ABACUS A Journal of Accounting, Finance and Business Studies

ABACUS, 2024 doi: 10.1111/abac.12334

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Managerial Ability and Debt Choice

Using a sample of 54,964 firm-year observations of US public firms during the period 2001 to 2020, we investigate how managerial ability affects corporate debt choice. We find evidence that managerial ability is negatively associated with the use of bank debt. This finding remains robust to a battery of robustness tests, including alternative measures of managerial ability and debt choice, various econometric specifications, and a range of endogeneity tests. Using the sudden death of the CEO as an exogenous shock to managerial ability, our difference-in-differences regression suggests a negative causal relationship between managerial ability and reliance on bank debt. Further, using advanced machine learning models, we identify that managerial ability is a highly influential variable in predicting firms' debt choices. Our cross-sectional tests indicate that this relationship is more pronounced in the presence of higher information opacity, weaker corporate governance, and poor financial conditions. In additional tests, we show that firms with more able managers use more unsecured debt and public debt. Taken together, our findings suggest that managerial ability matters in shaping corporate debt choice.

Key words: Debt choice; Financial constraints; Information asymmetry; Managerial ability.

In this study, we examine the relationship between managerial ability and debt choice. Debt has become a dominant source of financing in the US. For example, about $17 trillion in non-financial business debt was outstanding in the US at the end of 2021. Furthermore, the US capital market raised $2.3 trillion through debt issuance, while raising only $419 billion through equity issuance in 2021.[1] A firm that chooses to procure funds through the issuance of debt has the option of

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The authors thank the editor, Stewart Jones, and an anonymous reviewer for helpful comments and suggestions on earlier drafts of this paper. They also acknowledge helpful comments and suggestions from Mark Clatworthy, Grantley Taylor, Prem Puwanenthiren, Haiyan Jiang, Carl Shen, Ileana Steccolini, Ahsan Habib, and Riaz Uddin. They are grateful to Peter Demerjian for making managerial ability data publicly available. Finally, thanks are due to Xianyang Xin for excellent research assistance. The usual disclaimer applies.

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[1] https://www.federalreserve.gov/data/corpsecure/current.htm

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borrowing from private sources (such as banks) or borrowing from public sources. Given the dominance of debt in the corporate capital structure, an emerging literature examines the factors that influence corporate choice between public and private debt (also known as the debt choice). For example, studies show that firm characteristics, product market competition, and corporate governance factors determine firms' choices between public and bank debt (Ben-Nasr, 2019; Ben-Nasr *et al.*, 2021; Boubaker *et al.*, 2018; Boubakri and Saffar, 2019; Chen *et al.*, 2020, 2021). While this body of literature provides valuable insights, it typically assumes that decisions regarding debt choice are made by managers possessing the full capability to process pertinent information and respond appropriately to their companies' strategic needs. In reality, however, there is significant variation among managers in their abilities, influencing their access to external financing (Bertrand and Schoar, 2003; Bonsall *et al.*, 2017; Demerjian *et al.*, 2012; Shang, 2021). Therefore, in this study, we examine whether and how differences in managerial ability have any influence on corporate debt choices.

Consistent with Demerjian *et al.* (2012), we conceptualize managerial ability as the efficiency with which managers can convert corporate resources or inputs into revenue, profit, or firm value in comparison with industry peers. Prior studies provide considerable evidence that firms with more able managers are associated with higher operational, innovation, and financial performance (Cho *et al.*, 2016; Demerjian *et al.*, 2012). Studies also show that managerial ability improves informational transparency, as evidenced by lower earnings manipulation and more readable financial statements (Baik *et al.*, 2020; Demerjian *et al.*, 2013; Hasan, 2020). Therefore, managerial ability is viewed more favourably by credit rating agencies and lenders (Bonsall *et al.*, 2017). We extend this literature by exploring how managerial ability affects a firm's debt choice between bank debt and public debt.

The corporate decision to raise funds through bank financing or public debt depends on the relevant costs and benefits. The extant literature proposes a number of theories to explain debt choice. These include the information asymmetry between managers and capital providers, the monitoring efficiency or agency theory, and the debt renegotiation theory (Bharath *et al.*, 2008; Denis and Mihov, 2003; Diamond, 1984, 1991; Fama, 1985). Building on these theories, we propose three key arguments for the relationship between managerial ability and debt choice.

First, the information asymmetry thesis of debt choice proposes that private lenders' ability to collect and process information is superior to that of public lenders. Therefore, firms with higher information asymmetry borrow privately to overcome the adverse selection costs arising from information asymmetry (Bharath *et al.*, 2008). Nonetheless, the managerial ability literature shows that firms with more able managers demonstrate higher accounting and information quality, which reduces the information asymmetry and adverse selection costs of public debtholders (Baik *et al.*, 2020; Demerjian *et al.*, 2013; Hasan, 2020). Therefore, we argue that a higher level of accounting and information quality allows firms with more able managers to reduce their reliance on bank debt in financing their operations.

Second, the agency-based thesis of debt choice suggests that, owing to the concentrated ownership of debt claims, banks have greater ability and more

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incentives to monitor their borrowers closely, reducing their moral hazard problem. Consequently, firms with more agency problems borrow from banks rather than the public debt market (Denis and Mihov, 2003). Several studies suggest that agency problems are less salient in firms with higher managerial ability (Curi and Lozano-Vivas, 2020; Doukas and Zhang, 2021). To the extent that managerial ability reduces firms' agency problems, it reduces their moral hazard problems, and thus their reliance on bank debt. However, some studies suggest that more able managers have incentives to maximize their private interests at the cost of other key stakeholders (Eisfeldt and Papanikolaou, 2013). This line of literature suggests that managerial ability increases the moral hazard problem and the need for close monitoring and thus the use of bank debt. Overall, the relationship between managerial ability and bank debt is unclear according to the agency-based view.

Finally, debt renegotiation theory suggests that private debt is more convenient to renegotiate because of the concentrated ownership of debt claims. Therefore, firms experiencing higher financial distress tend to borrow privately (Denis and Mihov, 2003). The literature shows that managers with better ability use their skills and experience to enhance their firm's productivity, profitability, and financial performance (Demerjian *et al*., 2012, 2013). Therefore, firms with more able managers are exposed to less financial distress (Bonsall *et al*., 2017). Based on this evidence, we expect firms with high-ability managers to rely less (more) on bank (public) debt.

To provide empirical evidence, we employ a large sample of US publicly listed firms from 2001 to 2020 (54,964 firm-year observations). We use the managerial ability measure of Demerjian *et al*. (2012). Following prior studies (e.g., Ben-Nasr *et al*., 2021; Chen *et al*., 2021), we measure a firm's debt choice as the ratio of its bank debt to its total debt (Bank/Total Debt). Our empirical analysis shows that managerial ability is significantly and negatively associated with bank loans, indicating that firms with more able managers rely less on bank debt. This finding is economically meaningful. For example, a one-standard-deviation increase in managerial ability reduces the reliance on bank debt by 9.07% relative to the mean bank debt.

We employ five identification strategies to address the endogeneity issues arising from omitted variable bias, selection bias, and reverse causality concerns. First, we include additional managerial traits and firm characteristics as controls and obtain consistent evidence. Second, we utilize Oster's (2019) bound estimate to alleviate the omitted variable bias. Our findings suggest that omitted confounding variables do not drive our results. Third, we exploit CEO sudden death as an exogenous shock to managerial ability. Our difference-in-differences (DiD) analysis alleviates concern about the reverse causality problem and indicates that the negative relationship between managerial ability and bank debt is causal. Fourth, we apply two-stage least squares (2SLS) using heteroscedasticity-based instruments. Our analysis confirms that the negative relationship between managerial ability and bank debt remains robust. Finally, we apply the entropy-balancing estimate, which ensures a covariate balance between treated and control firms, to mitigate the concern about selection bias. Again, we continue to find consistent evidence. Our baseline results remain

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robust when alternative regression models (including firm fixed effects and high-definition fixed effects) are used in the analysis. Moreover, our results persist when using alternative measures of managerial ability and bank debt.

Next, we employ eXtreme Gradient Boosting (XGBoost) machine learning model to investigate the relative importance of managerial ability in predicting corporate debt choice. The relative variables importance (RVI) output from the XGBoost machine learning model suggests that managerial ability is the sixth most important variable among all of the independent variables in predicting the debt choice of firms, which strengthens the reliability of our key finding.

To provide further insights into our documented results, we conduct a range of cross-sectional analyses that investigate how the managerial ability–bank debt relationship varies depending on the information environment, financial conditions, and corporate governance mechanisms. Our results suggest that the negative relationship between managerial ability and bank debt is more pronounced for firms with greater information asymmetry, more financial constraints, and a poor governance structure. Our path analysis confirms that managerial ability has a direct effect on bank debt, while both the information environment and corporate governance channels mediate this relationship. In additional analyses, we find that firms with high managerial ability are negatively (positively) associated with unsecured (secured) debt. We also conclude that managerial ability is positively associated with public debt.

Our study contributes to the extant literature in three ways. First, to the best of our knowledge, this is the first study to investigate the impact of managerial ability on firm debt choice, specifically the choice between bank loans and public debt issuance. Previous studies identify product market competition (Boubaker *et al*., 2018), unemployment benefits (Ben-Nasr, 2019), board reforms (Ben-Nasr *et al*., 2021), board gender diversity (Datta *et al*., 2021), disclosure policy (Dhaliwal *et al*., 2011), ownership structure (Boubaker *et al*., 2017; Boubakri and Saffar, 2019; Liao, 2015; Lin *et al*., 2013), and social capital (Hasan *et al*., 2017) as affecting debt choice. We contribute to this literature by demonstrating that managerial ability plays an important role in shaping a firm's debt choice by reducing its reliance on bank debt.

Second, our study extends the literature on managerial ability that investigates how high-ability management influences corporate decisions and firm financial policies. For example, the extant literature shows that managerial ability significantly affects earnings quality (Demerjian *et al*., 2013), corporate innovation (Cho *et al*., 2016), corporate tax avoidance (Koester *et al*., 2017), corporate investment (Andreou *et al*., 2017; Lee *et al*., 2018), income smoothing (Baik *et al*., 2020), the information environment (Baik *et al*., 2018), and mergers and acquisitions (Doukas and Zhang, 2021). There are a few studies that also focus on the implications of managerial ability for the capital market, including credit risk management (Bonsall *et al*., 2017; Cornaggia *et al*., 2017), bank loan pricing (De Franco *et al*., 2017), and bank loan contracts (Bui *et al*., 2018). Our study significantly differs from these as we attempt to broaden our understanding regarding the impact of managerial ability on debt structure choices, which is largely overlooked in the existing literature.

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Finally, our study supplements the literature that investigates the determinants of secured versus unsecured loans. For example, Barclay and Smith (1995), Benmelech and Bergman (2009), Di Filippo *et al.* (2022), and Ioannidou *et al.* (2022) document that growth opportunities, loan size, creditworthiness, and information asymmetry significantly affect firms' access to secured and unsecured loans. We add to this stream of literature by providing evidence that firms with more able managers have greater access to unsecured loans. Taken together, our findings contribute to a growing literature documenting the role of managerial ability in financing policies.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

The idea of managerial ability dates back to the work of Lang and Stulz (1994), which argues that managers' actions can enhance or damage the firm value depending on their ability. In their seminal study, Bertrand and Schoar (2003) show that managerial idiosyncratic differences explain corporate policies and financial performance. In a more recent study, Demerjian *et al.* (2012) utilize data envelopment analysis (DEA) to estimate managers' efficiency in transforming corporate resources into revenues relative to their firms' industry peers. Subsequent studies exploit the managerial ability data of Demerjian *et al.* (2012) and document that managerial ability has a considerable influence on corporate outcomes (e.g., Bonsall *et al.*, 2017; Cho *et al.*, 2016; Demerjian *et al.*, 2013; Koester *et al.*, 2017). We expand this literature by investigating the role of managerial ability in influencing corporate debt choice. We propose three plausible theoretical arguments to establish a link between managerial ability and corporate debt choice.

Managerial Ability, Information Quality and Bank Debt

The extant literature suggests that higher-ability managers have a better understanding of their firms' business and use this information to communicate with investors more efficiently (Baik *et al.*, 2011; Demerjian *et al.*, 2012, 2013; Francis *et al.*, 2008; Malmendier and Tate, 2009). Baik *et al.* (2018) and Demerjian *et al.* (2013) document that firms with more able managers have superior information quality. Furthermore, Baik *et al.* (2020) find that firms with more able managers demonstrate higher income smoothing, improving earnings' informativeness. In a related study, Hasan (2020) shows that managerial ability leads to superior financial performance, which motivates firms to produce more readable financial statements to communicate their superior quality to the market. In addition, Baik *et al.* (2011) report that managerial ability is positively correlated with the regularity and precision of management earnings forecasts, as well as the market reaction to these forecasts, which further implies that managerial ability improves firms' information environment and information quality.

The information asymmetry-based argument of debt choice contends that banks have better access to a borrower firm's private information relative to public

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bondholders (Fama, 1985; Liao, 2015). Moreover, banks' ability to gather and process information is superior to that of public bondholders (Diamond, 1991). Therefore, firms with a poor information environment find it expedient to obtain finance from banks to lower the adverse selection costs (Bharath *et al.*, 2008; Dhaliwal *et al.*, 2011). According to Li *et al.* (2019), higher information asymmetry prompts firms to shift from public to bank debt.

To the extent that managerial ability reduces information asymmetry and adverse selection costs, firms with higher managerial ability are likely to reduce the information disadvantage of public debt holders, which in turn reduces the cost of issuance of public debt. Therefore, building on the information environment-based argument, we predict that higher managerial ability reduces firms' reliance on bank debt.

Managerial Ability, Agency Problems and Bank Debt

Existing studies provide mixed evidence concerning the effect of managerial ability on agency problems. Several studies document that more able managers reduce the agency problem by promoting the corporate social culture (Doukas and Zhang, 2021) and informational transparency (Baik *et al.*, 2011, 2020; Hasan, 2020). For example, Curi and Lozano-Vivas (2020) contend that more able managers suffer less from inefficiencies, which lowers agency costs. Demerjian *et al.* (2013) provide evidence that firms with more able managers are less prone to alter financial statements opportunistically. Bui *et al.* (2018) also find that managerial ability reduces borrowers' agency problems, leading to a lower loan spread.

In contrast, other studies suggest that managerial ability escalates the agency problems between a firm and its outside shareholders. This line of literature contends that highly able managers have more incentives and the ability to maximize their interests, which is not aligned with shareholders' interests. For example, Eisfeldt and Papanikolaou (2013) show that managers with more outside options (i.e., more able managers) have a disproportionate share of firms' cash flow, which increases shareholders' risk. Koester *et al.* (2017) find that firms with more able managers avoid corporate tax. Moreover, studies indicate that managerial ability is positively associated with over-investment behaviour (Eisfeldt and Papanikolaou, 2013).

The prior literature proposes that agency problems play an important role in shaping corporate debt choice. In particular, on the one hand, because of concentrated debt ownership, bank debt involves fewer free-rider problems and banks have a greater ability and more incentives to monitor borrowers, reducing managerial opportunistic behaviour (Ben-Nasr *et al.*, 2021; Denis and Mihov, 2003). On the other hand, public debt holders are exposed to the diffuse-ownership problem, which reduces their motivation and ability to monitor borrowers. Consequently, firms with high (low) agency problems tend to borrow privately (publicly).

In the context of our study, we argue that, because high-ability managers are associated with fewer agency problems, monitoring high-ability managers is less

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important. Therefore, public debtholders will be willing to extend debt to firms with more able managers. This argument suggests that firms with more able managers are negatively associated with the use of bank debt. However, given the evidence that highly able managers may exhibit more opportunistic behaviour, public debt holders may be less inclined to lend to firms with more able managers because of their monitoring disadvantage when compared with private lenders. Therefore, firms with more able managers may borrow more from banks. To this end, the relationship between managerial ability and bank debt is unclear ex-ante.

Managerial Ability, Financial Conditions and Bank Debt

Finally, we use the financial conditions of the firm as a plausible channel through which managerial ability may affect corporate debt choice. The extant literature suggests that managerial ability is a source of a resource base (Holcomb *et al.*, 2009) and that more capable managers are better able to predict product demand, invest in higher-value projects, comprehend technology and industry trends, and manage their teams more effectively than their less capable counterparts (Demerjian *et al.*, 2012). Studies also show that managerial ability is positively associated with innovation output (Cho *et al.*, 2016) and corporate investment during the crisis period (Andreou *et al.*, 2017). Cornaggia *et al.* (2017) contribute to this literature by demonstrating that managerial ability leads to a more favourable credit rating. Bonsall *et al.* (2017) expand this literature by revealing that managerial ability results in lower credit spreads. The prior literature also shows that managerial ability is negatively associated with both audit fees and the probability of obtaining a going-concern opinion.

Building on the debt renegotiation-based argument, we contend that superior financial conditions stemming from more able managers may affect corporate debt choice. According to debt renegotiation theory, because of the concentrated ownership of debt claims, bank debt is more flexible and easier to renegotiate than public debt. Therefore, it is optimal for borrowers in a weaker financial condition or a higher ex-ante probability of distress to borrow privately. Correspondingly, Denis and Mihov (2003) hypothesize that firms with high and low credit ratings use public debt while firms with intermediate ratings use bank loans. Given that more able managers are associated with superior operating, innovation and financial performance, and that firms with high managerial ability are not exposed to financial distress and debt covenant violation, firms with high managerial ability are not concerned with the renegotiation of debt. To the extent that managerial ability improves operational efficiency, financial performance, credit quality, and debt management capacity, we expect firms with more able managers to rely less (more) on bank (public) debt.

Thus, the above arguments lead us to hypothesize that firms with higher managerial ability rely less on bank debt, ceteris paribus.

H1: All else being equal, managerial ability reduces firms' reliance on bank debt.

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DATA AND RESEARCH METHOD

Data and Sample

We obtain debt structure data from Standard & Poor's Capital IQ database, which provides data on commercial papers, senior bonds and notes, subordinated bonds and notes, term loans, and revolving credit. We start our sample in 2001 since debt structure data are mostly unavailable before this period. We use the managerial ability data of Demerjian *et al.* (2012).[2] The financial data used in this study are acquired from Compustat. Following prior studies (Ben-Nasr *et al.*, 2021; Chen *et al.*, 2020), we exclude observations from financial (Standard Industrial Classification (SIC) 6000–6999) and utility (SIC 4900–4999) firms. We also exclude observations with missing and zero total debt, missing managerial ability, and control variables. This sampling process yields a final sample of 54,964 firm-year observations pertaining to 7,651 unique firms for the period 2001–2020.

Key Variables

Dependent variable: Debt choice Following extant studies (Ben-Nasr *et al.*, 2021; Boubaker *et al.*, 2018; Chen *et al.*, 2021; Lin *et al.*, 2013), we measure corporate debt choice as the ratio of bank debt to total debt (*Bank/Total Debt*). Bank debt is specified as the sum of term loans and revolving credit, and total debt is measured as the sum of bank debt and public debt (i.e., the sum of commercial papers, senior bonds and notes, and subordinate bonds and notes).[3] In the sensitivity analysis, we also specify debt choice as bank debt over total liabilities, the natural logarithm of bank debt and bank debt over total assets.

Main independent variable: Managerial ability Our main variable of interest is managerial ability (*Mgr. Ability*). We exploit the managerial ability score of Demerjian *et al.* (2012). The authors use two-stage procedures to estimate managerial efficiency in the use of corporate resources. In the first stage, they estimate the total firm efficiency, which gauges how efficiently a firm generates revenue from a certain set of inputs, using data envelopment analysis (DEA – a form of nonparametric frontier analysis). In particular, to estimate a firm's total efficiency in comparison with its industry peers, the authors solve an optimization problem that models the output (sales) as a function of seven inputs (cost of goods sold (COGS), selling and administrative expenses (SGA), property, plant and equipment (PP&E), operating leases, R&D, goodwill and other intangibles).

However, given that the total firm efficiency estimated using the above procedure contains both firm- and manager-specific components, in the second stage, the authors perform the following Tobit regression by industry to isolate the

[2] Managerial ability data are available at https://peterdemerjian.weebly.com/managerialability.html

[3] Because of data availability, we focus on the bank debt component of private debt, excluding non-bank private debt such as Rule 144A. We use the terms 'bank debt' and 'private debt' interchangeably.

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manager-specific efficiency from the firm-level factors explaining the total efficiency:

$$\begin{aligned} Total\ firm\ efficiency = {} & \lambda_0 + \lambda_1 ln(Total\ assets + \lambda_2 Market\ share \\ & + \lambda_3 Positive\ free\ cash\ flow\ indicator \\ & + \lambda_4 ln\,(Age) + \lambda_5 Business\ segment\ concentration \\ & + \lambda_6 Foreign\ currency\ indicator \\ & + \lambda_7 Year\ dummies + \varepsilon \end{aligned} \tag{1}$$

The residuals from the above regression model capture the managerial ability of the firm. The authors show that this measure of managerial ability captures the desirable attributes and that it is superior to other measures of managerial ability used in the prior literature (e.g., past stock returns, past ROA, managers' compensation, tenure, media citations, etc.). Consistent with prior studies (e.g., Bonsall *et al.*, 2017; Cornaggia *et al.*, 2017; Demerjian *et al.*, 2013; Hasan, 2020), our empirical analysis uses both continuous and industry-year-level decile rank scores of managerial ability.

Regression Model

We estimate the following regression model to examine the relationship between managerial ability and debt choice:

$$Bank/Total\ Debt = \beta_0 + \beta_1 Mgr.Ability + \beta_2 Controls + \varphi + \lambda + \varepsilon \tag{2}$$

where *Bank/Total Debt* is the bank debt as a proportion of the total debt, *Mgr. Ability* is the managerial ability score of Demerjian *et al.* (2012) and *Control* indicates the firm-level controls following prior studies (Boubaker *et al.*, 2018; Chen *et al.*, 2021). In particular, we include the natural logarithm of the total assets (*Total Assets*), the ratio of the market-to-book value of assets (*Growth*), financial leverage (*Leverage*), return on assets, asset tangibility (*Tangibility*), Altman's (1968) Z score (*Distress*), a dummy variable that indicates whether a firm is rated by the credit rating agency (*Rating*), and industry competition proxied by the Herfindahl index (*Competition*). Further, φ and λ denote the year and industry dummies, and ε is the error term. In the regression model, robust standard errors are clustered at the firm level.

In the sensitivity analysis, we estimate equation (2) using the firm fixed effect (FFE), Tobit, Newey–West, weighted least squares (WLS), and Fama–MacBeth (FM) regression models.

Descriptive Statistics

Table 1 reports the descriptive statistics of the variables used in our study. The mean (median) bank debt as a proportion of the total debt (*Bank/Total Debt*) is 0.412 (0.274), which is largely consistent with the prior studies (e.g., Boubaker *et al.*, 2018). Moreover, the mean (median) value of managerial ability (*Mgr. Ability*) is –0.01 (–0.033), with a standard deviation of 0.128. These values are

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TABLE 1

SUMMARY STATISTICS THIS TABLE PRESENTS SUMMARY STATISTICS OF THE VARIABLES. THE APPENDIX A PROVIDES VARIABLE DEFINITIONS.

	N	Mean	Std. Dev.	p25	Median	p75
Bank/Total Debt	54,964	0.412	0.414	0.000	0.274	0.905
Mgr. Ability	54,964	–0.010	0.128	–0.085	–0.033	0.030
Total Assets	54,964	5.616	2.598	3.877	5.867	7.471
Growth	54,964	2.791	4.621	1.151	1.578	2.484
Leverage	54,964	0.385	0.664	0.102	0.245	0.422
Return on Assets	54,964	–0.035	0.506	–.009	0.096	0.156
Tangibility	54,964	0.256	0.234	0.075	0.176	0.371
Distress	54,964	0.610	0.488	0.000	1.000	1.000
Rating	54,964	0.298	0.457	0.000	0.000	1.000
Competition	54,964	0.068	0.065	0.032	0.043	0.077
Mgr. Ability Rank	54,964	0.538	0.279	0.300	0.500	0.800
Bank/Total Liabilities	54,964	0.187	0.225	0.000	0.087	0.328
LN(Bank)	54,964	2.436	2.439	0.000	1.900	4.511
Bank/Total Assets	54,964	0.129	0.201	0.000	0.045	0.187
No Dividends	54,964	0.275	0.447	0.000	0.000	1.000
RE/TE	47,680	–1.417	4.071	–1.167	0.144	0.671
Bog Index	49,815	84.961	7.368	80.000	85.000	90.000
REM	47,024	0.006	0.620	–0.163	0.064	0.304
AUDIT_SPEC	46,437	0.443	0.497	0.000	0.000	1.000
INST	35,130	0.190	0.258	0.043	0.070	0.201
E-Index	24,437	3.305	1.417	2.000	4.000	4.000
DIND	14,562	0.763	0.137	0.692	0.800	0.875
Secured Debt/Total Debt	54,964	0.509	0.436	0.002	0.526	0.998
Unsecured Debt/Total Debt	54,964	0.453	0.435	0.000	0.359	0.979
Com. Paper/Total Debt	54,964	0.003	0.022	0.000	0.000	0.000
Sr. Bonds & Notes/Total Debt	54,964	0.353	0.413	0.000	0.063	0.779
Sub. Bonds & Notes/Total Debt	54,964	0.054	0.187	0.000	0.000	0.000
Term Loans/Total Debt	54,964	0.223	0.344	0.000	0.000	0.381
Revolving Credit/Total Debt	54,964	0.181	0.315	0.000	0.000	0.223

consistent with the prior studies (Bonsall *et al.*, 2017). The average firm in our study has a log of total assets of 5.616, a market-to-book ratio (*Growth*) of 2.791, financial leverage of 0.385, and returns on assets of –0.035. We also find that term loans and revolving credit capture 22.3% and 18.1% of the total debt, whereas senior bonds and notes represent 35.3% of the total debt.

Correlation

We present the correlations between the variables in Panel A of Table 2. We observe that managerial ability is significantly negatively correlated with bank debt ($p < 0.01$), which provides initial support for our hypothesis. We also note that bank debt is negatively correlated with total assets, growth, leverage, distress, and rating, while it is positively correlated with return on assets and competition (all significant at $p < 0.01$). Finally, the variance inflation factor (VIF) values included in the panel are relatively low, providing evidence that multicollinearity is not a major issue for our analysis.

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TABLE 2

CORRELATIONS AND UNIVARAITE TESTS.

Panel A: Pairwise correlations

Variables	VIF	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Bank/Total Debt		1.00									
(2) Mgr. Ability	1.08	–0.10*	1.00								
(3) Total Assets	2.51	–0.10*	–0.01*	1.00							
(4) Growth	2.63	–0.10*	0.15*	–0.42*	1.00						
(5) Leverage	1.93	–0.08*	0.05*	–0.32*	0.63*	1.00					
(6) Return on Assets	2.55	0.09*	0.03*	0.53*	–0.69*	–0.55*	1.00				
(7) Tangibility	1.12	–0.01	–0.13*	0.16*	–0.11*	0.03*	0.12*	1.00			
(8) Distress	1.36	0.04*	0.10*	0.32*	–0.14*	–0.32*	0.36*	–0.10*	1.00		
(9) Rating	1.84	–0.22*	–0.01	0.64*	–0.15*	–0.01*	0.21*	0.16*	0.08*	1.00	
(10) Competition	1.06	0.02*	–0.04*	0.11*	–0.07*	–0.01*	0.09*	0.18*	0.11*	0.08*	1.00

Panel B: Univariate tests of difference

Variables	(1)	(2)	(3)
	Mgr. Ability>Median	Mgr. Ability<Median	Diff.
Bank/Total Debt	0.389	0.434	–0.045*
Bank/Total Liabilities	0.163	0.209	–0.046*
LN(Bank)	1.956	2.884	–0.928*
Bank/Total Assets	0.120	0.138	–0.018*

Panel A of this table presents the correlation matrix of the variables. Panel B reports the univariate mean difference test.
*indicates significance at the 1% level (two-tailed). The Appendix A provides variable definitions.

Univariate Analysis

Panel B of Table 2 reports the univariate mean difference test of the use of bank debt between the subsample of high and the subsample of low managerial ability. We divide the sample using the median managerial ability score. Firm-year observations with higher (lower) than the sample median managerial ability scores are treated as a high- (low-) ability subsample. As shown in Panel B of Table 2, the mean value of bank debt is significantly lower for the high-ability subsample than for its low-ability counterpart ($p < 0.01$), and this result remains robust irrespective of the measure of bank debt used in the analysis. Overall, the finding from this analysis provides preliminary support for our main hypothesis that firms with a higher level of managerial ability rely less on bank debt.

REGRESSION RESULTS

Baseline Regression

In Table 3, we present the baseline regression results that examine whether managerial ability influences firms' debt choice. We predict that managerial ability

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reduces firms' reliance on bank debt. In Column (1), we regress debt choice (i.e., *Bank/Total Debt*) on managerial ability (*Mgr. Ability*) along with industry and year effects. The estimated coefficient for *Mgr. Ability* is negative and highly significant (coefficient = –0.312; $p < 0.01$), supporting our hypothesis. In Column (2), we re-estimate the full baseline regression model after including a set of control variables (e.g., Ben-Nasr, 2019; Chen *et al.*, 2022). We find a consistent negative and statistically significant coefficient for *Mgr. Ability* (coefficient = –0.292; $p < 0.01$), which further bolsters our empirical finding. In Column (3), we re-run the baseline regression using a high-dimensional fixed effect, in which we replace year and industry effects with year × industry effects. Prior studies suggest that this regression specification controls for time-variant industry-level heterogeneity, which may affect a firm's debt choice (Chen *et al.*, 2020). Our estimates in Column (3) continue to show that managerial ability is negatively associated with bank debt. We note that the coefficients of our controls are largely consistent with our expectations and the earlier literature (Boubaker *et al.*, 2018; Chen *et al.*, 2021; Lin *et al.*, 2013).

The economic significance of our estimates is non-trivial. For example, our baseline estimates in Column (2) suggest that a one-standard-deviation increase in managerial ability (= 0.128) is associated with a 9.07% (13.64%) decrease in bank debt relative to its mean (median) level. This economic significance remains qualitatively similar when interpreted using the estimates from the high-dimensional fixed-effect regression in Column (3). We also note that the economic significance of our study is in line with that of prior related studies (e.g., Boubaker *et al.*, 2018; Chen *et al.*, 2021).[4]

Taken together, our baseline regression results, reported in Table 3, provide strong support for our hypothesis that managerial ability reduces firms' reliance on bank debt as a form of financing.

Endogeneity Tests

One may contend that our above main finding is susceptible to endogeneity problems. In particular, it is possible that our regression model omits some variables that are correlated with bank debt and included controls. In addition, firms with lower bank debt may hire more able managers, which raises a concern about the reverse causality problem. In this section, we undertake several strategies to address the possible endogeneity problems.

Omitted variable bias: Additional control variables As a straightforward way to address omitted variable bias, we introduce additional control variables. In this section, we include two sets of control variables. First, we investigate whether the negative influence of managerial ability on bank debt persists after controlling for CEO-level attributes.

[4] Boubaker *et al.* (2018) and Chen *et al.* (2021) document declines in bank debt of 7.5% and 4.36% for a one-standard-deviation increase in their main independent variable.

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TABLE 3

BASELINE REGRESSION: MANAGERIAL ABILITY AND DEBT CHOICE

	(1)	(2)	(3)
	OLS	OLS	HDFE
VARIABLES	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt
Mgr. Ability	**–0.312*** **	**–0.292*** **	**–0.294*** **
	[0.026]	**[0.023]**	**[0.023]**
Total Assets		–0.022***	–0.021***
		[0.002]	[0.002]
Growth		–0.006***	–0.007***
		[0.001]	[0.001]
Leverage		0.007	0.007
		[0.006]	[0.006]
Return on Assets		0.111***	0.108***
		[0.008]	[0.008]
Tangibility		0.041*	0.049**
		[0.022]	[0.022]
Distress		0.041***	0.041***
		[0.007]	[0.007]
Rating		–0.182***	–0.184***
		[0.011]	[0.011]
Competition		0.167	–
		[0.115]	
Constant	0.409***	0.457***	0.567***
	[0.004]	[0.084]	[0.013]
Observations	54,964	54,964	54,964
Year effects	Yes	Yes	No
Industry effects	Yes	Yes	No
Year*Industry effects	No	No	Yes
Adj. R^2	0.01	0.14	0.14

This table presents baseline regression results of the impact of managerial ability on debt choice. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

The prior literature shows that CEOs' personal and organizational factors have significant effects on firm financial decisions and debt financing. For example, Serfling (2014) argues that young CEOs utilize more debt, even with stringent covenants, than their older counterparts, suggesting that younger CEOs prefer risky financial strategies. In addition, Graham *et al.* (2013) report that female CEOs are less likely to utilize debt with rigid terms and conditions than male CEOs. Likewise, studies show that CEOs' risk-taking incentives (i.e., delta and vega) strongly influence firms' credit ratings as well as debt policies (Chen *et al.*, 2021; Kuang and Qin, 2013). Therefore, considering the role of CEO attributes in a firm's debt financing, in Panel A of Table 4, we control for the CEO general ability index of Custódio *et al.* (2013) (Column 1), the natural logarithm of CEO age (Column 2), CEO–chair duality (Column 3), CEO gender (Column 4), CEO overconfidence (Column 5), CEO delta (Column 6), and CEO

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vega (Column 7). We include these additional controls separately (Columns 1–7) and collectively (Column 8). In both cases, we find that the negative effect of managerial ability on bank debt remains significant ($p < 0.01$) after controlling for the CEO-level controls, alleviating the concern that our managerial ability score is simply capturing the characteristics of top management.

Second, while we control for a range of standard firm characteristics in our baseline regression, we now control for some additional firm and governance aspects. Following the extant literature (Bharath *et al.*, 2008; Cline *et al.*, 2020; Tan *et al.*, 2020), we include a firm's corporate social responsibility (Column 1), the absolute value of discretionary accruals (Column 2), institutional share ownership (Column 3), financial statement comparability (Column 4), intangibles scaled by total assets (Column 5), and operating cash flow over total assets (Column 6). In Panel B of Table 4, we observe that our main findings remain qualitatively similar when we include these additional controls separately (Columns 1–6) and collectively (Column 7). Overall, we present reasonable evidence that our main results are not prone to omitted variable bias problems.

Omitted variable bias: Oster's (2019) bound estimate While we have included additional firm- and CEO-level control variables in the previous sections to deal with omitted variable concerns, the observed controls may not always represent the actual omitted factors (Ghouma and Ouni, 2022). Therefore, to alleviate the concern about omitted variable bias further and ensure the validity of our findings, we employ Oster's (2019) bound estimate method. This novel estimation method assesses the strength of coefficients from regressions, including and excluding control variables in conjunction with *R*-squared values to generate a new identifiable set. Oster (2019) suggests that the null hypothesis, that is, omitted variable bias, can be rejected if the identifiable set does not include a value of zero. Contemporary studies use this estimation technique to mitigate endogeneity concerns (e.g., Ferracuti, 2022; Hasan and Uddin, 2022; Jacob and Vossebürger, 2022).

Table 5 reports the results. Following past studies (e.g., Gao and Huang, 2020; Oster, 2019), we set $\delta = 1$ and $\text{Rmax} = \min(1.3\tilde{R}, 1)$. Our findings suggest that the estimated identified set for managerial ability does not contain zero, indicating that the omitted variable is unlikely to influence our baseline result that managerial ability has a negative impact on the use of bank debt. The findings from our analysis remain unaffected if we use $\text{Rmax} = \min(1.5\tilde{R}, 1)$ or $\text{Rmax} = \min(2.2\tilde{R}, 1)$ (untabulated).

Quasi-natural experiment Our second approach to address endogeneity is a quasi-natural experiment that exploits the exogenous turnover of CEOs because of sudden death. Considering that the CEO is the key decision-maker and the major contributor to the overall managerial ability of a firm (Chang *et al.*, 2010; Custódio *et al.*, 2019), a CEO's exogenous departure because of sudden death is likely to cause a negative shock to a firm's overall managerial ability. We argue that a CEO's sudden death is a purely exogenous incident as such a departure is

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TABLE 4

ADDITIONAL CONTROLS

Panel A: Control for managerial attributes

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt
Mgr. Ability	**–0.140*** **	**–0.164*** **	**–0.151*** **	**–0.176*** **	**–0.162*** **	**–0.138*** **	**–0.135*** **	**–0.117*** **
	[0.037]	**[0.033]**	**[0.036]**	**[0.032]**	**[0.034]**	**[0.034]**	**[0.034]**	**[0.043]**
Total Assets	–0.066***	–0.070***	–0.076***	–0.071***	–0.072***	–0.067***	–0.061***	–0.059***
	[0.005]	[0.005]	[0.006]	[0.005]	[0.005]	[0.006]	[0.005]	[0.008]
Growth	–0.023**	–0.027***	–0.042***	–0.027***	–0.026***	–0.023**	–0.022**	–0.031***
	[0.010]	[0.007]	[0.005]	[0.007]	[0.007]	[0.009]	[0.009]	[0.008]
Leverage	0.038	0.043	0.031	0.042	0.045	0.047	0.048	–0.012
	[0.049]	[0.040]	[0.037]	[0.040]	[0.043]	[0.049]	[0.049]	[0.046]
Return on Assets	0.302***	0.334***	0.474***	0.341***	0.292***	0.344***	0.333***	0.438***
	[0.110]	[0.082]	[0.066]	[0.079]	[0.085]	[0.094]	[0.098]	[0.088]
Tangibility	0.022	–0.010	–0.053	–0.007	0.024	–0.003	–0.008	–0.027
	[0.042]	[0.038]	[0.041]	[0.038]	[0.040]	[0.040]	[0.040]	[0.049]
Distress	–0.020	–0.019	–0.033**	–0.021	–0.023	–0.020	–0.016	–0.035**
	[0.016]	[0.014]	[0.014]	[0.014]	[0.015]	[0.015]	[0.015]	[0.017]
Rating	–0.147***	–0.147***	–0.149***	–0.143***	–0.133***	–0.150***	–0.150***	–0.146***
	[0.017]	[0.016]	[0.018]	[0.016]	[0.017]	[0.017]	[0.017]	[0.021]
Competition	0.200	0.208	0.166	0.235	0.105	0.192	0.182	–0.038
	[0.201]	[0.179]	[0.187]	[0.176]	[0.188]	[0.182]	[0.183]	[0.256]
General Ability	0.002							0.003
	[0.006]							[0.008]
CEO Age		0.028						0.098
		[0.041]						[0.063]
Duality			–0.018					–0.025*
			[0.011]					[0.014]
Female CEO				0.001				0.039
				[0.027]				[0.046]
Overconfidence					0.062***			–0.003

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TABLE 4

CONTINUED

Panel A: Control for managerial attributes

VARIABLES	(1) Bank/ Total Debt	(2) Bank/ Total Debt	(3) Bank/ Total Debt	(4) Bank/ Total Debt	(5) Bank/Total Debt	(6) Bank/ Total Debt	(7) Bank/ Total Debt	(8) Bank/ Total Debt
					[0.020]			[0.031]
LN(Delta)						–0.004		0.002
						[0.004]		[0.009]
LN(Vega)							–0.012***	–0.021***
							[0.003]	[0.006]
Constant	0.650***	0.565***	0.711***	0.695***	0.699***	0.697***	0.683***	0.310
	[0.123]	[0.189]	[0.118]	[0.107]	[0.115]	[0.112]	[0.109]	[0.271]
Observations	15,026	18,564	14,562	20,147	16,588	16,697	16,758	8,688
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.21	0.22	0.25	0.23	0.22	0.22	0.22	0.24

Panel B: Additional firm-level controls

VARIABLES	(1) Bank/ Total Debt	(2) Bank/ Total Debt	(3) Bank/ Total Debt	(4) Bank/ Total Debt	(5) Bank/ Total Debt	(6) Bank/ Total Debt	(7) Bank/ Total Debt
Mgr. Ability	**–0.167*** **	**–0.281*** **	**–0.281*** **	**–0.235*** **	**–0.242*** **	**–0.292*** **	**–0.096** **
	[0.033]	**[0.025]**	**[0.028]**	**[0.032]**	**[0.023]**	**[0.023]**	**[0.041]**
Total Assets	–0.075***	–0.023***	–0.038***	–0.061***	–0.026***	–0.022***	–0.082***
	[0.005]	[0.003]	[0.004]	[0.004]	[0.002]	[0.002]	[0.006]
Growth	–0.026***	–0.007***	–0.013***	–0.023***	–0.006***	–0.006***	–0.016**
	[0.005]	[0.001]	[0.002]	[0.004]	[0.001]	[0.001]	[0.006]
Leverage	0.012	0.007	0.026**	0.059**	0.001	0.008	–0.093***
	[0.037]	[0.007]	[0.012]	[0.028]	[0.006]	[0.006]	[0.033]

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TABLE 4

CONTINUED

Panel B: Additional firm-level controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt
Return on Assets	0.342***	0.124***	0.171***	0.304***	0.104***	0.107***	0.577***
	[0.049]	[0.009]	[0.015]	[0.031]	[0.008]	[0.009]	[0.076]
Tangibility	–0.028	0.050**	0.056*	0.042	0.133***	0.042*	0.305***
	[0.038]	[0.023]	[0.029]	[0.033]	[0.024]	[0.022]	[0.054]
Distress	–0.031**	0.044***	0.031***	0.023*	0.049***	0.041***	–0.010
	[0.014]	[0.008]	[0.009]	[0.012]	[0.007]	[0.007]	[0.017]
Rating	–0.124***	–0.200***	–0.181***	–0.167***	–0.192***	–0.182***	–0.136***
	[0.016]	[0.011]	[0.013]	[0.016]	[0.011]	[0.011]	[0.020]
Competition	0.263	0.106	0.177	0.504**	0.206*	0.165	0.448
	[0.191]	[0.131]	[0.142]	[0.216]	[0.116]	[0.115]	[0.299]
CSR	–0.208***						–0.196***
	[0.030]						[0.039]
Discretionary Accruals		–0.100***					0.404***
		[0.023]					[0.090]
INST			–0.014				–0.083**
			[0.018]				[0.034]
Comparability				0.061***			0.030
				[0.018]			[0.026]
Intangibles					0.206***		0.450***
					[0.020]		[0.045]
Cashflow						0.008	–0.348***
						[0.010]	[0.085]
Constant	0.892***	0.467***	0.519***	1.044***	0.422***	0.457***	1.210***
	[0.139]	[0.082]	[0.089]	[0.061]	[0.082]	[0.084]	[0.099]
Observations	19,109	48,661	35,096	24,310	53,869	54,941	11,447

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TABLE 4

CONTINUED

Panel B: Additional firm-level controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.22	0.14	0.17	0.21	0.14	0.14	0.27

Panel A of this table presents baseline regression after including CEO-level additional controls. Panel B presents the main results after including additional firm-level variables. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

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TABLE 5

TESTS FOR OMITTED VARIABLE BIAS USING OSTER (2019)

	(1) Controlled		(2) Uncontrolled		(3) Parameters: $\delta = 1$; $R_{MAX} = \min(1.3\tilde{R},1)$
Variable of Interest	Beta	R^2	Beta	R^2	Identified Set
Mgr. Ability	–0.292	0.140	–0.312	0.01	–0.286, –0.292

This table reports the omitted variable bias test results suggested by Oster (2019). Columns (1) and (2) report beta and R^2 from controlled and uncontrolled OLS regressions, respectively. Column (3) includes the identified set using the parameters. Following prior studies (e.g., Gao and Huang, 2020; Oster, 2019) we set $\delta = 1$ and $R_{max} = \min(1.3\tilde{R},1)$. The Appendix provides variable definitions.

neither pre-planned nor driven by poor managerial performance. This allows us to investigate how the variation in managerial ability after a CEO's sudden death in a given year affects a firm's debt choice. Given that the sudden death of a CEO causes a decline in a firm's managerial ability in the following year, we expect such shocks in managerial ability to increase firms' reliance on bank debt.

We obtain CEO turnover data from Gentry *et al.* (2021). In our dataset, we identify 17 incidents of sudden deaths. Following Gao *et al.* (2021), we employ a PSM-DiD methodology. We treat each CEO's death year as a cohort, and we retain three years before and three years after the CEO's demise. In each cohort, the firms that experienced a CEO death in the cohort period are defined as the treatment group, while the firms without such a shock are defined as the control group. We use the PSM approach to select the control firms for each treatment firm. First, we perform logistic regression one year before the CEO's death to estimate the propensity score that a firm appears in the treatment group. We use all the control variables in the baseline regression to conduct the matching. Second, we match each treatment firm with four control firms within the same industry (two-digit SIC) using the nearest propensity score.[5] In particular, we use caliper matching with replacement and require the control firms to have a propensity score within 0.01 of the treatment firms.[6] Third, we stack the matched control–treatment firms from all the cohorts to form a sample for DiD analysis.

We then check the matching quality of the treatment and control firms. Panel A of Table 6 provides a comparison of the mean values of all the control variables between the treatment and the control group and their respective *t*-statistics and *p*-values. The mean differences of the control variables in the treatment and control groups are statistically insignificant, indicating that the firms in the

[5] Following Gao *et al.* (2021) and Lemmon and Roberts (2010), we select four matches because this approach allows us to include those observations that are not adequately identical. In addition, using four matches for each treatment enables us to get a sufficient sample size that boosts test power.

[6] We obtain one match for two sudden death and three matches for one sudden death and four matches for the remaining 14 sudden deaths within 0.01 caliper matching.

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TABLE 6

QUASI-NATURAL EXPERIMENT

Panel A: PSM matching quality

	(1)	(2)	(3)	(4)	(5)
	Treatment	Control	Differences	t-stat	p-value
Total Assets	8.037	7.690	0.347	0.690	0.497
Growth	1.723	1.828	-0.105	-0.280	0.781
Leverage	0.243	0.230	0.013	0.240	0.808
Return on Assets	0.132	0.106	0.026	0.580	0.569
Tangibility	0.296	0.271	0.025	0.310	0.761
Distress	0.882	0.838	0.044	0.360	0.721
Rating	0.588	0.574	0.014	0.0800	0.933
Competition	0.0422	0.0617	-0.020	-0.970	0.339

Panel B: Standard and dynamic DiD estimation results

Dep. Var.	Bank/Total Debt	Bank/Total Debt
	(1)	(2)
Treatment*Post	0.121***	
	(0.043)	
Treatment*Post^{-2}		0.063
		(0.060)
Treatment*Post^{-1}		0.052
		(0.071)
Treatment*Post^{0}		0.050
		(0.079)
Treatment*Post^{+1}		0.134*
		(0.076)
Treatment*Post^{+2}		0.148*
		(0.084)
Treatment*Post^{+3}		0.210**
		(0.087)
Constant	0.281	0.318
	(0.471)	(0.465)
Other controls	Yes	Yes
Firm*Cohort FE	Yes	Yes
Year*Cohort FE	Yes	Yes
Observations	796	796
Adj. R^2	0.798	0.798

Panel A of this table presents the comparison of the mean value of the variables between treatment and control groups. Panel B presents the standard and dynamic DiD estimation results. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

control and treatment groups are comparable. Thus, we can use this matched sample for DiD analysis. We estimate the following equation for this purpose:

$$Bank/Total\,Debt_{i,c,t} = \beta_0 + \beta_1 Treatment_{i,c}{}^{*} Post_{t,c} + Controls + \varphi + \gamma + \varepsilon \qquad (3)$$

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where $Treatment_{i,c}$ is equal to 1 if firm i is the treatment firm in cohort c; $Post_{t,c}$ is an indicator that equals 1 if year t in cohort c is after the event year in the cohort. Further, φ and γ denote the year-cohort and firm-cohort fixed effects, and ε is the error term. We do not include *Treatment* and *Post* separately since the firm-cohort and year-cohort absorb their effects. Our variable of interest is the coefficient for β_1 (i.e., *Treatment*Post*). A positive and significant coefficient for β_1 would suggest that firms with a reduction in managerial ability due to the sudden death of a CEO rely more on bank debt during the post-event period. We report the results from this analysis in Column (1) of Panel B (Table 6). Consistent with our expectation, we find a positive and significant coefficient for β_1 (coefficient = 0.121; $p < 0.01$), implying that, following a CEO's sudden death, the use of bank loans increases by 12.1%.

We further test the parallel trend assumption of DiD estimation. For this test, we replace $Treatment_{i,c}*Post_{t,c}$ with a set of indicators (i.e., $Treatment_{i,c}*Post_{t,c}$ [–2,+3]). Column (2) of Panel B (Table 6) reports the parallel-trend analysis results. We find that the treatment impact is only evident after the event year, as supported by the positive and statistically significant coefficient estimates for $Treatment*Post^{+1}$, $Treatment*Post^{+2}$, $Treatment*Post^{+3}$. Thus, our findings satisfy the parallel-trend assumption of the DiD approach. Overall, the quasi-natural experiment confirms the causality between managerial ability and bank debt.

Instrumental variable approach Our third approach to mitigate the endogeneity concern is the instrumental variable (IV) approach, utilizing a method developed by Lewbel (2012). While the traditional instrumental variable approach relies on an external instrument, Lewbel's (2012) model generates an internal instrument based on heteroscedastic errors in the models, in which error correlations are caused by unobserved common factors (Mavis *et al.*, 2020). Given that finding an appropriate exogenous instrument is a difficult undertaking (Jiang, 2017), this method is used in the contemporary finance literature to address endogeneity problems (e.g., Chen *et al.*, 2021; Hasan *et al.*, 2021; Mavis *et al.*, 2020).

We report the results from this analysis in Panel A of Table 7. We observe that the internal instruments generated by Lewbel (2012) are appropriate for estimating the second-stage regressions as they do not have any under-identification, weak identification, or over-identification problems. The second-stage regression from the IV approach shows that the coefficient for instrumented managerial ability remains negative and significant ($p < 0.01$), indicating that our main result of a negative relationship between managerial ability and bank debt is not an artefact of endogeneity problems.

Entropy-balancing approach In this sub-section, following the extant literature (e.g., Chen *et al.*, 2022; Hasan and Uddin, 2022), we apply the entropy-balancing approach to disentangle potential endogeneity issues further. Unlike propensity score matching, entropy balance conserves the original full sample and ensures a balance of covariates between the treatment and the control group by reweighting

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TABLE 7

TWO-STAGE LEAST SQUARES REGRESSION AND ENTROPY BALANCING ESTIMATES

Panel A: Endogeneity – 2SLS

	(1)	(2)
VARIABLES	Bank/Total Debt	Bank/Total Debt
Mgr. Ability	**–0.250*** **	**–0.257*** **
	[0.042]	**[0.043]**
Total Assets	–0.021***	–0.021***
	[0.002]	[0.002]
Growth	–0.008***	–0.008***
	[0.001]	[0.001]
Leverage	0.004	0.003
	[0.006]	[0.006]
Return on Assets	0.110***	0.108***
	[0.008]	[0.009]
Tangibility	0.044**	0.051**
	[0.022]	[0.022]
Distress	0.041***	0.041***
	[0.007]	[0.008]
Rating	–0.183***	–0.185***
	[0.011]	[0.011]
Competition	0.163	0.000
	[0.115]	[0.000]
Constant	0.235**	0.493***
	[0.113]	[0.017]
Observations	54,964	54,964
Year effects	Yes	No
Industry effects	Yes	No
Year*Industry effects	No	Yes
Adj. R^2	0.12	0.07
Underidentification test		
Kleibergen-Paap rk LM statistic	265.631	263.001
p-value	(0.00)	(0.00)
Hansen J statistic	4.516	5.163
p-value	0.341	0.271
Weak instrument robust tests and confidence sets	Conf. Set	Conf. Set
LC_2sls	[–0.331, –0.168]	[–0.340, –0.173]

Panel B: Entropy balancing estimates

	(1)	(2)
VARIABLES	Bank/Total Debt	Bank/Total Debt
Mgr. Ability	**–0.205*** **	**–0.218*** **
	[0.028]	**[0.028]**
Total Assets	–0.012***	–0.014***
	[0.003]	[0.003]
Growth	–0.010***	–0.009***
	[0.002]	[0.001]
Leverage	0.012	0.009
	[0.008]	[0.007]

(Continues)

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TABLE 7

CONTINUED

Panel B: Entropy balancing estimates

	(1)	(2)
VARIABLES	Bank/Total Debt	Bank/Total Debt
Return on Assets	0.073***	0.078***
	[0.013]	[0.011]
Tangibility	0.088***	0.084***
	[0.030]	[0.029]
Distress	0.071***	0.070***
	[0.010]	[0.010]
Rating	–0.234***	–0.232***
	[0.014]	[0.013]
Competition	0.111	–
	[0.142]	
Constant	0.235**	0.493***
	[0.113]	[0.017]
Observations	54,964	54,964
Year effects	Yes	No
Industry effects	Yes	No
Year*Industry effects	No	Yes
Adj. R^2	0.15	0.16

Panel A of this table presents 2SLS regression results of the impact of managerial ability on debt choice using the heteroscedasticity -based instrument (Lewbel, 2012). Panel B reports results using entropy balancing estimates. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

the observations to confirm that the two groups are indistinguishable in terms of their firm characteristics (Hainmueller, 2012).

To execute the entropy-balancing estimate, we divide the sample into subsamples of high managerial ability (treatment—if *Mgr. Ability* > sample median) and low managerial ability (control—if *Mgr. Ability* < sample median). We then implement a reweighting scheme to ensure that the mean, variance, and skewness of all the covariates are balanced across the high-managerial-ability (the treatment group) and low-managerial-ability (the control groups) subsamples. Indeed, the results in Table A.1 (online appendix) show that our estimation approach achieves a desirable balance as there is no difference between the treatment and the control group with respect to the first, second, and third moments of the covariates. Panel B of Table 7 presents the regression results with the entropy-balanced sample. The results corroborate our baseline findings as we conclude that managerial ability has a significant negative association with bank debt at the 1% significance level.

Evidence from Machine Learning Model

The extant literature typically relies on parametric statistical models (e.g., OLS) to draw inference, which has received criticism recently because of concerns about

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"*p*-hacking" (Dyckman and Zeff, 2015; Harvey, 2017; Ohlson, 2015, 2022; Kim *et al*., 2018; Johnstone, 2022). Therefore, following recent studies (Jones, 2017; Chen *et al*. 2022; Bertomeu *et al*. 2021), we use advanced machine learning model, specifically XGBoost, to further examine the importance of managerial ability in predicting debt choice. Importantly, unlike traditional statistical models, XGBoost does not rely on *p*-values, instead functioning as ensemble learning, where it combines the predictive strength of numerous learners. The predictive ability of an XGBoost model is assessed through relative variable importance (RVI) scores and corresponding ranks assigned to each variable. RVI scores range from 0 to 100, with 100 indicating the highest possible importance in the model's predictions. Conversely, a score of 0 denotes no contribution to the model's predictions (Hastie *et al*., 2009; Jones, 2017). The rank, in this context, signifies the order in which variables are positioned based on their RVI scores.

Figure 1 displays the RVI scores and ranks generated by the XGBoost machine learning model.[7] Our analysis reveals that the RVI score for managerial ability is 35.183, well above zero, indicating significant predictive power in the machine-learning model (Jones *et al*., 2023). The rank of six suggests that managerial ability variable is the sixth most important variable among all the independent variables employed in the model for predicting corporate debt choice. This finding further supports our primary conclusion regarding the importance of managerial ability in debt choice.

CROSS-SECTIONAL ANALYSES

The Role of the Information Environment

Now we explore whether the relationship between managerial ability and bank debt varies depending on the information environment of the firm. Prior studies suggest that private lenders are less sensitive to information asymmetry problems since they have a superior ability to acquire and process private information (Fama, 1985; Houston and James, 1996; Li *et al*., 2019). Therefore, firms with more information asymmetry obtain more debt from banks than from public sources (Bharath *et al*., 2008). Thus, if the documented negative effect of managerial ability on bank debt is explained by the information asymmetry-based argument, one would expect this relationship to be amplified in an environment of high information asymmetry.

We use three proxies to measure information asymmetry: (1) the Bog index (BOG); (2) real earnings management (REM); and (3) audit specialization (AUDIT_SPEC). These measures are widely used in the literature (Abad *et al*., 2018; Bonsall and Miller, 2017; Chen *et al*., 2021). We treat firm-year observations that are higher (lower) than the median BOG and REM as groups

[7] We use all the variables in Panel B of Table 4 for XGBoost machine learning model. Nonetheless, for brevity, we present results for the top 15 variables.

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FIGURE 1

THE RELATIVE VARIABLES IMPORTANCE (RVI)

Variables	RVIs Score	Rank	RVIs Strengths
Total Assets	100.00	1	
Leverage	68.40	2	
Intangibles	49.52	3	
Tangibility	40.84	4	
INST	36.21	5	
Mgr. Ability	**35.18**	**6**	
Return on Assets	34.83	7	
Competition	33.70	8	
Growth	33.05	9	
Rating	25.32	10	
Cashflow	24.24	11	
CSR	23.45	12	
Discretionary Accruals	20.08	13	
Comparability	12.42	14	
SIC2_group5	2.96	15	

with high (low) information asymmetry. In addition, firms audited by non-specialist auditors are associated with more information asymmetry.

The results, presented in Panel A of Table 8, suggest that the negative association between managerial ability and bank debt is significantly more prominent for the sub-sample of firms with a higher BOG (i.e., when BOG > median) and higher REM (i.e., when REM > median). Moreover, although the coefficient for managerial ability is higher for non-specialist auditors than for specialist auditors, the difference between the coefficients is not statistically significant. Overall, our evidence is consistent with the expectation that information asymmetry moderates the association between managerial ability and bank debt.

The Role of Corporate Governance

Next, we explore the moderating role of corporate governance in the link between managerial ability and bank debt. The prior literature suggests that, because of debt concentration, private lenders, such as banks, have superior ability and incentives to scrutinize and monitor borrowers closely (Ben-Nasr *et al.*, 2021; Berlin and Loeys, 1988). Therefore, firms with more monitoring needs (i.e., with a weak governance structure) tend to use more bank debt. In the context of our study, we argue that, if the disciplinary mechanism arguments explain our documented negative link between managerial ability and bank debt, we should observe this relationship to be stronger for firms with a weak corporate governance practice.

Following the prior literature (Aggarwal *et al.*, 2015; Bebchuk *et al.*, 2009; Liu *et al.*, 2015), we use three measures of corporate governance: (1) institutional shareholder concentration (INST); (2) the entrenchment index (E-Index); and (3) director independence (DIND). We define firm-year observations with lower

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TABLE 8

CROSS-SECTIONAL ANALYSES

Panel A: The role of information environment

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt
	BOG>Median	BOG<Median	REM < Median	REM > Median	AUDIT_SPEC = Yes	AUDIT_SPEC = No
Mgr. Ability	**–0.310***** **[0.029]**	**–0.201***** **[0.035]**	**–0.185***** **[0.033]**	**–0.357***** **[0.037]**	**–0.209***** **[0.032]**	**–0.235***** **[0.035]**
Constant	0.348** [0.144]	0.438*** [0.077]	0.360*** [0.092]	0.693*** [0.092]	0.604*** [0.112]	0.384*** [0.089]
χ^2 (p–value)	**14.17*** (0.00)**		**31.27*** (0.00)**		**0.76 (0.38)**	
Observations	22,855	26,960	23,489	23,535	20,554	25,883
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.15	0.15	0.14	0.16	0.19	0.14

Panel B: The role of corporate governance

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt
	INST>Median	INST<Median	E-Index<Median	E-Index>Median	DIND>Median	DIND<Median
Mgr. Ability	**–0.133***** **[0.049]**	**–0.197***** **[0.033]**	**–0.128***** **[0.042]**	**–0.249***** **[0.037]**	**–0.080***** **[0.038]**	**–0.250***** **[0.069]**
Constant	0.373*** [0.081]	0.755*** [0.111]	0.841*** [0.148]	0.608*** [0.166]	0.935*** [0.106]	0.399*** [0.099]
χ^2 (p–value)	**2.59* (0.10)**		**13.07*** (0.00)**		**12.99*** (0.00)**	
Observations	17,328	17,802	11,795	12,642	8,589	5,973
Other controls	Yes	Yes	Yes	Yes	Yes	Yes

(Continues)

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TABLE 8

CONTINUED

Panel B: The role of corporate governance

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt
	INST>Median	INST<Median	E-Index<Median	E-Index>Median	DIND>Median	DIND<Median
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.13	0.22	0.20	0.24	0.30	0.20

Panel C: The role of financial conditions

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt	Bank/Total Debt
	Rating = NO	Rating = YES	DIV=NO	DIV=YES	RE/TE > Median	RE/TE < Median
Mgr. Ability	**–0.212*** **	**–0.115*** **	**–0.235*** **	**–0.164*** **	**–0.180*** **	**–0.259*** **
	[0.033]	**[0.030]**	**[0.028]**	**[0.039]**	**[0.035]**	**[0.033]**
Constant	0.426***	0.793***	0.386***	0.817***	0.723***	0.300***
	[0.086]	[0.082]	[0.085]	[0.110]	[0.109]	[0.088]
χ^2 (p–value)	**13.78*** (0.00)**		**6.80*** (0.01)**		**7.26*** (0.01)**	
Observations	38,584	16,380	39,846	15,118	23,844	23,836
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.11	0.21	0.11	0.31	0.27	0.11

Panels A, B, and C of this table examines how information environment, formal and informal governance mechanisms, and financial conditions moderate the relationship between managerial ability and debt choice. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

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(higher) than median INST and DIND as groups with high (low) agency problems. Moreover, firm-year observations with higher (lower) than the median E-Index are treated as groups with high (low) agency problems.

We present the results for this cross-sectional test in Panel B of Table 8. We observe that the negative impact of managerial ability on bank debt is significantly more salient for the sub-sample of firms with a lower INST (i.e., when INST < median), lower DIND (i.e., when DIND < median) and higher E-Index (i.e., when E-Index > median). Thus, our evidence is consistent with the prediction that firms with high-ability managers rely less on bank debt in the presence of weak corporate governance.

The Role of Financial Conditions

In our final cross-sectional test, we examine the role of financial constraints in the association between managerial ability and bank debt. Several studies show that financial constraints have a significant role in determining the choice of debt (Denis and Mihov, 2003; Lin *et al.*, 2013). For example, Denis and Mihov (2003) argue that firms with a higher probability of distress are more likely to choose a bank for finance because private debt (e.g., banks) allows for easier renegotiation in the event of debt covenant violation. Therefore, we argue that the role of managerial ability in affecting bank debt is likely to be stronger in the presence of weaker financial conditions.

We use three proxies to capture firms' financial conditions: (1) credit ratings (Rating); (2) dividend payments (DIV); and (3) firm maturity, measured as the ratio of retained earnings to total equity (RE/TE). Prior studies suggest that firms with a credit rating (i.e., Rating = yes), firms with a dividend payment (i.e., DIV = yes), and firms in the mature stage of the life cycle (RE/TE > median) have better financial conditions and access to external financing (Dickinson, 2011; Farre-Mensa and Ljungqvist, 2016; Kisgen, 2006).

In Panel C of Table 8, we find that the role of managerial ability in reducing the reliance on bank debt is significantly stronger for firms without credit ratings (i.e., Rating = no) and without dividend payments (DIV = no). Moreover, the effect is more pronounced for early and growth firms (when Re/TE < median).

Overall, our cross-sectional results provide reasonable evidence that the constraining role of managerial ability on bank debt is stronger in the presence of an opaque information environment, weak corporate governance, and poor financial conditions.

PATH ANALYSIS: THE MEDIATING ROLE OF INFORMATION ASYMMETRY, CORPORATE GOVERNANCE, AND FINANCIAL CONDITIONS

In this section, following Cahan *et al.* (2021) and Daradkeh *et al.* (2023), we conduct a path analysis to investigate the mediating role of information asymmetry, corporate governance, and financial conditions on the relationship

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between managerial ability and bank debt. As discussed above, prior studies show that managerial ability lowers firms' information asymmetry (Baik *et al.*, 2018; Hasan, 2020), which in turn motivates firms to rely more on public debt than bank debt in financing their operations (Li *et al.*, 2019). The existing literature presents mixed findings on the relationship between managerial ability and corporate governance. Specifically, while some studies suggest that agency problems are less prominent in firms with higher managerial ability (Bui *et al.*, 2018; Curi and Lozano-Vivas, 2020; Doukas and Zhang, 2021), other studies indicate that managerial ability exacerbates the agency problems between a firm and its outside shareholders (Eisfeldt and Papanikolaou, 2013; Koester *et al.*, 2017). As a result, *ex-ante*, it remains uncertain how corporate governance mediates the connection between managerial ability and bank debt. Finally, previous studies also suggest that more capable managers are positively associated with financial performance (Demerjian *et al.*, 2012, 2013), which allows these firms to borrow less from private sources. Considering these arguments, it is vital to investigate the extent to which managerial ability directly and indirectly affects bank debt. To assess these impacts, we estimate the following set of equations:

$$Bank/Total\ Debt = \psi_0 + \psi_1 Mgr.Ability + \psi_2 REM + \psi_3 INST + \psi_4 Rating + \psi' Controls + YearFE + IndustryFE + \epsilon_t \quad (4.1)$$

$$REM = \lambda_0 + \lambda_1 Mgr.Ability + \lambda' Controls + YearFE + IndustryFE + \epsilon_t \quad (4.2)$$

$$INST = \gamma_0 + \gamma_1 Mgr.Ability + \gamma' Controls + YearFE + IndustryFE + \epsilon_t \quad (4.3)$$

$$Rating = \varphi_0 + \varphi_1 Mgr.Ability + \varphi' Controls + YearFE + IndustryFE + \epsilon_t \quad (4.4)$$

Equation (4.1) illustrates the impact of information asymmetry (REM), corporate governance (INST), and financial condition (Rating) on bank debt. The inclusion of *Mgr. Ability* in this equation captures the possibility of managerial ability having a direct impact on bank debt. Equations (4.2) to (4.4) capture the indirect effect as they explain how *Mgr. Ability* affects *REM, INST*, and *Rating*, respectively. Thus, the coefficient $\psi 1$ in equation 4.1 measures the direct influence of *Mgr. Ability* on bank debt, while the coefficients of $\psi_2 * \lambda_1$, $\psi_3 * \gamma_1$, and $\psi_4 * \varphi_1$ represent the mediation effects of *REM, INST*, and *Rating*, respectively. All equations include control variables used in our baseline specifications.

Table 9 reports the regression results of the path analysis. In Column (1), we observe that the coefficient for *Mgr. Ability* is negative and statistically significant (coeff. = –0.241, $p < 0.01$). We also observe that the coefficients of INST (coeff. = –0.112, $p < 0.01$) and Rating (coeff. = –0.181, $p < 0.01$) are negative and significant, whereas the coefficient of REM (coeff. = 0.032, $p < 0.01$) is positive and significant. These results confirm that managerial ability, corporate governance, and financial conditions independently reduce bank debt while information asymmetry increases bank debt. In Column (2), we find that the association between *Mgr. Ability* and *REM* is negative and significant (coeff. = –1.032, $p < 0.01$), implying that managerial ability improves a firm's information

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TABLE 9

PATH ANALYSIS

	(1)	(2)	(3)	(4)
VARIABLES	Bank/Total Debt	REM	INST	Rating
REM	**0.032*** **			
	[0.005]			
INST	**–0.112*** **			
	[0.012]			
Rating	**–0.181*** **	–0.008	0.065***	
	[0.006]	[0.007]	[0.003]	
Mgr. Ability	**–0.241*** **	**–1.032*** **	**0.157*** **	**–0.003**
	[0.019]	**[0.022]**	**[0.009]**	**[0.016]**
Total Assets	–0.050***	0.039***	–0.085***	0.152***
	[0.002]	[0.002]	[0.001]	[0.001]
Growth	–0.013***	–0.058***	–0.009***	–0.001
	[0.001]	[0.001]	[0.001]	[0.001]
Leverage	0.048***	0.168***	0.074***	0.181***
	[0.007]	[0.008]	[0.003]	[0.006]
Return on Assets	0.173***	0.292***	–0.038***	–0.053***
	[0.010]	[0.012]	[0.005]	[0.009]
Tangibility	0.058***	0.244***	–0.000	–0.022*
	[0.014]	[0.017]	[0.007]	[0.013]
Distress	0.021***	0.094***	–0.064***	–0.088***
	[0.006]	[0.007]	[0.003]	[0.005]
Competition	0.157	–0.215*	–0.066	0.117
	[0.101]	[0.121]	[0.047]	[0.090]
Constant	0.626***	–0.491***	0.815***	–0.573***
	[0.048]	[0.057]	[0.022]	[0.042]
Year effects	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes
Observations	32,582	32,582	32,582	32,582
R-squared	0.185	0.256	0.513	0.491
Direct effect				
Mgr. Ability	–0.241***			
	[0.019]			
Mediation effects				
REM	–0.033***			
	[0.005]			
INST	–0.018***			
	[0.002]			
Rating	0.001			
	[0.003]			
Total effect	–0.291***			
	[0.019]			

This table examines how the information environment (REM), corporate governance (INST) and financial conditions (RATING) mediate the influence of managerial ability on bank debt. Standard errors clustered at the firm level are presented in parentheses. *, **, and *** signify significance at the 10%, 5%, and 1% levels. The Appendix provides variable definitions.

environment. In Column (3), we report a positive relationship between *Mgr. Ability* and *INST* (coeff. $= 0.157$, $p < 0.01$), signifying that managerial ability improves corporate governance. Nevertheless, in Column (4), we fail to find any significant association between *Mgr. Ability* and *Rating*.

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We also explicitly estimate the direct and mediating effects of *Mgr. Ability* on bank debt. We find that the direct impact of *Mgr. Ability* (coeff. = –0.241, $p < 0.01$) and the mediation impact of *Mgr. Ability* on bank debt through its effect on *REM* (coeff. = –0.033, $p < 0.01$) and *INST* (coeff. = –0.018, $p < 0.01$) is statistically significant. However, the mediating effect of *Rating* is positive but insignificant. Importantly, the total effect (i.e., the combined direct and mediation effects) of *Mgr. Ability* on bank debt is significantly negative (coeff. = –0.291; $p < 0.01$). Overall, our path analysis confirms that managerial ability has a direct effect on bank debt, while both information environment and corporate governance channels mediate this relationship.

SENSITIVITY ANALYSIS

Alternative Regression Models

To bolster our findings from the main regression, we use five alternative regression specifications and report the results in Panel A of Table 10. First, we re-estimate the baseline regression with the firm fixed-effect model, which mitigates concern about firm-specific time-invariant unobserved heterogeneity. The results in Column (1) show that the coefficient for managerial ability is negative and significant (coeff. = –0.040, $p < 0.05$). Next, we re-estimate the main regression using the Tobit model, which addresses the concern about our censored bank debt data (truncated between 0 and 1). The results presented in Column (2) show that the coefficient for managerial ability is still negative and significant (coeff. = –0.532, $p < .01$). We then use the Newey–West and weighted least squares (WLS) models to alleviate the concerns about serial correlation and heterogeneity in different industries, respectively. The results reported in Column (3) and Column (4) confirm that our baseline results are robust as the coefficient for managerial ability remains negative and significant ($p < 0.01$). We finally re-estimate the main regression using the Fama–MacBeth (FM) model. The negative and highly significant coefficient for managerial ability (coeff. = –0.271, $p < .01$) in Column (5) again confirms our earlier findings. Overall, the results from these five alternative regression estimates corroborate the main finding that firms with more able managers rely less on bank debt.

Alternative Measures of Managerial Ability and Bank Debt

As a robustness test, we use an alternative measure of managerial ability. In particular, following prior studies (Demerjian *et al.*, 2013; Hasan, 2020), we use a decile rank value of managerial ability (*Mgr. Ability Rank*) as our main independent variable. The results obtained using this alternative specification are presented in Column (1) of Table 10 (Panel B). We find that the results from this estimation are highly consistent with our primary results, showing a negative and significant coefficient (coeff. = –0.117, $p < 0.01$).

We then use three other specifications of bank debt: (1) bank debt as a proportion of total liabilities (*Bank/Total Liabilities*); (2) the natural log of

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TABLE 10

SENSITIVITY ANALYSIS

Panel A: Alternative regression specifications

	(1)	(2)	(3)	(4)	(5)
	FFE	Tobit	Newey–West	WLS	FM
VARIABLES	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt	Bank/ Total Debt
Mgr. Ability	**–0.040****	**–0.532*****	**–0.292*****	**–0.322*****	**–0.271*****
	[0.020]	**[0.045]**	**[0.013]**	**[0.026]**	**[0.035]**
Constant	0.285***	0.251**	0.457***	0.465***	0.745***
	[0.030]	[0.120]	[0.036]	[0.089]	[0.040]
Observations	54,964	54,964	54,964	54,964	54,964
Other controls	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	No
Industry effects	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	No	No	No	No
Adj. R^2/Pseudo R^2	0.53	0.07	–	0.14	0.15

Panel B: Alternative measures of managerial ability and bank debt

	(1)	(2)	(3)	(4)
VARIABLES	Bank/Total Debt	Bank/Total Liabilities	LN(Bank)	Bank/Total Assets
Mgr. Ability Rank	**–0.117*****			
	[0.010]			
Mgr. Ability		**–0.188*****	**–1.989*****	**–0.094*****
		[0.013]	**[0.163]**	**[0.010]**
Constant	0.560***	0.278***	–0.925***	0.135***
	[0.084]	[0.056]	[0.336]	[0.030]
Observations	54,964	54,964	54,964	54,964
Other controls	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes
Adj. R^2	0.13	0.13	0.35	0.22

This table presents baseline regression results of the impact of managerial ability on debt choice using alternative regression models (Panel A) and different measures of managerial ability and bank debt (Panel B). We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

bank debt (*LN(Bank)*); and (3) bank debt as a proportion of total liabilities (*Bank/Total Assets*). The results are presented in Table 10, Panel B (Columns (2) to (4)). We find that the coefficient for managerial ability remains negative (coeff. ranging from –0.094 to –1.989) and statistically significant ($p < 0.01$) for alternative specifications of bank debt. Overall, the findings from these alternative measures of variables of interest suggest the robustness of our finding that firms with more able managers rely less on bank debt.

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Lagged Regression Model

The possibility that managerial ability affects the corporate future debt choice may be a concern. Therefore, to examine the sensitivity of our findings, we regress the bank debt of year $t + 1$ on the one-year-lagged managerial ability and controls. Our results in Table A.2 show that the coefficient for lagged managerial ability remains negative and significant ($p < 0.01$), suggesting the robustness of our main finding.

Holdout Samples

Contemporary studies have identified an over-reliance on OLS regression models and significance testing to draw inferences about the effectiveness of statistical models and explanatory variables., resulting in suspicions of p-hacking and the excessive reporting of false positives in the literature (Dyckman, 2016; Harvey, 2017; Ohlson, 2022; Kim *et al.*, 2018). To address this issue, researchers recommend using holdout samples, which can provide a level of confidence that models are not overfitted on training data, while also minimizing concerns about data snooping and selection biases (Chen *et al.*, 2023; Schorfheide and Wolpin, 2012). Therefore, in this section, we present regression results using holdout samples of 20% and 10%.

In Table A.3, coefficients for *Mgr. Ability* remain negative and significant ($p < 0.01$) even when different holdout samples are used. This finding indicates that our main analysis is not affected by any specific sample or selection issues. In untabulated analysis, when employing a five-fold and ten-fold cross-validation procedure, we continue to find qualitatively similar results.

ADDITIONAL ANALYSIS

Managerial Ability and Secured vs Unsecured Debt

In this sub-section, we examine the relationship between managerial ability and the two debt categories: secured debt and unsecured debt. Secured debt is backed by collateral and associated with stricter monitoring of borrowers (Rajan and Winton, 1995). Therefore, firms with poor monitoring and financial conditions are forced to resort to secured debt. Conversely, unsecured debt is offered to firms with higher financial performance and improved credit ratings. In this context, the extant literature (Cornaggia *et al.*, 2017; Demerjian *et al.*, 2012) shows that high-ability managers are associated with improved financial performance and creditworthiness. Hence, we expect managerial ability to have a negative relationship with secured loans but a positive relationship with unsecured loans.

Table 11 reports the regression result regarding the impact of managerial ability on the use of secured versus unsecured debt. As expected, we find that more able managers are negatively associated with the use of secured debt (coeff. = –0.256, $p < 0.01$) but positively associated with the use of unsecured debt (coeff. = 0.243, $p < 0.01$).

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TABLE 11

MANAGERIAL ABILITY AND SECURED VS UNSECURED DEBT

	(1)	(2)
VARIABLES	Secured/Total Debt	Unsecured/Total Debt
Mgr. Ability	**–0.256*** **	**0.243*** **
	[0.024]	**[0.024]**
Constant	0.614***	–0.049
	[0.071]	[0.061]
Observations	54,964	54,964
Other controls	Yes	Yes
Year effects	Yes	Yes
Industry effects	Yes	Yes
Adj. R^2	0.21	0.21

This table shows the effect of managerial ability on the use of secured and unsecured debt. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

Managerial Ability and Public Debt

Our main analysis establishes that firms with high-ability managers rely less on bank debt. In this section, we extend the analysis and consider whether managerial ability has any relationship with access to public debt, which helps to reduce firms' use of bank debt. According to Denis and Mihov (2003), firms with lower information asymmetry and firms with better credit quality prefer to borrow from public sources. Likewise, Cantillo and Wright (2000) and Houston and James (1996) suggest a positive relationship between firm profitability and public debt. Given that managerial ability positively affects firms' information opacity, credit quality, and profitability, we expect that firms with more able managers use more finance from public sources.

Column (1) of Table 12 documents the results of the relationship between managerial ability and the use of public debt. Consistent with our expectation, the coefficient for managerial ability is positive and significant (coeff. $= 0.200$; $p < 0.01$), implying that firms with more able managers rely more on public debt.

Managerial Ability and Different Components of Bank and Public Debt

Having established a negative (positive) relationship between managerial ability and bank (public) debt, we now explore the components of each class of debt that drive the documented results. As mentioned earlier, bank debt consists of term loans and revolving credit and public debt is the sum of commercial papers, senior bonds and notes, and subordinate bonds and notes.

Columns (2) to (4) in Table 12 show how managerial ability is related to each component of public debt. We find that the coefficient for managerial ability is positive and significant ($p < 0.01$) for both commercial papers (Com Paper/Total Debt) and senior bonds and notes (Sr. Bonds & Notes/Total Debt), suggesting that these two dimensions of public debt drive the positive relationship, as identified in Column (1).

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TABLE 12

MANAGERIAL ABILITY AND OTHER DIMENSIONS OF DEBT

	(1)	(2)	(3)	(4)	(5)	(6)
	Public debt	Components of public debt			Components of bank debt	
VARIABLES	Public/ Total Debt	Com. Paper/ Total Debt	Sr. Bonds & Notes/ Total Debt	Sub. Bonds & Notes/ Total Debt	Term Loans/ Total Debt	Revolving Credit/ Total Debt
Mgr. Ability	**0.200*** **	**0.009*** **	**0.206*** **	**–0.014**	**–0.177*** **	**–0.116*** **
	[0.024]	**[0.002]**	**[0.025]**	**[0.013]**	**[0.019]**	**[0.016]**
Constant	0.011	–0.011***	0.025	0.008	0.289***	0.158***
	[0.058]	[0.002]	[0.066]	[0.017]	[0.083]	[0.059]
Observations	54,964	54,964	54,964	54,964	54,964	54,964
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes
Adj. *R*–squared	0.21	0.09	0.17	0.06	0.07	0.12

This table examines the impact of managerial ability on various forms of debt. We present robust standard errors clustered at the firm level in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively (two-tailed). The Appendix provides variable definitions.

Then, Columns (5) and (6) in Table 12 investigate the relationship between managerial ability and each form of bank debt (i.e., term loans and revolving credit). Our results suggest that managerial ability reduces the reliance on both forms of bank debt ($p < 0.01$).

CONCLUSION

We investigate whether managerial ability has any relationship with debt choice. Building on information asymmetry, agency, and debt renegotiation arguments, we predict that firms with higher managerial ability rely less on bank debt. Using a large sample of US public firms, we find robust evidence supporting our hypothesis. With respect to economic significance, we find that a one-standard-deviation increase in managerial ability is associated with a 9.07% decrease in the use of bank debt. This finding remains robust when using alternative regression models and different measures of managerial ability and bank debt.

We employ several identification strategies, including the omitted variable bias test using Oster's (2019) bound estimates, difference-in-differences regression, and 2SLS regression results using a heteroscedasticity-based instrument (Lewbel, 2012) and entropy-balancing estimates and obtain consistent results. In the cross-sectional analysis, we find that the negative link between managerial ability and bank debt is more salient for the sub-samples of firms with higher information asymmetry, weaker corporate governance, and poor financial

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conditions. In the path analysis, we confirm that managerial ability has a direct relationship with bank debt, while both the information environment and corporate governance mediate the relationship. In an additional analysis, we find that managerial ability is negatively (positively) associated with the use of secured (unsecured) debt. Finally, we find evidence that managerial ability is positively associated with public debt. The findings from our study extend both the bank debt and the managerial ability literature by showing that managerial ability has important implications for corporate financing decisions.

ACKNOWLEDGEMENT

Open access publishing facilitated by Macquarie University, as part of the Wiley - Macquarie University agreement via the Council of Australian University Librarians.

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APPENDIX

Variables	Definitions
Bank/Total Debt	Bank debt as a proportion of total debt.
Mgr. Ability	The managerial ability score of Demerjian *et al.* (2012).
Total Assets	The natural logarithm of total assets.
Growth	The ratio of market-to-book of assets.
Leverage	Financial leverage, measured as total debt over total assets.
Return on Assets	Income before depreciation and amortization over total assets.
Tangibility	Asset tangibility, measured as property, plant and equipment over total assets.
Distress	Financial distress, measured as the Altman Z score (1968). We use a dummy variable that takes the value of 1 if the Z score is higher than 1.81.
Rating	A dummy variable that takes the value of 1 if a firm is rated by a credit rating agency in a year and 0 otherwise.
Competition	Industry competitiveness, measured using the Herfindahl index.
Mgr. Ability Rank	Decile value of the managerial ability score (Demerjian *et al.*, 2012).
Bank/Total Liabilities	Bank debt as a proportion of total liabilities.
LN(Bank)	The natural logarithm of bank debt.
Bank/Total Assets	Bank debt as a proportion of total assets.
No Dividends	A dummy variable that takes the value of 1 if a firm pays no dividends in a year and 0 otherwise.
RE/TE	Retained earnings as a proportion of total equity.
Bog Index	A financial reporting readability measure.
REM	Real earnings management (Roychowdhury, 2006).
AUDIT_SPEC	A dummy variable that takes the value of 1 if a firm is audited by an industry specialist auditor in a year and 0 otherwise.
INST	The proportion of institutional shareholdings.
E-Index	The entrenchment index, constructed following Bebchuk *et al.* (2009).
DIND	The proportion of independent directors on the board.
LN(Vega)	The natural logarithm of the CEO vega.
Secured Debt/Total Debt	Secured debt as a proportion of total debt.
Unsecured Debt/Total Debt	Unsecured debt as a proportion of total debt.
Com. Paper/Total Debt	Commercial papers as a proportion of total debt.
Sr. Bonds & Notes/Total Debt	Sr. bonds and notes as a proportion of total debt.
Sub. Bonds & Notes/Total Debt	Subordinated bonds and notes as a proportion of total debt.
Term Loans/Total Debt	Term loans as a proportion of total debt.
Revolving Credit/Total Debt	Revolving credit as a proportion of total debt.

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Appendix S1: Online Appendix

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