Bank Loan Maturity and Corporate Investment

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Abstract

This study analyzes bank loan maturity and corporate investment linkage by using novel firm-level data covering the universe of all incorporated firms in Türkiye over the last decade. The results of the panel regression model with multi-dimensional fixed effects reveal that loan maturity has a significant positive association with investment, indicating that longer debt maturity fosters corporate investment. The results reveal that the positive linkage between longer debt maturity and investment is more pronounced for small and medium-sized enterprises (SMEs). This is also the case for young firms and firms with high growth opportunities. Considering the evidence provided in the literature that bank lending conditions, including maturity structure, are highly cyclical and vulnerable to financial conditions and economic policy uncertainties, our findings highlight the importance of reducing the policy uncertainties as well as the importance of policies that make equity financing more attractive and deepen the capital markets.

Keywords: Bank loans, Corporate investment, Debt maturity structure

JEL classifications: C23, D22, E22, G31, G32

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Non-technical Summary

The impact of corporate financing decisions on firms' investment activities is a major issue in finance literature. Even though the maturity structure of debt is an essential component of corporate capital structure decisions, prior literature presents mixed results and there is no consensus on the impact of debt maturity structure on investment decisions. In order to expand the small literature and present a complete picture of the issue for emerging markets, we analyze the corporate debt maturity structure and investment linkage for Türkiye, one of the largest emerging countries, over the last decade.

Utilizing confidential and comprehensive firm-level data, which contains the universe of all incorporated firms in Türkiye, the results of the panel regression model with multi-dimensional fixed effects reveal that corporate debt maturity has a significant positive association with corporate investment. This is prima facie that longer maturity debt fosters corporate investment. The results show that the positive linkage between longer debt maturity and investment is more pronounced for SMEs. This is also the case for young firms and firms with high growth opportunities.

As in many emerging countries, bank lending is the dominant source of external finance for corporates in Türkiye, whereas alternative sources such as equity and bond markets are quite limited. However, bank lending conditions including maturity structure are highly cyclical and vulnerable to domestic and global financial conditions and economic policy uncertainties where creditors respond to policy uncertainties by shortening debt maturity. Considering the real consequences of the debt maturity structure, our findings highlight the importance of decreasing the policy uncertainties as well as the necessity to broaden the range of external financing and deepen the capital markets.

1. Introduction

The impact of corporate financing decisions on firms' investment activities is a major issue that has been discussed in finance literature since the pioneering paper of Modigliani and Miller (1958). Even though the maturity structure of debt is an essential component of corporate capital structure decisions, the existing literature presents mixed results, and there is no consensus on the impact of debt maturity structure on investment decisions. This study analyzes the corporate debt maturity structure and investment linkage for Türkiye, one of the largest emerging countries.

The literature on the consequences of debt maturity is scarce compared to the literature on the determinants of debt maturity structure (Wu et al., 2022). Besides, the evidence provided is at best mixed, especially for emerging countries. One of the main drawbacks is the lack of representatives in their samples. They mostly use samples with a limited number of firms, or they focus on only public and large firms due to data availability. This study aims to expand upon the limited literature and present a more complete picture by utilizing a comprehensive and representative database. This unique dataset, which is one of the novel aspects of this study, is constructed from various confidential firm-level data sources containing the universe of all incorporated firms in Türkiye over the last decade.

In our analysis, we focus on bank lending since bank lending is the dominant source of external finance for corporates in Türkiye where more than 95% of outstanding loans are granted by banks.[1] Our granular bank-firm-loan level database enables us to measure maturity in a more precise way. Unlike previous studies, we measure firm-level maturity as the weighted average of all outstanding loans' maturities in terms of days where the weights are outstanding loan amounts.[2] The results of the panel regression model with multi-dimensional fixed effects show that loan maturity has a significant positive association with corporate investment.[3] This is prima facie evidence that longer maturity debt fosters corporate investment.

The positive impact of longer maturity debt on investment is expected to be higher for small firms since borrowing capacity as well as access to credit problem decrease with firm size and

[1] The possible role of other external debt maturities such as bonds and trade credit is discussed in Sections 2 and 4.
[2] Existing literature uses the definition of maturity as the share of long-term debt in total debt where long-term debt is the outstanding debt that has a maturity equal to or longer than one year. Our results using this definition are in line with our main results. The details are discussed in Section 4.
[3] One criticism of the empirical analysis is the possible endogeneity problem that may arise due to the simultaneity of firm's financing and investment decisions. Due to lack of loan application data including loan acceptances and rejections, the focus of the study is the linkage between corporate debt maturity structure and investment rather than the causal inference.

for banks the continuation of the lending relationship with small firms is less valuable than larger firms (Berger and Udell, 1992; Khwaja and Mian, 2008; Iyer et al., 2014; Yarba and Güner, 2020a, b; Yarba, 2023). This indicates that small firms suffer more from the downsides of short-term debt such as higher rollover risk than large firms. To examine this, we re-estimate the model separately for SMEs and large firms. While the results reveal that a positive significant association between debt maturity and investment exists for all size groups, the impact is more pronounced for SMEs. This suggests that smaller firms benefit from longer debt maturity more than larger firms.

Some empirical studies argue that the association between debt maturity and corporate investment is negative for those firms with high growth opportunities (e.g., Aivazian et al., 2005a; Nnadi et. al., 2020, among others). Contrary to this argument, our results reveal that the positive association between debt maturity and corporate investment is more pronounced for firms with higher growth opportunities. We further examine possible heterogeneity in the debt maturity-investment relation with respect to firm age and capital intensity due to their important roles in firms' credit access and borrowing capacity evidenced in the literature (Guariglia, 2008; Yarba, 2022, 2023). The positive association between debt maturity and investment is evident for all subgroups. The results show that the impact is more pronounced for young firms than for old firms. This is also the case for low capital-intensive firms, which indicates their higher debt rollover risk.

This paper contributes to several strands of literature. First, this study adds to the literature on capital structure-investment linkage. Our results, overall, constitute evidence rejecting the irrelevance of capital structure. In particular, our study contributes to the empirical literature on the relationship between debt maturity structure and firm investment. The impact of maturity structure is theoretically ambiguous. On the one hand, Myers (1977) argues that firms with long-term debt could avoid positive net value projects as a result of conflict between debtholders and managers (as representatives of shareholders). Thus, debt maturing can result in a "debt overhang" or underinvestment problem in firms with long-term debt. In the same vein, Barclay and Smith (1995) and Billett et al. (2007) argue that reducing debt maturity helps control the underinvestment problem. On the other hand, Diamond and He (2014) and Acharya et al. (2011) argue that the short-term debt has some downsides, such as higher rollover risk and less risk sharing, which may have detrimental impacts on investment behavior. In addition, shorter maturity of debt enables better monitoring and can mitigate debt overhang (Diamond,

(1991 and 1993). Accordingly, the evidence provided in the prior empirical work is at best mixed. While Aivazian et al. (2005a) show that longer maturity debt decreases US firms' investments, Dang (2011) shows that debt maturity structure has no significant effect on UK firms' investment activities. Pacheco (2017) analyzes Portuguese SMEs and shows that long-term debt increases firms' investments, while short-term debt decreases firms' investments. Nnadi et al. (2020) investigate Asian developing countries (Singapore, Indonesia and Thailand) and show that debt maturity has a negative effect on investment in Thailand's case and no significant effect in Indonesia and Singapore. Our findings lend support to the literature that reports detrimental impact of short-term debt on investment behavior (e.g., Diamond and He, 2014; Acharya et al., 2011; Pacheco, 2017, among others). In addition, contrary to the arguments in the literature (e.g., Aivazian et al., 2005a; Nnadi et al. 2020, among others), our findings suggest that firms with high growth opportunities benefit more from longer debt maturity. While this contradiction might be due to the differences in legal and institutional environments (Wald, 1999), it might also be due to the lack of representativeness of previous studies. Unlike the previous empirical studies using only public firms or samples with limited number of firms, this study provides significant evidence that longer maturity debt fosters corporate investment by utilizing a comprehensive dataset.

The remainder of this paper is organized as follows. Section 2 introduces our data and the empirical methodology used in the study. Section 3 presents empirical results and Section 4 discusses various robustness checks. Lastly, Section 5 summarizes our findings and concludes.

2. Data and Empirical Methodology

In this study, we used several confidential and comprehensive databases. Our main source is the Turkish Revenue Administration dataset that includes annual balance sheets and income statements prepared according to the Tax Procedure Law of Türkiye. This firm-level dataset includes the universe of incorporated Turkish firms. We further linked our main data to the Social Security Institute dataset that provides firm-level employment information. Lastly, we used the Credit Register database of the Banks Association of Türkiye including detailed information about bank loans at the bank-firm level. All datasets in the study are provided by the Central Bank of the Republic of Türkiye (CBRT).

To avoid inconsistency, we drop firm-year observations with non-positive assets, debt or fixed assets. In our analysis, we focus on bank lending since bank lending is the dominant source of external finance for corporates in Türkiye where more than 95% of outstanding loans are

granted by banks (Akgunduz et al., 2023). Foreign currency (FX) corporate loans are concentrated among a small number of firms (5% of firms on average) over the sample period. Since the usage of FX loans is highly regulated in Türkiye, we excluded firms with FX loans in our main specification to avoid possible bias that might be induced by FX debt. Nonetheless, we also re-estimate all specifications in the study by including these firms for a robustness check. The details are discussed in Section 4. Moreover, we also exclude the firms that use financial leasing (around 3% of the sample) and firms that have access to the bond market, and firms that are listed on Borsa Istanbul (around 400 firms). We also exclude credit cards, non-cash loans and non-performing loans. The final sample, on average, covers 71% of all TL-denominated corporate loans granted and accounts for 83% of net sales of all Turkish firms over the sample period. We also winsorize firm-level variables used in the model at the 1st percentile in each tail to minimize the effects of outliers. The result is unbalanced panel data with 937,110 firm-year observations over the period 2011-2021. Table 1 presents summary statistics of all variables used in our empirical models.

Table 1. Descriptive Statistics

	Mean	Std. Dev.	Median	Number of Observations
Investment	0.10	0.91	0.01	937,110
Maturity	6.04	0.76	6.15	937,110
Size	14.95	1.49	14.90	937,110
Profitability	-0.04	0.23	-0.01	937,110
Growth Opportunities	-0.05	0.79	0.01	937,110
Leverage	0.47	0.28	0.47	937,110
Liquidity	0.08	0.14	0.02	937,110
Firm Age	2.49	0.62	2.56	937,110

Note: This table reports descriptive statistics of variables used in the empirical model. Investment rate is the logarithmic change in net tangible assets, maturity is the log of the weighted average of all outstanding loans' maturities in terms of days where the weights are outstanding loan amounts, firm size is the logarithm of total assets, leverage is total debt scaled by total assets, liquidity is the sum of cash and equivalents scaled by total assets, age is the log of number of years since firm's founding, profitability is earnings before interest, tax and depreciation scaled by total assets and growth opportunity is the logarithmic change in real net sales deflated by Consumer Price Index (CPI) .

To analyze the corporate maturity structure-investment linkage, we use the standard investment model similar to those used in the literature (Lang et al., 1996; Aivazian et al., 2005a and 2005b; Badertscher et al., 2013; Zubair et al., 2020). The empirical model with multi-dimensional fixed effects used in the study is given below.

$$Y_{i,t} = \beta_0 + \beta_1 \, x \, Maturity_{i,t} + \sum_k \lambda_k \vartheta_{k,i,t-1} + \mu_i + \gamma_{s,t} + \Omega_{r,t} + \varepsilon_{i,t} \qquad (1)$$

where Y denotes investment rate for firm i in year t and measured as the logarithmic change in net tangible assets (Akbar et al., 2013; Gebauer et al., 2018; Kalemli-Özcan et al., 2019). In previous studies, debt maturity is measured as the ratio of long-term debt to total debt (Kalemli-Özcan et al., 2019; Cai et al., 2008; Antoniou et al., 2006; Alcock et al., 2012; Barclay and Smith, 1995). Our bank-firm-loan level credit database allows us to measure maturity in a more precise way. Unlike previous studies, we measure firm-level maturity as the weighted average of the maturity of firms' outstanding loans in terms of days where the weights are outstanding loan amounts. ϑ stands for the control variables including firm size measured as the logarithm of total assets (Zubair et al., 2020; Kalemli-Özcan et al., 2019; Gebauer et al., 2018; Min & Smyth, 2016); leverage calculated as sum of total debt scaled by total assets (Cai et al., 2008; Antoniou et al., 2006; Alcock et al., 2012; Barclay & Smith, 1995); liquidity measured as the sum of cash and equivalents scaled by total assets; age measured as the log of number of years since firm's founding, and profitability calculated as earnings before interest, tax and depreciation scaled by total assets (Kaplan & Zingales, 1997; Dang, 2011; Lang et al., 1996; Aivazian et al., 2005a, 2005b). We further control for the growth opportunities measured as the logarithmic change in real net sales deflated by CPI since the market-based measures such as Tobin's Q value are not available for the sample consisting of the privately held firms (Jiang et al., 2021; Gebauer et al., 2018; Mortal & Reisel, 2013; Yarba & Yassa, 2022). We include firm fixed effects (μ) in the model to control unobservable firm-specific and time-invariant heterogeneity. To avoid possible variations in firm investment driven by technology or demand shocks and control any time-variant region and industry factors, we further include sector x year (γ) and region x year fixed effects (Ω) to the model. Based on Eurostat, sector and region classifications are at NACE-2 and NUTS-3 levels, respectively.ε is the idiosyncratic error term and robust standard errors are clustered at the firm level.

3. Empirical Results

Table 2 presents the empirical results of the baseline model in Equation 1 for the full sample. The results in Column 1, where we include firm fixed effects, show that there is a significant association between maturity and investment. We find that a 10% increase in maturity is associated with a 0.9% increase in investment. This is statistically significant at the 1% level and economically plausible. We further control for any possible time-variant region and industry factors by including region x year and sector x year fixed effects in Columns 2 and 3.

The results remain robust, suggesting that corporate investment is increasing with the longer maturity of bank loans.

Myers (1977) argues that firms may forgo some positive-net present value projects, resulting in underinvestment since the benefits from additional investment accrue largely to existing debt holders rather than shareholders, which is referred to as debt overhang in the literature. These underinvestment incentives can be mitigated by lowering leverage and/or shortening the maturity structure of debt (Billett et al., 2007; Johnson, 2003; Myers, 1977). In addition, shorter maturity of debt enables better monitoring and can mitigate debt overhang (Diamond, 1991 and 1993). Contrary to these arguments, our results show that after controlling leverage, firms with longer debt maturity tend to have higher investment rates, which lends support to the literature that reports the detrimental impact of short-term debt on investment behavior (Diamond & He, 2014; Diamond, 1993; Acharya et al., 2011; Pacheco, 2017).

Table 2. Debt Maturity and Investment: Baseline Model Results

	Investment		
	(1)	(2)	(3)
Maturity	0.08912***	0.08626***	0.08646***
	(0.00186)	(0.00189)	(0.00189)
Size	-0.26614***	-0.26998***	-0.26998***
	(0.00373)	(0.0041)	(0.0041)
Profitability	0.16751***	0.17098***	0.17094***
	(0.00799)	(0.00806)	(0.00806)
Growth Opportunity	0.01948***	0.02191***	0.02169***
	(0.00183)	(0.00183)	(0.00184)
Leverage	-0.04692***	-0.02504***	-0.02482***
	(0.00833)	(0.00838)	(0.00839)
Liquidity	0.76941***	0.74746***	0.74758***
	(0.01791)	(0.01786)	(0.01787)
Firm Age	-0.05742***	-0.08002***	-0.07826***
	(0.0072)	(0.00909)	(0.00913)
Firm FE	Yes	Yes	Yes
Sector x year FE	No	Yes	Yes
Region x year FE	No	No	Yes
Number of Observations	937,110	937,110	937,110
Adj. R-squared	0.35306	0.35881	0.35969

Note: This table presents estimations of the empirical model in Equation 1 for the full sample. The details of the sample and definitions of variables are given in Section 2. Robust standard errors clustered at the firm level are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Moreover, the results show that profitability, liquidity and growth opportunities have significant positive associations with corporate investment. This indicates that firms with higher profitability, liquidity, and growth opportunities tend to invest more, providing supporting evidence of the positive impact of growth opportunities and cash flow on investment

(Lang et al., 1996; Martínez-Carrascal & Ferrando, 2008). On the other hand, firm size and age have significant negative associations with investment, which suggests that older firms tend to invest less and investment decreases with firm size. The negative association between firm size and investment indicates decreasing returns to scale in investment. Results also show that firm leverage has a significant negative association with investment, providing evidence in support of the arguments on the detrimental impact of high corporate indebtedness on investment (Aivazian et al., 2005a and 2005b; Kalemli-Özcan et al., 2019; Cevik & Miryugin, 2020; Dang, 2011; Borensztein & Ye, 2021; Yarba, 2023).

We next examine whether firm size matters. The positive maturity-investment linkage is expected to be more pronounced for small firms due to their higher rollover risk since they tend to be informationally opaque and dependent on banks for their external financing (Kashyap et al., 1994, 1996). To investigate this, we split out the sample into firm size groups and repeat our analysis for micro-sized, small, medium-sized and large firms.[4] Following the literature (e.g., Guevara et al., 2021; Lawless et al 2015, among others), the firm size groups are determined by using 10, 50 and 250 employees as thresholds based on European Union as well as the Turkish official definition. The results are presented in Table 3.

The results show that the coefficient of maturity is positive and highly significant at the 1% level. This suggests that there is a positive significant association between maturity and investment for all size groups. However, the positive impact of maturity on investment decreases with firm size. In other words, smaller firms benefit from longer debt maturity more than larger firms. This indicates that small firms suffer more from the downside of short-term debt such as higher rollover risk than large firms. This finding is in line with the arguments in the literature that the continuation of the lending relationship of small firms with banks is less valuable to banks compared to larger firms, and borrowing capacity as well as access to credit problem decreases with firm size (see Berger and Udell, 1992; Khwaja and Mian, 2008; Iyer et al., 2014; Yarba and Güner, 2020a and 2020b).

[4] To check whether the differences in estimated coefficients across firm size groups are statistically significant, we also interacted maturity with firm size dummies. The results show that the differences in estimated coefficients are statistically significant and economically similar to those in Table 3.

Table 3. Debt Maturity and Investment by Firm Size

	Investment				
	Micro	Small	Medium	SMEs	Large Firms
	(1)	(2)	(3)	(4)	(5)
Maturity	0.09510***	0.08848***	0.06850***	0.08704***	0.05163***
	(0.00312)	(0.00281)	(0.00511)	(0.00191)	(0.01279)
Size	-0.30250***	-0.27668***	-0.24950***	-0.27046***	-0.23887***
	(0.00658)	(0.00756)	(0.01604)	(0.00414)	(0.03744)
Profitability	0.16759***	0.17010***	0.15716***	0.17053***	0.22331***
	(0.01279)	(0.01227)	(0.02491)	(0.00815)	(0.0536)
Growth Opportunities	0.02415***	0.01957***	0.0054	0.02153***	0.03344**
	(0.00271)	(0.00329)	(0.00567)	(0.00185)	(0.01581)
Leverage	0.02870**	-0.07240***	-0.09835***	-0.02407***	0.00472
	(0.01293)	(0.01305)	(0.02957)	(0.00846)	(0.07084)
Liquidity	0.77587***	0.71890***	0.70835***	0.74766***	0.68853***
	(0.02592)	(0.02919)	(0.05852)	(0.01798)	(0.15503)
Firm Age	-0.05089***	-0.07539***	-0.11045***	-0.07796***	-0.11263
	(0.01532)	(0.01456)	(0.02883)	(0.00922)	(0.09078)
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector x year FE	Yes	Yes	Yes	Yes	Yes
Region x year FE	Yes	Yes	Yes	Yes	Yes
Number of Observations	482,813	364,162	78,312	925,287	11,823
Adj. R-squared	0.41242	0.4379	0.50463	0.36067	0.53578

Note: This table presents estimations of the empirical model in Equation 1 for micro-sized, small, medium-sized and large firms, where the number of employees of 10, 50, and 250 are used as thresholds. SMEs include micro, small and medium firms. Definitions of variables are given in the Section 2. Robust standard errors clustered at the firm level are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

Some empirical studies reporting the negative association between debt maturity and corporate investment put forward that this negative linkage is more pronounced for the firms with high growth opportunities (Aivazian et al., 2005a; Nnadi et. al., 2020). To investigate the issue and to achieve further confirmation of our findings, we next examine whether the positive association between maturity and investment is still valid for firms with higher growth opportunities. To this end, we repeat our analysis separately for the firms with high and low growth opportunities.[5] Firms with high growth opportunities are defined as those whose beginning-of-year growth opportunities are higher than the median of the sample distribution.[6]

[5] Alternatively, we interacted maturity with a dummy for high growth opportunities. The results show that the differences in estimated coefficients are statistically significant and economically similar to those in Tables 4.
[6] We also use third quartile as an alternative threshold. The results are similar with those reported in Table 4. Thus, they are not reported to conserve space but are available upon request.

The results reported in Table 4 show that there is a significant positive association between debt maturity and investment for both subgroups (Columns 1 and 2). Aivazian et al. (2005a) argue that debt maturity negatively affects the investment of US firms with high growth opportunities and has no significant effect on investments of firms with low growth opportunities. Similarly, Nnadi et. al. (2020) argue that high-growth firms reduce debt maturity and leverage to mitigate underinvestment risk. Contrary to these arguments in the literature, our findings suggest that firms with high growth opportunities benefit more from longer debt maturity.

Table 4. Debt Maturity and Investment by Growth Opportunities, Firm Age and Capital Intensity

	Investment					
	Low Growth Opportunities	High Growth Opportunities	Old Firms	Young Firms	Low Capital Intensity	High Capital Intensity
	(1)	(2)	(3)	(4)	(3)	(4)
Maturity	0.07340***	0.10192***	0.07824***	0.10186***	0.09623***	0.07050***
	(0.00307)	(0.00296)	(0.00229)	(0.00372)	(0.0033)	(0.00191)
Size	-0.28344***	-0.25860***	-0.24834***	-0.35235***	-0.23554***	-0.15268***
	(0.00723)	(0.00591)	(0.00562)	(0.00739)	(0.00685)	(0.00392)
Profitability	0.16778***	0.15743***	0.15379***	0.17835***	0.18841***	0.12114***
	(0.01325)	(0.01294)	(0.01052)	(0.01371)	(0.01254)	(0.00799)
Growth Opportunities	0.02261***	0.03804***	0.01884***	0.01599***	0.00568*	0.02225***
	(0.00452)	(0.0045)	(0.00232)	(0.00308)	(0.00321)	(0.00178)
Leverage	-0.00026	-0.07356***	-0.02018*	-0.03105**	-0.00561	-0.04046***
	(0.01394)	(0.01256)	(0.0108)	(0.01538)	(0.01394)	(0.00807)
Liquidity	0.76671***	0.66243***	0.74578***	0.81764***	0.63711***	0.44811***
	(0.03007)	(0.02629)	(0.02379)	(0.03071)	(0.02576)	(0.01665)
Firm Age	-0.04755***	-0.06660***	0.00164	-0.14548***	-0.00032	-0.12915***
	(0.01721)	(0.01301)	(0.0327)	(0.02456)	(0.01676)	(0.0097)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector x year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region x year FE	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	452,534	484,576	556,877	380,233	470,409	466,701
Adj. R-squared	0.53161	0.53413	0.33444	0.46879	0.44838	0.53478

Note: This table presents estimations of the empirical model in Equation 1. Definitions of variables are given in the note for section 2. Robust standard errors clustered at the firm level are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

We further examine whether firm age and capital intensity matter. The positive association between maturity and investment is expected to be more pronounced for low capital-intensive firms and young firms due to their higher rollover risk related to their lower borrowing capacity and higher credit constraints evidenced in the literature (Guariglia, 2008; Yarba, 2023). To

investigate this, we separately repeat our analysis for high and low capital-intensive firms.[7] A firm is classified as "high capital-intensive" if its beginning-of-year capital intensity is higher than the median of the sample distribution and the remainder are classified as low capital-intensive firms.[8] Following the literature, we measure capital intensity as the ratio of real tangible fixed assets to the number of employees. We also split our sample into young and old firms using 10 years as the threshold.[9] The results reported in Table 4 reveal that the positive association between debt maturity and investment is evident for all subgroups, which provides additional robustness for our baseline results. The results also show that the positive relationship is more pronounced for young firms and low capital-intensive firms, indicating their higher debt rollover risk.[10]

Overall, our results highlight the important role of longer debt maturity structure in fostering corporate investment. As in many emerging countries, bank lending is the dominant source of external finance for corporates in Türkiye where more than 95% of outstanding loans are granted by banks. However, lending conditions are highly cyclical and vulnerable to domestic and global financial conditions and economic policy uncertainties. Yarba and Güner (2020b) show that increases in uncertainties significantly affect corporate leverage dynamics in Türkiye. Periods of high uncertainty intensify the risk of information asymmetry and increase the volatility of future cash flows, which may hinder borrowers' ability to repay their debts. Accordingly, Tran and Phan (2022) show that creditors respond to policy uncertainty by shortening debt maturity. In the same vein, Datta et al. (2019) provide significant evidence of a strong relationship between debt maturity and policy uncertainty, which is more pronounced for financially constrained firms. On the other hand, in their recent study, Yarba and Güner (2020a) provide significant evidence that improvements in financial development foster Turkish corporates' long-term debt usage, and point out the importance of financial development on maturity structure. However, while external financing as an alternative to straight bank debt is quite limited, the stock market capitalization is low in comparison to her peer countries, and there are only around four hundred listed firms (71% of which are large

[7] To check whether the differences in estimated coefficients across subsamples based on firm age and capital intensity are statistically significant, we also interacted maturity with related dummies. The results show that the differences in estimated coefficients are statistically significant and economically similar to those in Table 4.
[8] We also use 75th and 90th percentiles as alternative thresholds. The results are similar with those reported in Table 4. For brevity, they are not reported but are available upon request.
[9] The results using alternative thresholds such as 5 years and the median of the age distribution are in line with those reported in Table 4. For brevity, they are not reported for brevity but are available upon request.
[10] We also analyze heterogeneous effects by sector, leverage and export orientation due to their important roles on firms' credit access and borrowing capacity evidenced in the literature. The positive maturity-investment linkage is evident for all subgroups. For brevity, they are not reported but are available upon request.

firms) in Türkiye (Yarba and Yassa, 2021). Considering the linkage of corporate debt maturity structure with investment, our findings shed light on the importance of a detailed analysis to develop appropriate policies to improve financial deepening and prolong the maturities in the country. As this is beyond the scope of this paper, we leave the issue for our future studies.

4. Additional Robustness Checks

In this section, we conduct several additional tests to provide further confirmation of the robustness of our baseline results. First, we use alternative measurements of investment rate as the dependent variable in our empirical model. In our baseline specification, following the literature, we use log change in net tangible assets as the measurement of investment rate (see Kalemli-Özcan et al., 2019 and Gebauer et al., 2018 among others). As additional robustness checks, we use gross tangible assets including depreciation instead of net tangible assets in the calculation of investment rate, investment (annual change in net tangible assets) to total assets ratio and gross investment (annual change in gross tangible assets) to total assets alternatively. The estimation results presented in Columns 1, 2 and 3 in Table 5 using alternative measurements of investment rate are in line with our main results reported in Table 2.

Existing literature uses the definition of maturity as the share of long-term debt in total debt whereas long-term debt is the outstanding debt that has a maturity equal to or longer than one year. Our granular bank-firm-loan level database enables us to measure maturity in a more precise way. In our analysis, we measure firm-level maturity as the weighted average of its all outstanding loans' maturities in terms of days where the weights are outstanding loan amounts. Nonetheless, we re-estimated our model using the share of long-term debt in total debt as maturity. The re-estimated results are in line with our main results (Column 4, Table 5).

The FX corporate debt is concentrated among a small number of firms (5% of firms on average) over the sample period. The usage of FX-denominated credits is highly regulated and they tend to be used for long-term investments in Türkiye (CBRT, 2015; 2017; 2018a, 2018b). To mitigate endogeneity concerns and control the possible bias introduced by FX-denominated corporate debt, we exclude the firms holding FX debt in our baseline specification. Nonetheless, we include these firms and repeat our analysis with this extended sample. The re-estimated results presented in Column 5 of Table 5 are in line with our main results. Moreover,

including firms that have access to the bond market and firms that are listed on Borsa Istanbul (around 400 firms) does not alter our results.[11]

Table 5. Additional Robustness Checks

	Gross Investment Rate	Net Investment/ Total Assets	Gross Investment/ Total Assets	Maturity: Long-term Debt/Total Debt	Including FX Debt Holders
	(1)	(2)	(3)	(4)	(5)
Maturity	0.06057***	0.02585***	0.02738***	0.08459***	0.08495***
	(0.00115)	(0.00033)	(0.00035)	(0.00356)	(0.0018)
Leverage	-0.01244**	-0.01612***	-0.01646***	-0.01938**	-0.02720***
	(0.00536)	(0.00162)	(0.00175)	(0.00840)	(0.00811)
Size	-0.19462***	-0.08383***	-0.09284***	-0.26628***	-0.26369***
	(0.00266)	(0.00078)	(0.00085)	(0.00411)	(0.00394)
Profitability	0.12650***	0.03035***	0.03409***	0.17073***	0.17153***
	(0.00456)	(0.00161)	(0.00174)	(0.00807)	(0.00776)
Growth Opportunities	0.01859***	0.00498***	0.00620***	0.02220***	0.02339***
	(0.00122)	(0.00029)	(0.00031)	(0.00184)	(0.00179)
Liquidity	0.47896***	0.13091***	0.13048***	0.74846***	0.74877***
	(0.01087)	(0.00298)	(0.00322)	(0.01789)	(0.01731)
Age	-0.13501***	0.00588***	-0.00552***	-0.08435***	-0.07824***
	(0.00617)	(0.00176)	(0.00191)	(0.00914)	(0.00865)
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector x year FE	Yes	Yes	Yes	Yes	Yes
Region x year FE	Yes	Yes	Yes	Yes	Yes
Number of Observations	937,110	937,110	937,110	937,110	994,552
Adj. R-squared	0.35969	0.39853	0.43162	0.35798	0.35277

Note: This table presents estimations of the empirical model in Equation 1. Definitions of variables are given in the Section 2. Robust standard errors clustered at firm level are reported in parentheses. ***, **, and * indicate statistical significance at 1%, 5% and 10%, respectively.

In our main analysis, we do not include the maturity of trade credit in our model due to the arguments in the literature that it serves transaction purposes rather than financing activities (Gebauer et al., 2018, among others). Besides, firms that have long-term trade debt (outstanding trade debt with a maturity of one year or longer than a year) are quite limited (around 3% of the sample). Nonetheless, we include the maturity of trade credit as an additional

[11] For brevity, these results are not reported in the paper but are available upon request.

control variable and repeat our analysis. The results are qualitatively and quantitatively similar to those in Section 3.[12]

As a final robustness check, to analyze the possible bias induced by entry/exit, we repeat our analysis for firms with at least T years of consecutive data, where $T \in [4, 11]$. Our main results are based on the sample where T=3 since the lagged value of sales growth is incorporated into our empirical model. Results show no bias due to entry and/or exit.[13]

5. Concluding Remarks

Even though the maturity structure of debt is an essential component of corporate capital structure decisions, prior literature presents mixed results and there is no consensus on the impact of debt maturity structure on investment decisions. To expand upon the small literature and present a complete picture of the issue for emerging markets, we analyze the corporate debt maturity structure and investment linkage for Türkiye, one of the largest emerging countries, over the last decade.

Utilizing confidential and comprehensive firm-level data, which contains the universe of all incorporated firms in Türkiye, the results of the panel regression model with multi-dimensional fixed effects reveal that corporate debt maturity has a significant positive association with corporate investment, which suggests that longer debt maturity fosters corporate investment. The results show that the association is larger when firm size is smaller, indicating that small firms suffer from the downside of short-term debt such as higher rollover risk more than the large firms. This result is in line with the arguments in the literature that the continuation of the lending relationship of small firms with banks is less valuable to banks compared to larger firms and that borrowing capacity as well as access to credit problems decrease with firm size. In addition, we examine possible differential effects of firm age, growth opportunities, and capital intensity. While the positive association between debt maturity and investment is evident for all subgroups, the impact is more pronounced for young firms than old firms. This is also the case for the firms with high-growth opportunities and low capital-intensive firms indicating their higher rollover risk.

[12] For brevity, these results are not reported in the paper but are available upon request.
[13] For brevity, these results are not reported in the paper but are available upon request.

As in many emerging countries, bank lending is the dominant source of external finance for corporates in Türkiye, whereas alternative sources such as equity and the bond market are quite limited. However, bank lending conditions including maturity structure are highly cyclical and vulnerable to domestic and global financial conditions and economic policy uncertainties where creditors respond to policy uncertainties by shortening debt maturity (Tran and Phan, 2022; Wu et al., 2022; Yarba and Güner, 2020b). Considering the real consequences of the debt maturity structure, our findings highlight the importance of the reducing the policy uncertainties as well as the necessity to broaden the range of external financing and deepen the capital markets.

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