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Robert Kieschnick, Rabih Moussawi

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Firm Age, Corporate Governance, and Capital Structure Choices*

Robert Kieschnick
University of Texas at Dallas
School of Management, SM31
Richardson, Texas 75080
Email: rkiesch@utdallas.edu

Rabih Moussawi
Villanova University
Villanova School of Business
800 E Lancaster Ave, Bartley 1003
Villanova, PA 19085
Email: rabih.moussawi@villanova.edu

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ABSTRACT

Do the effects of corporate governance on corporate capital structure choices change as a public firm ages? First, we address the direct effects of firm age and governance features on both its decisions to use debt and how much debt to employ. Our analysis reveals a number of novel results. While firm age is positively correlated with the use of debt, it is negatively correlated with how much debt a firm uses. We also find that the effects of firm age on how much debt a firm uses is primarily due to the interaction between firm age and its governance features. The more power that insiders possess, the less debt that the firm uses as it ages. We interpret our evidence as implying that over time, managers allow their risk preferences to dominate their firm capital structure decisions when they are protected from discipline.

Key words: firm age, corporate governance, capital structure

JEL Code: G32, G34

1. Introduction

Prior research suggests that as a firm grows older many of its features change, and collectively these influence a number of aspects of its behavior. In terms of a firm's capital structure decisions, there are several studies that document how aging firms have more assets-in-place than growth options, and so justifies their taking on more debt (e.g., Hovakimian, Opler and Titman (2001), Sundaresan, Wang and Yang (2015), etc.).[1]

In a different vein, other research suggests that after going public, the appropriateness of different corporate governance features for aging firms also changes. Filatotchev, Toms and Wright (2006) argue that as firms age (and particularly after their IPO), their governance (board composition) needs to change to reflect its different needs.[2] More recently, Johnson, Karpoff and Yi (2016) argue that the costs and benefits of takeover defenses change as the firm ages. They report evidence that after a firm's IPO, the costs tend to outweigh the benefits as the firm ages and is reflected in their valuation, especially in firms that employ the most stringent defenses. Both of these studies suggest that the effect of these features on a firm's capital structure decisions may change as the firm ages as a publicly traded firm.

Given the above points, we are the first study to examine how the age of a firm since its initial public offering mediates the effects of its governance on the firm's capital structure choices. However, to examine this issue we must confront several issues that are poorly addressed in prior research. First, much of the prior empirical research has used capital structure measures that violate the concerns raised by Welch (2007, 2011). For example, many empirical corporate capital structure studies use measures for which equity is not the obverse of debt, or vice versa. Second, a number of studies use book value measures (e.g., Mehran (1992), etc.) and fail to recognize that the book value of equity is a plug number in accounting. As a consequence, book value measures cannot reveal much about a firm's financing choices except for firms that have not suffered a loss.

Third, prior research on the influence of corporate governance on corporate capital structure typically uses capital structure measures that are compositional or fractional variables. This fact has both statistical and theoretical implications. As pointed out by statisticians (e.g., Cox (1996)) and econometricians (e.g., Papke and Wooldridge (1996)), the conditional

[1] So accepted is this argument, that it even shows up in textbooks (e.g., Vernimmen et. al. (2005), etc.).
[2] While Filatotchew, Toms and Wright discuss the need for the governance of a firm to change over the different phases of its life cycle, they only provide illustrations of why the composition of the board needs to change.

expectation function for such variables must be nonlinear since these are doubly-bounded random variables. Unfortunately, the implications of using linear or censored linear regression models for these data are poorly understood, as evidenced by the continued use of such linear or censored linear regression models in capital structure studies. When one estimates a linear regression model for these data, then one is effectively estimating the first order terms of a Taylor series approximation. Thus, all the higher order terms are now relegated to the error term which induces endogeneity bias across all the explanatory variables. As a result, one cannot trust the evidence from estimating linear models for these data either in terms of their parameter estimates, their standard error estimates, or their assessment of the endogeneity of an explanatory variable. Since corporate governance is often viewed an endogenous outcome, this last issue is a critical concern.

Fourth, the vast majority of these studies ignore the evidence that there are firms in their samples that do not use "debt" as they define debt. This treatment has statistical and theoretical implications. Statistically, prior research that uses either a censored linear or a linear regression model for similar data ignores the selection issue. Theoretically, they are ignoring the possibility that the decision to use 'debt' is influenced by different factors and in various ways than the decision on how much debt to use *conditional* on the decision to use debt. Consistent with this concern, prior research (e.g., Strebulaev and Yang (2013)) implies that the governance features of firms that do not use 'debt' are quite different from firms that do. Thus, the failure to address this aspect of the data raises additional issues in interpreting prior evidence on the influence of corporate governance on corporate capital structure decisions.

Our paper contributes to the literature by examining the effects of firm age on how corporate governance influences a firm's capital structure choices after explicitly addressing the aforementioned empirical concerns. To do this, we use data on U.S. corporations from 1996 to 2016. Based on our examination of these data, we draw the following major conclusions.

First, firm age, without considering its interaction with different corporate governance features, is negatively correlated with a firm's use of debt conditional on its using debt. This result contrasts with extant arguments about the correlation between firm age and corporate capital structures. But, as we show, this negative effect is largely due to the interaction between firm age and its governance features.

Second, consistent with Strebulaev and Yang (2013), we find that the corporate governance features that significantly influence whether a firm uses debt differ from those that influence how much debt that the firms uses if it uses debt. More specifically, we find that dual class firms are more likely to be all equity firms initially, but they are also more likely to use debt as they age as public corporations. We interpret this evidence to imply that these firms turn to lower cost sources of external financing to fund their growth since selling new equity might be more expensive for them.

Third, we find evidence the corporate charter provisions of a firm and its board composition are correlated with omitted variables in regression models of how much debt financing that a firm chooses to use *conditional* on its using debt. In the case of corporate charter provisions, our evidence is consistent with the evidence in Karpoff, Schonlau and Wehrly (2017). More importantly, these omitted factors are negatively correlated with the firm's use of debt financing and so may account for prior evidence of negative correlations between these governance features and corporate debt use.

Fourth, we find evidence that as a firm ages, its corporate charter restrictions and board composition influence its capital structure choices quite differently than they do when the firm is young. This evidence is consistent with the arguments in Filatotchev, Toms and Wright (2006) and Johnson, Karpoff and Yi (2016). Further, these changes largely explain why we find that firm age is negatively correlated with how much debt financing a firm uses.

Altogether, we interpret our evidence as suggesting that as a firm grows older, entrenched managers are able to let their risk preferences play a greater role in their firm's capital structure decisions (e.g., Bertrand and Mullainathan (2003), Morellec (2004), Lewellen (2006), Gow, Kaplan, Larcker, and Zakolyukina (2016), etc.). To lay out our evidence for the above conclusions, we organize our paper as follows. Section 2 describes our sample construction and variable definitions. Section 3 provides our baseline analyses on the issues of concern, and Section 4 provides evidence on the robustness of our conclusions. Section 5 assesses the implications of our findings, and Section 6 concludes.

2. Sample Data and Variable Definitions

To construct our sample, we start with the corporations in Compustat with non-negative total assets or sales between 1996 and 2016. We use this database for our annual and quarterly

accounting data. We then matched these data with data from CRSP to compute certain variables (e.g., asset volatility). We also match these data with data from the FRED database for inflation measures, and with before financing tax estimates from John Graham.[3]

Our corporate governance data is drawn from different databases provided by Institutional Shareholder Services' (ISS) RiskMetrics (formerly IRRC). We use RiskMetrics' Directors database in order to extract board size, composition, and ownership information, and the RiskMetrics' governance database to extract information on firms' corporate charter features. Unfortunately, ISS' RiskMetrics provides a new data feed after 2007 that does not include many of the governance provisions used by Gompers, Ishii, and Metrick (2003) to construct their Governance Index (Gindex). Consequently, we provide a detailed methodology to reconcile the governance provisions in the old and new RiskMetrics' governance datasets in order to construct a Gindex-type governance index, which is consistent throughout the entire sample time period, as well as the more parsimonious index proposed by Bebchuk, Cohen, and Ferrell (2009) that focuses on six prominent governance provisions. As demonstrated in Table 1, the need to use RiskMetrics data on governance and directors restricts our sample size.

Capital structure measure

Welch (2011) points out that the question of how to measure a firm's capital structure is more important than often recognized. Unfortunately, prior empirical capital structure research has tended to ignore two critical issues. First, studies (e.g., Mehran (1992), etc.) that use book value measures fail to recognize that book equity is a plug number in accounting that is used to balance assets and claims on assets and so cannot represent a firm's equity financing choice.[4] This problem not only arises for firms that report negative book equity, but also for firms that report negative earnings for any given year or firms. Thus, as Trimbath (2001), Welch (2011), and others point out, book value measures of a firm's capital structure are questionable measures for testing theories of capital structure choices.

Second, as Welch (2011) points out, many empirical capital structure studies use measures for which increases in debt do not necessarily imply increases in equity, or vice versa. This situation is illustrated by Berger, Ofek and Yermack (1997) and similar studies.

[3] We thank John Graham for making these data available for our use. These estimates are based on the methodology detailed in Graham and Mills (2008).
[4] See Pratt and Hirst (2009) or other accounting textbooks for discussion of why this is so.

Because of the above measurement issues, we focus on the following measure of a firm's capital structure (*MLM*): [5]

$$MLM = \frac{Long\ Term\ Debt + Short\ Term\ Debt}{Long\ Term\ Debt + Short\ Term\ debt + Market\ Value\ of\ Common\ Stock}$$

As demonstrated by Figure 1, and like many similar measures, *MLM* has a large probability mass at 0 (i.e. $LM \in [0,1)$) – which reflects the presence of "all equity" firms in the sample. This feature introduces statistical issues that we noted earlier, and discuss further below.

Firm age measures

One can measure firm age as the time between the initial creation of a firm and the present time (in years). One can measure firm age as the time between its going public and the present time (also in years). We choose to focus on the second measure of firm age since Filatotchev, Toms and Wright (2006) and Johnson, Karpoff and Yi (2016) both emphasize the length of time that a firm has been a public firm as the key feature influencing how firm age moderates the influence of governance in publicly traded firms. To measure this feature, we used Jay Ritter's IPO date,[6] Compustat's first reported fiscal period end date (datadate variable), and CRSP's initial listing date (first trading date). Because we derive similar conclusions regardless of which base year we use, we will simply report estimates of the length of time a firm has been public based on its CRSP listing information since this produces a larger sample size, and using the Compustat data in our robustness check since Strebulaev and Yang (2013) use the dates in Compustat for their firm age measure.

Corporate governance measures

We follow corporate law in identifying the key elements of corporate governance. That is, we use board size, board composition, and corporate charter/bylaw provisions as the essential features of corporate governance. A corporation does not exist without having a corporate charter and requires a board to set corporate policy if it has more than 300 investors. In addition to these measures, we add whether the CEO is also the chairman of the board since some argue

[5] We recognize that there is some controversy over whether preferred stock should be classified as "debt" or "equity." To avoid such controversy, we only focus on financing that is either debt or equity. However, including preferred stock in our measure did not change any of our conclusions.

[6] https://site.warrington.ufl.edu/ritter/ipo-data/, we thank Jay Ritter for making his data available to researchers.

that this is a key board feature. Also, we add whether the firm has a dual class structure with a superior voting share class, since this is typically excluded from standard charter index metrics and it is an important corporate charter feature.

Board size: We define *Board size* as the number of directors on the board. This variable is considered in a number of studies of corporate governance to be negatively correlated with the strength of board monitoring of management.[7] As shown in Table 2, the median board size is 9 board members for our sample.

PIboard: To capture board composition, we use proportion of insiders on board. Specifically, we compute the fraction of board members who are also managers of the company or family members of managers of the company. We focus on the proportion of insiders on the board, rather than the proportion of outsiders (independents) on the board because of the potential uncertainty about who is truly an outside board member. On average, insiders of the company represent 19% of the board in our sample.

Gindex: We use Institutional Shareholder Services' (ISS) RiskMetrics Governance database (formerly known as the IRRC Takeover Defense database) which provide two separate feeds of governance provisions. The first feed, the ISS Governance dataset provides the governance provisions for the largest 1500 companies between 1990 and 2006. Gompers, Ishii and Metrick (2003) used this database to construct their Gindex measure.

In 2007, a new governance database, known as RiskMetrics governance data, was released for the year 2007 which resulted from a different collection process and contains therefore different variables. According to the documentation on Wharton Research Data Service (WRDS), RiskMetrics data includes an initial comprehensive review of the company bylaws and charter, while the former IRRC data focused on changes from one vintage to the next. In particular the new data does not include many of the provisions that were part of the original IRRC feed.

In order to construct a consistent Gindex-like governance index over the entire sample period using both feeds of data, we first translate all the RiskMetrics governance provisions into

[7] See Hermalin and Weisbach (2003) for a review and further discussion of such studies.

their equivalent dummy variable provisions in the IRRC feed. Then, we use the six state laws provisions from the 2006 version of the IRRC (Business Combination (Freezeout), Fair Price, Control Share Acquisition, Recapture of Profits, Control Share Cashout, and Director Duties (Stakeholder Clause) Law) and populate them for the new data after merging by state. We also use the state law opt-outs from the new dataset whenever it is available. Provisions that are missing in the new feed are excluded from the computation of our governance index, in both sub-periods (1990-2006, and 2007-2017).

Specifically, we exclude the following eight governance provisions that are not in the new ISS RiskMetrics Governance data: Anti-greenmail provision, Director's Duties-Nonfinancial Impact, Director Liability, Director Indemnification, Director Indemnification Contracts, Compensation Plans, Silver Parachutes, and Pension Parachutes. Gindex therefore includes the following individual provisions, in addition to the six state laws (net of opt-outs) mentioned above: blank check preferred stock, classified or staggered board, fair price, limits to charter amendments, limits to shareholder bylaws amendments, limits to call special meetings, limits for written consent, supermajority requirements to approve mergers, poison pill, golden parachutes, unequal voting, cumulative voting (the lack thereof), and confidential voting (the lack thereof).

Eindex: We follow Bebchuk Cohen and Ferrell (2009) and construct their Eindex metric, which contains the following six provisions: classified or staggered boards, limits to charter amendments, limits to shareholder bylaw amendments, supermajority requirements for mergers, poison pills, and golden parachutes. We use this index in our examination of the robustness of our baseline evidence that uses the above modified Gindex metric.

Dual class: Prior research (e.g., Daines and Klausner (2001), etc.) suggests that having dual class stock with differential voting rights is an alternative to the use of restrictive corporate charter provisions. Since many corporate charter indices do not include this feature, we construct a dummy variable that takes on the value of 1 if a firm has dual class stock.

CEO-Chair: A number of studies suggest that when the CEO is also the chairman of the board, that this confers additional power to the CEO and diminishes the ability of the board to monitor

and discipline management. Consequently, we create a dummy variable that takes on the value of 1 if the CEO is also chairman of the board.

Control variables

While not a focus of our study, we try to control for any factor that robustly explains the variation in corporate capital structures. For this purpose, we start with Frank and Goyal's (2009) identification of different explanatory variables and then adjust their list with information from subsequent studies (e.g., Lemmon, Roberts, and Zender (2008), etc.). As a result, we use the following variables as control variables in our study.

Industry median LM: This variable represents the median LM measure for firms in a firm's industry. Consistent with Gillan, Hartzell, and Starks (2003) and Gompers, Ishii, and Metrick (2003), we use Fama and French's (1997) 48 industry classification when computing industry medians. One interpretation is that this variable should capture the influence of a firm's industry or competitors on its capital structure choices.[8] Another interpretation is that it captures the fitness benchmark of a firm in an evolutionary model of corporate capital structure choices (see Arce, Cook and Kieschnick (2015)). Please note that we only use the prior median (a pre-determined measure) and not the current median in our analyses which is consistent with learning from others' prior decisions and avoids the reflection problem.

Initial LM: This variable represents the initial capital structure of a sample firm when it first goes public. The use of a firm's initial leverage measure is also consistent with the evidence in Lemmon, Roberts, and Zender (2008). As they note, this variable captures firm fixed effects as it does not change over time but does across firms. Further, and just as important, it addresses the initial conditions problem for nonlinear models discussed in Wooldridge (2005) and others.

Ln(Assets) is the natural logarithm of the firm's total assets. This variable captures the effect of firm size on a company's capital structure choices. One interpretation of why firm size matters

[8] Because of the controversy of how to interpret this measure, we also excluded it from our analyses and do not find that this substantially changes our basic conclusions about the effects of firm age, corporate governance, or their interaction on corporate financing decisions.

is because it captures a firm's access to capital markets and its associated transaction costs. As a result, firm size often figures in different financial constraint measures.

Market-to-book ratio is the ratio of the market value of assets to the book value of assets for a firm. This variable is typically found to be a significant determinant of a firm's capital structure and is often interpreted to capture its growth prospects.

Asset tangibility denotes the ratio of inventory and fixed assets to total assets. This variable is typically found to be a significant determinant of a firm's capital structure and is often interpreted to capture its ability to use collateralized debt.

Asset volatility: We follow the logic of Crosbie and Bohn (2003) and derive an estimate of a firm's asset volatility that is consistent with the Black/Scholes/Merton option framework for corporate claims.

Profitability represents the ratio of operating income to total assets. This variable is typically found to be a significant determinant of a firm's capital structure and is often interpreted to capture its operating cash inflows.

Expected inflation rate: We use the 90-day T-bill rate to capture these expectations.[9] We conjecture that this measure better captures market expectations about future inflation, which Frank and Goyal (2009) find to be a significant influence on corporate capital structure decisions.

GM marginal tax rate: We use Graham and Mills' (2008) before financing marginal tax rate as they provide evidence that it is a statistically significant determinant of a firm's capital structure.

Appendix 1 provides further information on the construction of the above variables, and Table 1 provides their summary statistics.

[9] We did not use the CPI or similar inflation metrics because they are not forward looking measures and we should expect firms to be forward looking. We also tried Treasury bond rates over different future horizons but derive similar results and so use this measure as it has been used in prior research.

3. Analysis of Firm Age, Corporate Governance and Capital Structure Choices

We do several things in this section. First, we identify a statistical model that addresses the statistical issues identified earlier. Second, using this statistical model, we provide a baseline analysis without considering the potential endogeneity of some of our governance variables. We do this so our evidence that accounts for such endogeneity issues can be contrasted with this evidence. Third, we test for the endogeneity of our corporate governance measures using an approach that is appropriate for the kind of nonlinear models that we employ. Fourth, we provide a revision of our baseline analysis that accounts for the endogeneity of certain governance features but not for the effect of firm age on these features. And finally, we provide a revision of our analysis that accounts for the endogeneity of certain governance features to incorporate the potential effects of interactions between a firm's governance features and its age on its capital structure choices. Together these analyses represent the core contributions of this study.

3.1. Statistical issues and their theoretical implications

A common practice in most empirical studies on the role of corporate governance in capital structure decisions is measuring a firm's capital structure by some fractional or proportional variable. Specifically, all such studies that we have reviewed define a firm's capital structure as a ratio of 'debt' to 'debt' plus 'equity', which by construction is a fractional variable.

Cox (1996), Papke and Wooldridge (1996) and others have shown that the conditional mean of a fractional or proportional random variables must be nonlinear. Consistent with these arguments, Cook, Kieschnick and McCullough (2008), Fattouh, Harris and Scaramozzino (2008), Ramalho and Silva (2009), Ramalho, Ramalho, and Murteira (2011), and others report evidence that the conditional expectation function for a firm's capital structure is nonlinear.

One might argue that the typical linear model used in empirical capital structure can be interpreted as first order Taylor series approximations to a nonlinear surface around the mean. Such an argument misses two subtle but important concerns: (1) erroneously induced endogeneity, and (2) erroneously implied homogeneity. To see the first error, one must recognize that the higher order terms of a Taylor series approximation must form a large part of the error term in a linear regression model. Consequently, there is will be a correlation between

the error term and each of the included explanatory variables that is likely to be more serious for the more significant determinants of a firm's capital structure. Further, it should be clear that this form of endogeneity bias *cannot* be addressed by standard instrumental variable methods for a linear model because any instrument that is correlated with the "suspect" regressor must be correlated with the "suspect" regressors' high order terms in the residual. Consequently, it is unclear what confidence one can have in prior evidence on the effects of corporate governance on corporate capital structure that used a linear regression model.

The second error arises because linear regression model for these data ignore the fact that some firms do not use debt in their sample. This feature has two important implications that are ignored in prior empirical capital structure studies. First, as shown in Capinski and Kopp (2004), the failure to account for this feature implies that these studies have estimated the wrong conditional mean of the distribution of firm capital structures. This error can account for the inference of some studies that firms under-utilize debt given their features. Second, as Humphreys (2013) points out, these observations are likely the results of economic decisions driven by separate considerations. In other words, the factors influencing the decision to use debt may be different from the factors that influence decisions on how much debt to use once the decision to use debt has been made. Cook, Kieschnick, McCullough (2008) and Ramalho, Ramalho, and Murteira (2011) examine this issue and provide strong evidence that it is important to recognize this distinction when examining the factors that influence a firm's capital structure choice. These conclusions were reinforced, in the case of corporate governance issues, by a number of studies (e.g., Strebulaev and Yang (2013)) that suggest that the governance features of zero leverage firms are quite different from the governance features of non-zero levered firms.

Consequently, we address the above issues by using the two-part quasi-likelihood model based on Papke and Wooldridge's (1996, 2008) quasi-likelihood model developed in Ramalho and Silva (2009) and Ramalho, Ramalho, and Murteira (2011) for these data.[10] By doing this we provide better evidence on which corporate governance features, if any, matter for corporate capital structure decisions.

[10] Using Ospina and Ferrari's (2010) zero-inflated beta regression model leads us to similar conclusions to those reported, but we use the quasi-likelihood version to avoid debate over the proper specification of the continuous component.

3.2 Baseline analyses without correction for endogeneity or interaction effects

We begin our analysis of the effects of corporate governance on corporate capital structure decisions by ignoring potential endogeneity problems introduced by the use of governance variables and the potential interaction between firm age and a firm's governance features. We do so in order to establish a benchmark against which we can judge how addressing endogeneity, for example, affects our inferences. We report the results of estimating our two-part quasi-likelihood model in Table 2. Please note that in this and all subsequent estimated regression models, we use the lagged values of the regressors. Consequently our regressors are predetermined variables.

The second column of Table 2 reports the influence of the different regressors on the probability that a firm uses debt financing, since the second part is conditional on this decision. One can simply flip the signs of the coefficients to examine the effect of a variable on probability of a firm being an all equity firm. The reported evidence implies that the likelihood of a firm using debt is significantly correlated with its industry's use of debt (+), its initial use of debt (+), its size (+), its asset tangibility (+), its asset volatility (-), its profitability (-), its board size (+), and its use of dual class stock (-).

By and large, the evidence on the effects of our control variables on the use of debt are consistent with the evidence reported in Strebulaev and Yang (2013). What is new or different is that board size and the dual class stock are significantly correlated with these choices and that a firm age since going public is not.[11] Further, we find that a firm's industry's use of debt is a significant influence on it use of debt. This last result is consistent with firms paying attention to their competitors past decisions on financing in making their current financing choices.

Next, in column three of Table 2, we turn to examine the evidence on what factors significantly influences a firm's decision on how much debt to use conditional on its use of debt. We find that how much debt financing a firm uses is significantly correlated with its industry's use of debt financing (+), its initial use of debt (+), its size (+), its growth prospects (-), its profitability (-), its asset volatility (-), its tax rate before financing (-), its age (-), its board size (-), and the proportion of insiders on its board (-). While the sign of the Graham-Mills (2008) before financing tax rate is the opposite of what they report, it is consistent with the fact that

[11] Strebulaev and Yang use a firm age measure based on Compustat presence. When we use this measure, we find it to be significant at the 10% marginal significance level.

more profitable firms use less debt financing. Of more interest, given the focus of our study, we find that firm age since going public is negatively correlated with how much debt it uses – which is inconsistent with the evidence in Hovakimian, Opler and Titman (2001), Sundaresan, Wang and Yang (2015), etc. How much of this difference is due to our addressing statistical issues that they ignored is unclear. Regardless, this evidence is more consistent with the evidence Deangelo and Roll (2015) that older firms appear to value financial flexibility or unused debt capacity.

3.3 Testing for the endogeneity of corporate governance in capital structure decisions

Before we can address how firm age influences the effects of corporate governance on a firm's capital structure choices, we have to address the potential endogeneity of our different corporate governance measures. To address endogeneity issues in nonlinear models, such as ours, requires a different methodology than is usual in empirical finance with its reliance on linear models. Two stage prediction methods, which two stage least squares is an example, can produce biased and inconsistent estimators in nonlinear models (see Terza, Basu and Rathouz (2008)). To address this concern, we follow Wooldridge (2014) and employ the control function approach. Terza, Basu and Rathouz (2008) demonstrate this type of estimator provides more consistent estimates of the parameters than do two stage prediction estimators in nonlinear models. [12]

To implement this approach, one proceeds in two steps. First, you regress the other regressors on the potentially endogenous variable along with instruments; just as you might with a two-stage least squares regression. Next, you extract the residuals from this regression, which becomes the control function for the potentially endogenous variable. And finally, you include this control function in the primary regression model along with the potentially endogenous variable. The logic of the control function approach is that this separates out, or controls, that part of the endogenous variable that is correlated with the error term.[13]

Of special note, Heckman and Vavarro-Lozano (2004) demonstrate that the control function approach is more robust to omitted variable problems in estimation than many alternatives. Specifically, they point out: "Because the method of control functions explicitly

[12] See Greene (2017) or Wooldridge (2010) for textbook descriptions of the control function approach to addressing endogeneity. This approach is now the dominant approach for dealing with endogeneity in semi-parametric and non-parametric regression models.

[13] It is worth noting that the control function approach and two-stage least squares approach produce exactly the same parameter estimates for an endogenous regressor in a linear model.

models omitted relevant conditioning variables, rather than assuming that there are none, it is more robust to omitted conditioning variables." [14] This point is relevant for our study as our regressors are predetermined variables. Therefore, the likely cause of their being endogenous variables in our regression models is because of their correlation with omitted variables.

Applying this procedure, we first regress a firm's *ln(Gindex), ln(board size), PIBboard, Dual class and CEO Chair* measures on the other variables included in the regression models reported in Table 2 along with different instruments, and then use the residuals from these regressions as control functions. As instruments, we use a set of state dummy variables. Specifically, we identify if a firm is incorporated in California, Texas, Maryland, Minnesota, Ohio, Nevada, New York and Pennsylvania.

These choices are reasonable for three reasons. First, state law controls what provisions might be or might not be included in a corporate charter. Second, there is variation in permitted ATPs across states. For example, firms incorporated in Texas or California have few state ATPs, whereas those incorporated in Pennsylvania or Ohio have many state ATPs. Third, the corporate law of a state likely influences other aspects of its governance. Moreover, there is no reason to expect that the state in which a firm is incorporated (rather than headquartered) will be correlated with economic or financial influences on its capital structure choices. For example, a firm with headquarters in California and incorporated in Delaware is more likely to be influenced in its financing decisions by companies with headquarters near it geographically, and yet its corporate governance features are more likely to be influenced by what is permitted by Delaware corporation law – which is the channel of concern. Note that this argument is consistent with the evidence in Gao, Ng, Wang (2010) and explains why we cannot use the geography based instruments used in Karpoff, Schonlau and Wehrly (2017).

With these points in mind, we report in Table 3 the regressions of each of the corporate governance features that we consider on our control variables, other governance features and instruments. As might be expected, we observe more of these instruments being significantly correlated with our *ln(Gindex)* variable than with our other governance variables. Nevertheless, we observe significant coefficients for one or more instruments for each of the other governance variables. Just as importantly, the instruments that are significant differs across governance

[14] Heckman and Navarro-Lozano (2004), page 30.

measures. In fact, we can show that incremental F tests are significant at that the 1% marginal significance level for each governance feature for an appropriate choice of these instruments.

What is particularly interesting about the evidence in Table 3 is that the partial correlations between these state of incorporation variables and each of our governance features is statistically significant. For example, firms incorporated in Texas or California have fewer ATPs in their corporate charters than firms incorporated in other states, and they also tend to have smaller boards, fewer insiders on their board, less likely to have a CEO be the chairman, and to use dual class stock. In other words, as conjectured above, the corporate law of a state influences more than just what is permitted in a corporate charter.

While these results imply that our instruments were relevant, they do not show that they are exogenous. Unfortunately, there is controversy about whether one can even establish instrument exogeneity (e.g., Roberts and Whited (2013)). A further complication is that there are no well-established tests for exogeneity in the kinds of nonlinear models that we estimate. So, we address this issue in two ways. First, by examining the variability of corporate capital structures across states and then later, in our robustness section, the robustness of our evidence to different instruments.

We examine the variability of our corporate capital structure measure both for the U.S. and for each state and report this evidence in Table 4. This evidence suggests that there is as much variability in capital structures of firms in each state of incorporation that we identified as instrument as there is in the whole U.S. and so we do not observe tighter clustering in some of these states than in the population. Thus, there are as many other influences on the corporate structure decisions of firms in each state of incorporation as there are in the whole U.S. While this does not prove that our instruments satisfy the exogeneity requirement, it is certainly consistent with their doing so.[15] Consequently, we will proceed as if our instruments are valid instruments and examine the robustness of our conclusions to a different set of instruments later.

Given the implied control functions for each of our governance measures, we can now test if they are exogenous variables in our capital structure regressions. One of the nice features of the control function approach is that if the control function associated with a governance measure is statistically significant, then this indicates that the associated governance variable is

[15] Remember instrument exogeneity requires an instrument to be uncorrelated with the conditional error. Our evidence suggests there is a lack of correlation with the unconditional error, which implies the latter.

an endogenous variable in our capital structure regressions. With this point in mind, we incorporate the control function associated with each of our corporate governance variable into the two-part regression models reported in Table 2. To make it is easier to see their implications, we separate the results for estimating their effects on the probability of using debt from the results on their effects on how much debt a firm uses conditional on its using debt. Table 5 reports the evidence for the factors influencing the likelihood of a firm using debt; whereas Table 6 reports the evidence for the factors influencing how much debt is used by firms that use debt. Further, to focus attention on what is relevant, we do not report the estimation results for our control variables and just report the results for the regressors of interest.

The evidence in Table 5 implies that none of the governance measures that we consider are endogenous variables in the statistical model for whether a firm uses debt or not. Consequently, we need not worry further about controlling for their endogeneity in the statistical models for these decisions.

The evidence in Table 6, however, implies that the control functions associated with a firm's G-index and the proportion of insiders on its board are endogenous variables in regression models for decisions on how much debt to use conditional on the use of debt. Interestingly, the significantly negative sign on the control function associated with a firm's Gindex is consistent with the evidence reported in Karpoff, Schonlau and Wehrly (2017).

3.4 Baseline analysis with corrections for the endogeneity of governance features

Taking the above results into account, we re-estimate our two-step quasi-likelihood model and incorporate control functions for a firm's modified Gindex and its board composition into the part focused on the conditional mean capital structure of firms that use debt. We report these results in Table 7. Since the evidence for the estimated effects of different governance features on the probability of a firm using debt are similar to those reported in Table 2, we will focus on the effects of different governance features on the proportion of debt financing used by firms that use debt financing.

The evidence in the last column of Table 7, which includes the control functions for the Gindex and board composition, suggests striking changes in the coefficients of different corporate governance variables. Board size is no longer statistically significant. Further, the signs on both the modified G-index and the board composition variables are now significantly

positive while the signs on their associated control functions are significantly negative. In other words, the negative signs on these variables in our earlier regressions were driven by their correlations with omitted variables. We interpret this evidence as implying that it is omitted variables that are correlated with these two variables that account for prior evidence of a their significantly negative correlation with certain firm financing decisions.

Interestingly, these results can explain why these governance variables may appear insignificant in some studies yet exercise a significantly negative influence in other studies (e.g., Garvey and Hanka (1999) versus John and Litov (2010) on the effects of ATPs on capital structure choice). Effectively they exercise a different influence on the decision to use debt from that on how much debt to use.

More importantly, they raise the question of what omitted variables might be correlated with either a firm's use of charter restrictions on governance or insider dominance on a firm's board. One answer provided by prior research to this question is that these governance features allow managers to emphasize their preferences over a firm's leverage choices. Since bankruptcy risk is a largely undiversifiable risk for management and entails both the loss of income as well as the prospects of finding similar remunerative work, it should be no surprise that managers would prefer to use less debt financing than managers who face disciplinary pressures to do otherwise. Such an interpretation is consistent with the arguments and evidence in Lewellen (2006) and the arguments and evidence in Bebchuk, Cremers and Peyer (2011) on the effects of CEO power on firm value.

3.5. Addressing the mediating role of firm age on how corporate governance influences corporate capital structure decisions

The above evidence implies that firm age exercises a completely different influence on whether a firm uses debt from how much debt that it chooses to use given the decision to use debt. Whether this also implies that firm age affects how a firm's governance features influences these decisions is unclear since the above evidence ignores these interactions. As discussed earlier, as a firm ages its governance may need to change. If it does not change, then this may have important consequences for its behavior.

Filatotchev, Toms and Wright (2006), for example, argue that more outside directors should be on the board to monitor management as it ages, particularly after the firm goes public.

Consequently, one might expect the effect of board composition on a firm's capital structure decisions to become more important the longer it has been a publicly traded firm. In a similar vein, Johnson, Karpoff and Yi (2016) find evidence that the effects of a firm's takeover provisions change after it goes public and reduce firm value if they persist. Consequently, one might expect the influence of either a firm's charter provisions or its board composition on its capital structure choices to change as its ages.

To test these arguments, we revise our prior regression models to incorporate the interaction between our firm age measure and each of our governance variables. We report these results in Table 8. For the decision to use debt, we find evidence that it is the interaction between firm age and whether the firm is a dual class firm or not matters the most. To begin, dual class firms are less likely to use debt but as they age they are more likely to use debt. One interpretation for this behavior is that dual class firms find it necessary to turn to debt financing after they go public if they intend to finance growth. One obvious reason for this is they find it more expensive to sell stock in a firm in which outside shareholders have less say on its management.

For the choice of how much debt to use given that the firm uses debt, we no longer find whether a firm is a dual class firms or not, or how long it has been a dual class firm to be important. Instead, we find the composition of the board and the firm's charter provision to be more important. When they are initially traded, firms with more ATPs and insider dominated boards use more debt than other firms, but as they grow older they use less. This evidence is consistent with a story in which firms dress up to look good when they go public, but change as they age. Again, we interpret these results as suggesting that when protected from discipline, managerial risk preferences play a bigger role in a firm's leverage decisions as the firm ages.

Before we discuss the implications of our different regressions in more detail, we will first explore the robustness of our key results.

4. Robustness checks

We examine the robustness our evidence to several variations in how we defined certain key variables and our choice of instruments. First, the primary alternative to the G-index is the E-index, developed by Bebchuk, Cohen, and Ferrell (2009). Consequently, we substitute the *ln(Gindex)* for *ln(Eindex)*. To do this, we first estimate a control function for this new measure

and then re-estimate a two-part model with the appropriate control functions. We report these results in Table 9 in a similar manner to which we reported our baseline results in Table 8. Consistent with our evidence in Table 8, we find that dual class firms are initially less likely to use debt financing, but as they age, they are more likely to use debt financing. For firms that use debt, we again see that initially, firms with more restrictive corporate charter provisions and insider dominates boards use more debt, but as they age, they use less debt. Once again, this points to the importance of board independence as a firm ages.

Next, we vary how we measure firm age as a public firm. Specifically, we follow Strebulaev and Yang (2013) and use the number of years that a firm reports financial data on Compustat as its age. Using this measure, we re-estimate a two-part quasi-likelihood model similar to the model reported in Table 8. We report these results in Table 10. A perusal of these results reveal that they are very similar to those reported in Tables 8 and 9. Consequently, our evidence on the effects of firm age on how corporate governance influences corporate capital structure choices appears robust to this variation.

Third, we explore the robustness of our evidence to use of a book value measure of a firm's capital structure. To do so, we first create a capital structure similar to our market value measure, but use the book value of equity in place of the market value of equity. Specifically, we define this book value measure, *BLM*, as:

$$BLM = \frac{Long\ Term\ Debt + Short\ Term\ Debt}{Long\ Term\ Debt + Short\ Term\ debt + Book\ Value\ of\ Common\ Stock}$$

To address our concerns with such a measure, we drop all firms that report a negative book value of equity from the analyses using this measure.

Following the same estimation procedures as before, we estimate a two-part quasi-likelihood model similar to those reported in Tables 8, 9, and 10 but using dependent variables based on this book value capital structure measure. We report these results of this new estimation in Table 11. Since the inferences we draw from these results are the same as we draw from the evidence in Tables 8, 9 and 10, we view our conclusions about the evidence in Table 8 as robust to this variation in how we measure a firm's capital structure.

Finally, we address the robustness of our evidence to the choice of instruments. While the evidence in Table 3 demonstrated that our instruments were strong instruments, it did not demonstrate that they satisfied exogeneity requirements. Here, as discussed earlier, we face several problems. First, there is a lot of debate about whether can even test for exogeneity.

Instead, such literature argues that satisfying the exogeneity requirements depends more on the argument made for why one's instruments satisfy this requirement. Because of this argument we focused in our earlier discussion on reasons why we think that our instruments satisfy this requirement. Second, there is no generally accepted test for exogeneity in the kinds of quasi-likelihood models that we estimate. We can compute the residuals and conduct a J test. We did and the largest J statistics was 1.83, which was insignificant at the 10 percent marginal significance level. While this evidence is comforting, one must consider it only indicative.

Consequently, we approach this issue in a different way. We created a different set of instruments and repeat the analyses in Tables 8, 9, 10, and 11 using new control functions based on these new instruments. We follow the type of approach taken in Karpoff, Schonlau and Wehrly (2017) and match each sample firm's governance features with the governance features of a random firm from the same state but in a different industry. We use these matched governance features as instruments. We then compute new control functions for a firm's modified Gindex and proportion of insiders on the board and estimate the type of specifications reported in Tables 8, 9, 10 and 11 but using these new control functions. We report these results in Table 12. This evidence is consistent with the evidence in Tables 8, 9, 10, and 11. The main difference is that the direct effect of a firm's modified Gindex on how much debt the firm uses is less significant than in the prior tables. Regardless, based on the arguments in Stock and Watson (2011), this evidence suggests that our prior instruments and these instruments are either correlated with omitted variables in the same way or that both sets of instruments satisfied the exogeneity requirement. Otherwise, we should have expected a greater deviation in results.

5. Implications of our evidence

We now want to step back and discuss the implications of the evidence in Tables 8, 9, 10, 11, and 12 a bit further. First, we do not find evidence that the corporate governance features that we consider are endogenous variables in statistical models of the likelihood of a firm using debt (or similarly, a firm being all equity financed). Since our regressors are pre-determined variables, this evidence implies that these governance features are not significantly correlated with omitted variables that also significantly influences the decision to use debt or not use debt. This conclusion provides some assurance that prior studies that ignored such endogenity provide reasonable evidence.

Second, of the different corporate governance features that we consider, only the use of dual class stock has a consistent, statistically significant effect on a firm's decision to use debt. Interestingly, when these firms are first publicly traded firms, they are less likely to use debt, or more likely to be all equity financed. As they age, however, this changes and they become more likely to use debt. We conjecture that this pattern suggests that they find it to be less costly to issue debt to fund growth as they become older publicly traded firms.

Third, despite using different instruments, we like Karpoff, Schonlau, and Wehrly (2017), that a firm's G-index or E-index are endogenous variables that are correlated with omitted variables. When firms first begin as publicly traded firms, how much debt they use is positively correlated with their corporate charter restrictions on takeovers. However, as they age, their use of debt is negatively correlated with these provisions. Further, it is the omitted variables that are correlated with a firm's use of restrictive charter provisions that are significantly and negatively correlated with their use of debt. One way of interpreting this evidence is that corporate charter restrictions are not per se value reducing features, but rather they permit behavior that is and especially as the firm gets older.[16]

Fourth, we find that the most consistent statistically significant corporate governance feature affecting a firm's decision on how much debt to use is its board composition. Further, like with our corporate charter evidence, we find evidence that it is omitted variables that are correlated with board composition that exercises the most significant negative influence on how much debt a firm uses. And just as importantly, we find that initially a firm's use of debt is positively correlated with insider dominated boards, but as the firm ages, this relationship changes and such boards are negatively correlated with how much debt a firm uses.

And finally, we find that the influence of firm age on how much debt it uses is largely explained by how firm age affects the relationship between the governance of a firm and its capital structure choices. Given how these changes evolve, we interpret this evidence to imply that, as a firm ages, entrenched managers are able to let their preferences play a greater role in their firms' capital structure choices.

[16] Imagine two firms with restrictive corporate charter provisions, in one firm, management uses these features to pursue high risk or innovative investment and in the other firm, management uses these features to slack off. It is unobserved behavior of management rather than the corporate charter provisions per se that change the outcomes.

6. Conclusion

Prior research has considered the idea that as a firm grows older many of its features change, and collectively these influence a number of aspects of its behavior. For example, some argue that as a firm grows older and converts its growth options into asset-in-place that it will lever up. Another stream of literature, however, argues that as a firm ages, the influence of its governance structure on its behavior also changes. Thus, we ask whether the effects of corporate governance on corporate debt use choices change as a public firm ages.

In order to address this question, we must also address several specification errors in prior capital structure research. First, consistent with Welch's (2007, 2011) critiques, ensure that our capital structure measure implies that an increase in debt financing is associated with a decrease in equity financing, and vice versa. Second, we address Welch's other critique that book value measures of equity are plug values in financial accounting and so do not represent firm's choices. Third, we explicitly address Papke and Wooldridge's (1992) critique of regressions on fractional or proportional random variables. This critique also implies that prior endogeneity tests using linear models for these data are invalid. Fourth, we address Cook, Kieschnick, and McCullough (2008) and Ramalho and Vidigal da Silva (2009) critique of empirical capital structure models that ignore the selection issue implied by all equity firms. Fifth, we address endogeneity in nonlinear capital structure models using control function methods – which prior evidence suggests are less biased than two state prediction methods (e.g., 2SLS, etc.).

Using data on a sample of U.S. corporations from 1996 through 2016, we derive the following key conclusions. First, firm age, without considering its interaction with different corporate governance features, is negatively correlated with a firm's use of debt conditional on its using debt financing. This result contrasts with prior arguments and evidence on the relationship between firm age and it use of financial leverage.

Second, dual class firms are more likely to not use debt financing initially, but are more likely to use debt as they age as public corporations. We interpret this evidence to imply that these firms turn to lower cost sources of external financing as they age to fund their growth since selling new equity might be more expensive for them.

Third, we find evidence the corporate charter provisions of a firm and its board composition are correlated with omitted variables in regression models of how much debt

financing that a firm chooses to use conditional on its using debt. These omitted factors are negatively correlated with the firm's use of debt financing.

Finally, we find evidence that as a firm ages, its corporate charter restrictions and its board composition influence its capital structure choices quite different than they do when the firm is young. Further, these changes largely explain why we find that firm age is negative correlated with how much debt financing a firm uses.

Altogether, we interpret our evidence as suggesting that as a firm grows older as a pubic firm, governance features associated with managerial entrenchment allow managerial risk preferences to play a greater role in their firm's capital structure decisions. This interpretation is consistent with the arguments and evidence in Bertrand and Mullainathan (2003), Morellec (2004), Lewellen (2006), Gow, Kaplan, Larcker, and Zakolyukina (2016), etc.

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Table 1
Summary of Sample Statistics

This table presents the descriptive statistics for the key variables used in our study. See Appendix 1 for further information on the definition of these variables. All variables based on Compustat data are winsorized at the 1% level.

Variable	*N*	*Mean*	*Median*	*Std Deviation*
MLM	129440	0.2540	0.1804	0.2551
Initial MLM	130654	0.2550	0.2409	0.1346
Industry median MLM	128844	0.2007	0.1148	0.2252
Ln(Assets)	130337	6.0238	5.9641	2.2579
Market-to-book ratio	129629	2.0078	1.3551	1.8600
Asset tangibility	126157	0.2300	0.1353	0.2437
Profitability	126114	0.0325	0.0797	0.2366
Asset volatility	104567	0.4884	0.3869	0.3601
GM marginal tax rate	55860	0.2744	0.3500	0.1236
Expected inflation rate	142760	2.5986	2.1900	2.1947
Firm age	141042	14.9638	10.0000	14.7917
Board size	32123	9.4650	9.0000	2.6943
PIBoard	32123	0.1860	0.1429	0.1071
Dual class	35696	0.0899	0	0.2861
CEO Chair	32123	0.6352	1	0.4814
Gindex	35696	7.2083	7	2.0296
Eindex	35696	2.6165	3	1.3560

Table 2
Baseline regressions without correction for endogeneity of governance measures

See Appendix 1 for definition of variables. MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. All regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(MLM>0)	*E(MLM|MLM>0)*
Constant	-3.6801	-0.6388
	(0.05)	(0.00)
Industry median MLM	1.1550	0.9411
	(0.30)	(0.00)
Initial MLM	2.7187	1.7100
	(0.00)	(0.00)
Ln(Assets)	0.7651	0.0857
	(0.00)	(0.00)
Market-to-book ratio	-0.0088	-0.5433
	(0.88)	(0.00)
Asset tangibility	1.9336	0.2849
	(0.00)	(0.00)
Profitability	-3.2987	-1.4140
	(0.00)	(0.00)
Asset Volatility	-1.4843	-0.6383
	(0.00)	(0.00)
GM marginal tax rate	-0.3180	-0.3662
	(0.75)	(0.00)
Expected inflation rate	0.3090	-0.0239
	(0.21)	(0.34)
Firm age	0.0104	-0.0031
	(0.15)	(0.00)
Ln(board size)	1.2831	-0.1347
	(0.00)	(0.04)
PIBoard	0.0215	-0.4056
	(0.98)	(0.01)
Dual class	-0.6966	0.0876
	(0.02)	(0.15)
CEO chairman	0.2746	-0.0282
	(0.12)	(0.30)
Ln(Gindex)	0.2966	0.0139
	(0.31)	(0.75)
Year fixed effects	Yes	Yes
# of obs	15,558	15,558
Chi-Square	435.5	3975
p-value	(0.00)	(0.00)

Table 3
Estimation of control functions

See Appendix 1 for definition of variables. The state variables (e.g., *Texas*, etc.) represent dummy variable that takes on the value 1 if a firm is incorporated in that state. All control variables are lagged one period. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero.

	ln(Gindex)	*ln(board size)*	*PIB*	*CEO Chair*	*Dual class*
Ln(board size)	0.186		-0.0604	-0.103	0.0762
	(0.00)		(0.00)	(0.01)	(0.02)
PIBoard	-0.230	-0.279		-0.357	0.507
	(0.00)	(0.00)		(0.00)	(0.00)
Dual class	-0.0652	0.0438	0.0634	-0.00539	
	(0.00)	(0.05)	(0.00)	(0.87)	
CEO Chair	0.0323	-0.0172	-0.00744		-0.00246
	(0.00)	(0.02)	(0.03)		(0.80)
Ln(Gindex)		0.0937	-0.0266	0.0818	-0.0600
		(0.00)	(0.00)	(0.00)	(0.00)
California	-0.370	-0.0500	-0.00816	-0.0221	-0.0814
	(0.00)	(0.17)	(0.52)	(0.82)	(0.00)
Texas	-0.0277	-0.0332	-0.00732	-0.180	-0.0597
	(0.43)	(0.38)	(0.43)	(0.00)	(0.00)
Maryland	0.111	-0.0164	0.00960	-0.0167	0.00622
	(0.00)	(0.73)	(0.51)	(0.79)	(0.86)
Minnesota	0.247	-0.0247	-0.00903	-0.0493	-0.0112
	(0.00)	(0.27)	(0.33)	(0.28)	(0.67)
Ohio	0.250	0.0826	0.00643	0.0199	0.0492
	(0.00)	(0.00)	(0.50)	(0.67)	(0.23)
Nevada	0.131	-0.0662	0.0463	-0.0241	-0.0757
	(0.00)	(0.04)	(0.05)	(0.70)	(0.00)
New York	0.134	0.0302	0.0267	0.0245	0.0563
	(0.00)	(0.24)	(0.00)	(0.54)	(0.25)
Pennsylvania	0.339	-0.0328	-0.0103	0.0302	-0.00783
	(0.00)	(0.19)	(0.14)	(0.51)	(0.71)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
# of obs	15,550	13,668	13,668	13,668	15,550
F statistic	26.36	41.13	20.46	26.48	30.83
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 4
Variation in market value leverage measure across states

The below table provides the standard deviation of our market value leverage measure, MLM, for each state. MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock

State	*Std Dev*	*State*	*Std Dev*	*State*	*Std Dev*
U.S.	**0.255**				
AK	0.229	KY	0.196	OH	0.238
AL	0.183	LA	0.219	OK	0.250
AR	0.190	MA	0.259	OR	0.215
AS	0.004	MD	0.255	PA	0.251
AZ	0.271	ME	0.257	PR	0.212
CA	0.234	MI	0.274	RI	0.259
CO	0.234	MN	0.218	SC	0.273
CT	0.219	MO	0.223	SD	0.201
DC	0.315	MS	0.220	TN	0.243
DE	0.250	MT	0.224	TT	0.219
FL	0.245	NC	0.246	TX	0.253
GA	0.257	ND	0.159	UT	0.219
HI	0.214	NE	0.379	VA	0.250
IA	0.250	NH	0.168	VI	0.312
ID	0.226	NJ	0.235	VT	0.193
IL	0.240	NM	0.248	WA	0.261
IN	0.259	NV	0.271	WI	0.221
KS	0.233	NY	0.232	WV	0.213
				WY	0.219

Table 5
The decision to use debt and the endogeneity of corporate governance

Each of the below logistic type regressions represents P(MLM>0) where MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. See Appendix 1 for definition of variables. All regressors except the control functions for different governance measures are lagged one period. The below is the first part of Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses

	P(MLM>0)				
Ln(board size)	0.891	3.190	0.653	1.089	1.094
	(0.11)	(0.17)	(0.29)	(0.03)	(0.03)
PIBoard	-0.559	0.0314	-5.360	0.188	0.609
	(0.60)	(0.98)	(0.45)	(0.87)	(0.63)
Dual class	-0.270	-0.406	0.0488	-0.271	-2.927
	(0.47)	(0.29)	(0.93)	(0.46)	(0.18)
CEO Chair	0.424	0.457	0.416	2.907	0.426
	(0.04)	(0.03)	(0.05)	(0.10)	(0.04)
Ln(Gindex)	0.517	0.230	0.336	0.253	0.348
	(0.59)	(0.56)	(0.38)	(0.50)	(0.33)
CF(Gindex)	-0.0798				
	(0.94)				
CF(ln(board size)		-2.323			
		(0.32)			
CF(PIBoard)			4.875		
			(0.49)		
CF(CEO Chair)				-2.480	
				(0.17)	
CF(Dual class)					2.717
					(0.22)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
# of obs	12,818	12,818	12,818	12,818	12,818
Chi-Square	262.8	267.5	264.5	269.9	270.3
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 6
The use of debt and the endogeneity of corporate governance

Each of the below regressions represent E(MLM|MLM>0) where MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. See Appendix 1 for definition of regressors. All regressors are lagged one period. Below is the second part of regression models based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	E(MLM|MLM>0)				
Ln(board size)	-0.179	-0.0892	-0.000678	-0.0820	-0.137
	(0.02)	(0.81)	(0.99)	(0.30)	(0.08)
PIBoard	-0.418	-0.472	1.737	-0.343	-0.603
	(0.02)	(0.01)	(0.10)	(0.08)	(0.01)
Dual class	0.163	0.145	0.00930	0.148	0.418
	(0.01)	(0.03)	(0.92)	(0.03)	(0.22)
CEO Chair	-0.0459	-0.0356	-0.0252	0.401	-0.0356
	(0.12)	(0.23)	(0.39)	(0.24)	(0.23)
Ln(Gindex)	0.306	0.00103	0.0600	-0.0332	0.0167
	(0.03)	(0.99)	(0.29)	(0.56)	(0.74)
CF(Gindex)	-0.343				
	(0.02)				
CF(ln(board size)		-0.0280			
		(0.94)			
CF(PIBoard)			-2.250		
			(0.03)		
CF(CEO Chair)				-0.439	
				(0.20)	
CF(Dual class)					-0.275
					(0.42)
Controls	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
# of obs	12,818	12,818	12,818	12,818	12,818
Chi-Square	3266	3247	3251	3245	3241
p-value	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 7
Baseline regressions with corrections for the endogeneity of governance measures

Firm age is measured as the number of years that a firm is on CRSP. MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. See Appendix 1 for definition of variables. CF(*) represents the control function associated with the * governance measure. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(MLM>0)	E(MLM|MLM>0)
Ln(board size)	1.094	-0.0597
	(0.03)	(0.49)
PIBoard	0.609	1.905
	(0.63)	(0.07)
Dual class	-2.927	0.0205
	(0.08)	(0.82)
CEO Chair	0.426	-0.0352
	(0.04)	(0.23)
Ln(Gindex)	0.348	0.377
	(0.33)	(0.01)
Firm age	0.0142	-0.00190
	(0.10)	(0.06)
CF(lnGindex)		-0.356
		(0.01)
CF(PIBoard)		-2.357
		(0.02)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	12,818	12,818
Chi-square	270.3	3277
p-value	(0.00)	(0.00)

Table 8
The interaction between firm age and corporate governance

Firm age is measured as the number of years that a firm is on CRSP. LM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. See Appendix 1 for definition of variables. CF(*) represents the control function associated with the * governance measure. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(MLM>0)	E(MLM|MLM>0)
Ln(board size)	0.562	-0.167
	(0.50)	(0.19)
PIBoard	2.128	2.315
	(0.15)	(0.03)
Dual class	-2.101	0.0370
	(0.00)	(0.79)
CEO Chair	0.329	-0.0300
	(0.34)	(0.62)
Ln(Gindex)	0.189	0.361
	(0.71)	(0.03)
Firm Age	-0.0646	-0.00788
	(0.44)	(0.26)
Firm Age*Ln(Gindex)	0.00574	-0.000415
	(0.80)	(0.83)
Firm Age*Ln(board size)	0.0380	0.00349
	(0.24)	(0.21)
Firm Age*PIBoard	-0.110	-0.0196
	(0.06)	(0.01)
Firm Age*Dual Class	0.0777	9.00e-05
	(0.00)	(0.98)
Firm Age*CEO Chair	-0.00297	-0.000245
	(0.83)	(0.86)
CF(lnGindex)		-0.350
		(0.02)
CF(PIBoard)		-2.241
		(0.03)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	15,468	12,818
Chi-square	423.6	3321
p-value	(0.00)	(0.00)

Table 9
The interaction between firm age and corporate governance with different governance index

Firm age is measured as the number of years that a firm is on CRSP. LM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus preferred stock plus the market value of common stock. See Appendix 1 for definition of variables. CF(*) represents the control function associated with the * governance measure. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(MLM>0)	E(MLM|MLM>0)
Ln(board size)	1.0564	-0.1129
	(0.23)	(0.42)
PIBoard	1.5105	3.5619
	(0.37)	(0.00)
Dual class	-1.9884	0.0776
	(0.00)	(0.62)
CEO Chair	0.2135	-0.0273
	(0.56)	(0.66)
Ln(Eindex)	-0.1297	0.5168
	(0.75)	(0.03)
Firm Age	-0.0394	-0.0038
	(0.60)	(0.57)
Firm Age*Ln(Eindex)	0.0151	-0.0013
	(0.37)	(0.32)
Firm Age*Ln(board size)	0.0221	0.0032
	(0.52)	(0.26)
Firm Age*PIBoard	-0.0802	-0.0178
	(0.22)	(0.03)
Firm Age*Dual Class	0.0692	-0.0022
	(0.02)	(0.57)
Firm Age*CEO Chair	-0.0014	-0.0001
	(0.92)	(0.92)
CF(lnEindex)		-0.3940
		(0.08)
CF(PIBoard)		-3.3904
		(0.00)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	14,512	11,983
Chi-square	394.1	3099
p-value	(0.00)	(0.00)

Table 10
The interaction between firm age and corporate governance with different firm age measure

Similar to Stebulaev and Yang (2013), firm age is based on Compustat data. MLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the market value of common stock. See See Appendix 1 for definition of variables. CF(*) represents the control function associated with the * governance measure. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(MLM>0)	E(MLM|MLM>0)
Ln(board size)	0.302	-0.220
	(0.71)	(0.12)
PIBoard	3.800	1.702
	(0.02)	(0.13)
Dual class	-2.149	0.172
	(0.01)	(0.31)
CEO Chair	0.426	0.0467
	(0.25)	(0.53)
Ln(Gindex)	0.467	0.444
	(0.38)	(0.02)
Firm Age	-0.0583	-0.00169
	(0.21)	(0.71)
Firm Age*Ln(Gindex)	-0.00865	-0.00379
	(0.69)	(0.20)
Firm Age*Ln(board size)	0.0563	0.00437
	(0.03)	(0.13)
Firm Age*PIBoard	-0.182	-0.00445
	(0.00)	(0.67)
Firm Age*Dual Class	0.0842	-0.00533
	(0.02)	(0.20)
Firm Age*CEO Chair	-0.00139	-0.00215
	(0.92)	(0.23)
CF(lnGindex)		-0.301
		(0.05)
CF(PIBoard)		-2.082
		(0.04)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	13,808	10,911
Chi-square	350.3	3170
p-value	(0.00)	(0.00)

Table 11
The interaction between firm age and corporate governance with book leverage measure

Firm age is measured as the number of years that a firm is on CRSP. BLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the book value of common stock. See Appendix 1 for definition of variables. CF(*) represents the control function associated with the * governance measure. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

	P(BLM>0)	E(BLM|BLM>0)
Ln(board size)	0.4531	-0.0104
	(0.59)	(0.94)
PIBoard	2.1367	2.2590
	(0.15)	(0.08)
Dual class	-2.1190	0.0402
	(0.00)	(0.82)
CEO Chair	0.3365	-0.0454
	(0.33)	(0.45)
Ln(Gindex)	0.2280	0.4367
	(0.67)	(0.02)
Firm Age	-0.0664	-0.0029
	(0.44)	(0.73)
Firm Age*Ln(Gindex)	0.0047	-0.0005
	(0.84)	(0.83)
Firm Age*Ln(board size)	0.0399	0.0023
	(0.23)	(0.50)
Firm Age*PIBoard	-0.1076	-0.0248
	(0.07)	(0.01)
Firm Age*Dual Class	0.0798	-0.0005
	(0.00)	(0.93)
Firm Age*CEO Chair	-0.0037	0.0004
	(0.80)	(0.78)
CF(lnGindex)		-0.4122
		(0.01)
CF(PIBoard)		-2.4309
		(0.05)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	15,229	12,623
Chi-Square	415.3	1426
p-value	(0.00)	(0.00)

Table 12
The interaction between firm age and corporate governance with different instruments

Firm age is measured as the number of years that a firm is on CRSP. BLM represents the ratio of long-term and short-term debt to the sum of short-term debt plus long-term debt plus the book value of common stock. See Appendix 1 for definition of variables. $CF_2(*)$ represents the new control function associated with the * governance measures. All other regressors are lagged one period. The two-part regression model is based on Ramalho, Ramalho and Murteira (2011) zero-inflated modification of Papke and Wooldridge's (2008) fractional regression model. The variance-covariance was estimated using Sandwich estimators with correction for clustering on firms. P-values associated with the null hypothesis that the coefficient equals zero are reported within parentheses.

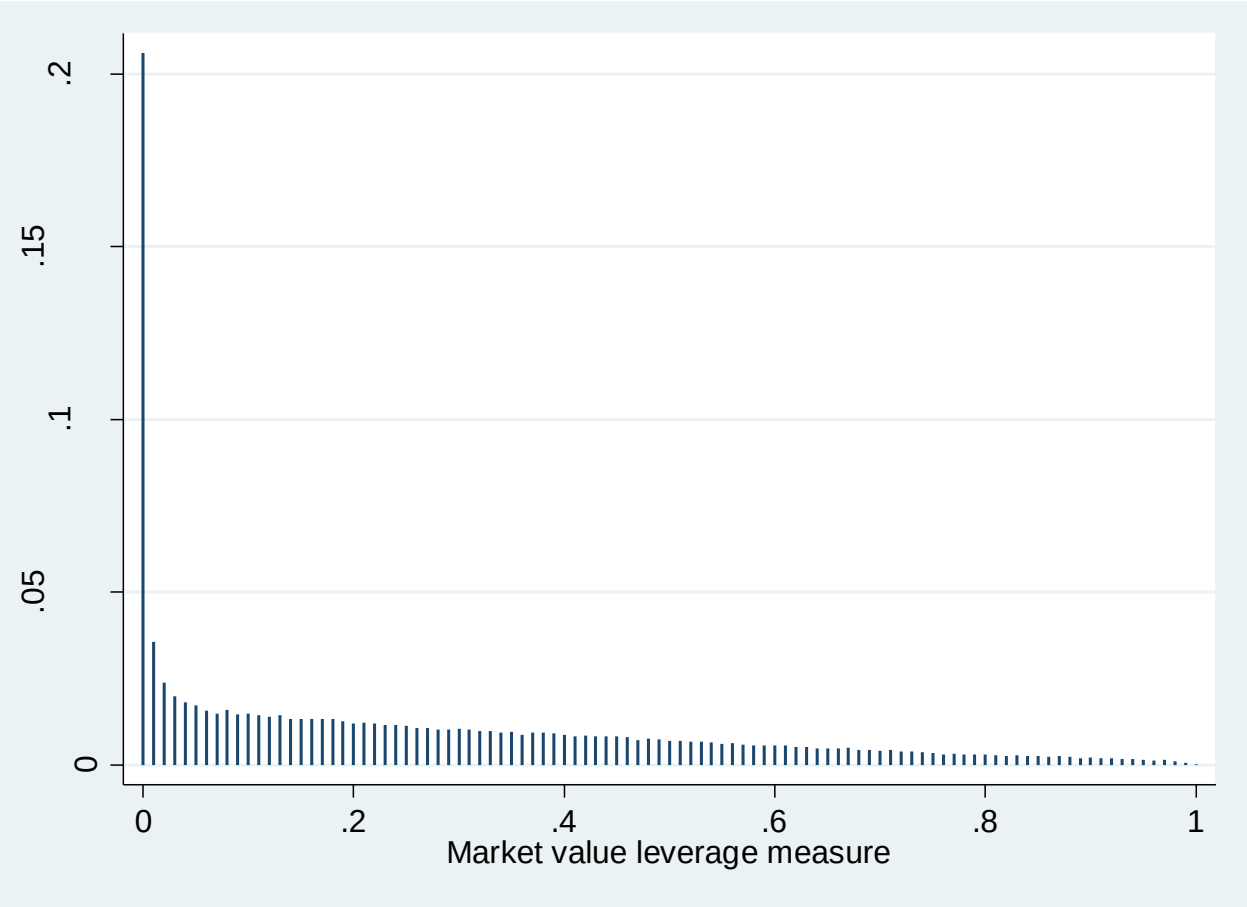
	P(BLM>0)	E(BLM|BLM>0)
Ln(board size)	0.6665	-0.1415
	(0.42)	(0.27)
PIBoard	1.9524	2.4087
	(0.19)	(0.03)
Dual class	-1.8661	-0.0356
	(0.00)	(0.78)
CEO Chair	0.2627	-0.0047
	(0.44)	(0.94)
Ln(Gindex)	0.1480	0.2367
	(0.77)	(0.10)
Firm Age	-0.0593	-0.0075
	(0.47)	(0.27)
Firm Age*Ln(Gindex)	0.0092	-0.0007
	(0.68)	(0.72)
Firm Age*Ln(board size)	0.0306	0.0034
	(0.35)	(0.22)
Firm Age*PIBoard	-0.1005	-0.0204
	(0.09)	(0.01)
Firm Age*Dual Class	0.0597	0.0006
	(0.03)	(0.85)
Firm Age*CEO Chair	0.0006	-0.0006
	(0.97)	(0.69)
CF_2(lnGindex)		-0.2015
		(0.08)
CF_2(PIBoard)		-2.3187
		(0.03)
Controls	Yes	Yes
Year fixed effects	Yes	Yes
# of obs	15,457	12,678
Chi-Square	430.1	3279
p-value	(0.00)	(0.00)

Appendix 1: Definitions of Study Variables

All our variables are constructed using Compustat, Execucomp, RiskMetrics Governance, RiskMetrics Directors databases.

Economic/Financial variables	
Asset Tangibility	Ratio of Net property, plant and equipment (PPENT) to total assets (AT)
Asset volatility	Volatility of the firm's assets estimated via the KMV model (see Crosbie and Bohn (2003)) and the SAS code available on WRDS for its estimation.
Expected inflation rate	First yearly observation of the 3-month T-bill as a proxy for expected inflation
Firm age	We used different measures: (1) Years since founding, (2) Years on CRSP, and (3) Years on Compustat.
GM Marginal tax rate	Graham and Mill's before-financing marginal tax rate with imputed values for missing observations
Initial leverage	Initial Compustat leverage (either MLM or BLM) of the firm
Industry leverage	Median of either MLM or BLM for different industries by year. We used Fama and French's (1997) 48 industry delineations.
MLM	[Long-term debt + Short-term debt]/[Long-term debt+Short-term debt + market value of common stock]
BLM	[Long-term debt + Short-term debt + preferred stock]/[Long-term debt + Short-term debt + book value of common stock]
Ln(Assets)	Logarithm of total assets (AT)
Market-to-book	Ratio of the market value of assets to the book value of assets and the book value of assets.
Profitability	Ratio of Profit (OIBDP) to Total Assets (AT)
Governance variables	
Board size	The number of directors on the board derived from RiskMetrics' director database
PIBoard	Proportion of board accounted for by managers or their family members, derived from RiskMetrics director database
Dual class	A dummy variable that takes on the value 1 if a firm is a dual class firm.
CEO Chair	A dummy variable that takes on the value 1 if the CEO is also chairman of the board
Gindex	We modified the Gompers, Ishii, and Metrick (2003) governance index to account for the change in what charter provisions are reported by ISS' RiskMetrics.
Eindex	This is the index of charter provisions identified in Bebchuk, Cohen and Ferrell (2009).

Figure 1
Histograms of Market Value Leverage Measure (MLM)



Highlights for “Firm Age, Corporate Governance, and Capital Structure Choices”

- Corporate leverage is negatively correlated with firm age.
- The interaction between firm age and governance explains this negative correlation.
- The correlation between firm age and board composition is important.