Board Size) (Instrumented)	**59.758*****	**41.907*****	**56.128*****	**0.918*****	**0.760*****	**0.752*****
	(10.113)	**(7.894)**	**(9.429)**	**(13.637)**	**(7.173)**	**(11.617)**
% of Independent Directors	-0.031***	-0.029***	-0.031***	-0.001***	-0.001***	-0.001***
	(-4.836)	(-4.105)	(-4.459)	(-11.406)	(-6.657)	(-9.935)
CEO Age	0.047***	0.045***	0.036***	0.000***	0.000***	0.000***
	(5.461)	(3.961)	(3.618)	(6.770)	(4.902)	(5.465)
Average Director Age	-6.185***	-6.112***	-5.226***	-0.108***	-0.090***	-0.086***
	(-4.307)	(-3.672)	(-3.334)	(-9.095)	(-6.272)	(-7.926)
Average Director Tenure	-0.542***	-0.627***	-0.539**	-0.020***	-0.017***	-0.016***
	(-2.655)	(-2.589)	(-2.312)	(-10.133)	(-5.995)	(-8.564)
Ln(Total Assets)	-4.307***	-3.059***	-4.006***	-0.073***	-0.061***	-0.060***
	(-9.064)	(-7.194)	(-8.429)	(-13.312)	(-7.115)	(-11.323)
EBIT/Total Assets	11.487***	13.299***	11.661***	0.209***	0.184***	0.176***
	(4.028)	(3.248)	(3.569)	(10.130)	(6.295)	(8.934)
Total Debt/Total Assets	-1.952***	-2.882***	-2.128***	-0.031***	-0.027***	-0.024***
	(-4.325)	(-4.951)	(-4.075)	(-9.067)	(-7.134)	(-7.332)
Capital Expenditures/Total Assets	2.812	2.198	1.514	0.034**	0.018	0.025*
	(1.087)	(0.634)	(0.523)	(2.280)	(1.242)	(1.813)
R&D/Total Assets	6.204*	3.343	12.086***	0.302***	0.250***	0.253***
	(1.864)	(1.111)	(3.816)	(12.114)	(6.804)	(10.723)
Advertising/Total Assets	0.597	3.682	2.568	0.028**	0.021*	0.027**
	(0.348)	(1.626)	(1.140)	(2.027)	(1.807)	(1.974)
Free Cash Flow/Total Assets	-6.634**	-6.647*	-6.792**	-0.133***	-0.125***	-0.113***
	(-2.388)	(-1.657)	(-2.158)	(-6.645)	(-5.111)	(-5.983)
Dividend-paying Dummy (t-1)		6.880***				
		(35.761)				
Dividend-paying Dummy (Zip code-average)			5.971***			
			(19.727)			
Dividends/Total Assets (t-1)					0.297***	
					(4.114)	
Dividends/Total Assets (Zip Code-average)						0.519***
						(12.960)
Constant	-82.766***	-52.103***	-84.416***	-1.059***	-0.850***	-0.887***
	(-9.505)	(-6.573)	(-8.921)	(-13.387)	(-7.032)	(-11.633)
Observations	9,258	7,678	9,258	9,462	7,879	9,462
R-squared	0.381	0.831	0.553	0.590	0.638	0.661

Robust z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: The effects of board size on the propensity to be an acquirer and the announcement returns.

We report the robust t-statistics in parentheses. The standard errors are clustered at the firm level. Free cash flow is calculated as net income plus depreciation minus capital expenditures.

	(1)	(2)	(3)	(4)
	Acquirer Dummy	CAR(-1,1)	CAR(-2,2)	CAR(-5,5)
Ln(Board Size) (Instrumented)	**7.707****	**0.041**	**0.027**	**0.070**
	(2.345)	**(0.467)**	**(0.287)**	**(0.516)**
% of Independent Directors	-0.010**	-0.000	0.000	-0.000
	(-2.466)	(-0.625)	(0.098)	(-0.249)
CEO Age	-0.003	0.000	0.000	0.000
	(-0.519)	(0.445)	(0.188)	(0.510)
Average Director Age	-2.747***	0.004	0.007	0.022
	(-3.068)	(0.148)	(0.234)	(0.546)
Average Director Tenure	-0.337***	0.001	0.000	-0.003
	(-2.584)	(0.356)	(0.113)	(-0.466)
Ln(Total Assets)	-0.242	-0.005	-0.005	-0.010
	(-0.883)	(-0.767)	(-0.683)	(-0.890)
EBIT/Total Assets	7.768***	0.096	0.179**	0.120
	(3.829)	(1.433)	(2.560)	(1.193)
Total Debt/Total Assets	-0.302	0.019**	0.017*	0.004
	(-1.019)	(2.099)	(1.708)	(0.322)
Capital Expenditures/Total Assets	-6.315***	-0.009	-0.063	-0.013
	(-3.509)	(-0.146)	(-0.962)	(-0.152)
R&D/Total Assets	5.912***	-0.029	-0.041	-0.066
	(4.040)	(-0.789)	(-1.056)	(-1.024)
Advertising/Total Assets	-1.775	0.002	-0.004	0.012
	(-1.413)	(0.036)	(-0.072)	(0.159)
Free Cash Flow/Total Assets	-6.277***	-0.036	-0.114	-0.065
	(-3.067)	(-0.555)	(-1.625)	(-0.677)
Dividends/Total Assets	-15.529***	-0.108	-0.139	-0.073
	(-5.199)	(-1.182)	(-1.378)	(-0.561)
Constant	-3.459	-0.087	-0.066	-0.134
	(-0.711)	(-0.653)	(-0.442)	(-0.648)
Observations	10,179	2,705	2,705	2,705
R-squared	0.133	0.057	0.057	0.052

Robust z-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix

Table A1: Robustness checks using the number of firms in the earliest year and firms established before the sample period.

	(1)	(2)	(3)
	First Stage	Second Stage	OLS Only firms founded before the sample period
	No. of Firms in the Same 3-digit Zip Code	Ln(Board Size)	Ln(Board Size)
No. of Firms in the Same 3-digit Zip Code (Earliest year)	**1.074*****		
	(157.582)		
No. of Firms in the Same 3-digit Zip Code (Instrumented)		**-0.002*****	
		(-8.819)	
No. of Firms in the Same 3-digit Zip Code			**-0.002*****
			(-2.783)
% of Independent Directors	0.006*	0.001***	0.001**
	(1.773)	(5.646)	(2.014)
CEO Age	0.012	-0.000	-0.001
	(1.620)	(-0.847)	(-0.952)
Average Director Age	2.244**	0.137***	0.153
	(2.323)	(3.426)	(1.543)
Average Director Tenure	0.747***	0.022***	0.003
	(5.466)	(3.930)	(0.189)
Ln(Total Assets)	1.086***	0.082***	0.080***
	(29.475)	(53.836)	(20.249)
EBIT/Total Assets	2.718	-0.229***	-0.357*
	(1.388)	(-2.828)	(-1.684)
Total Debt/Total Assets	-0.534	0.032**	0.039
	(-1.578)	(2.260)	(1.247)
Capital Expenditures/Total Assets	-5.594***	-0.001	0.095
	(-2.933)	(-0.012)	(0.412)
R&D/Total Assets	5.476***	-0.317***	-0.311***
	(4.683)	(-6.538)	(-2.865)
Advertising/Total Assets	1.629	0.041	0.130
	(1.066)	(0.649)	(0.769)
Dividends/Total Assets	2.036	0.235***	0.357
	(1.008)	(2.814)	(1.615)
Free Cash Flow/Total Assets	-24.564***	1.076***	1.084***
	(-6.123)	(6.479)	(2.739)
Industry Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Observations	9,462	9,462	8,388
R-squared	0.776	0.420	0.432

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A2: Dynamic panel data analysis using the Arellano-Bond GMM estimator

	(1)	(2)	(3)	(4)
	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)	Ln(Board Size)
No. of Firms in the Same 3-digit Zip Code	**-0.002****			
	(-2.344)			
No. of Firms in the Same 5-digit Zip Code		**-0.000*****		
		(-4.422)		
No. of Firms in the Same Phone Area Code			**-0.002*****	
			(-3.131)	
No. of Firms in the Same State				**-0.000****
				(-2.212)
Ln(Board Size) (t-1)	0.414***	0.413***	0.423***	0.420***
	(16.730)	(16.723)	(16.888)	(16.786)
% of Independent Directors	0.000*	0.000*	0.000**	0.000**
	(1.903)	(1.714)	(2.086)	(1.991)
CEO Age	-0.000	-0.000	-0.000	-0.000
	(-0.591)	(-0.438)	(-0.600)	(-0.533)
Average Director Age	-0.222***	-0.241***	-0.221***	-0.221***
	(-3.609)	(-3.956)	(-3.594)	(-3.567)
Average Director Tenure	-0.120***	-0.121***	-0.120***	-0.120***
	(-11.306)	(-11.394)	(-11.296)	(-11.306)
Ln(Total Assets)	0.069***	0.066***	0.070***	0.069***
	(11.069)	(10.962)	(11.241)	(10.969)
EBIT/Total Assets	-0.501***	-0.453***	-0.475***	-0.486***
	(-3.311)	(-2.984)	(-3.115)	(-3.187)
Total Debt/Total Assets	0.039*	0.041*	0.035	0.038*
	(1.734)	(1.842)	(1.529)	(1.647)
Capital Expenditures/Total Assets	0.516***	0.473***	0.484***	0.498***
	(3.135)	(2.887)	(2.920)	(2.991)
R&D/Total Assets	-0.022	-0.031	-0.017	-0.018
	(-0.302)	(-0.415)	(-0.230)	(-0.242)
Advertising/Total Assets	-0.158	-0.163	-0.168	-0.165
	(-1.263)	(-1.305)	(-1.341)	(-1.313)
Dividends/Total Assets	0.090	0.080	0.089	0.088
	(1.106)	(0.993)	(1.099)	(1.082)
Free Cash Flow/Total Assets	0.531***	0.484***	0.506***	0.519***
	(3.368)	(3.067)	(3.182)	(3.260)
Constant	1.962***	2.071***	1.936***	1.939***
	(8.239)	(8.846)	(8.113)	(8.036)
Observations	7,879	7,879	7,879	7,879

z-statistics in parentheses
*** p<0.01, ** p<0.05, *
p<0.1

Table A3: The effect of the number of firms in the geographically-proximate area on board independence

	(1)	(2)	(3)
	OLS	Fixed-effects	Random-effects
	% of Independent Directors	% of Independent Directors	% of Independent Directors
No. of Firms in the Same 3-digit Zip Code	**-0.041**	**0.019**	**-0.014**
	(-1.342)	**(0.526)**	**(-0.569)**
Ln (Board Size)	4.086**	0.630	1.507*
	(2.342)	(0.738)	(1.942)
CEO Age	-0.136***	0.073***	0.028
	(-3.526)	(3.128)	(1.302)
Average Director Age	36.176***	30.711***	30.084***
	(6.484)	(8.211)	(9.311)
Average Director Tenure	-10.602***	-6.860***	-7.751***
	(-14.292)	(-13.288)	(-17.413)
Ln(Total Assets)	1.077***	-0.723*	0.862***
	(4.246)	(-1.953)	(4.145)
EBIT/Total Assets	-18.773*	7.139	-7.813
	(-1.706)	(0.776)	(-1.248)
Total Debt/Total Assets	3.518*	-1.154	0.026
	(1.826)	(-0.942)	(0.024)
Capital Expenditures/Total Assets	16.323	-9.827	5.690
	(1.450)	(-0.979)	(0.822)
R&D/Total Assets	9.441	2.500	8.027*
	(1.530)	(0.480)	(1.857)
Advertising/Total Assets	-5.336	-19.586***	-10.456*
	(-0.598)	(-2.606)	(-1.777)
Dividends/Total Assets	23.066*	-3.060	11.742*
	(1.961)	(-0.323)	(1.792)
Free Cash Flow/Total Assets	-78.726***	-51.799***	-62.255***
	(-3.594)	(-3.466)	(-4.137)
Industry Dummies	Yes	No	Yes
Year Dummies	Yes	Yes	Yes
Firm Fixed-effects	No	Yes	No
Observations	9,462	9,462	9,462
R-squared	0.290	0.707	0.246

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1