The Paradox of Record Cash and Record Debt*

Raymond Kim †

W.A. Franke College of Business
Northern Arizona University
A. Gary Anderson Graduate School of Management
University of California, Riverside

December 11, 2023

Abstract

The paradoxical reality of firms simultaneously holding record levels of cash and debt is at odds with a widely held traditional view that firms use excess cash to deleverage their balance sheet. In my analysis of over 50 years of firm-level data, I have identified a recent, novel trend: acquired cash expands debt capacity and subsequent leverage. Using the Tax Cut and Jobs Act as an exogenous shock, results reveal two key motives: 1) repatriation tax avoidance, and 2) the cash collateral channel to boost debt capacity. Findings indicate that larger multinational firms with a repatriation tax motive favor financial flexibility, while domestic firms undergo a dichotomy. Domestic firms under mild distress use cash as collateral to increase debt capacity, while smaller firms under significant constraints and uncertainty adhere to traditional financial theories by using cash to deleverage their balance sheets.

JEL classification: G32

Keywords: Cash, leverage, liabilities, capital structure, collateral, Tax Cut and Jobs Act, Homeland Investment Act, deficit financing, financial leverage, repatriation taxes

*I thank my advisor Jean Helwege at UC Riverside for her guidance and mentorship. I also thank my dissertation committee Richard Smith, Yawen Jiao, Alexander Barinov, and Marcelle Chauvet. Additionally, I thank Jason Smith (discussant), Mike Dong, Greg Richie, Othman Alolah, Brett Myers, Kamal Haddad, Babak Lotfaliei, Yaoyi Xi, Lisa De Simone, Stefano Bonini, Howard Qi, Farooq Malik, Patrick Herb, Blake Rayfield, Michelle McAllister, Sharier Khan (discussant), JP Morgan Chase, and participants at the 2019 FMA Annual Meeting and presentations at Northern Arizona University, University of San Diego, San Diego State University, and Stevens Institute of Technology, for their comments and insight. This paper was also distributed under its prior title: "Do Firms Prefer Leverage Over Cash?"

†The author is from Northern Arizona University, W.A. Franke College of Business, 101 E. McConnell Drive, Flagstaff, AZ 86011 email: raymond.kim@nau.edu
A. Gary Anderson Graduate School of Management, University of California, Riverside, 900 University Ave. Riverside, CA 92521 email: raymond.kim@ucr.edu All errors are my own.

1 Introduction

Why do corporations simultaneously hold record levels of cash holdings and debt (Figure 1) instead of using cash to deleverage? By the end of 2020, US non-financial corporations amassed an unprecedented $5.8 trillion in cash holdings alongside $10.6 trillion of debt,[1] contradicting traditional theories that say internal cash is a preferred substitute to debt due to higher costs of information asymmetry, monitoring costs, transactional frictions, financial distress, and market volatility. The capital structure literature has rarely challenged the hierarchy of cash over debt,[2] and generally focuses separately on the precautionary motives for cash holdings[3] or the benefits of corporate debt.[4] While each stream of literature can provide reasons for record levels of cash or record levels of debt; they fall short of explaining why both coexist concurrently. Despite the importance of both topics, there is a lack of interaction between the two areas of research, which unfortunately leaves the paradox unexplained.

This paper provides evidence to address this recent paradox with two novel explanations: 1) the multinational strategy to avoid repatriation taxes and 2) the use of corporate cash as collateral to enhance debt capacity, especially among mildly distressed firms. In the first explanation, multinational corporations hold cash overseas to avoid repatriation taxes and issue debt domestically to access liquidity at home. Apple CEO Tim Cook alluded to this

[1] Federal Reserve Flow of Funds Table L 102 Nonfinancial Business (March 11, 2021) indicates that across rows 2-11 (cash, deposits, treasuries, commercial paper etc.) US non-financial corporations held a combined total of $5.8 trillion in cash and cash-equivalent securities by the end of 2020. Securities Industry and Financial Markets Association data shows total corporate debt reached $10.6 trillion at the end of 2020.

[2] Helwege and Liang (1996) investigate IPOs from 1984-1992 and find that IPO cash shortfalls are unrelated to external financing, supporting a non-negative relationship between cash and debt. Acharya, Almeida, and Campello (2007) finds that constrained firms with hedging needs do not pay down debt when holding cash. Sufi (2009) finds lagged cash flows increase lines of credit, but still find negative correlations between cash holdings and lines of credit.

[3] Opler, Pinkowitz, Stulz, and Williamson (1999) analyzes the precautionary motive for cash holdings, while Stulz (1990) and Almeida, Campello, and Weisbach (2004) find that holding cash reserves increases financial flexibility. Bates, Kahle, and Stulz (2009) also finds riskier, R&D intensive firms are behind a trend of cash buildups.

[4] Jensen (1986) argues debt can mitigate agency problems between shareholders and managers while Graham (2000) explores the tax benefits of debt which can be sensitive to changes in tax rates (Heider and Ljungqvist, 2015) and interest rates (Barry, Mann, Mihov, and Rodriguez, 2008).

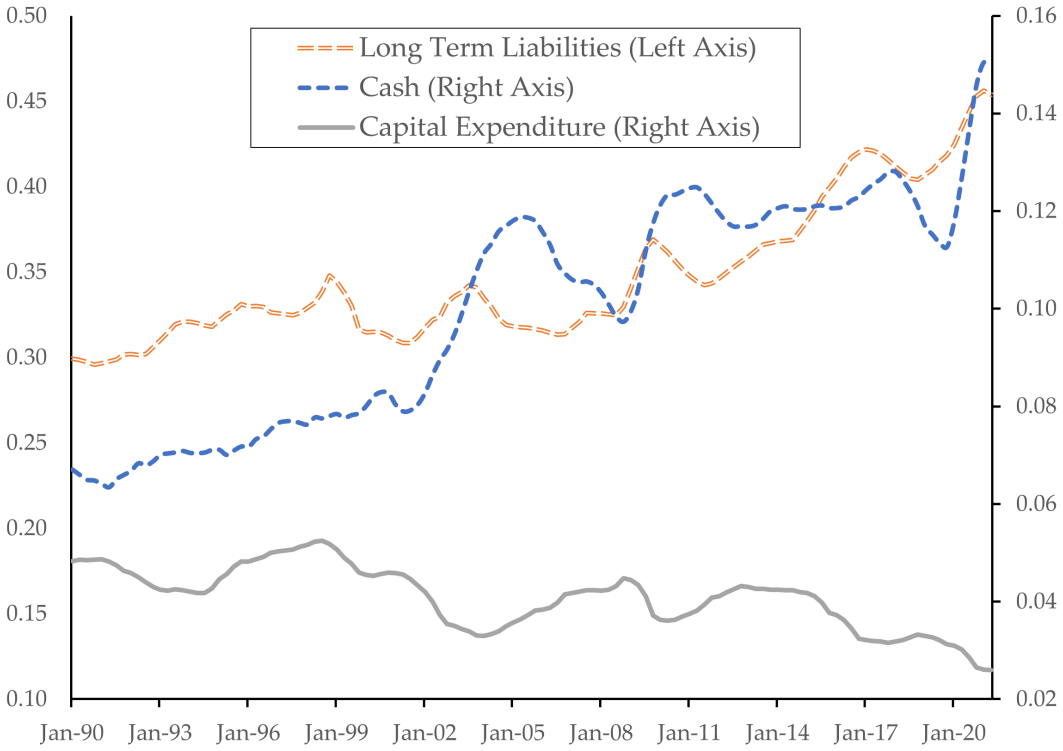

Figure 1. This figure represents all firms in COMPUSTAT except for financials and utilities. The data is quarterly from 1990Q1 to 2021Q2 and scaled by net assets, defined as book assets minus cash and cash equivalents.

explanation when he said:

> *"If you earn money globally, you can't bring it back into the United States unless you pay 35% plus your state tax... Our good position is we can borrow. And so to invest in the United States, we have to borrow."*
>
> **-Apple CEO Tim Cook on CNBC: May 11, 2017**

Tim Cook's comment offered a comprehensive perspective on the repatriation tax motive, suggesting that avoidance of tax liabilities is the driving force that is simultaneously increasing overseas cash holdings and corporate liabilities. This repatriation tax motive is also supported in piecemeal by the capital structure literature,[5] as well as this paper which finds

[5] Foley, Hartzell, Titman, and Twite (2007); De Simone, Piotroski, and Tomy (2018); Graham and Leary (2018); Harford, Wang, and Zhang (2017) finds corporations hold higher cash balances overseas due to repatriation tax burdens. Overseas tax liabilities also significantly increase leverage ratios (Faulkender and Smith, 2016) and domestic liabilities (De Simone and Lester, 2018).

that accumulated cash positively predicts future long-term liabilities.

This paper further finds that surprisingly, even after multinational firms are dropped from the sample, acquired cash predicts subsequent leverage in domestic firms without overseas operations. Findings suggest these domestic firms leverage cash reserves to increase debt capacity—a vital strategy for firms that are mildly distressed. However, this strategy reverses when smaller firms are in severe financial distress and uncertainty[6], using cash to deleverage to improve its financial health, in line with pecking order theory.

To explain this paradox, I first identify the nature and scope of the relationship between corporate cash and long-term liabilities by using a broad cross-section of COMPUSTAT panel data from 1971-2021 (excluding financials and utilities), scaled by net assets (book assets minus cash). Observations comprise 814,833 firm-quarter observations in the total sample and 394,336 in the 2003-2021 sample. To compare the recent paradox with prior capital structure trends from the 1970s to the 1990s, this paper utilizes a broader and more robust sample than prior studies that often focused narrowly on industrial firms. This study also employs more stringent econometric settings than papers of that era. This includes using two-way fixed effects at the firm and time level to control for unobserved time-invariant firm characteristics, firm-invariant time-varying factors, and stationarity issues related to explanatory variables being in level terms. I also use two-way clustering of standard errors at the firm and time level to address potential autocorrelation and heteroskedasticity in error terms associated with time. This approach not only enhances the validity of the study's conclusions but also contributes a more nuanced understanding of the evolution of corporate financial behaviors over time.

I first use the Homeland Investment Act of 2003 (HIA) as an event study that influenced expectations of a tax holiday starting in 2003 Q1. Results suggest the HIA influenced long-term liabilities to track cash (Figure 1), as firms keep cash overseas and raise debt

[6]Izhakian, Yermack, and Zender (2022) theorizes that uncertainty leads firms to decrease leverage. Bretscher, Schmid, and Vedolin (2018) finds that interest rate uncertainty depresses financially constrained firm investments.

domestically to avoid repatriation taxes. I also control for pecking order proxies and variables influencing cash and debt by using the financing deficit,[7] financing constraints,[8] and standard leverage controls such as size, profitability, Tobins Q, lagged debt, and tangibility. Results suggest that starting with the HIA, the predictive power of acquired cash on subsequent leverage is over three times greater than financing deficits. The repatriation tax also grows stronger in firms with more overseas operations as COMPUSTAT Historical Segments Annual data shows coefficients on acquired cash increase as you move up quartiles based on overseas revenues. The observed convexity is attributed to increasing gains in leverage due to the combined impact of repatriation taxes and the progressive corporate tax rate on Subpart F Income on overseas cash, which together amplify the value of debt shield strategies.

Surprisingly, findings also extend to domestic firms through a second "cash collateral" motive.[9] Intriguingly, the behavior of domestic firms vis-á-vis cash holdings and debt capacity exhibits a dichotomy of outcomes contingent on size and financial condition. The smallest firms with severe constraints that face uncertainty are more traditional by using cash to deleverage and improve their financial position, in line with pecking order theory and Acharya et al. (2007). Conversely, as firms grow larger in scale and are only mildly distressed, their financial strategies evolve; they increasingly leverage their cash holdings to expand debt capacity, deviating from traditional financial norms.

Findings are further confirmed by using the 2017 Tax Cut and Jobs Act (TCJA)[10] as an exogenous shock that decreased demand for debt after reducing incentives to use debt as a tax shield (Carrizosa, Gaertner, and Lynch, 2022; Alolah, Helwege, and Kim, 2023).

[7]Financing deficit as generally defined by Shyam-Sunder and Myers (1999), Frank and Goyal (2003), and Lemmon and Zender (2010) are dividend and working capital needs that are unmet by cash flows and external financings.

[8]Acharya et al. (2007) finds that financial constraints impact the relationship between debt and cash

[9]Barro (1976), Stiglitz and Weiss (1981), and Hart and Moore (1994) shows collateral pledging enhances a firm's financial capacity, improves debt financing (Benmelech and Bergman, 2011), and bank lending (Peek and Rosengren, 2000) by using collateral such as real estate (Gan, 2007; Chaney, Sraer, and Thesmar, 2012) and patents (Mann, 2018). Higher quality collateral commands lower borrowing costs (Chava, Nanda, and Xiao, 2017; Barro, 1976) and lowers financial constraints for firms (Almeida et al., 2004; Denis and Sibilkov, 2010). In this paper, the literature on collateral is extended to the use of cash as collateral.

[10]The Tax Cut and Jobs Act limited corporate interest deductions and lowered the corporate tax rate from 35% to 21%

Based on this, we would expect that lower demand for debt shields primarily applies to healthy, profitable firms that needed debt shields prior to TCJA. Conversely, distressed firms, which did not require debt shields prior to the TCJA due to low profitability, would remain unaffected by these changes. Findings precisely align with these expectations, demonstrating a clear distinction in the impact of the TCJA based on a firm's financial status and prior dependency on debt shields for tax advantages.

The dual motive of "repatriation tax avoidance" and the "cash collateral" channel can partially explain the paradox of record corporate cash and record corporate debt. The traditional expectations of firms using cash for deleveraging are found mostly in smaller, troubled firms that are faced with high information asymmetry. Consequently, the nuanced relationship between firm size, cash holdings, and debt capacity outlined in this study calls for further empirical research to deepen our understanding of these dynamics that simultaneously increase acquired cash and subsequent leverage.

The rest of the paper is organized as follows: Section 2 examines Data Trends in Capital Structure from 1971-2021, Section 3 is the Hypothesis and Empirical Results, and Section 4 is the Conclusion.

2 Data Trends in Capital Structure 1971-2021

The data consists of all firms in the Compustat-Capital IQ database from Standard & Poor's from 1971-2021, except for financial firms (SIC codes 6000-6999) and utilities (SIC Codes 4900-4999). Quarterly or yearly observations with missing values for market capitalization, cash holdings, or financing deficit are also excluded. All items are scaled by net assets, defined as book assets minus cash holdings, except for Tobin's Q, which is market capitalization divided by book assets. All variables are also winsorized at 0.5% and 99.5%. This paper primarily focuses on the period of 2003-2021, which constitutes the main sample shown in Table 1. The sample periods of 1971-1989 and 1990-1998, included in our analysis, are

selected from this paper's dataset to match the years used in the studies Shyam-Sunder and Myers (1999) and Frank and Goyal (2003), respectively.

In Table 1, the 1971-1989 sample consists of 8,761 unique firms, which is considerably larger and more comprehensive than the 157 industrial firms in Shyam-Sunder and Myers (1999). Table 1 shows a mean long-term debt-to-net asset ratio of 0.21 for our sample. However, when recalculated as long-term debt to total assets, similar to the approach in Shyam-Sunder and Myers (1999), the ratio is 0.19. This closely aligns with their reported average long-term debt-to-total asset ratio of 0.18, the only reported metric in their study encompassing their entire sample.

In this paper, the data from 1990-1998 consists of 196,185 quarterly observations with 10,948 unique firms, which compares favorably to the 57,616 total yearly observations from 1990-1998 and 7,277 unique firms in 1998 found in Frank and Goyal (2003). Recalculating the long-term debt to assets ratio, it is 0.17 which is similar to the 0.18 found in Frank and Goyal (2003). Other variables such as cash and financing deficit are also similar.

In these two periods, the financing deficit played a declining role over time in explaining firm leverage (Frank and Goyal, 2003). By 2003-2021, the data shows a rapid increase in size, average cash holdings, long-term liabilities, and financing deficits. The average size has grew sevenfold from \$536 million to \$3.689 billion, and cash dramatically increased from a mean(median) of 6% (25%) in 1971-1989 to 14% (154%) in 2003-2021. While median long-term liabilities remained stable over time, the average jumped up significantly from 26% to 42%, suggesting the increase is mostly driven by right-tail firms. Although liabilities and debt are often used interchangeably,[11] the differences between the two have grown in recent years. Initially, it remained steady at 5% from 1971-1998, but grew dramatically to 18% in the main sample period of 2003-2019. One explanation may be that long-term liabilities, like capital leases or intra-company loans between holding companies and their

[11]The use of total long-term liabilities (COMPUSTAT Item LLTQ) as a dependent variable is a departure from Shyam-Sunder and Myers (1999) and Frank and Goyal (2003) which uses "Gross Debt" on the left-hand side. However, it is not entirely clear which accounting items are used in making up "Gross Debt".

Table 1. Summary Statistics 1971-2021 This table presents summary statistics for quarterly observations of COMPUSTAT firms for selected time periods. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. Variables are scaled by net assets (total assets minus cash) unless otherwise stated. All variables are winsorized at 0.5% and 99.5%.

2003-2021	Obs	Mean	S.D.	P25	P50	P75	Max
Cash Holdings	409,903	1.54	8.52	0.04	0.14	0.51	308.29
Long Term Liabilities	403,124	0.42	1.20	0.05	0.22	0.46	50.24
Long Term Debt	406,843	0.24	0.48	0.00	0.10	0.32	7.64
Book Assets (Millions)	410,230	3,689	14,818	34	213	1,343	250,000
Financing Deficit	409,903	0.30	2.27	-0.03	0.02	0.12	56.77
Capital Expenditure	401,852	0.05	0.08	0.01	0.02	0.05	0.78
Dividends	399,825	0.01	0.03	0.00	0.00	0.00	0.75
Investment	409,903	0.06	0.15	0.01	0.02	0.07	2.23
Internal Cash Flow	409,903	-0.13	1.06	-0.01	0.02	0.06	6.30
Profitability	390,478	-0.16	0.83	-0.03	0.02	0.04	0.41
Tangibility	409,276	0.36	0.31	0.10	0.26	0.59	1.00
Tobin's Q	410,230	2.01	3.36	0.55	1.07	2.12	55
1990-1998	Obs	Mean	S.D.	P25	P50	P75	Max
Cash Holdings	196,185	0.52	1.78	0.02	0.07	0.30	26.80
Long Term Liabilities	189,945	0.25	0.28	0.04	0.18	0.38	3.32
Long Term Debt	194,602	0.20	0.24	0.01	0.13	0.30	2.39
Book Assets (Millions)	196,961	829	3,174	18	69	310	37,427
Financing Deficit	196,185	0.12	0.71	-0.03	0.03	0.13	13.08
Capital Expenditure	190,555	0.06	0.09	0.01	0.03	0.07	0.75
Dividends	193,148	0.01	0.02	0.00	0.00	0.00	0.38
Investment	196,185	0.07	0.13	0.01	0.04	0.10	1.11
Internal Cash Flow	196,185	0.01	0.31	0.00	0.02	0.05	2.94
Profitability	171,401	-0.01	0.23	0.00	0.03	0.05	0.34
Tangibility	195,390	0.36	0.25	0.15	0.29	0.52	0.99
Tobin's Q	196,961	1.65	2.09	0.50	0.98	1.94	20
1971-1989	Obs	Mean	S.D.	P25	P50	P75	Max
Cash Holdings	202,533	0.25	0.81	0.02	0.06	0.18	14.70
Long Term Liabilities	163,427	0.26	0.23	0.09	0.22	0.37	1.92
Long Term Debt	200,245	0.21	0.20	0.05	0.18	0.30	1.50
Book Assets (Millions)	203,929	536	1,933	16	60	237	30,050
Financing Deficit	202,533	0.05	0.52	-0.01	0.01	0.06	12.11
Capital Expenditure	104,919	0.06	0.09	0.01	0.03	0.07	0.75
Dividends	106,527	0.01	0.02	0.00	0.00	0.01	1.01
Investment	202,533	0.05	0.11	0.00	0.00	0.05	1.21
Internal Cash Flow	202,533	0.02	0.13	-0.01	0.00	0.02	2.10
Profitability	154,343	0.03	0.13	0.01	0.04	0.06	0.75
Tangibility	201,754	0.38	0.23	0.20	0.34	0.53	0.98
Tobin's Q	203,929	1.10	1.61	0.34	0.63	1.20	23

foreign subsidiaries, offer tax deductions (De Simone and Lester, 2018) as well as financial flexibility, which CFOs cited as the top factor in driving debt decisions (Graham, 2022).

The average financing deficit also grew sixfold from 5% to 30%. Despite the relative stability in firm investment activities such as capital expenditure and investment over time, the increase in financing deficits appears to be driven by a notable decline in internal cash flows, which decreased from 2% to -13% between 2003 and 2021. This downturn in internal cash flows was likely due to the Great Recession, and the dramatic increase in cash may be due to firms wishing to avoid financial distress during future downturns, which is in line with CFO survey data from Graham (2022).

One notable difference between this paper and Shyam-Sunder and Myers (1999); Frank and Goyal (2003) lies in this paper's econometric methods. This paper incorporates two-way fixed effects at the firm and time levels to account for omitted variable bias from time-invariant firm characteristics and time-varying macro variables. Firm and time-fixed effects also address stationarity issues related to explanatory variables being in level terms. All specifications also incorporate two-way clustering of standard errors at the firm and quarter levels. Clustering at the quarter level address potential autocorrelation and heteroskedasticity in error terms associated with time. These specifications are missing in Shyam-Sunder and Myers (1999) or Frank and Goyal (2003).

3 Hypothesis and Empirical Results

The simultaneous accumulation of record cash and debt has prompted the need for new hypotheses. The academic literature has largely considered the accumulation of cash holdings and debt as distinct phenomena, rarely addressing why both have increased in tandem. As corporations acquire cash before increasing leverage, the repatriation tax motive and the cash collateral motive emerge as potential explanations for this capital structure paradox.

3.1 Repatriation Tax Motive

When the Homeland Investment Act of 2003 (HIA) temporarily reduced the repatriation tax to 5.25% in 2005 and 2006, American companies brought $312 billion back home. De Simone et al. (2018) finds the HIA influenced companies to update their priors and anticipate further repatriation tax holidays, an expectation that was subsequently realized with the Tax Cut and Jobs Act of 2017.[12]. This unique novel setting of the HIA allows for studying the increasing benefits of debt separately from the adverse selection costs of externally financed debt.

Apple's strategy of issuing domestic debt to avoid repatriation taxes on overseas cash reveals a situation where companies acquire cash and then increase leverage, implying a positive relationship between lagged cash and future leverage. Similar to Apple, Faulkender and Smith (2016) finds that firms with higher overseas tax rates tend to issue more debt and De Simone et al. (2018) finds firms hold more cash overseas due to repatriation taxes. Taken together, the first hypothesis examines the existence of the repatriation tax motive:

Hypothesis 1. *After the Homeland Investment Act of 2003, firms increased their debt after acquiring cash.*

From an understanding of the repatriation tax motive, the following empirical model tests Hypothesis 1 :

$$\begin{aligned} L_{it} =& \alpha_i + \lambda_t + \beta_H \times (HIA \times Cash_{i,t-1}) + \beta \times Cash_{i,t-1} \\ &+ \beta_D \times DEF_{i,t} + X'\Gamma + u_{i,t} \end{aligned} \tag{1}$$

L is leverage, α_i is firm fixed effects and λ_t is time fixed effects. HIA is a dummy with a

[12]The TJCA of 2017 implemented two tax-preferred rates: foreign earnings held in cash and cash equivalents were taxed at 15.5 percent, and those not held in cash or cash equivalents at only 8 percent. The TCJA permits a US corporation to pay any tax on the deemed repatriations in installments over eight years.
https://www.taxpolicycenter.org/briefing-book/what-tcja-repatriation-tax-and-how-does-it-work

value of 1 from 2003-2021, 0 otherwise. $Cash_{i,t-1}$ is lagged cash, and if a firm accumulates cash overseas and increases future leverage due to the HIA, then β_H should be positive and significant. X' is a row vector of control variables such as capital expenditure, financing deficit (Frank and Goyal, 2003; Helwege and Liang, 1996), and traditional leverage controls, while Γ is a column vector of the corresponding coefficients.

Table 2 tests Hypothesis 1 by examining 814,833 firm-quarter observations using the entire COMPUSTAT flow of funds data from 1971Q1-2021Q2. Column (1) finds that lagged cash is significantly positive on long-term liabilities with a coefficient of 0.0518***. It is unclear whether this significance is due to the HIA. In Column (2), the coefficient for $HIA \times Cash_{t-1}$ is significantly positive at 0.0534*** and the coefficient on $Cash_{t-1}$ is 0.008 and insignificant. This suggests the positive relationship between lagged cash and long-term liabilities found in (1) is due to the HIA since it was insignificant prior to the HIA. However, it may be the case that firms are raising debt due to financing needs, so Column (3) adds the financing deficit, and the $HIA \times Cash_{t-1}$ coefficient of 0.0543*** is over 3x larger than the $Financing\ Deficit_{i,t}$ coefficient of 0.0159***. The addition of capital expenditure in (4) does not change the results that lagged cash has a greater impact on leverage than the financing deficit. In fact, the negative coefficient on $Cash_{t-1}$ in (3) and (4) implies the traditional pecking order expectation that firms use excess cash to deleverage was stronger prior to the HIA.

While firm and time-fixed effects address stationarity issues related to explanatory variables being in level terms, the relationship between lagged cash and leverage may be driven by omitted variables such as contemporaneous cash. Table 3 explore this possibility and Column (1) and (2) finds lagged and contemporaneous cash is positive and significant. However, when both are included in (3), the $Cash_{i,t-1}$ has a coefficient of 0.049*** while $Cash_{i,t}$ is insignificant. The continued robustness of lagged cash is surprising as firms naturally increase contemporaneous cash when increasing leverage. Next, Columns (4)-(6) explores whether the disaggregated variables of the financing deficit, such as cash dividends, net investment,

Table 2. 1971-2021 Panel Regression and the Homeland Investment Act of 2003
The sample period is from 1971Q1 to 2021Q2. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. Equation 1 is estimated. Variables are defined in Appendix A, scaled by lagged net assets (book assets minus cash) and winsorized at 0.5% and 99.5%. HIA is an indicator with a value of 1 beginning on 2003 Q1, and a value of 0 for all prior periods. All specifications incorporate two-way fixed effects two-way clustering of standard errors at the firm and year levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$			
	(1)	(2)	(3)	(4)
$Cash_{i,t-1}$	0.0518***	0.0008	-0.001	-0.002
	(5.78)	(0.16)	(-0.23)	(-0.38)
$HIA\times\ Cash_{i,t-1}$		0.0534***	0.0543***	0.055***
		(6.31)	(6.49)	(6.65)
Financing Deficit$_{i,t}$			0.0159***	0.0161***
			(2.62)	(2.79)
Capital Expenditure$_{i,t}$				0.0567
				(1.65)
Observations	814,833	814,833	814,833	814,833
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm Cluster	Yes	Yes	Yes	Yes
Time Cluster	Yes	Yes	Yes	Yes
R^2	0.55	0.55	0.55	0.55
Within R^2	0.11	0.12	0.12	0.11

change in working capital, and internal cash flow, or the sum of net debt and equity issues have stronger debt individual debt implications. The disaggregated financing deficit Frank and Goyal (2003) is:

$$DEF_{i,t} = DIV_{i,t} + I_{i,t} + \Delta W_{i,t} - C_{i,t} = \Delta D_{i,t} + \Delta E_{i,t} \tag{2}$$

Columns (4)-(6) uses these disaggregated components and the results are robust to the results found in (1)-(3). The persistent significance of $Cash_{t-1}$ suggests that cash drives leverage decisions in ways not fully addressed by the capital structure literature.

Table 3. 2003Q1-2021Q2 Omitted Variables and Disaggregation of Financing Deficit

The sample period is from 2003Q1-2021Q2. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. The baseline regression is estimated using a disaggregated financing deficit variable as defined in Equation 2. Variables are defined in Appendix A, scaled by lagged net assets (book assets minus cash) and winsorized at 0.5% and 99.5%. All specifications incorporate two-way fixed effects two-way clustering of standard errors at the firm and year levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$Cash_{i,t-1}$	0.056***		0.049***	0.055***		0.054***
	(5.71)		(2.99)	(5.38)		(3.25)
$Cash_{i,t}$		0.055***	0.008		0.054***	0.001
		(5.96)	(0.86)		(5.56)	(0.1)
$Dividends_{i,t}$				0.022	0.085	0.022
				(0.13)	(0.52)	(0.13)
$Investments_{i,t}$				0.206***	0.22***	0.206***
				(6.94)	(7.75)	(6.91)
Δ *Working Capital*$_{i,t}$				0.012*	-0.011	0.012
				(1.91)	(-1.32)	(1.64)
Internal Cash Flow$_{i,t}$				0.012	0.004	0.012
				(0.63)	(0.25)	(0.64)
Observations	387,469	387,419	387,419	387,864	378,842	378,842
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Firm Cluster	✓	✓	✓	✓	✓	✓
Time Cluster	✓	✓	✓	✓	✓	✓
R^2	0.59	0.58	0.59	0.59	0.58	0.59
Within R^2	0.13	0.12	0.13	0.12	0.11	0.12

Table 4 uses traditional and non-traditional leverage controls as another robustness check. Traditional leverage controls include the lagged dependent variable of LT Liabilities, size, profitability, tangibility, and Tobin's Q. Non-traditional leverage controls include $Constrained_{i,t}$, which analyzes 10-Q SEC filings using a keyword list from Bodnaruk, Loughran, and McDonald (2015), predicting corporate finance liquidity events such as dividend omissions, equity recycling, and underfunded pensions.

Table 4 Columns (1) and (2) has $Cash_{i,t-1}$ coefficients of 0.064*** and $Constrained_{i,t}$ has a coefficient of 8.07*** indicating the more financially constrained a firm, the more leverage it has. In (2), the coefficient on $Uncertainty_{i,t}$ is -4.335***, indicating that firms operating with more uncertainty, reduce leverage. (3) and (4) adds traditional leverage controls and earlier results do not change. Column (5) is the most stringent setting due to adding lagged dependent variable $Long\ Term\ Liabilities_{i,t-1}$, which reduces the coefficient of $Cash_{i,t-1}$in half to 0.033***, raising the R^2 from 0.63 to 0.76 and the Within R^2 from 0.14 to 0.44. In contrast, the coefficient on the $Financing\ Deficit_{i,t}$ stays mostly the same. With the lagged dependent variable and firm and time fixed effects that already addressed stationarity in level variables, results remain robust.

Overall, the empirical tests for Hypothesis 1 show a persistent and significantly positive relationship between acquired cash and future leverage after the Homeland Investment Act of 2003. This contrasts the negative coefficient on acquired cash before the HIA, which is more in line with traditional capital structure theories where firms use acquired cash for deleveraging.

This unique novel setting of the HIA allows for studying the increasing benefits of debt separately from the adverse selection costs of externally financed debt. Firms with greater overseas revenues have higher tax liabilities and higher demand for tax deductions. As Miller (1977) noted, the marginal benefits of debt rise with corporate taxes such as repatriation taxes and progressive corporate taxes on Subpart F income generated from interest on

Table 4. 2003Q1-2021Q2 Panel Regression with Leverage Controls

The sample period is from 2003Q1-2021Q2. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. Variables are defined in Appendix A, scaled by lagged net assets (book assets minus cash) and winsorized at 0.5% and 99.5%. All specifications incorporate two-way fixed effects two-way clustering of standard errors at the firm and year levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$				
	(1)	(2)	(3)	(4)	(5)
Cash$_{t-1}$	0.064***	0.064***	0.061***	0.068***	0.033***
	(5.67)	(5.67)	(4.69)	(4.65)	(3.15)
Constrained$_{i,t}$	8.07***			8.756***	6.845***
	(4.1)			(4.45)	(6.00)
Uncertainty$_{i,t}$		-4.335***		-4.126***	-2.969***
		(-3.49)		(-3.35)	(-4.55)
Financing Deficit$_{i,t}$			0.013**	0.017***	0.018***
			(2.36)	(2.62)	(4.37)
Size$_{i,t}$			-0.015	-0.028*	0.002
			(-1.32)	(-1.78)	(0.16)
Profitability$_{i,t}$			0.111	0.114	-0.001
			(1.52)	(1.37)	(-0.01)
Tangibility$_{i,t}$			0.315***	0.345***	0.438***
			(6.4)	(4.13)	(7.2)
Tobins Q$_{i,t}$			0.003	0.003	-0.004
			(0.87)	(0.6)	(-1.34)
Long Term Liabilities$_{i,t-1}$					0.563***
					(7.47)
Observations	243,923	243,923	370,259	236,788	229,100
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Cluster	Yes	Yes	Yes	Yes	Yes
Time Cluster	Yes	Yes	Yes	Yes	Yes
R^2	0.62	0.62	0.60	0.63	0.76
Within R^2	0.13	0.13	0.14	0.14	0.44

overseas cash.[13] Miller (1977) models the tax-deductible gains from leverage G_L as:

$$G_L = [1 - \frac{(1-\tau_c)(1-\tau_{PS})}{1-\tau_{PB}}]B_L \tag{3}$$

where τ_c is the corporate tax rate, τ_{PS} is the personal tax rate for stock income, τ_{PB} is the personal tax rate for bond income, and B_L is the market value of the levered firm's debt. As the corporate tax rate, τ_c, increases, the gains from leverage increase. Similarly the corporate tax rate on overseas cash, τ_c^{OC} can be modeled as:

$$\tau_c^{OC} = C^F[X(I,\omega)](\tau_{t+\epsilon}^R + r\tau^I) \tag{4}$$

The overseas cash C^F depends on a firm's cash flows X, which is a function of a firm's investment I and state of the world ω. This overseas cash is subject to the repatriation tax of τ^R at time $t+\epsilon$, and the investment income rate r generated on overseas cash (Subpart F Income) will be immediately subject to the progressive corporate tax rate of τ^I, which suggests that marginal gains from leverage may be convex. A modification of the baseline regression captures this convexity:

$$L_{it} = \alpha_i + \lambda_t + \beta \times Cash_{i,t-1} + \gamma \times Cash_{i,t-1}^2 + X'\Gamma + u_{it} \tag{5}$$

If $\gamma > 0$, the convexity between overseas cash and debt can be visualized in Figure reftikz2. Hypothesis 2 tests for this convexity.

Hypothesis 2. *The repatriation tax motive should be stronger in firms with greater overseas operations. Due to a progressive corporate tax rate, the relationship between acquired cash and future leverage should have convexity.*

In testing for Hypothesis 2, I look at multinational firms in the COMPUSTAT Annual

[13] US corporations are taxed on Subpart F income generated from interest on overseas cash, even if those overseas cash holdings are not repatriated.
https://www.irs.gov/pub/int_practice_units/DPLCUV_2_01.PDF

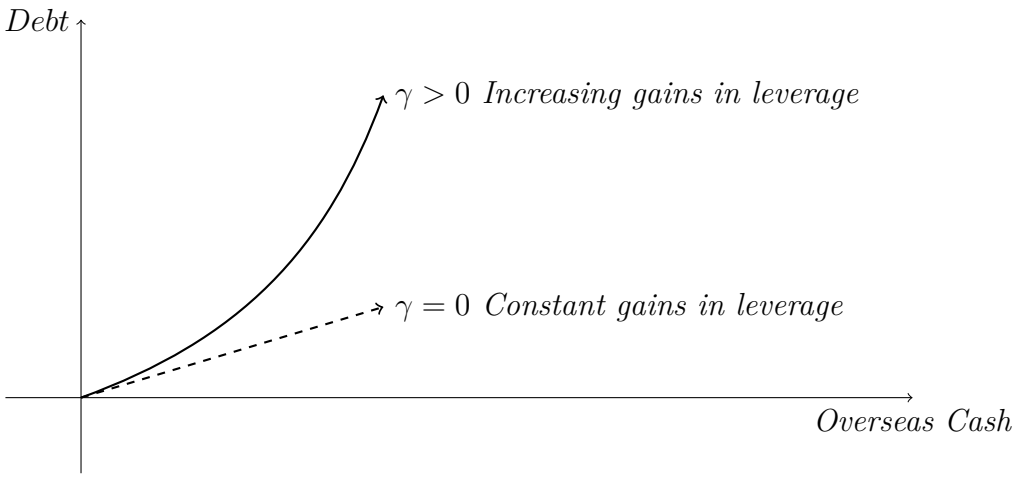

Figure 2. This outlines the convex relationship hypothesized by $\gamma > 0$ in Equation 5 due to overseas cash and increasing marginal gains in leverage due to repatriation taxes and progressive corporate taxes on Subpart F Income.

Segments database and sort firms into four quartiles based on the size of their overseas operations. For sorting purposes, a firm's average annual overseas revenues from 2003-2020 is used to sort firm-year observations into four quartiles. In Table 5, the 1st quartile comprises firms with zero overseas revenue, and each quartile progressively increases in overseas revenue, with the 4th quartile comprising firms with the most overseas revenue. Controls consists of the financing deficit, log of net assets, profitability, tangibility, and Tobin's Q.

In Table 5, the coefficients on $Cash_{t-1}$ generally increase as quartiles increase, with values of 0.051***, 0.156***, 0.092**, and 0.305***. The general increase in coefficients is in line with the repatriation tax motive where multinationals with more overseas operations have a greater need for leverage. When the test for convexity $Cash^2_{t-1}$ is added to (2), (4), (6), and (8), only the 4th quartile is positive and significant with a value of 0.015***. In line with the repatriation motive, firms with the most overseas operations, such as Apple, hold the strongest repatriation tax motives.

Table 5. 2003-2021 Panel Regressions by Multinational Quartiles

The sample period is from 2003Q1-2021Q2. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. Variables are defined in Appendix A, scaled by lagged net assets (book assets minus cash) and winsorized at 0.5% and 99.5%. Firms are sorted into quartiles based on average overseas revenue from the 2003-2020 COMPUSTAT Historical Segments Annual data, where the 1st (4th) Quartile consists of firms with the lowest (highest) overseas revenue. The following Equation 5 is estimated:

$$L_{i,t} = \alpha_i + \lambda_t + \beta \times Cash_{i,t-1} + \gamma \times Cash^2_{i,t-1} + X'\Gamma + u_{i,t}$$

where L_{it} is long-term liabilities, γ tests for convexity, and control variables X are the financing deficit, log of net assets, profitability, tangibility, and Tobin's Q. All variables other than Tobin's Q are scaled by lagged net assets . All specifications incorporate two-way fixed effects and two-way clustering of standard errors at the firm and year levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$							
	1st Quartile		2nd Quartile		3rd Quartile		4th Quartile	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Cash_{i,t-1}$	0.051***	0.062***	0.156***	0.153**	0.092**	0.138**	0.305***	0.174***
	(4.17)	(2.66)	(4.75)	(2.36)	(2.43)	(2.05)	(6.67)	(3.11)
$Cash^2_{i,t-1}$		-0.0001		0.00		-0.0018		0.015***
		(-0.88)		(0.05)		(-0.58)		(4.11)
Observations	32,617	32,617	31,878	31,878	32,897	32,897	31,535	31,535
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Cluster	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Cluster	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.46	0.46	0.75	0.75	0.56	0.56	0.61	0.62
Within R^2	0.10	0.10	0.68	0.68	0.13	0.13	0.26	0.28

3.2 Domestic Surprise

Domestic firms do not have a repatriation motive due to having no overseas profits to repatriate. However, in Table 5, multinational firms with zero revenues overseas still had a $Cash_{i,t-1}$ coefficient (0.051***) that was similar in economic and statistical significance to the $Cash_{i,t-1}$ coefficient in the entire sample of Table 2, 3, and 4. It is unclear whether another motive exists for domestic firms to increase leverage after accumulating cash. When examining differences between multinational and domestic firms in Table 6, multinational firms predictably hold more cash, are larger in size, and have larger financing deficits. However, a different picture emerges when examining ratios, as domestic firms have higher average cash-to-net-asset ratios (1.96 vs. 0.62), long-term liability to net-asset ratios (0.46 vs. 0.37), and financing deficit to net-asset ratios (0.38 vs. 0.10). Domestic firms seem to have weaker cash flows, as they are are on average less profitable (-0.23 vs -0.01) and have higher Altman Z scores (6.27 vs 3.62) than multinational firms. On the other hand, domestic firms have higher cash ratios (3.55 vs. 1.51), higher tangibility (0.43 vs. 0.28), and a higher ratio of long-term debt due in 1Y to long-term debt, suggesting that domestic firms have more collateral on hand for their debt. This suggests domestic firms may have a motive to accumulate cash due to credit constraints from higher lending standards and/or limited debt capacity.

3.3 Cash Collateral and Debt Capacity

Evidence suggests domestic firms may use cash as collateral to alleviate constraints on debt capacity, and a couple of theoretical frameworks touch upon this dynamic. For instance, Gamba and Triantis (2008) argues for cash expanding a firm's debt capacity in the following framework:

$$p'(1+r) \leq b'(1+r) + sk'(1-\delta) + \pi(k', \theta_d) - g(y(k', p', b', \theta_d)) \tag{6}$$

Table 6. Multinational vs. Domestic Firms 2003-2021
This table presents summary statistics for quarterly observations of multinational and domestic firms listed on COMPUSTAT for selected time periods. Multinational firms are defined as firms with overseas operations listed in the COMPUSTAT Historical Segments Annual database. Financial firms, utilities, and firms with missing market-to-book ratios are excluded. All variables are winsorized at 0.5% and 99.5%.

	Multinational		Domestic		Means	
2003Q1-2021Q2	Obs	Mean	Obs	Mean	Difference	T-Stat
Cash Holdings ($M)	146,718	824	263,341	119	705	-146.0
Total Assets ($M)	146,760	7,784	263,470	1,407	6,377	-135.0
Net Assets ($M)	146,693	6,831	263,337	1,273	5,558	-132.9
Long Term Liabilities ($M)	144,367	2,629	259,002	546	2,083	-123.0
Financing Deficit ($M)	146,799	155	263,480	41	114	-56.7
Cash/Net Assets	141,143	0.62	253,193	1.96	-1.34	50.2
LTL/Net Assets	138,860	0.38	248,951	0.46	-0.08	20.5
Deficit/Net Assets	141,175	0.10	253,264	0.38	-0.28	39.9
Profitability	134,109	-0.01	242,778	-0.23	0.22	-81.2
Tangibility	141,003	0.28	252,755	0.43	-0.15	137.0
Tobins Q	146,760	1.80	263,470	2.13	-0.33	30.3
Altman's Z Score	139,427	3.62	249,768	6.27	-2.65	29.3
Interest Coverage Ratio	113,473	38.88	179,269	27.14	11.74	-18.7
Cash Ratio	144,402	1.51	258,979	3.55	-2.04	78.1
Interest Expense Ratio	126,370	0.01	228,147	0.01	0.00	58.4
Current LT Debt/LT Debt	64,132	0.74	69,006	1.52	-0.78	13.3

As p' is a firm's perpetual debt and b' is a firm's cash balance, Gamba and Triantis (2008) defines the debt capacity as a function of cash. A firm's end-of-period debt is constrained by a firm's cash balance plus the fire sale of depreciated assets plus after-tax cash flows. Also, in Jarrow, Krishenik, and Minca (2018) a firm can increase debt capacity by holding more cash:

$$(y^*, R^*) \in \underset{A_1}{\operatorname{argmax}}(h(y, R)) \tag{7}$$

A firm maximizes expected payoff $h(y, R)$ by investing in risky asset y using borrowed funds at an interest rate R from a large, pessimistic creditor. The firm can alleviate creditor pessimism by increasing cash holdings. The large credit can utilize its market power and demand higher lending rates or fewer risky assets from the borrower, forcing the firm to hold

more cash to expand debt capacity. The following hypotheses are formed with the evidence so far:

Hypothesis 3. *Domestic firms increase leverage after acquiring cash.*

Hypothesis 4. *Acquired cash reduces financial constraints in debt, supporting the "cash collateral" motive.*

Hypothesis 3 and 4 tests whether the role of cash is in line with the "collateral channel". If cash is a high-quality collateral that reduces financial constraints and increases debt capacity, then the interaction between financial constraint indicators and lagged cash will be positive and significant in the following empirical model:

$$L_{it} = \alpha_i + \lambda_t + \beta \times Cash_{i,t-1} + \beta_F \times (Cash_{i,t-1} \times Z_{i,t}) + X'\Gamma + u_{it} \tag{8}$$

$Cash_{i,t-1} \times Z_{i,t}$ captures the interaction between cash and a vector of variables that increase and decrease demand for debt. Variables that increase demand for debt measure financial constraints such as distress, Altman's Z Score, Interest Coverage Ratios, and constraints measured by textual analysis. If β_F is positive and significant, this suggests that financially constrained firms can acquire cash to expand debt capacity. Variables that decrease demand for debt include the Tax Cut and Jobs Act of 2017 (TCJA), which was implemented in 2018 and reduced the incentive to use debt as a tax shield (Carrizosa et al., 2022; Alolah et al., 2023). If cash was used as collateral for debt, then lower demand for debt means β_F should be negative and significant. However, this lower demand for debt would apply to profitable, healthy companies that presumably need debt shields. Distressed firms and their demand for debt would not be impacted by the TCJA because they would not need debt shields due to low profitability. The existence of a "cash collateral" channel can partially explain the paradox of record corporate cash and record corporate debt.

Table 7 tests Hypothesis 3. Surprisingly, the positive and significant coefficients on lagged cash for domestic firms across all specifications suggest that domestic firms also have

Table 7. Domestic Firms and the Tax Cut and Jobs Act (TCJA)
The sample period is from 2003Q1-2021Q2 and excludes financial firms, utilities, and firms with missing market-to-book ratios. "TCJA" is an indicator with a value of 1 from 2018Q1 onwards and a value of 0 beforehand. "Distressed" refers to firms with an Altman's Z-Score less than 1.8, while "Sound" refers to firms with an Altman's Z-Score greater than 3.0. Control variables are the financing deficit, log of net assets, tangibility, and Tobin's Q. All variables other than Tobin's Q are scaled by lagged net assets. All specifications incorporate two-way fixed effects and two-way clustering of standard errors at the firm and quarter levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$				
	Domestic Only (1)	Domestic Only (2)	Domestic Only (3)	Domestic & Distressed (4)	Domestic & Healthy (5)
$Cash_{i,t-1}$	0.052***	0.086***	0.089***	0.105***	0.082***
	(5.12)	(5.78)	(5.91)	(4.87)	(6.25)
$Cash_{i,t-1} \times\ TCJA_t$			-0.052***	-0.024	-0.055***
			(-3.65)	(-1.00)	(-5.85)
$Profitability_{i,t}$		-0.133**	-0.135**	-0.295***	-0.004
		(-2.41)	(-2.47)	(-5.72)	(-0.06)
$Profitability_{i,t} \times\ Cash_{i,t-1}$		0.008***	0.009***	0.011***	0.007***
		(5.34)	(5.41)	(3.49)	(4.27)
$Profitability_{i,t} \times\ Cash_{i,t-1}$			-0.006***	-0.002	-0.005***
$\times\ TCJA_t$			(-3.08)	(-0.57)	(-4.49)
Observations	248,278	238,370	238,370	121,850	86,123
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes
Firm Cluster	Yes	Yes	Yes	Yes	Yes
Time Cluster	Yes	Yes	Yes	Yes	Yes
R^2	0.60	0.62	0.62	0.56	0.80
Within R^2	0.12	0.16	0.16	0.11	0.27

a significant relationship between acquired cash and long-term liabilities. In Column (3) the negative coefficients on $Cash_{i,t-1} \times TCJA_t$ (-0.052***) demonstrates that the TCJA's reduction in demand for debt also reduced the cash collateral channel as expected. Column 4 (5) is made up of distressed (healthy) firms with an Altman's Z Score of 1.8 or below (3.0 or

above). In Column (4) and (5), the coefficient on $Cash_{i,t-1} \times TCJA_t$ is -0.024 and -0.055***, in line with Hypothesis 3. The reduction in debt demand due to the TCJA came from healthy firms that need debt shields, not distressed firms that still need cash as collateral and may not be profitable enough to use debt shields.

For profitability, the coefficients in (2), (3), and (4) are negative with values of -0.133** -0.135***, and -0.295***, suggesting that distressed firms use their profits for deleveraging since the coefficient is largest in (4). The insignificant coefficient in (5) suggests that healthy firms do not use profits for deleveraging. When profitable firms have cash from the prior quarter, they appear to be less desperate to deleverage. This is indicated by positive coefficients on $Profitability_{i,t} \times Cash_{i,t-1}$ in columns (2) to (5). After TCJA, healthy and profitable firms would reduce their demand for tax shields, while distressed firms never prioritized debt shields to begin with. The coefficients on $Profitability_{i,t} \times Cash_{i,t-1} \times TCJA_t$ are -0.006***, -0.002, and -0.005***, confirming this. The R^2 and *Within* R^2 is 0.80 and 0.27 for column (5) are the highest in Table 7, suggesting that the TCJA's reduction in demand for tax shields hit healthy, profitable firms the hardest.

Next, Table 8 tests Hypothesis 4 by examining Formula 8 under different conditions of financial distress and constraints. In (1), *Distress* is an indicator with a value of 1 if the firm's Altman's Z Score is below 1.8, 0 otherwise. The coefficient on the interaction $Distress_{i,t} \times Cash_{i,t-1}$ is 0.036***, suggesting that distressed firms tend to increase their long-term liabilities as their cash from the previous period increases. If this coefficient were negative, it would suggest that financially distressed firms use cash holdings to reduce leverage. However, the positive coefficient implies that an increase in the previous period's cash is associated with increased current leverage for distressed firms. This suggests that rather than using the accumulated cash to pay off debts, these firms are potentially leveraging their cash holdings to expand their debt capacity. Column (2) focuses on Altman's Z Score, a recognized indicator of financial distress. The negative coefficient of -0.02*** for $Altman's\ Z\ Score_{i,t} \times Cash_{i,t-1}$ suggests as firms become more distressed and their Altman's

Table 8. Domestic Firms Under Financial Distress

The sample period is from 2003Q1-2021Q2 and excludes financial firms, utilities, and firms with missing market-to-book ratios. The dependent variable is long-term liabilities and the control variables are the financing deficit, log of net assets, profitability, tangibility, and Tobin's Q. Variables other than Tobin's Q are scaled by lagged net assets. "Bankruptcy" is an indicator when the Altman Z-Score is less than 1.8, "Low-Interest Coverage" is an indicator that the interest coverage ratio (EBIT/Interest Expense) is below 1. $Constrained_{i,t}$ and $Uncertainty_{i,t}$ uses a keyword list from Bodnaruk et al. (2015) to analyze 10-Q SEC filings. All specifications incorporate two-way fixed effects and two-way clustering of standard errors at the firm and quarter levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$				
	(1)	(2)	(3)	(4)	(5)
$Distress_{i,t} \times Cash_{i,t-1}$	0.036***				
	(4.90)				
$Distress_{i,t}$	0.287***				
	(12.90)				
Altman's Z Score$_{i,t} \times Cash_{i,t-1}$		-0.02***			
		(-3.66)			
Altman's Z Score$_{i,t}$		-0.500***			
		(-9.33)			
Low Interest Coverage$_{i,t}$			0.029***		
$\times Cash_{i,t-1}$			(3.32)		
Low Interest Coverage$_{i,t}$			0.115***		
			(8.23)		
$Constrained_{i,t} \times Cash_{i,t-1}$				-6.529**	
				(-2.02)	
$Constrained_{i,t}$				12.99***	
				(3.92)	
$Uncertainty_{i,t} \times Cash_{i,t-1}$					-1.524**
					(-1.98)
$Uncertainty_{i,t}$					-0.794
					(-0.33)
$Cash_{i,t-1}$	0.057***	0.075***	0.055***	0.112***	0.089***
	(4.28)	(5.2)	(4.24)	(3.52)	(5.22)
Observations	231,051	231,051	238,370	133,463	133,463
Controls	✓	✓	✓	✓	✓
Firm & Time FE	✓	✓	✓	✓	✓
Firm & Time Cluster	✓	✓	✓	✓	✓
R^2	0.62	0.61	0.60	0.64	0.64
Within R^2	0.15	0.16	0.14	0.15	0.155

Z Score decreases, firms again leverage their cash holdings to expand debt capacity as seen in (1).

In (3), firms with low-interest coverage (EBIT/Interest Expense < 1) have difficulty covering their interest expenses with earnings, and these firms also tend to use acquired cash to increase long-term liabilities (0.029***). The positive coefficient on the standalone low-interest coverage dummy (0.115***) also suggests these firms have higher long-term liabilities, irrespective of their cash position. (4) has a negative coefficient of -6.529** for $Constrained_{i,t} \times Cash_{i,t-1}$, indicating that financially constrained firms tend to use cash to reduce liabilities. This may be reflective of Bodnaruk et al. (2015)'s constrained definition being more closely correlated with liquidity events such as dividend eliminations. In (5), the coefficient on $Uncertainty_{i,t} \times Cash_{i,t-1}$ also indicates firms use cash to pay down debt when there is uncertainty.

The overall results suggest when a firm is under mild distress, it may be more inclined to utilize its cash to expand debt capacity. On the other hand, when faced with severe financial distress and uncertainty, domestic firms become more conservative and appear inclined to use acquired cash to deleverage. This dichotomy hints at complex underlying factors governing capital structure decisions. Further tests can provide a clearer picture in identifying thresholds influencing a firm's decision to aggressively expand debt capacity or conservatively use cash holdings to deleverage.

3.4 Characteristics of Paradox Firms

This section delves further into the characteristics of firms that are driving the paradox of record cash and record debt. Table 9 breaks down the sample into quartiles based on a matrix constructed using median long-term liabilities and median cash holdings established every quarter. Specifically, the quartiles consist of firms with (1) above median debt and above median cash, (2) above median debt but below median cash, (3) below median debt and above median cash, and (4) below median debt and below median cash. Notably in Panel A,

Table 9. 2003-2021: Matrix Analysis

Data, variables, and controls follow Table 8. Quartiles use median long-term liabilities and median cash holdings established every quarter. High/Low Debt indicates above/below median leverage while High/Low Cash indicates above/below median cash. Panel A represents all firms while Panel B/C represents firms with a negative/positive Altman Z Score. Variable are in bold/italics if the mean is higher/lower than the mean of the other three quartiles. All specifications incorporate two-way fixed effects and two-way clustering of standard errors at the firm and quarter levels. T-statistics are reported in parentheses.

	Dependent variable: Long Term Liabilities$_{i,t}$			
	High Debt High Cash	High Debt Low Cash	Low Debt High Cash	Low Debt Low Cash
Panel A: All Firms	(1)	(2)	(3)	(4)
Cash$_{i,t-1}$	0.103***	0.202	0.000	-0.006
	(5.8)	(1.5)	(-0.21)	(-1.66)
Observations	45,814	70,699	69,193	45,945
Panel B: Negative Z-Score				
Cash$_{i,t-1}$	0.057***	0.390**	-0.0002***	0.0069*
	(5.29)	(2.04)	(-3.09)	(1.72)
Observations	16,355	16,504	12,378	12,393
Panel C: Positive Z-Score				
Cash$_{i,t-1}$	0.115***	0.19	0.0001*	-0.0204***
	(5.73)	(1.66)	(1.78)	(-3.69)
Observations	28,157	49,579	55,268	31,648
Variables	Mean	Mean	Mean	Mean
Tech Firms	**0.48**	*0.12*	**0.4**	*0.16*
Cash ($M)	**228**	**127**	*66*	*26*
Long Term Liabilities ($M)	**428**	**1,488**	*12*	*66*
Total Assets ($M)	**1,003**	**3,163**	*200*	*491*
Market Cap ($M)	**1,201**	**2,570**	*423*	*524*
LT Debt to LT Liabilities	**0.56**	**0.72**	*0.28*	*0.43*
Current to Total Liabilities	*0.06*	*0.08*	*0.07*	**0.22**
LT Debt Issuance ($M)	**73.9**	**298.5**	*1.5*	*24.0*
LT Debt Reduction ($M)	**45.1**	**256.1**	*2.4*	*24.9*
Financing Deficit	**0.18**	*0.05*	**0.14**	*0.03*
Altman Z Score	*-1.00*	*-0.41*	**17.14**	*5.58*
Bankrupt (Zscore < 0)	**0.37**	*0.26*	*0.19*	**0.29**
Not Bankrupt (Zscore > 3)	*0.28*	*0.14*	**0.65**	**0.37**
Low Interest Coverage Ratio	**0.44**	**0.38**	*0.21*	**0.39**
Financially Constrained	**0.74**	**0.74**	*0.67*	*0.67*
Uncertainty	**1.31**	*1.09*	**1.32**	*1.11*

firms with high debt and high cash have a coefficient of 0.103***, indicating their preference to aggressively increase debt after acquiring cash. However, a more focused analysis of firms experiencing extreme distress, as represented in Panel B with negative Altman Z-Scores, reveals an interesting divergence. By tightening our criteria for distressed firms from below an Altman Z-Score of 1.8 to strictly below 0, we aim to offer a more granular insight into the behavior of firms under different levels of distress. Firms with negative Altman Z-Scores in Panel B's Quartile 3 have a negative coefficient of -0.0002*** for firms with low debt and high cash. This suggests classic pecking order behavior where firms use cash holdings to deleverage. In addition, a similar behavior is observed in Panel C's Quartile 4, where firms with positive Altman Z-Scores also use cash holdings to deleverage. Quartile 3 and 4 firms are smaller, with higher Altman Z-Scores and lower net debt issuances. This suggests that smaller firms may have more difficulty expanding debt capacity or are more prone to deleverage even when in good financial health.

A significant takeaway is that the positive coefficient on cash in the overall domestic sample in Table 7 and 8 is primarily derived from the first two quartiles. Interestingly, these quartiles predominantly encompass larger firms with lower Altman Z scores. This suggests that larger domestic firms are in a position to aggressively extend their debt capacity with acquired cash, while their smaller counterparts often resort to using cash to deleverage.

Next, Table 10 uses κ t-statistics from linear regressions $L_t = \beta_0 + \kappa Cash_{t-1} + X'\Gamma$ at the firm level, and firms are sorted into Quartiles where the 1st(4th) Quartile has the highest (lowest) firm-level κ t-statistics. Similar to prior panel regressions, the control variables X for these firm-level linear regressions are the financing deficit, log of net assets, profitability, tangibility, and Tobin's Q. In Panel A, Quartile 1 firms are larger, and their higher κ t-statistics indicate they tend to use cash to aggressively expand debt capacity. In Quartile 4, negative κ t-statistics indicate these smaller firms tend to use acquired cash to deleverage their balance sheet. This divergence between Quartile 1 and 4 underscores firms' varied cash and leverage strategies, likely influenced by their size.

Table 10. 2003Q1-2021Q2 Domestic Cash Betas Sorted by T-Statistics
Using κ t-statistics from linear regression $L_t = \beta_0 + \kappa Cash_{t-1} + X'\Gamma$, firms are sorted into Quartiles where the 1st(4th) Quartile has the highest (lowest) κ t-statistics. Linear (Panel) Regressions in Panel A (B/C) follow Table 8 for control variables. Variable outcomes are highlighted in bold/italics if the mean comparison is higher/lower than the mean of the other three quartiles. Panel B/C incorporates two-way fixed effects and two-way clustering of standard errors at the firm and quarter levels. T-statistics are reported in parentheses.

	Quartiles of Linear Regression T-Statistics$_{i,t}$			
	Highest	2nd Highest	3rd Highest	Lowest
Panel A: Quartile Only	(1)	(2)	(3)	(4)
Cash$_{i,t-1}\beta_i$ (Mean)	0.7539	0.5009	-0.2557	-0.5571
Cash$_{i,t-1}\beta_i$ (Median)	0.3530	0.1228	-0.0339	-0.2156
T-Stat (Median)	2.8146	0.8626	-0.4130	-2.0997
Observations	56,542	56,421	56,554	56,490
Panel B: Negative Z-Score	*Dependent variable: Long Term Liabilities$_{i,t}$*			
Cash$_{i,t-1}$	0.099***	0.009	0.025*	-0.03***
	(6.11)	(0.96)	(1.72)	(-3.13)
Observations	12,385	14,954	14,802	13,557
Panel C: Positive Z-Score	*Dependent variable: Long Term Liabilities$_{i,t}$*			
Cash$_{i,t-1}$	0.118***	0.05***	0.025	0.01
	(5.78)	(2.51)	(1.64)	(0.63)
Observations	40,581	37,959	37,663	39,991
Variables	Mean	Mean	Mean	Mean
Tech Firms	**0.31**	0.28	0.28	0.26
Cash to Net Assets	*1.69*	**1.83**	**1.81**	*1.64*
LT Liabilities to Net Assets	**0.54**	**0.48**	*0.46*	*0.38*
Total Assets ($M)	**2,117**	*1,088*	**1,436**	*910*
Market Cap ($M)	**1,909**	*1,118*	1,234	*993*
LT Debt to LT Liabilities	*0.52*	**0.54**	**0.55**	*0.52*
Current to Total Liabilities	*0.09*	**0.11**	**0.11**	*0.10*
LT Debt Issuance ($M)	**160**	*95*	**124**	*80*
LT Debt Reduction ($M)	**133**	*80*	**103**	*68*
Financing Deficit	*0.08*	0.10	**0.11**	**0.10**
Profitability	**-0.04**	*-0.07*	*-0.07*	-0.06
Tangibility	0.43	*0.43*	**0.44**	**0.45**
Tobins Q	*1.80*	2.07	2.06	**2.07**
Dividend %	**0.24**	*0.20*	**0.22**	*0.20*
Altman Z Score	*3.99*	*4.28*	*4.89*	**6.20**
Bankrupt (Zscore < 0)	*0.24*	**0.29**	**0.29**	*0.26*
Not Bankrupt (Zscore > 3)	*0.35*	*0.34*	*0.35*	**0.39**
Low Interest Coverage Ratio	*0.32*	**0.36**	**0.36**	*0.34*
Financially Constrained	**0.72**	**0.71**	**0.71**	*0.70*
Uncertainty	1.21	*1.21*	1.21	1.21

Panel B consists of Quartile firms with negative Altman Z-Scores, indicating a degree of financial vulnerability. The coefficient on $Cash_{i,t-1}$ in Quartile 1 and 4 is 0.099*** and -0.03*** respectively. This suggests Quartile 1 firms may take advantage of their size to use cash holdings to expand debt capacity, even in the face of potential financial distress. On the other hand, Quartile 4 firms are generally smaller, which may expose them to more financial vulnerability. This may be why these firms adopt a more conservative stance and use cash to deleverage, reducing their risk in times of financial distress.

Panel C consists of Quartile firms with positive Altman Z-Scores, indicating firms that are financially healthier than Panel B. The coefficient on $Cash_{i,t-1}$ in Quartile 1 and 4 is 0.118*** and 0.01, respectively, suggesting a slightly different picture than Panel B. Larger firms in Quartile 1 continue to use cash holdings to expand debt capacity, capitalizing on their sound financial health. On the other hand, Quartile 4 firms attenuate their caution compared to Quartile 4 firms in Panel B, no longer strictly using cash holdings to deleverage. Improving financial health may offset the tendency of smaller firms to deleverage with excess cash.

4 Conclusion

The paradoxical reality of firms simultaneously holding record levels of cash and debt is at odds with a widely held, rarely challenged principle that firms tend to use excess cash holdings to deleverage their balance sheet. In this paper, I find that after the Homeland Investment Act of 2003, firms shifted to using cash to aggressively expand debt capacity instead of deleveraging. In fact, results indicate cash holdings have 3x more explanatory power for future leverage than long-established variables such as the financing deficit.

In this paper, I uncover two primary motives driving this paradox: the repatriation tax motive and the "cash collateral" motive. The repatriation tax motive becomes increasingly stronger as multinationals have increasingly larger overseas operations. The observed con-

vexity is due to increasing gains in leverage from the combined impact of repatriation taxes and the progressive tax rate on Subpart F Income on overseas cash, which together amplify the value of debt shield strategies. Using the Tax Cuts and Jobs Act (TCJA) as an exogenous shock that reduces demand for tax shields, results reveal a nuanced response. Specifically, it showed that only firms needing debt shields, typically those in better financial health, demonstrated a reduction in expanding debt capacity. Conversely, distressed firms with less need for a debt shield did not exhibit a similar reduction, in line with expectations. This distinction underscores the varying impact of the TCJA on firms based on their financial status and specific needs for debt-related tax benefits.

Domestic firms, which are smaller and have less debt capacity than multinationals, have a different motive. When domestic firms reach debt capacity limits and are under mild distress, they use acquired cash to expand debt capacity. However, smaller firms, with greater information asymmetry, that are under severe constraints and uncertainty use cash to deleverage its balance sheet, in line with pecking order theory and Acharya et al. (2007).

These strategies are likely driven by corporate needs for financial flexibility and avoidance of financial distress during downturns, in line with CFO surveys in Graham (2022). Large firms want financial flexibility to pursue investment opportunities, while smaller firms want to avoid financial distress during downturns. Firms also want reliable access to funding DeAngelo (2022). While larger firms have reliable access to long-term debt markets, smaller firms often do not. Smaller companies are more susceptible to economic fluctuations, so they prioritize strategies to stave off financial distress during downturns and diligently maintain their lines of credit. In conclusion, this paper finds that firms adopt different strategies to achieve financial flexibility and reliable access to capital. These strategies help explain why we have the paradox of record levels of corporate cash and debt.

A Appendix: Variable Definitions

Variable	Definition
Altman's Z Score	3.3 * (EBIT/ATQ) + 0.99 * (REVTQ/ATQ) + 0.6 * ((PRCCQ*CSHOQ)/LTQ) + 1.2*((ACTQ-LCTQ)/ATQ) + 1.4 * (REQ/ATQ)
Capital Expenditure	CAPXY
Cash Holdings	CHEQ
Constrained	Textual sentiment score given to 10K SEC Filings using a financial constraints word list from Bodnaruk et al. (2015)
Cost of Debt	Interest Expense/Total Liabilities (XINTQ/LTQ)
Financing Deficit	Cash Dividends (DV)+Net Investment(CAPX+IVCH+AQC-SPPE-SIV-IVSTCH-IVACO)+Change in Net Working Capital (WCAPC+CHECH+DLCCH)-Operating Cash Flow(OANCF-RECCH-INVCH-APALCH-TXACH-EXRE) following Frank and Goyal (2003).
Homeland Investment Act	Indicator that equals 1 starting on 2003Q1 and equals 0 before
Internal Cash Flow	Income Before iby dpq xidocy txdcy esubcy fopoy sppivy - NIQ
Leverage	Income before Extraordinary Items (IBY) + Depreciation and Amortization (DPQ) + Extraordinary Items and Discontinued Operations (XIDOCY) + Deferred Taxes (TXDCY) + Equity in Net Loss/Earnings (ESUBCY) + Other Funds from Operations (FOPOY) + Gain/Loss from Sale of PPE and Investments (SPPIVY) - Net Income (NIQ)
Long Term Liabilities	Long-Term Liabilities (LLTQ)
Low-Interest Coverage (Dummy)	Indicator that equals 1 when the interest coverage ratio, Earnings Before Interest and Taxes/Interest Expense (NIQ+XINTQ+TXTQ)/XINTQ, is below 1 and 0 otherwise
Multinational Firm	A firm that is listed in the COMPUSTAT Annual Historical Database with non-US operations
Negative	Textual sentiment score given to 10K SEC Filings using an negative word list from Bodnaruk et al. (2015)
Net Debt	Long Term Debt Issuance (DLTISY) - Long Term Debt Reduction (DLTRY)

Variable	Definition
Net Investment	Capital Expenditure (CAPXY)+Increase in Investments (IVCHY)+Acquisitions (AQCY) + Use of Funds Other (FUSEOY) - Sale of Property (SPPEY) - Sale of Investments (SIVY)
Profitability	Operating Income Before Depreciation (OIBDPQ)/ Lagged Net Assets (ATQ-CHEQ)
Short Term Maturity	Current Portion of Long Term Debt/Total Long Term Debt (LCTQ/LTQ)
Tangibility	Plant Property and Equipment/Lagged Net Assets (PPENTQ/(ATQ-CHEQ))
Tax Cut and Jobs Act	Indicator that equals 1 after 2018Q1 and 0 before
Tobin's Q	Market Value of Assets (PRCCQ*CSHOQ)/Total Assets (ATQ)
Uncertainty	Textual sentiment score given to 10K SEC Filings using an uncertainty word list from Bodnaruk et al. (2015)
Δ Working Capital	Changes in Working Capital (WCAPCHY)+ Changes in Cash (CHECHY) + Changes in Current Debt (DLCCHY)

References

Acharya, V. V., H. Almeida, and M. Campello. 2007. Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of financial intermediation* 16:515–554.

Almeida, H., M. Campello, and M. S. Weisbach. 2004. The cash flow sensitivity of cash. *The Journal of Finance* 59:1777–1804.

Alolah, O., J. Helwege, and R. Kim. 2023. Risk Aversion, Taxes and Capital Structure Adjustments. *Working paper* .

Altman, E. I. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The journal of finance* 23:589–609.

Baker, M., and J. Wurgler. 2002. Market timing and capital structure. *The journal of finance* 57:1–32.

Barro, R. J. 1976. The loan market, collateral, and rates of interest. *Journal of money, Credit and banking* 8:439–456.

Barry, C. B., S. C. Mann, V. T. Mihov, and M. Rodriguez. 2008. Corporate debt issuance and the historical level of interest rates. *Financial Management* 37:413–430.

Bates, T. W., K. M. Kahle, and R. M. Stulz. 2009. Why do US firms hold so much more cash than they used to? *The journal of finance* 64:1985–2021.

Benmelech, E., and N. K. Bergman. 2011. Bankruptcy and the collateral channel. *The Journal of Finance* 66:337–378.

Bharath, S. T., P. Pasquariello, and G. Wu. 2009. Does information asymmetry drive capital structure decisions. *Review of Financial Studies* 22:3211–43.

Blanchard, O. J., F. Lopez-de Silanes, and A. Shleifer. 1994. What do firms do with cash windfalls? *Journal of financial economics* 36:337–360.

Bodnaruk, A., T. Loughran, and B. McDonald. 2015. Using 10-K text to gauge financial constraints. *Journal of Financial and Quantitative Analysis* 50:623–646.

Bretscher, L., L. Schmid, and A. Vedolin. 2018. Interest rate risk management in uncertain times. *The Review of Financial Studies* 31:3019–3060.

Bruner, R. F. 1988. The use of excess cash and debt capacity as a motive for merger. *Journal of Financial and Quantitative Analysis* 23:199–217.

Byoun, S. 2008. How and when do firms adjust their capital structures toward targets? *The Journal of Finance* 63:3069–3096.

Carrizosa, R., F. Gaertner, and D. Lynch. 2022. Debt and Taxes? The Effect of TCJA Interest Limitations on Capital Structure. *Journal of the American Taxation Association* pp. 35–55.

Chaney, T., D. Sraer, and D. Thesmar. 2012. The collateral channel: How real estate shocks affect corporate investment. *American Economic Review* 102:2381–2409.

Chang, A., D. Teshner, G. Wilson, L. Grimando, A. Wong, and F. Khan. 2017. U.S. Corporate Cash Reaches $1.9 Trillion But Rising Debt and Tax Reform Pose Risk. *SP Global Platts* URL https://www.spglobal.com/en/research-insights/articles/us-corporate-cash-reaches-19-trillion-but-rising-debt-and-tax-reform-pose-risk.

Chava, S., V. Nanda, and S. C. Xiao. 2017. Lending to innovative firms. *The Review of Corporate Finance Studies* 6:234–289.

De Simone, L., and R. Lester. 2018. The effect of foreign cash holdings on internal capital markets and firm financing .

De Simone, L., J. D. Piotroski, and R. E. Tomy. 2018. Repatriation Taxes and Foreign Cash Holdings: The Impact of Anticipated Tax Reform. *The Review of Financial Studies* p. hhy124.

DeAngelo, H. 2022. The capital structure puzzle: What are we missing? *Journal of Financial and Quantitative Analysis* 57:413–454.

DeAngelo, H., L. DeAngelo, and T. M. Whited. 2011. Capital structure dynamics and transitory debt. *Journal of Financial Economics* 99:235–261.

Denis, D. J. 2012. The persistent puzzle of corporate capital structure: Current challenges and new directions. *Financial Review* 47:631–643.

Denis, D. J., and V. Sibilkov. 2010. Financial constraints, investment, and the value of cash holdings. *The Review of Financial Studies* 23:247–269.

Donaldson, G. 1961. *Corporate debt capacity.*

Fama, E. F., and K. R. French. 2002. Testing trade-off and pecking order predictions about dividends and debt. *The review of financial studies* 15:1–33.
Fama, E. F., and K. R. French. 2005. Financing decisions: who issues stock? *Journal of financial economics* 76:549–582.
Faulkender, M., M. J. Flannery, K. W. Hankins, and J. M. Smith. 2012. Cash flows and leverage adjustments. *Journal of Financial economics* 103:632–646.
Faulkender, M., and M. Petersen. 2012. Investment and capital constraints: repatriations under the American Jobs Creation Act. *The Review of Financial Studies* 25:3351–3388.
Faulkender, M., and J. M. Smith. 2016. Taxes and leverage at multinational corporations. *Journal of Financial Economics* 122:1–20.
Faulkender, M., and R. Wang. 2006. Corporate financial policy and the value of cash. *The Journal of Finance* 61:1957–1990.
Faulkender, M. W., K. W. Hankins, and M. A. Petersen. 2019. Understanding the rise in corporate cash: Precautionary savings or foreign taxes. *The Review of Financial Studies* 32:3299–3334.
Foley, C. F., J. C. Hartzell, S. Titman, and G. Twite. 2007. Why do firms hold so much cash? A tax-based explanation. *Journal of Financial Economics* 86:579–607.
Francis, T., and T. Mann. 2014. America's Business Puzzle: Record Debt and Record Cash; Tax-Avoidance Logic: Stockpile Overseas Earnings Load Up on Debt, *Wall Street Journal*. URL https://www.wsj.com/articles/interest-rate-clock-ticks-for-tax-avoidance-practice-1406837494.
Frank, M. Z., and V. K. Goyal. 2003. Testing the pecking order theory of capital structure. *Journal of financial economics* 67:217–248.
Frank, M. Z., and V. K. Goyal. 2008. Trade-off and pecking order theories of debt. In *Handbook of empirical corporate finance*, pp. 135–202. Elsevier.
Gamba, A., and A. Triantis. 2008. The value of financial flexibility. *The journal of finance* 63:2263–2296.
Gan, J. 2007. Collateral, debt capacity, and corporate investment: Evidence from a natural experiment. *Journal of Financial Economics* 85:709–734.
Gao, H., J. Harford, and K. Li. 2013. Determinants of corporate cash policy: Insights from private firms. *Journal of Financial Economics* 109:623–639.
Graham, J. R. 2000. How big are the tax benefits of debt? *The Journal of Finance* 55:1901–1941.
Graham, J. R. 2022. Presidential address: Corporate finance and reality. *The Journal of Finance* 77:1975–2049.
Graham, J. R., and M. T. Leary. 2018. The evolution of corporate cash. *The Review of Financial Studies* 31:4288–4344.
Hanlon, M., E. L. Maydew, and D. Saavedra. 2017. The taxman cometh: Does tax uncertainty affect corporate cash holdings? *Review of Accounting Studies* 22:1198–1228.
Harford, J., S. Klasa, and W. F. Maxwell. 2014. Refinancing risk and cash holdings. *The Journal of Finance* 69:975–1012.
Harford, J., C. Wang, and K. Zhang. 2017. Foreign cash: Taxes, internal capital markets, and agency problems. *The Review of Financial Studies* 30:1490–1538.
Hart, O., and J. Moore. 1994. A theory of debt based on the inalienability of human capital. *The Quarterly Journal of Economics* 109:841–879.
Heider, F., and A. Ljungqvist. 2015. As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes. *Journal of financial economics* 118:684–712.
Helwege, J., and N. Liang. 1996. Is there a pecking order? Evidence from a panel of IPO firms. *Journal of financial economics* 40:429–458.
Helwege, J., and N. Liang. 2004. Initial public offerings in hot and cold markets. *Journal of Financial and Quantitative Analysis* 39:541–569.
Izhakian, Y., D. Yermack, and J. F. Zender. 2022. Ambiguity and the tradeoff theory of capital structure. *Management Science* 68:4090–4111.
Jarrow, R., A. Krishenik, and A. Minca. 2018. Optimal cash holdings under heterogeneous beliefs. *Mathematical Finance* 28:712–747.
Jensen, M. C. 1986. Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review* 76:323–329.
Leary, M. T., and M. R. Roberts. 2005. Do firms rebalance their capital structures? *The journal of finance* 60:2575–2619.

Leary, M. T., and M. R. Roberts. 2010. The pecking order, debt capacity, and information asymmetry. *Journal of financial economics* 95:332–355.
Lemmon, M. L., and J. F. Zender. 2010. Debt capacity and tests of capital structure theories. *Journal of Financial and Quantitative Analysis* 45:1161–1187.
Loughran, T., and B. McDonald. 2011. When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks. *The Journal of Finance* 66:35–65.
Maddaloni, A., and J.-L. Peydró. 2011. Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the Euro-area and the US lending standards. *The Review of Financial Studies* 24:2121–2165.
Mann, W. 2018. Creditor rights and innovation: Evidence from patent collateral. *Journal of Financial Economics* 130:25–47.
Miller, M. H. 1977. Debt and taxes. *the Journal of Finance* 32:261–275.
Myers, S. C. 1984. The capital structure puzzle. *The Journal of Finance* 39:574–592.
Myers, S. C., and N. S. Majluf. 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of financial economics* 13:187–221.
Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson. 1999. The determinants and implications of corporate cash holdings. *Journal of financial economics* 52:3–46.
Peek, J., and E. S. Rosengren. 2000. Collateral damage: Effects of the Japanese bank crisis on real activity in the United States. *American Economic Review* 90:30–45.
Shyam-Sunder, L., and S. C. Myers. 1999. Testing static tradeoff against pecking order models of capital structure1. *Journal of financial economics* 51:219–244.
Stiglitz, J. E., and A. Weiss. 1981. Credit rationing in markets with imperfect information. *The American economic review* 71:393–410.
Stulz, R. 1990. Managerial discretion and optimal financing policies. *Journal of financial Economics* 26:3–27.
Sufi, A. 2009. Bank lines of credit in corporate finance: An empirical analysis. *The Review of Financial Studies* 22:1057–1088.