World Journal of Applied Economics (2025), 11(1): 1-15
doi: 10.22440/wjae.11.1.1

econworld
Research Article

Is Corporate Indebtedness a Drag on Investment after Financial Shocks?[a]

İbrahim Yarba[b]

Received: 03.12.2024; Revised: 17.02.2025; Accepted: 19.02.2025

Using novel firm-level data covering the universe of all incorporated manufacturing firms in Türkiye, this paper examines whether elevated corporate indebtedness holds back investment in the aftermath of a large financial shock, such as the one experienced in Türkiye in 2018. The results of the difference in differences model reveal that high-indebted firms reduce their investments significantly compared to low-indebted firms. This suggests that high debt remaining on corporate balance sheets seems to become a substantial impediment to investment. Accordingly, loans are found to be decreasing with leverage. The results also show that the detrimental impact of high financial leverage seems to be valid only for SMEs but not for large firms. Moreover, the effect is more pronounced for non-exporters and young firms, and firms with high cash holdings could attenuate the adverse impact of high indebtedness.

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

Keywords: Corporate debt; Financial shocks; Firm investment; Debt overhang; Corporate cash policy

1 Introduction

Corporate indebtedness has increased rapidly in emerging countries over the last decade, largely due to the low-risk aversion environment, easy access to credit, and low interest rates. During and after the 2008 global financial crisis, quantitative easing became widespread in advanced economies such as the United States, the United Kingdom, and the Eurozone. Expansionary monetary policies adopted by central banks of advanced economies increased global liquidity and prompted capital flows into emerging countries. Low interest rates coupled with easy access to credit amplified the acceleration in domestic demand and credit growth in emerging markets. As such, non-financial corporate debt in emerging countries surged from about 57% of GDP in 2008 to 102 percent of GDP in 2019 (BIS, 2025). The elevated indebtedness renders corporates vulnerable to shifts in risk sentiment and financial shocks, posing challenges for investments and substantial growth in emerging countries. Accordingly, the issue has received vast attention on both the policy-making and academic fronts (Borensztein & Ye, 2021; World Bank, 2017; Köse et al., 2017).

This paper aims to analyze the case of Türkiye, one of the largest emerging economies. In particular, I examine whether elevated corporate indebtedness becomes an impediment

[a] I thank the editor and two anonymous referees for their valuable comments and suggestions.
[b] Central Bank of the Republic of Türkiye, Ankara, Türkiye. email: ibrahimyarba@gmail.com
0000-0001-8429-9334

to investment in the aftermath of a financial shock, which makes Türkiye a good laboratory for analyzing the issue. As in emerging countries, non-financial corporate debt in percent GDP was almost doubled in Türkiye over the period 2008-2019 (Figure 1). At the same time, capital formation as a fraction of GDP had an increasing trend (Figure 2). However, it declined dramatically in 2018 when Türkiye experienced a large financial shock triggered by the escalation of political tension between the US and Türkiye. The Turkish lira experienced a sharp depreciation against the US dollar in mid-2018, which was 81% at its peak compared to end-2017 (Figure 3). The increases in Credit Default Spread (CDS), implied volatilities of the foreign exchange (FX) market, and spreads in the bond market were even more dramatic: 225% for CDS (Figure 4), 428% for implied volatility of USD/TRY (Figure 3), and 104% for bond market spread (Figure 4).

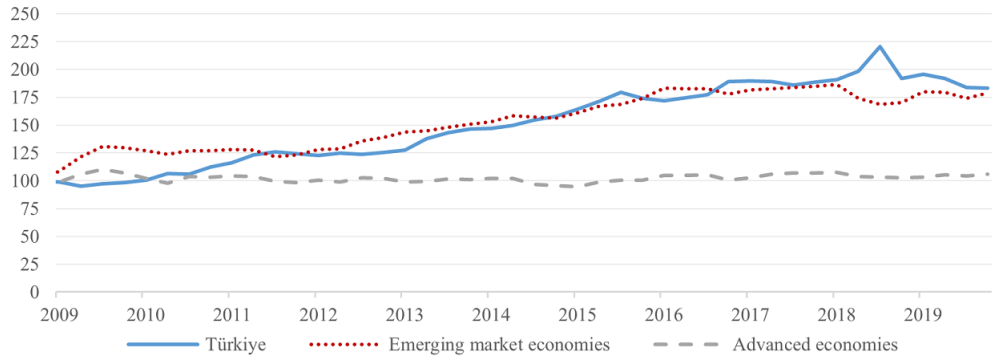

Figure 1: Non-financial corporate debt, in percent of Gross Domestic Product (GDP)
Source: BIS (2025) Quarterly data over the 2009Q1-2019Q4 period, (2008Q4=100)

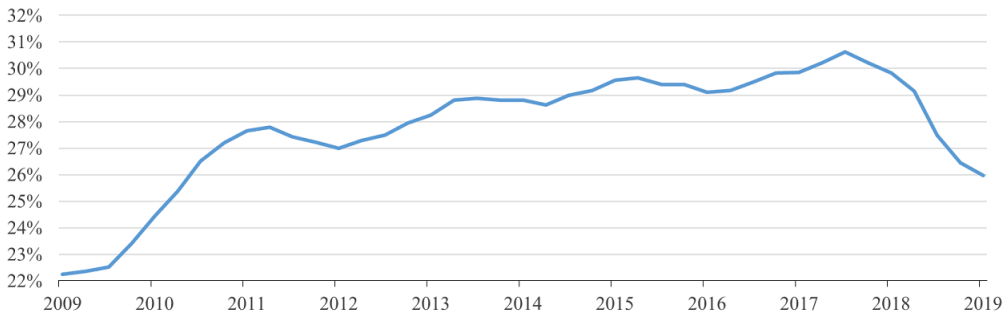

Figure 2: Gross fixed capital formation trend in Türkiye, in percent of GDP
Source: Turkish Statistical Institute. Moving average (4-quarter) of gross fixed capital formation in percent of GDP over the 2009Q1-2019Q4 period.

To analyze whether the elevated corporate indebtedness impeded investment in the aftermath of a large financial shock such as the one experienced in 2018 in Türkiye, I employ a difference-in-differences (DID) estimation approach. This enables me to compare the investment behavior of firms with different indebtedness before and after the financial shock. The dataset utilized, a novel aspect of the study, encompasses the universe of incorporated manufacturing firms in Türkiye.[1] The granularity of the micro-rich data used in the study

[1] The details of the datasets and variables used in the study are given in Section 2.

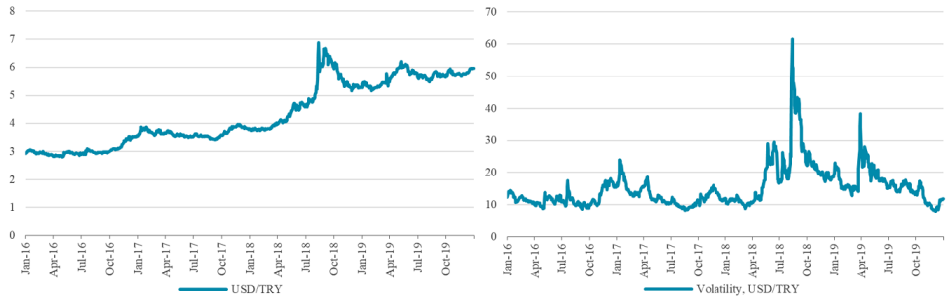

Figure 3: Evolution of Turkish lira and implied volatility

Source: Bloomberg. On the left-hand side, the figure presents the unit value of the Turkish lira against US dollars (USD/TRY). On the right-hand side, the figure presents 1-month implied volatilities of USD/TRY. Daily data over the 2016-2019 period.

enables me to saturate the model with multi-dimensional fixed effects. These allow me to account for variations in investment behaviors across firms, which might be driven by demand or technology shocks rather than the corporate debt, i.e. region- and sector-year fixed effects. The results of the DID model show that investment is decreasing with financial leverage in the aftermath of the shock. On average, high-indebted firms reduce their investments by 1.5 percentage points compared to low-indebted firms.[2] Accordingly, corporate loans are found to be decreasing with leverage. This suggests that high corporate indebtedness hinders investment during the post-financial shock period. I further examine the heterogeneities across firms. The results reveal that the adverse impact of high leverage on investment is valid for SMEs but not for large firms. Besides, the detrimental impact

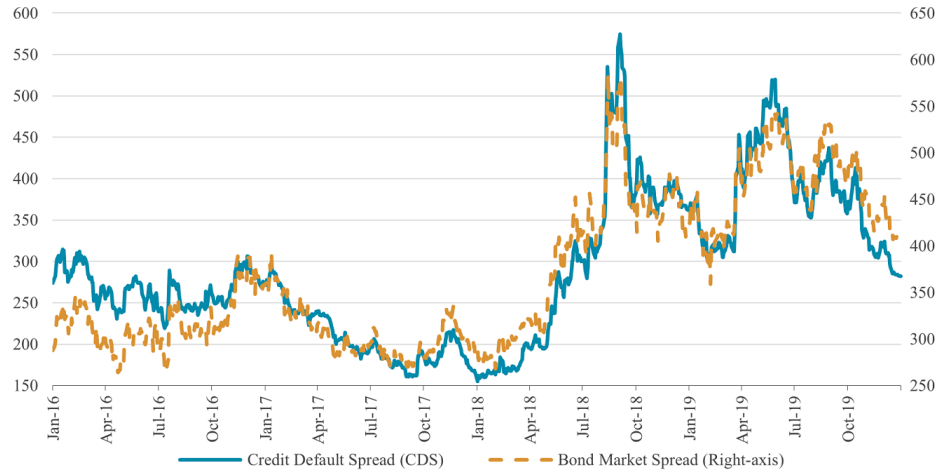

Figure 4: Credit default spread (CDS) and spreads in the bond market

Source: Bloomberg. The solid line represents the 5-year Credit Default Spread in USD for Türkiye, which has the highest trading volume. The dashed line represents the bond market spread, the commonly used Emerging Market Bond Index spread (EMBI) for Türkiye. Daily data over the 2016-2019 period.

[2] On average, this amounts to a 14% increase in the investment rate. This is statistically significant and economically plausible.

is more pronounced for non-exporters and young firms, indicating their lower tolerance to elevated indebtedness. The results also show that firms with high cash flow could lessen the adverse impact of high financial leverage.

The results of this study contribute to a large literature on the impact of capital structure on investment activity. Evidence provided in the existing literature is mixed, and there is no consensus on the corporate leverage and investment linkage. On the one hand, agency costs reduction between shareholders and managers (Ross, 1977; Grossman & Hart, 1982), disciplining managers to avoid wasting resources on perks (Grossman & Hart, 1982) and tax advantages (Modigliani & Miller, 1963) provided by external debt are shown to have positive impacts on investment. On the other hand, Myers (1977) argues that debt overhang induces underinvestment as existing debt holders benefit from proceeds of additional investments rather than shareholders. High debt inhibits investment activities by increasing payment and interest expenses and thereby lowering available funds for investment. The findings of this paper are in line with previous empirical work that lends support to debt overhang which induces underinvestment (e.g., Borensztein & Ye, 2021; Çevik & Miryugin, 2020; Gebauer et al., 2018; Lang et al., 1996). In particular, this paper documents the differential impact of high leverage that becomes a strenuous burden on investment after financial shocks. This aligns with the findings of Kalemli-Özcan et al. (2019), which, using a broad sample of European firms, report the role of high leverage in declining investment in the aftermath of the 2007-2009 global financial crisis.

Moreover, this study expands upon the small empirical literature on the corporate debt-investment linkage in emerging economies. Borensztein & Ye (2021), for instance, shows the detrimental impact of high leverage on investment in emerging and developing economies. Similarly, Das & Tulin (2017) and Magud & Sosa (2015) report the negative association between corporate indebtedness and investment. However, the lack of representativeness of their samples is the main drawback of these studies, which can be attributed to the data availability of privately held firms. The former study utilizes a dataset of 10,974 Indian firms, while the latter uses 16,000 publicly traded firms in emerging countries. Unlike these studies, this paper investigates the issue in detail by utilizing a comprehensive firm-level dataset, which contains the universe of all incorporated manufacturing firms in Türkiye.

Finally, this paper contributes to the literature on the role of corporate cash holdings. Previous literature (e.g., Jensen, 1986; Pinkowitz et al., 2006; Dittmar & Mahrt-Smith, 2007) provides ample evidence of the downside of excessive cash holdings, such as agency costs associated with excessive liquidity. Contrary to these findings, this study reveals the significant role of cash holdings in attenuating the adverse effect of high indebtedness on investment, which supports the precautionary motive for cash holdings, which alleviate the underinvestment problem by providing a buffer against financial frictions (e.g., Harford et al., 2014; Stiglitz & Weiss, 1981; Opler et al., 1999).

The remainder of the paper is organized as follows: The data and empirical framework used in the paper are introduced in Section 2. The results of the empirical analysis are reported in Section 3. A series of additional robustness checks is discussed in Section 4, and concluding remarks are presented in Section 5.

2 Data and Empirical Methodology

The unique panel dataset used in this study is constructed using various sources. The main source is the Revenue Administration dataset (RA), which is made available by the Central Bank of the Republic of Türkiye (CBRT). This confidential firm-level database covers the universe of incorporated manufacturing firms in Türkiye and contains financial data, including annual income statements and balance sheets. In addition, the Credit Register database of the Banks Association of Türkiye, providing firm-level credit information in detail, is used. The dataset is further linked to the firm-level employment database of the Social Security Institution of Türkiye to obtain information about firm size.

As is common in the literature, firm-year observations with inconsistent data, such as negative total assets, total liabilities, employment, debt, or fixed assets, are dropped. Non-profit organizations and governmental firms are excluded. To minimize the possible influence of outliers, all firm-level variables are winsorized at the first percentile in each tail. Descriptive statistics on all variables used in the empirical analysis are presented in Table 1.

Table 1: Summary statistics

	Full sample			**SMEs**			**Large firms**		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Investment	0.11	0.00	0.26	0.11	0.00	0.26	0.14	0.07	0.20
Leverage	0.12	0.02	0.16	0.11	0.02	0.16	0.27	0.28	0.19
Firm Size	14.86	14.83	2.11	14.76	14.79	2.01	19.25	19.22	1.33
Firm growth	0.15	0.01	0.74	0.15	0.01	0.75	0.10	0.07	0.37
Maturity	0.13	0.00	0.23	0.13	0.00	0.23	0.26	0.22	0.23
Cash flow	0.00	0.00	0.11	0.00	0.00	0.11	-0.01	-0.02	0.12
Firm age	2.33	2.48	0.80	2.32	2.48	0.80	2.85	3.04	0.69
Sample	313,655			306,428			7,227		

Notes: Descriptive statistics for the 2016-2019 period. *Leverage* is the total financial debt ratio scaled by total assets; investment rate is the logarithmic change in plant, machinery and equipment; firm size is log of total assets; growth is the percentage change of annual net sales; maturity is the share of long-term debt in total debt; cash flow is earnings before interest, tax, and depreciation scaled by total assets, and firm age is log of the number of years since founding. A firm is classified as a large firm if its number of employees is higher than 250, and SME, otherwise.

To compare the investment behavior of firms with different indebtedness before and after the financial shock, I employ a difference-in-differences (DID) approach where I define the pre-period as 2016-2017 and the post-period as 2018-2019. In the model, I control for the relevant determinants of investment commonly used in the literature (e.g., Badertscher et al., 2013; Zubair et al., 2020; Lang et al., 1996). Specifically, I control for firm size, age, and cash flow. Firm size is measured by the logarithm of total assets, firm age is defined as the logarithm of the number of years since the firm's founding, and cash flow is proxied by earnings before interest, tax, and depreciation scaled by total assets. I also control for the maturity structure of debt. It is measured as the share of long-term debt in total debt, where long-term debt is the outstanding debt with a maturity of one year or longer than a year. Since Tobin's q and other market-based proxies are not available for privately held firms, which are 99.79% of the sample, following the literature, sales growth measured as the annual percentage change of net sales is used to factor in growth opportunities (e.g., Asker et al., 2015; Mortal & Reisel, 2013; Yarba & Yassa, 2022; Shin & Stulz, 1998).

Variations in investment behaviors across firms may be driven by demand or technology shocks rather than corporate debt. Thus, province x year ($\vartheta_{r,t}$) and sector x year ($\delta_{s,t}$) fixed effects are included in the model to control for any possible omitted and time-variant region and industry factors. The specification further controls for firm fixed effects (μ_i) to absorb any firm-specific and time-invariant (unobserved) heterogeneity. The econometric specification employed in this paper is given below:

$$Y_{i,t} = \lambda_0 + \lambda_1\ Lev_i + \lambda_2\ Post_i + \lambda_3\ Post_t\ Lev_i + \sum_k \beta_k\ \theta_{k,I,t-1} + \mu_i + \vartheta_s\ \delta_t + \phi_r\ \delta_t + \epsilon_{i,t} \tag{1}$$

The outcome of interest is the investment rate ($Y_{i,t}$) for the firm i in year t. Following the literature, it is measured as the logarithmic change in plant, machinery, and equipment. The main variable of interest, corporate financial leverage (Lev_i), is the 2017 year-end financial debt to total assets ratio.[3] Alternatively, instead of a continuous variable, I also use a dummy variable equal to one if the leverage of firm i is in the highest quartile of the sample distribution at the end of 2017 and zero otherwise. This allows me to examine how firms with low and high indebtedness respond differentially to the shock in terms of investment behavior. Lev_i is absorbed by firm fixed effects in the model since it is defined as time-invariant at the firm level. $Post_t$ takes a value of one for the post-crisis period from 2018 to 2019 and zero otherwise. $\mu_i, \vartheta_s\ \delta_t$, and $\phi_r\ \delta_t$ are the firm, sector x year, and region x year fixed effects, respectively. θ represents the control variables (firm size, cash flow, age, maturity, and growth opportunities), and $\epsilon_{i,t}$ is the idiosyncratic error term.

3 Empirical Results

3.1 Baseline specification

Table 2 presents the estimations of eq. (1) for the full sample. All regressions include firm, sector x year, and province x year fixed effects, which control for any time-invariant unobserved heterogeneity and any time variant unobservable region and industry factors. In column 1, the coefficient of *Post* x *Lev* is negative and significant at the 1% level. The result remains robust when firm-specific variables, including firm size, cash flow, age, maturity, and growth opportunities, are controlled for (column 2). This suggests that investment decreases with financial leverage during the post-financial shock period.

I also estimate the model using a binary variable instead of a continuous variable, which allows me to examine how firms with low and high indebtedness respond to the shock differentially. The binary variable is equal to one for the firms whose leverage ratios (measured as financial debt to total assets) are in the top quartile of the sample distribution at the end of 2017, and zero otherwise.[4] The coefficients of the interaction term, *Post* x *Lev* reported in columns 3 and 4, are also negative and statistically significant, consistent with those reported in columns 1 and 2. The results show that high-indebted firms reduce their investments by 1.5 percentage points during the post-financial shock period compared to

[3] Robustness tests using alternative measurements for investment and leverage are discussed in Section 4.
[4] The results using the median value as the threshold are similar, thus for the sake of brevity, they are not reported but available upon request.

Table 2: Baseline results: Corporate indebtedness and investment, full sample

Dependent variable:	Panel A: Continuous		Panel B: Binary	
Investment	(1)	(2)	(3)	(4)
Post x Leverage	-0.055***	-0.044***	-0.019***	-0.015***
	(0.006)	(0.006)	(0.002)	(0.002)
Firm-specific controls	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes
Observations	313,655	313,655	313,655	313,655
Adj. R-squared	0.411	0.414	0.411	0.414

Notes: $Post_t$ is one for the post-crisis period from 2018 to 2019 and zero otherwise. In Panel A, Lev_i is the 2017 year-end financial debt-to-total assets ratio. In Panel B, it is the binary variable that is equal to one for the firms whose leverage ratios are in the top quartile of the sample distribution at the end of 2017 and zero otherwise. Definitions of other variables are in the note for Table 1. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

low-indebted firms.[5] This suggests that high corporate indebtedness seems to be a significant impediment to investment during the post-financial shock period.

To support the internal validity of the DID model, I now check whether firms with different leverage ratios exhibited similar investment activity trends prior to the shock. To do so, I falsely assume the shock started in 2017. I define the pre-period as 2015-2016 and the post-period as 2017-2018. The estimation results presented in Table 3 reveal no statistically significant differential impact on investment behavior across firms with different leverages. This is the case in all specifications reported in Table 3, which supports the parallel trends assumption of the DID model.

Table 3: Placebo test

Dependent variable:	Panel A: Continuous		Panel B: Binary	
Investment	(1)	(2)	(3)	(4)
Post x Leverage	0.007	0.048	-0.008	0.007
	(0.035)	(0.035)	(0.012)	(0.012)
Firm-specific controls	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes
Observations	298,100	298,100	298,100	298,100
R-squared	0.357	0.366	0.357	0.366

Notes: This table reports the estimations of the placebo test that falsely assumes the shock started in 2017 where the pre-period is 2015-2016 and the post-period is 2017-2018. Definitions of variables are in the note for Table 1. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

I now assess the possible impact of excessive leverage on corporate loans. Debt overhang, which was first discussed by Myers (1977), engages underinvestment by reducing the incentive to invest as existing debt holders benefit from proceeds of additional profitable investments rather than shareholders. Similarly, excessive leverage reduces lenders' incentive

[5] Considering the average investment rate of 10.7 percent, this amounts to a 14 percent increase in the investment rate. This is statistically significant at the 1 percent level and economically plausible.

to extend new credit, which lowers available funds for investment (Myers, 1977; Lamont, 1995).[6] To test these arguments, I exploit the Credit Register database containing firm-level loan data. Estimations of the model in eq. (1) by using the logarithm of loans as the dependent variable are presented in Table 4, which indicates that loans decrease significantly with increased financial leverage (columns 1 and 2). In line with the expectation, loans decreased for high-indebted firms by 28% on average compared to low-indebted firms in the aftermath of the financial shock (column 4).

Table 4: Corporate indebtedness and loans

Dependent variable:	Panel A: Continuous		Panel B: Binary	
log(Loans)	(1)	(2)	(3)	(4)
Post x Leverage	-0.926***	-0.996***	-0.267***	-0.289***
	(0.061)	(0.061)	(0.022)	(0.022)
Firm-specific controls	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes
Observations	313,655	313,655	313,655	313,655
Adj. R-squared	0.849	0.850	0.849	0.850

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

3.2 Does firm size matter?

The detrimental impact of high leverage on investment is expected to be less for larger firms since the continuance of the lending relationship is less valuable with smaller firms compared to larger firms (e.g., Iyer et al., 2014; Khwaja & Mian, 2008). Besides, it is well documented in the literature that borrowing capacity and access to credit problems are less severe when the firm size is larger (e.g., Yarba & Güner, 2020a,b; Mutluer Kurul & Tiryaki, 2016; Berger & Udell, 1992; Yarba, 2023).

To investigate whether firm size matters, I re-estimate the DID model for micro-sized, small, medium-sized, and large firms, separately using the number of employees of 10, 50, and 250 as thresholds, respectively. The estimated coefficient of *Post* x *Lev* is found to be negative and statistically significant for only SMEs, including micro, small, and medium-sized firms (columns 1 to 6 of Table 5). The coefficient is negative and not significant for large firms with employment above 250 (columns 7 and 8 of Table 5), while it turns out to be positive for larger firms with employment above 500 (columns 5 to 8 of Table 6). In line with the literature, the results suggest that the adverse impact of high leverage on investment in the aftermath of the financial shock is valid for SMEs, which is not the case for large firms.

[6] Financial constraints can also hinder firms from extending new credit, thereby limiting their ability to exploit investment opportunities. Thus, I also add firm size, cash flow, and firm age to the model, which are commonly used as proxies for financial constraints in the literature. I also include sector x time fixed effect to the model, which enables me to exploit the variation in the lending of the firms with different leverage ratios operating in the same sector within the same year. This also controls time-varying sectoral heterogeneity on the demand side. However, data restrictions such as loan application data, including loan acceptances and rejections at the bank-firm level, do not allow for clear identification of whether the variation is driven by supply-side factors or firm demand.

Table 5: Corporate indebtedness and investment by firm size

Dependent variable: Investment	Micro		Small		Medium		Large	
	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Leverage	-0.041***	-0.014***	-0.039***	-0.013***	-0.032**	-0.011**	-0.034	-0.007
	(0.010)	(0.004)	(0.010)	(0.004)	(0.015)	(0.005)	(0.026)	(0.010)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	168,903	168,903	104,193	104,193	33,332	33,332	7,227	7,227
Adj. R-squared	0.432	0.432	0.382	0.382	0.389	0.389	0.446	0.446

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

Table 6: SMEs versus large firms

Dependent variable: Investment	SMEs		Employment≥250		Employment≥500		Employment≥1000	
	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Leverage	-0.045***	-0.015***	-0.034	-0.007	0.019	0.013	0.173**	0.060**
	(0.006)	(0.002)	(0.026)	(0.010)	(0.041)	(0.015)	(0.088)	(0.030)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	306,428	306,428	7,227	7,227	2,775	2,775	1,061	1,061
Adj. R-squared	0.414	0.414	0.446	0.446	0.467	0.467	0.549	0.549

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

3.3 Additional heterogeneous effects by cash holdings, export orientation, and firm age

In this section, I analyze additional heterogeneities with respect to cash holdings, export orientation, and firm age. These analyses can also be viewed as additional robustness checks on the main results presented in Section 3.1.

I first examine the role of corporate cash holdings. The impact of cash holdings is theoretically ambiguous, and the evidence of prior empirical work is mixed. On the one hand, precautionary cash holdings of corporates are argued to be a buffer against financial frictions, which lessens the underinvestment problem (e.g., Opler et al., 1999; Stiglitz & Weiss, 1981). Harford et al. (2014) also shows that cash holdings can prevent corporates from forgoing growth opportunities by alleviating the refinancing risk. On the other hand, some other studies (e.g., Jensen, 1986; Pinkowitz et al., 2006; Dittmar & Mahrt-Smith, 2007) provide significant evidence of the downside of excessive cash holdings, such as agency costs associated with excessive liquidity.

To investigate the possible differential effect of corporate cash holdings, I split the full sample into firms with low and high cash holdings. Firms with high cash holdings are the firms whose cash ratios (defined as cash and equivalents scaled by total assets) are in the top quartile of the sample distribution at the end of 2017, and low-cash holders, otherwise. The re-estimated results presented in Table 7 for these subgroups reveal strong heterogeneity. The coefficient of *Post* x *Lev* is negative and statistically significant for the firms with low

cash holdings (columns 1 and 2), while it is small and insignificant for those with high cash holdings (columns 3 and 4). The results suggest that the adverse impact of high indebtedness on investment during the post-financial shock is valid only for firms with low cash holdings. In other words, firms with high cash flow appear to be able to lessen the adverse impact of high leverage on investment, which is in line with the precautionary motive of cash holdings.

Table 7: Low cash holdings versus high cash holdings

Dependent variable: Investment	Firms with low cash holdings		Firms with high cash holdings	
	Continuous	Binary	Continuous	Binary
	(1)	(2)	(3)	(4)
Post x Leverage	-0.044***	-0.016***	-0.023*	-0.006
	(0.007)	(0.002)	(0.013)	(0.005)
Firm-specific controls	No	Yes	No	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes
Observations	233,547	233,547	80,108	80,108
Adj. R-squared	0.408	0.408	0.439	0.439

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

I next proceed to examine whether export orientation matters. To this aim, I repeat the analysis for exporters and non-exporters separately. The re-estimated results for these subgroups are reported in columns 1 to 4 of Table 8. Results show that high-indebted firms' reduction in investment during the post-financial shock compared to low-indebted firms exists for both exporters and non-exporters. However, the adverse impact is smaller for the former. As reported in column 2 of Table 8, high-indebted exporters reduce their investments by 1.27 percentage points during the post-financial shock period compared to low-indebted exporters, while the reduction is 1.92 percentage points for non-exporters on average (column 4 of Table 8). This suggests that exporters can mitigate the adverse effect of high indebtedness in line with the literature pointing out the role of export orientation in contributing to credit access.

I re-estimate the empirical model for young and old firms separately to assess whether the impact depends on firm age, where the top quartile of the sample distribution is used as the threshold.[7] The re-estimated results reported in columns 5 to 8 of Table 8 reveal that the negative impact exists for both old and young firms, whereas it is higher for the latter group (columns 6 and 8 of Table 8) on average. In line with the literature, these suggest that the tolerance of elevated indebtedness is lower for younger firms.

4 Additional robustness checks

In this section, additional analyses are conducted to further confirm the robustness of the results.[8] In the previous section, leverage is measured as total financial debt over total assets where trade credit is excluded due to the arguments in the literature that it serves for

[7] Since the results using median value as the threshold are similar to those reported in Table 7 and Table 8, they are not reported for the sake of brevity but are available upon request.

[8] In all specifications, estimation results using leverage as a binary variable are similar to those using leverage as a continuous variable. Thus, for brevity, estimations using leverage as a dummy variable are not reported but are available upon request.

Table 8: Additional heterogeneous effects by export orientation and firm age

Dependent variable: Investment	Exporters		Non-exporters		Young firms		Old firms	
	Continuous	Binary	Continuous	Binary	Continuous	Binary	Continuous	Binary
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post x Leverage	-0.040***	-0.013***	-0.056***	-0.019***	-0.049***	-0.017***	-0.031***	-0.010***
	(0.010)	(0.004)	(0.008)	(0.003)	(0.007)	(0.003)	(0.009)	(0.003)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	100,346	100,346	213,309	213,309	241,192	241,192	72,463	72,463
Adj. R-squared	0.396	0.396	0.419	0.419	0.423	0.423	0.355	0.355

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

transaction purposes rather than financing activities (e.g., Gebauer et al., 2018). To account for the possible usage of trade credit as a complement to financial debt (e.g., McGuinness et al., 2018), an alternative measure of leverage, including trade credit, is constructed. Besides, in his recent study, Yarba (2021) argues that other liabilities, which are neither financial nor trade debt, are also used as an alternative channel of firm finance. Thus, a measure of leverage, including all other liabilities, is constructed as well. The re-estimated results with these alternative measures of leverage are presented in columns 1 and 2 of Table 9. Estimated coefficients further confirm the baseline results reported in Table 2.

As another check, I repeat the analysis with the subset of firms with positive financial debt, excluding firms in the sample with no financial debt. Next, I repeat the analysis using investment (measured as the annual change in plant, machinery, and equipment) over net sales as the dependent variable instead of investment rate (the logarithmic change in plant, machinery, and equipment). The re-estimated results reported in columns 3 and 4 of Table 9 are in line with those reported in Table 2.

Firms that hold foreign currency-denominated debt account for 12.99 percent of firms in the analysis. In order to assess whether this induces any bias, I re-estimate the model by excluding the firms with foreign currency debt. No bias is evident in these results reported in column 5 of Table 9.

Table 9: Additional robustness checks

Dependent variable: Investment	Leverage including trade credits	Leverage including all liabilities	Excluding firms with zero financial debt	Dependent variable: investment to net sales ratio	Excluding FX debt holders	Leverage: Average of the 2016-2017 period
	(1)	(2)	(3)	(4)	(5)	(6)
Post x Leverage	-0.028***	-0.027***	-0.032***	-0.010***	-0.064***	-0.043***
	(0.003)	(0.003)	(0.007)	(0.002)	(0.007)	(0.006)
Firm-specific controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Province x year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	313,655	313,655	194,607	313,655	272,891	313,655
Adj. R-squared	0.415	0.414	0.386	0.413	0.433	0.414

Notes: Definitions of variables are in the notes for Table 1 and Table 2. Firm-level clustered robust standard errors are reported in parentheses. ***p-value<0.01, **p-value<0.05, *p-value<0.1.

The simultaneity of leverage and investment decisions introduces a potential endogeneity problem, and the direction of causality within the leverage-investment nexus is subject to debate. The inverse relationship between leverage and investment could stem from factors other than debt hindering investment, such as firms with lower growth opportunities investing less and simultaneously increasing their leverage to control agency problems. To mitigate this concern, I control for growth opportunities. Tobin's q and other market-based proxies are not available for privately held firms, which are approximately 99.79% of the sample. Thus, following the literature, growth opportunity is proxied by sales growth measured as the annual percentage change of net sales (e.g., Asker et al., 2015; Mortal & Reisel, 2013; Yarba & Yassa, 2022; Shin & Stulz, 1998). I also add firm size, cash flow, and firm age as additional control variables to the model, which are commonly used as proxies for financial constraints in the literature. I further use multidimensional fixed effects to control unobserved factors; however, the endogeneity may still exist. To mitigate endogeneity concerns, I also adopt a difference-in-differences setup. I use a predetermined leverage variable constructed over the pre-crisis variable to explain the variation in firm investment behavior during the post-crisis period. In the baseline model, corporate leverage is measured as the 2017 year-end total debt to total assets ratio. Alternatively, I repeat the analysis where leverage is measured as the mean value of 2016 and 2017. The re-estimated coefficients are similar to the baseline estimations (column 6 of Table 9).

5 Conclusion

The elevated corporate indebtedness in emerging countries over the last decade has rendered corporates vulnerable to shifts in risk sentiment and financial shocks, posing challenges for investments and substantial growth. Despite the importance of the issue, the evidence provided is scarce which can be attributable to a lack of data availability. To expand upon the literature on emerging economies, this paper examines whether elevated corporate indebtedness holds back investment in the aftermath of a large financial shock such as the one experienced in Türkiye in 2018.

Using the firm-level data of all incorporated manufacturing firms in Türkiye, the results of the difference in differences model reveal that high-indebted firms reduce their investments significantly compared to low-indebted firms in the aftermath of the financial shock. This suggests that high debt remaining on corporate balance sheets seems to become a substantial impediment to investment. Accordingly, corporate loans are found to be decreasing with leverage. The more pronounced impacts for non-exporters and young firms indicate their lower tolerance to elevated indebtedness. Besides, the detrimental effect of high financial leverage is valid only for SMEs but not for large firms. This lends support to the arguments in the literature that debt overhang is more likely to affect small firms since they tend to be informationally opaque and dependent on banks for their external financing (Iyer et al., 2014; Yarba & Güner, 2020b; Yarba, 2023). In Türkiye, SMEs are vital to the economy, accounting for 71% of total employment and 47% of total sales, according to recent data from the Turkish Statistical Institute. My findings highlight the need for a deeper understanding of the financing challenges of SMEs to develop effective policies that broaden their funding options to enable them to continue to play their crucial role in the economy.

Another important result is that firms with high cash holdings could alleviate the adverse impact of high financial leverage. This is consistent with the precautionary motive of corporate cash holdings in the literature while pointing out the importance of the insurance systems for receivables to improve corporate cash management, especially for SMEs. The findings of the paper emphasize the importance of regulations that decrease the vulnerabilities of corporates to financial and economic conditions, especially for emerging countries, and prevent firms from excessive debt that is potentially a drag on investment activities.

References

Asker, J., Farre-Mensa, J., & Ljungqvist, A. (2015). Corporate investment and stock market listing: A puzzle? *Review of Financial Studies*, *28*(2), 342-390. doi:10.1093/rfs/hhu077

Badertscher, B., Shroff, N., & White, H. (2013). Externalities of public firm presence: Evidence from private firms' investment decisions. *Journal of Financial Economics*, *109*(3), 682–706. doi:10.1016/j.jfineco.2013.03.012

Berger, A. N., & Udell, G. F. (1992). Some evidence on the empirical significance of credit rationing. *Journal of Political Economy*, *100*(5), 1047–1077. doi:10.1086/261851

BIS. (2025). *Bank for International Settlements Database.* Retrieved from https://data.bis.org/

Borensztein, E., & Ye, L. (2021). Corporate debt overhang and investment in emerging economies: Firm-level evidence. *International Finance*, *24*(1), 18-39. doi:10.1111/infi.12382

Çevik, S., & Miryugin, F. (2020). *Leverage Shocks: Firm-Level Evidence on Debt Overhang and Investment* (Working Paper Series, No. 20/287). IMF. https://www.imf.org/en/Publications/WP/Issues/2020/12/18/Leverage-Shocks-Firm-Level-Evidence-on-Debt-Overhang-and-Investment-49965.

Das, S., & Tulin, V. (2017). *Financial Frictions, Underinvestment, and Investment Composition: Evidence from Indian Corporates* (Working Paper Series, No. 17/134). IMF. https://www.imf.org/en/Publications/WP/Issues/2017/06/08/Financial-Frictions-Underinvestment-and-Investment-Composition-Evidence-from-Indian-44939.

Dittmar, A., & Mahrt-Smith, J. (2007). Corporate governance and the value of cash holdings. *Journal of Financial Economics*, *83*(3), 599–634. doi:10.1016/j.jfineco.2005.12.006

Gebauer, S., Setzer, R., & Westphal, A. (2018). Corporate debt and investment: a firm-level analysis for stressed euro area countries. *Journal of International Money and Finance*, *86*, 112-130. doi:10.1016/j.jimonfin.2018.04.009

Grossman, S., & Hart, O. (1982). Corporate financial structure and managerial incentives. In J. J. McCall (Ed.), *The Economics of Information and Uncertainty* (p. 107-140). University of Chicago Press. https://www.nber.org/books-and-chapters/economics-information-and-uncertainty/corporate-financial-structure-and-managerial-incentives.

Harford, J., Klasa, S., & Maxwell, W. F. (2014). Refinancing risk and cash holdings. *The Journal of Finance*, *69*(3), 975–1012. doi:10.1111/jofi.12133

Iyer, R., Peydró, J., da Rocha-Lopes, S., & Schoar, A. (2014). Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007-2009 crisis. *The Review of Financial Studies*, *27*(1), 347-372. doi:10.1093/rfs/hht056

Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American Economic Review*, *76*(2), 323–329.

Kalemli-Özcan, Ş., Laeven, L., & Moreno, D. (2019). *Debt Overhang, Rollover Risk, and Corporate Investment: Evidence from the European Crisis* (Working Paper, No. 2241). European Central Bank. https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2241~cbea165b30.en.pdf.

Khwaja, A. I., & Mian, A. (2008). Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *The American Economic Review*, *48*(4), 1413-1442.

Köse, M. A., Ohnsorge, F., Ye, L., & Islamaj, E. (2017). *Weakness in Investment Growth: Causes, Implications and Policy Responses* (Policy Research Working Paper, No. 7990). World Bank. https://documents1.worldbank.org/curated/en/267921488463293454/pdf/WPS7990.pdf.

Lamont, O. (1995). Corporate-Debt Overhang and Macroeconomic Expectations. *American Economic Review*, *85*(5), 1106-1117.

Lang, L., Ofek, E., & Stulz, R. (1996). Leverage, Investment, and Firm Growth. *Journal of Financial Economics*, *40*(1), 3–29. doi:10.1016/0304-405X(95)00842-3

Magud, N., & Sosa, S. (2015). *Investment in Emerging Markets: We Are Not in Kansas Anymore...Or Are We?* (Working Paper, No. 15/77). IMF. https://www.imf.org/external/pubs/ft/wp/2015/wp1577.pdf.

McGuinness, G., Hogana, T., & Powell, R. (2018). European trade credit use and SME survival. *Journal of Corporate Finance*, *49*, 81-103. doi:10.1016/j.jcorpfin.2017.12.005

Modigliani, F., & Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *American Economic Review*, *53*(3), 443-453.

Mortal, S., & Reisel, N. (2013). Capital Allocation by Public and Private Firms. *Journal of Financial and Quantitative Analysis*, *48*(1), 77-103. doi:10.1017/S0022109013000057

Mutluer Kurul, D., & Tiryaki, S. T. (2016). How credit-constrained are firms in Turkey? A survey-based analysis. *Applied Economics Letters*, *23*(6), 420-423. doi:10.1080/13504851.2015.1078439

Myers, S. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, *5*(2), 147–175. doi:10.1016/0304-405X(77)90015-0

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, *52*(1), 3–46. doi:10.1016/S0304-405X(99)00003-3

Pinkowitz, L., Stulz, R., & Williamson, R. (2006). Does the contribution of corporate cash holdings and dividends to firm value depend on governance? A cross-country analysis. *The Journal of Finance*, *61*(6), 2725–2751. doi:10.1111/j.1540-6261.2006.01003.x

Ross, S. (1977). The Determination of financial structure: the incentive-signalling approach. *The Bell Journal of Economics*, *8*(1), 23–40. doi:10.2307/3003485

Shin, H. H., & Stulz, R. (1998). Are internal capital markets efficient? *Quarterly Journal of Economics*, *113*(2), 531-552. doi:10.1162/003355398555676

Stiglitz, J., & Weiss, A. (1981). Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, *71*(3), 393–410.

World Bank. (2017). *Global Economic Prospects: Weak Investment in Uncertain Times.* doi:10.1596/978-1-4648-1016-9

Yarba, İ. (2021). Hidden reserves as an alternative channel of firm finance. *Central Bank Review*, *21*(2), 39–48. doi:10.1016/j.cbrev.2021.04.001

Yarba, İ. (2023). Does the inverted U-shape between corporate indebtedness and investment hold up for emerging markets? Evidence from Türkiye. *Borsa Istanbul Review*, *23*(Supplement 2), S75-S83. doi:10.1016/j.bir.2023.11.002

Yarba, İ., & Güner, Z. N. (2020a). Leverage dynamics: Do financial development and government leverage matter? Evidence from a major developing economy. *Empirical Economics*, *59*, 2473–2507. doi:10.1007/s00181-019-01705-5

Yarba, İ., & Güner, Z. N. (2020b). Uncertainty, macroprudential policies and corporate leverage: firm-level evidence. *Central Bank Review*, *20*(2), 33–42. doi:10.1016/j.cbrev.2020.03.005

Yarba, İ., & Yassa, A. (2022). Does stock market listing boost or impede corporate investment? *Borsa Istanbul Review*, *22*(2), 285-294. doi:10.1016/j.bir.2021.04.001

Zubair, S., Kabir, R., & Huang, X. (2020). Does the financial crisis change the effect of financing on investment? Evidence from private SMEs. *Journal of Business Research*, *110*, 456–463. doi:10.1016/j.jbusres.2020.01.063