Crowding Out Long-Term Corporate Investment: The Role of Long-Term Government Debt Supply

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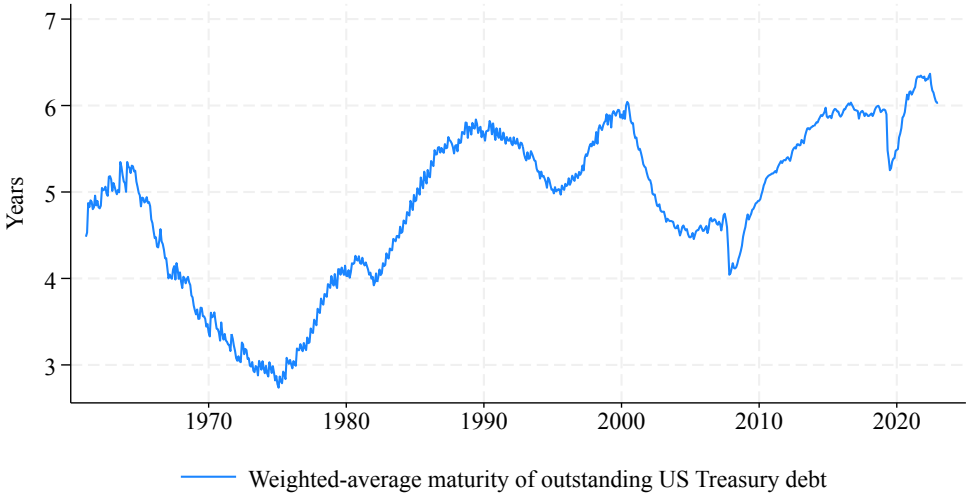
July 22, 2025

Many interventions affect the maturity structure of government debt



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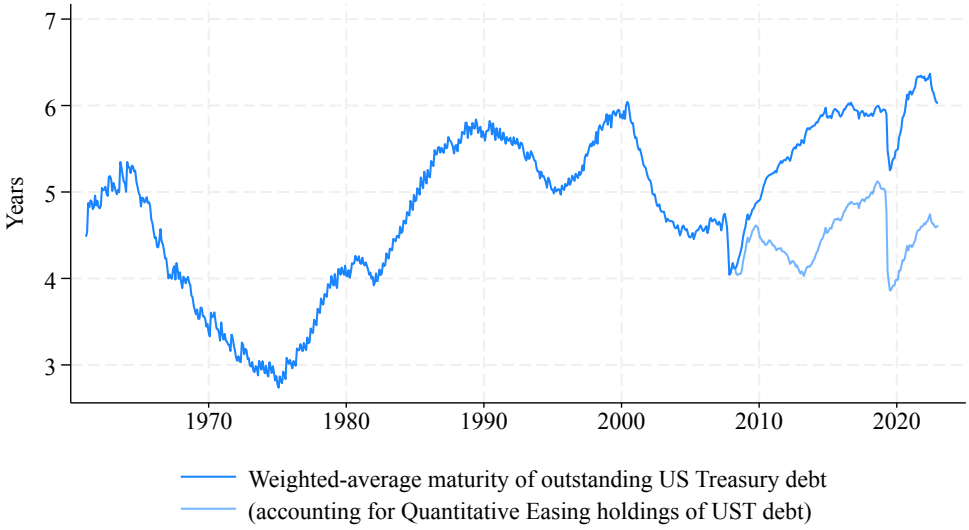

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- Implication for corporate investment: LT investments less attractive than ST investments

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      e.g., Caballero, 1999; Krugman, 2022; Graham, 2022, Gormsen and Huber, 2023
  - Normative implications if LT investment is too low (social returns, financial constraints)
    e.g., Aghion et al., 2010; Garicano and Steinwender, 2016; Jones and Summers, 2020; Ma et al., 2022

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    $\rightarrow$ discount rate channel

$\rightarrow$ **Insights** about implications of interventions in debt markets for equity-financed firms

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2. Discount rate channel: investment reallocation for both debt- and equity-financed firms
   - ↑ cost of debt for LT firms (via *maturity-matching*)
   - ↑ cost of equity for LT firms (via ↓ valuation of LT cash flows in stock market)

Related literature

1. **Debt supply, asset prices, corporate decision-making, and aggregate outcomes**
   - Asset pricing: Vayanos and Vila (2021); Krishnamurthy and Vissing-Jorgensen (2012); Greenwood and Vayanos (2014); Hanson (2014); Todorov (2020); Jansen (2021); Lucca and Wright (2022); Bretscher et al. (2023); Jansen et al. (2024); ……
   - Corporate financing: Baker et al. (2003); Greenwood et al. (2010); Badoer and James (2016); Selgrad (2023); Dos Santos (2024)…
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   - Maturity of government debt and the economy: Barro (1979); Lucas and Stokey (1983); Bohn (1990); Cochrane (2001); Angeletos (2002); Greenwood et al. (2015); Andreolli (2023);Corhay et al. (2023); Li et al. (2023); D'Avernas et al. (2024); …
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   - Bank provision of long-term finance: Gopalan et al. (2016); Choudhary and Limodio (2022); Diamond et al. (2024)…
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3. **Financial cost of capital and corporate investment**
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   - Investment and discount rates: Sharpe and Suarez (2021); Graham (2022); Gormsen and Huber (2023a, b) …

   → Persistent shifts in LT rates (rel. to ST rates) affect relatively more firms with long-term investments

Roadmap

Identification: US Treasury debt maturity (1965-2007)

Data and measurement of investment duration

The investment reallocation effect

Mechanism

Identification assumption

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- **Panel regressions** over different cross-section *i* (industry, firm, division) using Compustat :

$$Investment_{i,t} = \beta \cdot InvestmentDuration_i \times LongTermDebtSupply_t + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

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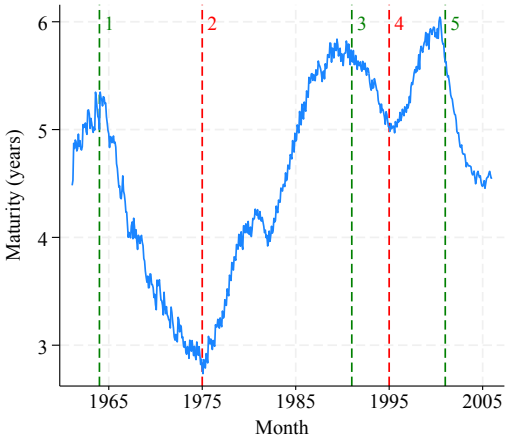
  - **Solution**: plausibly exogenous trends in maturity of outstanding US government debt (1965-2007)

Treasury debt maturity (1965-2007)



Weighted-average maturity of Treasury debt

- 5 regime shifts (*issuances*) → 5 trends (*outstanding*)

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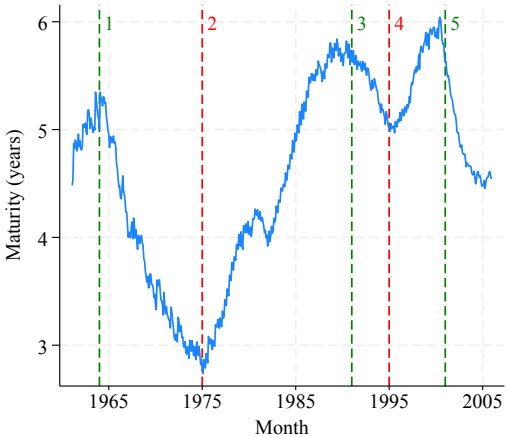

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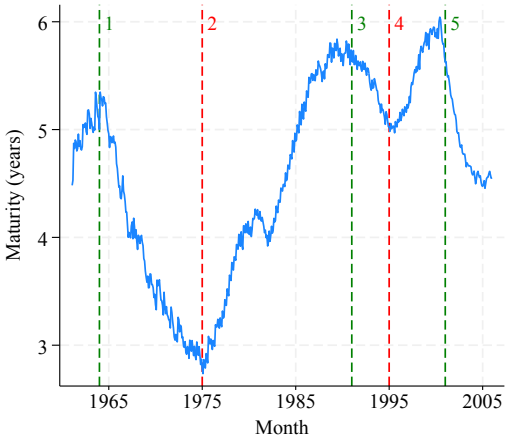

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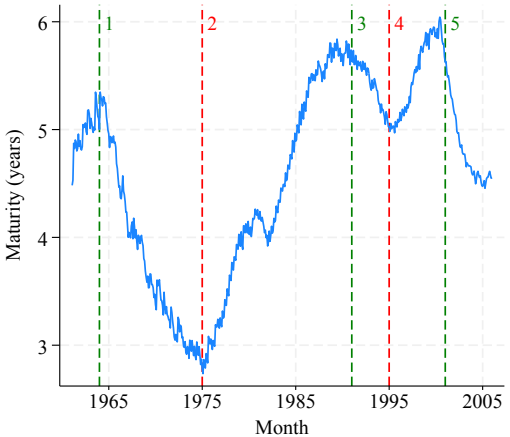

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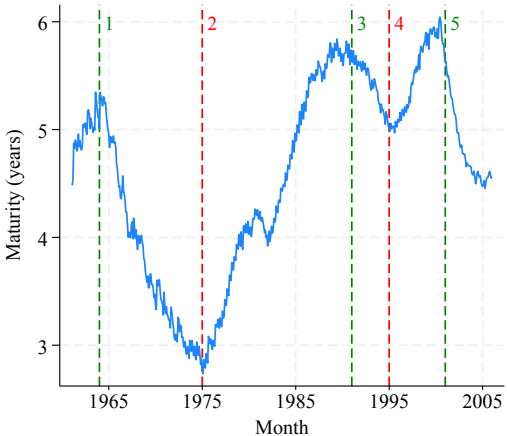

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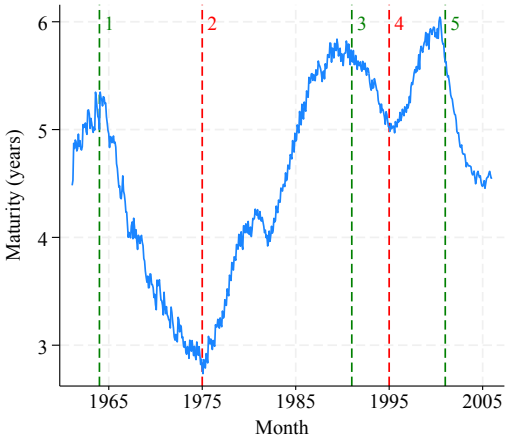

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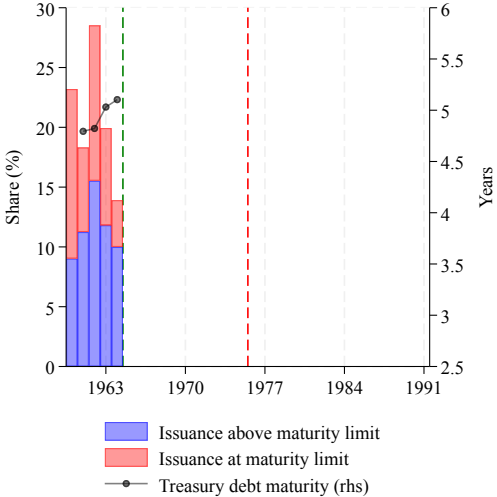
▸ Profiles ▸ Debt ▸ Measures ▸ Macro ▸ Investment ▸ Demand ▸ Quantitative ▸ 1 ▸ 2 ▸ 3 ▸ 4 ▸ 5

Treasury debt maturity and the policy regime shifts



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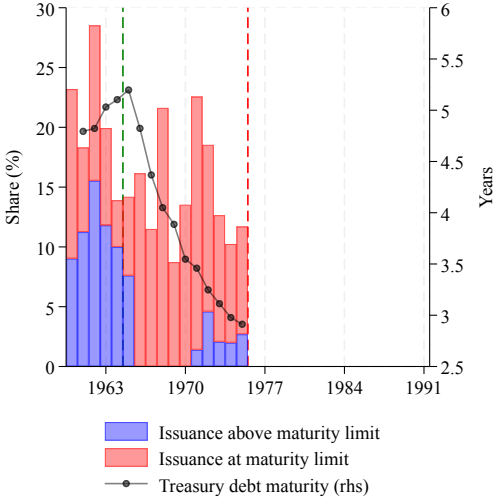

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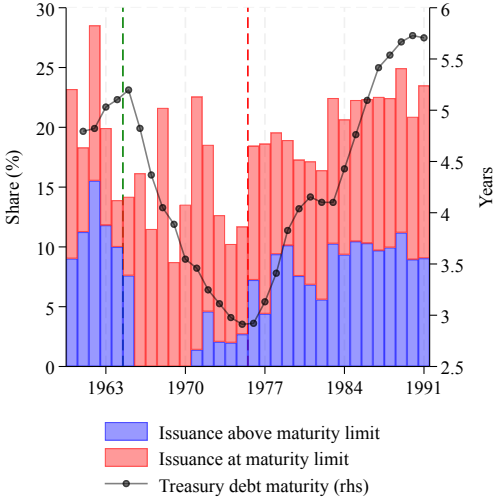

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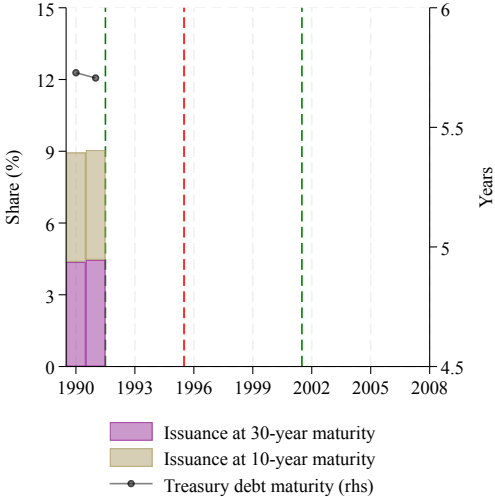

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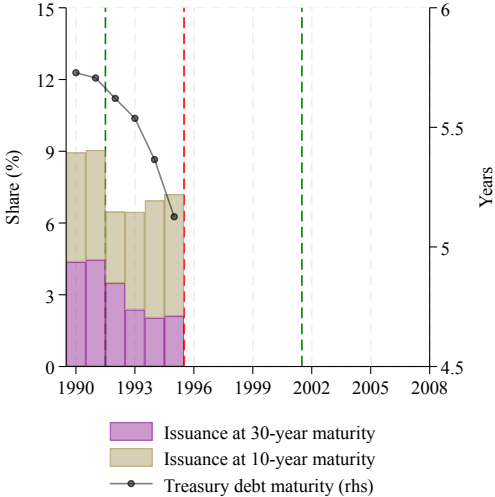

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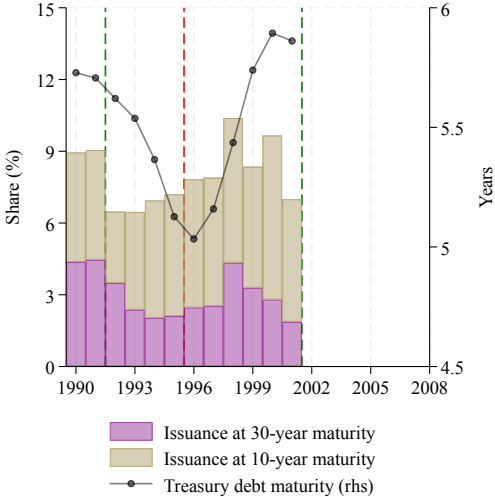

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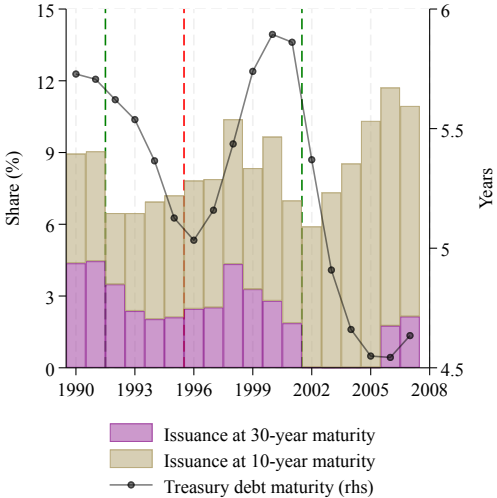

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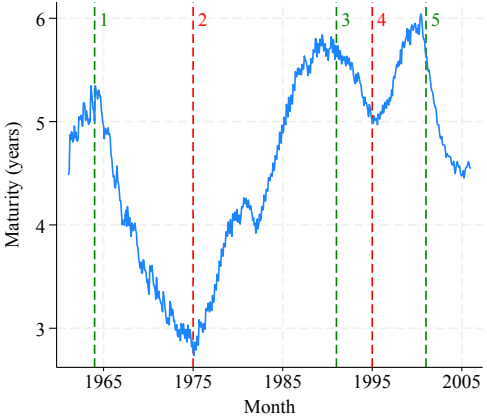
- 2002-06: Suspension of LT bond issuances (delayed response to fiscal surpluses)

Treasury debt maturity and relevance of the policy regime shifts



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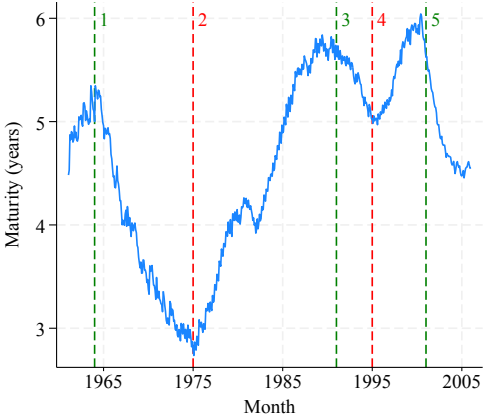

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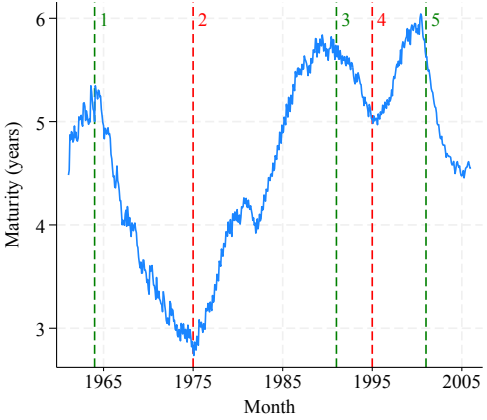

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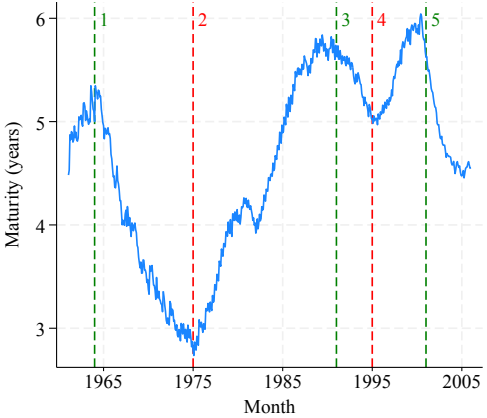

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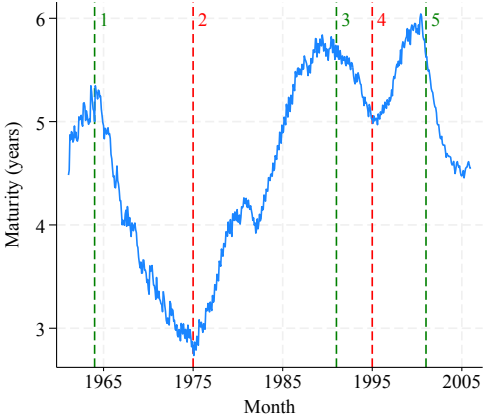

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→ **Use the realized variation over 1965-2007**

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Roadmap

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Mechanism

Firm-level data

Data: Investment by US public firms over 1965-2007 (Compustat Annual files)

- Excluding financial firms (SIC 6000 to 6999) and public utilities (SIC 4900 to 4999)
- Excluding observations with missing assets, sales, capital expenditures, or equity
- Excluding firms that disappear and reappear in the panel or with less than 3 years in the sample

Investment duration: proxy using depreciation rates

$InvestmentDuration_i$ proxied with firm-level or industry-level average of

$$AssetMaturity_{it} = \underbrace{\frac{NetPPE_{it}}{NetPPE_{it} + CA_{it}}}_{\text{Fixed-Assets Share}} \cdot \underbrace{\frac{1}{\delta_{it}}}_{\text{Fixed-Assets Maturity}} + \underbrace{\frac{CurrentAssets_{it}}{NetPPE_{it} + CA_{it}}}_{\text{Current-Assets Share}} \cdot \underbrace{1}_{\text{Current-Assets Maturity}}$$

with $\delta_{it} = \frac{DepreciationExp_{it}}{NetPPE_{it}}$

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with $\delta_{it} = \frac{DepreciationExp_{it}}{NetPPE_{it}}$

- Intuition: $\delta \uparrow \iff$ remaining life of the asset $\downarrow \iff$ duration of asset's cash flows $\downarrow$

▸ Asset Mat ▸ Fixed Asset Mat ▸ Breakdown Variation ▸ Maturity-matching ▸ Formula ▸ Horizon

Investment duration: facts validating measurement assumptions

- Variants of this measure align with predictions regarding economic asset lifespan

  e.g, Livdan and Nezlobin, 2021; Kermani and Ma, 2022; Geelen et al., 2023; Dessaint et al., 2023

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- Primarily a time-invariant industry characteristic

  - NAICS 3-digits FE $\approx$ 40% of firm-year variation, Firm FE $\approx$ 80%

    $\rightarrow$ Use averages at firm or NAICS 3-digits level

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    → Use averages at firm or NAICS 3-digits level

  - LT industries: Transportation, Mining, Oil & Gas

  - ST industries: Business Services, Wholesale Trade, Retail

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Roadmap

Identification: US Treasury debt maturity (1965-2007)

Data and measurement of investment duration

The investment reallocation effect

Mechanism

Validation: ↑ gov. debt maturity $\Longrightarrow$ ↑ LT Treasury yields

$$TermSpread_t = \beta \cdot TSYMAT_t + \gamma \cdot Z_t + \varepsilon_t$$

- **Macro Controls (Z_t):** 1-y yield, unemp. rate, credit spreads, GDP growth, inflation, exp. inflation, linear trend, D/GDP

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	(1)	(2)	(3)	(4)
	$y10 - y1$	$y10 - y1$	$y10 - y1$	$y10 - y1$
TSYMAT	0.34*	0.36***	0.32**	0.29*
	(0.19)	(0.11)	(0.14)	(0.16)
1-year yield		-0.32***	-0.31***	-0.34***
		(0.03)	(0.04)	(0.04)
Unemployment Rate		0.60***	0.60***	0.50***
		(0.05)	(0.05)	(0.09)
D/GDP			0.61	1.06
			(1.22)	(1.53)
Macro Controls	–	–	–	✓
Observations	516	516	516	516
R-squared	0.07	0.79	0.79	0.81

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- Evidence from excess returns consistent with risk compensation increasing in maturity

▸ Corporates ▸ Controls ▸ Measures ▸ Predictability ▸ Macro ▸ Maturities ▸ Returns ▸ Spread ▸ Convenience ▸ Framework

Across-firms reallocation: reduced form

$$Capex_{f,t}/Assets_{f,t-1} = \beta \cdot TSYMAT_t \cdot AssetMat_f + \alpha_f + \gamma_t + \delta \cdot TSYMAT_t \cdot X_{f,t-1} + \theta \cdot AssetMat_f \cdot Z_t + \varepsilon_{f,t}$$

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	Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × AssetMat	-0.121***	-0.136***	-0.142***	-0.154***	-0.160***	
	(0.023)	(0.022)	(0.026)	(0.025)	(0.028)	
TSYMAT × High AssetMat						-0.842***
						(0.165)
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
TSYMAT x Firm Controls	–	✓	–	✓	✓	✓
AssetMat x Macro Controls	–	–	✓	✓	✓	✓
AssetMat x D/GDP	–	–	–	–	✓	✓
Observations	120275	120275	120275	120275	120275	120275
Adjusted R^2	0.437	0.470	0.438	0.471	0.471	0.470

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Time FE	✓	✓	✓	✓	✓	✓
TSYMAT x Firm Controls	–	✓	–	✓	✓	✓
AssetMat x Macro Controls	–	–	✓	✓	✓	✓
AssetMat x D/GDP	–	–	–	–	✓	✓
Observations	120275	120275	120275	120275	120275	120275
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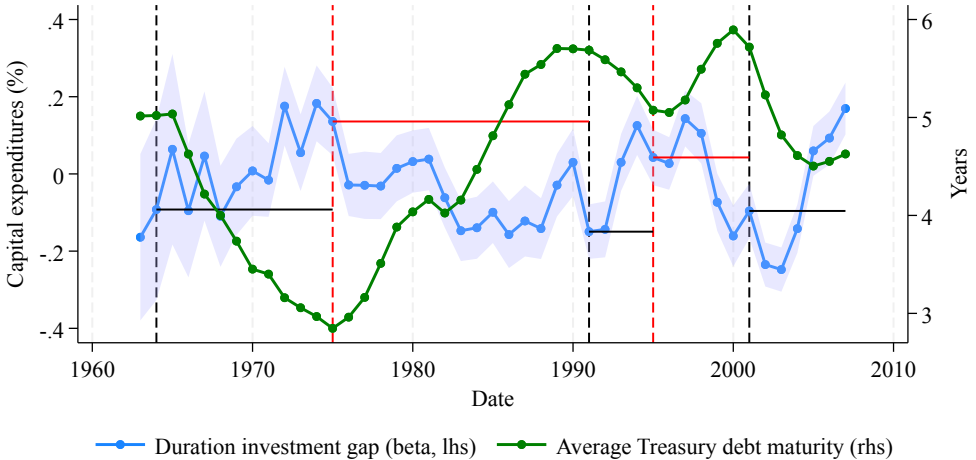
- **1-year ↑ in TSYMAT** (1.1 sd): Reallocation of 5% of aggregate capex from long- to short- firms

▸ Dummy measure ▸ Instrument ▸ OLS vs 2SLS ▸ Framework ▸ LP ▸ DiD

Across-firms reallocation: event studies

$$Capex_{f,t}/Assets_{f,t-1} = \beta \cdot \mathbb{1}_t \cdot AssetMat_f + \alpha_f + \gamma_t + \varepsilon_{f,t}$$



LP DiD Event Term

Selected additional results

- LT firms experience drop in employment growth and R&D

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- **Within-firm across-divisions** reallocation

▸ LP ▸ OLS vs 2SLS ▸ Breaking down investment ▸ Other outcomes ▸ Agg. ▸ Horizon ▸ Samples ▸ Duration measures
▸ Investment measures ▸ Supply measures ▸ UK ▸ Irreversibility ▸ Collateral ▸ Cyclicality ▸ Within-industry ▸ Within-firm ▸ Tax Policy

Roadmap

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Evidence so far:

$$\uparrow \text{long-term government debt supply} \implies \uparrow \text{long-term rates}$$
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$\implies$ $\downarrow$ NPV of LT investments, for firms financed with (maturity-matched) debt $\rightarrow$ *cost of debt channel*

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- Segmented equity and debt markets:

$\implies$ $\downarrow$ NPV of LT investments, for firms financed with (maturity-matched) debt $\rightarrow$ *cost of debt channel*

- Integrated markets:

$\implies$ $\downarrow$ NPV of LT investments, regardless of financing source $\rightarrow$ *discount rate channel*

▸ Framework

Cost of debt channel: ↑ gov. debt maturity $\Longrightarrow$ ↑ LT firms' cost of debt

	Baseline sample	Bond panel sample
	(1)	(2)
	Interest Expense to Total Debt	Yield-to-Maturity
TSYMAT × AssetMat	0.047**	0.044***
	(0.020)	(0.013)
Time FE	✓	✓
Firm FE	✓	✓
AssetMat x Macro Controls	✓	✓
Observations	106439	8237
Adjusted R^2	0.313	0.892

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- **Δ in investment (% of assets) / Δ in cost of bonds (pp) $\approx$ 2.7**
  e.g., Coppola (2024)$\approx$ 1.5-2.5, Kubitza (2023)$\approx$ 6

▸ Corp Spread ▸ Mat-Matching ▸ Mat-Matching Het. ▸ Elasticities ▸ Issuance ▸ EventIntExp ▸ Debt Reallocation ▸ Breaking A&L ▸ Capital Structure

Discount rate channel: reallocation across different capital structures

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	Capital Expenditures			
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.11**			
	(0.05)			
TSYMAT × AssetMat × High Leverage	-0.02			
	(0.06)			
Firm FE x LT Leverage Tercile	✓			
Time FE x Capital Structure Tercile	✓			
Observations	69711			
Adjusted R^2	0.484			

- Response of firms in bottom terciles of (LT) debt financing consistent with discount rate channel

▸ 1-year LT debt definition ▸ Heterogeneity ▸ Breaking Down A&L ▸ Change in Capital Structure ▸ Gap filling ▸ Debt Reallocation

Discount rate channel: reallocation across different capital structures

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	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.11**	-0.14***		
	(0.05)	(0.05)		
TSYMAT × AssetMat × High Leverage	-0.02			
	(0.06)			
TSYMAT × AssetMat × High Leverage (res.)		-0.01		
		(0.05)		
Firm FE x LT Leverage Tercile	✓	✓		
Time FE x Capital Structure Tercile	✓	✓		
Observations	69711	69739		
Adjusted R^2	0.484	0.481		

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		(0.05)		
TSYMAT × AssetMat × High LT Leverage (5y)			-0.01	
			(0.09)	
Firm FE x LT Leverage Tercile	✓	✓	✓	
Time FE x Capital Structure Tercile	✓	✓	✓	
Observations	69711	69739	55786	
Adjusted R^2	0.484	0.481	0.490	

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	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.11**	-0.14***	-0.11	-0.08
	(0.05)	(0.05)	(0.09)	(0.05)
TSYMAT × AssetMat × High Leverage	-0.02			
	(0.06)			
TSYMAT × AssetMat × High Leverage (res.)		-0.01		
		(0.05)		
TSYMAT × AssetMat × High LT Leverage (5y)			-0.01	
			(0.09)	
TSYMAT × AssetMat × High LT Leverage (5y, res.)				-0.04
				(0.06)
Firm FE x LT Leverage Tercile	✓	✓	✓	✓
Time FE x Capital Structure Tercile	✓	✓	✓	✓
Observations	69711	69739	55786	54850
Adjusted R^2	0.484	0.481	0.490	0.511

- Response of firms in bottom terciles of (LT) debt financing consistent with discount rate channel

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Discount rate channel: additional evidence

More support for discount rate channel based on investment characteristics:

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- Implied cost of capital for LT firms ↑

  e.g., Eskildsen, Ibert, Jensen, and Pedersen, 2024; Mohanram and Gode, 2013

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  → Valuations and price-to-dividend ratios for stocks with long payout duration ↓

  → Future realized equity returns for stocks with long payout duration ↑

▸ Valuations ▸ Returns ▸ ICC ▸ Division ▸ Debt Reallocation

Concluding remarks

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  - LT investments have large social returns → motive for lower maturity

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- The supply of LT government debt crowds out LT corporate investment
  - New causal implications of Treasury debt management and QE
- Novel evidence that government interventions in debt markets also affect equity-financed firms
- **Implications** for optimal maturity of consolidated government debt:
  - LT investments have large social returns → motive for lower maturity
  - LT investments are hit more by credit constraints → motive for lower maturity *in recessions*

Thank You!

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Roadmap

Appendix: Simple conceptual framework

Appendix: Government debt maturity

Appendix: Duration measures

Appendix: Investment reallocation

Appendix: Mechanism

Appendix: Debt reallocation

Appendix: UK shock

Appendix: Conceptual framework

Simple conceptual framework rationalizing the results (1/2)

- Result 1: Long-term debt supply shocks increase **long-term interest rates**
  - Partial equilibrium with **limited arbitrage between ST and LT bonds** (Greenwood and Vayanos, 2014)
    - risk averse investor absorbing shocks to long-term bond supply
    - interest rate risk (uncertain future short bond prices)

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    - risk averse investor absorbing shocks to long-term bond supply
    - interest rate risk (uncertain future short bond prices)
  - **Government financing** shocks in general equilibrium:
    - Deviations from Ricardian Eq. due to segmentation/limited participation in financial markets
    - e.g. financial sophistication, overlapping generations, or specialized arbitrageur

▸ Back to validation ▸ Back to Investment ▸ Back to Taking Stock

Simple conceptual framework rationalizing the results (2/2)

- Result 2: (**Profitability** of) long-term investments drops
  - Two investment technologies w/ risk-free payoffs: long/short duration are available to the same investor
  - Long-term cash flows are discounted with **long-term interest rates**

Simple conceptual framework rationalizing the results (2/2)

- Result 2: (**Profitability** of) long-term investments drops
  - Two investment technologies w/ risk-free payoffs: long/short duration are available to the same investor
  - Long-term cash flows are discounted with **long-term interest rates**
- Result 3: **Long-term corporate debt supply drops**
  - Investor dislikes roll-over risk and hedges additional interest risk from real investments
    - i.e. matches cash-flow duration of assets and liabilities
  - Byproduct: long-term interest rates do not increase as much

Back to validation | Back to Investment | Back to Taking Stock

Simple bond market framework with limited arbitrage

- t = 0,1,2
- Two types of bonds (no default risk)
  - 1-period bonds with exogenous returns $R_{0,1}$ (known) and $R_{1,1}$ (uncertain at t = 0)
  - 2-period bonds with endogenous return $R_{0,2}$ obtained through market clearing at 0

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  - 1-period bonds with exogenous returns $R_{0,1}$ (known) and $R_{1,1}$ (uncertain at t = 0)
  - 2-period bonds with endogenous return $R_{0,2}$ obtained through market clearing at 0
- **Mean-variance households** maximize final period consumption $\tilde{C}_2$ by investing in bonds

$$argmax_{B_{t,h}} \quad E\left[\tilde{C}_2\right] - \frac{\gamma}{2} Var\left[\tilde{C}_2\right] \qquad s.t.$$

$$(\mathbf{BC}_1): 0 = B_{0,1} + B_{0,2} \quad (\mathbf{BC}_2): 0 = B_{1,1} - B_{0,1}R_{0,1} \quad (\mathbf{BC}_3): C_2 = -B_{1,1}R_{1,1} - B_{0,2}R_{0,2}$$

  - $B_{t,h}$ = the dollar amount of borrowing at time t at maturity h
  - zero initial wealth → carry trades: purchase LT bonds by borrowing with ST bonds

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  - preferred habitat investors demanding L\$

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- Net supply of long-term bond is **exogenous**
  - government issuing G\$
  - preferred habitat investors demanding L\$
- Long-term bond market clearing

$$\underbrace{G - L}_{\text{Net Supply}} = \underbrace{-\frac{R_{0,1} \cdot E\left[R_{1,1}\right] - R_{0,2}}{\gamma \cdot Var\left[R_{1,1}\right] \cdot (R_{0,1})^2}}_{\text{Arbitrageurs Demand}}$$

Simple bond market framework with limited arbitrage

- Net supply of long-term bond is **exogenous**
  - government issuing G\$
  - preferred habitat investors demanding L\$
- Long-term bond market clearing

$$\underbrace{G - L}_{\text{Net Supply}} = \underbrace{-\frac{R_{0,1} \cdot E\left[R_{1,1}\right] - R_{0,2}}{\gamma \cdot Var\left[R_{1,1}\right] \cdot (R_{0,1})^2}}_{\text{Arbitrageurs Demand}}$$

$$\Longrightarrow \underbrace{R_{0,2} - R_{0,1} \cdot E[R_{1,1}]}_{\text{Term Premium}} = (G - L) \cdot \gamma \cdot Var\left[R_{1,1}\right] (R_{0,1})^2$$

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- **P1: ↑ net supply of LT bonds → ↑ term premium**

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Simple bond market framework with limited arbitrage + firms

- Mean-variance households can also invest in two firms with different cash flow duration

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- New program:

$$argmax_{B_{t,h},\ I_{t,h}} \quad E\left[\tilde{C}_2\right] - \frac{\gamma}{2} Var\left[\tilde{C}_2\right] \qquad s.t.$$

$$(\mathbf{BC}_1) : I_{0,1} + I_{0,2} = B_{0,1} + B_{0,2}$$
$$(\mathbf{BC}_2) : B_{0,1} R_{0,1} = B_{1,1} + z_1 f(I_{0,1})$$
$$(\mathbf{BC}_3) : C_2 + B_{1,1} R_{1,1} + B_{0,2} R_{0,2} = z_2 f(I_{0,2})$$

▸ Back to validation ▸ Back to Investment ▸ Back to Taking Stock

Optimal investment and corporate bond supply

- Long-duration investment reacts more to long-term interest rates

$$f(I) = \log(I) \qquad \Longrightarrow \qquad I_{0,1} = \frac{z_1}{R_{0,1}} \qquad I_{0,2} = \frac{z_2}{R_{0,2}}$$

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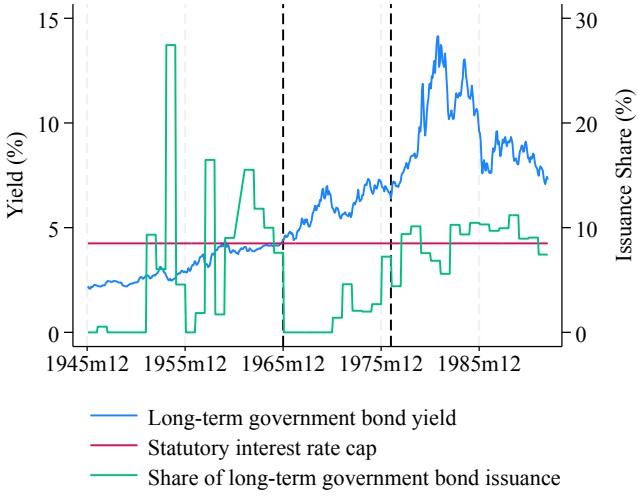
  - **P3: ↑ net supply of LT bonds → ↓ issuance for firms with a longer investment duration**

▸ Back to validation ▸ Back to Investment ▸ Back to Taking Stock

Roadmap

1965-1976: statutory constraint on long-term government debt issuance



Timing of the constraint

- Second Liberty Bond Act (1917): 4.25pp interest rate cap
- Post-WWII long-run trend in interest rates crossed arbitrary ceiling in 1965

Persistence of the constraint

- By 1967, Treasury officials recognized its role and repeatedly lobbied Congress
- Cautious congressional approach hindered substantial reform before 1976

Back

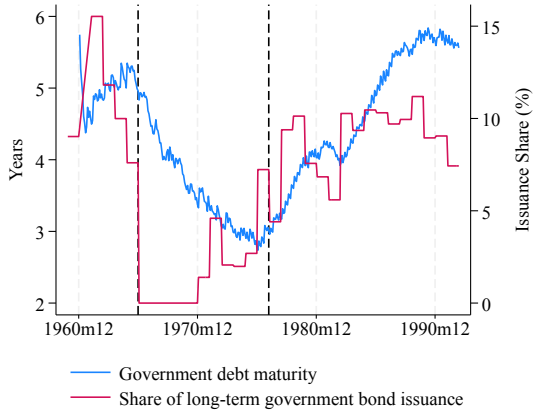
1965-1976: statutory constraint on long-term government debt issuance

Persistence of the constraint

- Treasury officials recognized the role of this ceiling and lobbied Congress for its removal
  - Secretary Fowler (1967): “this presents a problem that should be dealt with, in an orderly and systematic way, so that we do not face an excessive pileup of maturing debt”
  - Secretary Connally (1971): “the result has been a substantial and serious piling up of the debt in the short- term area. [...] we are vulnerable to any recurrence of high rates”.
- Cautious and staggered congressional process explains persistence until 1976
  - Swapped maturity of exemption from 5 to 7 years (1967) and from 7 to 10 years (1975)
  - Experimented an issuance exemption of $10 bn (1971) amended to apply to outstanding debt (1973)
    - “there is sufficient evidence here to justify a limited experiment, to see what happens if the Treasury were permitted to issue a limited amount of [long-term] debt”
    - “reluctant [to repeal] until there has been an opportunity to observe the effects [...]”
  - Changed exemption size to $12 bn (1976) to $17 bn (1976) to $70 bn (1980)…
  - Final repeal (1988)

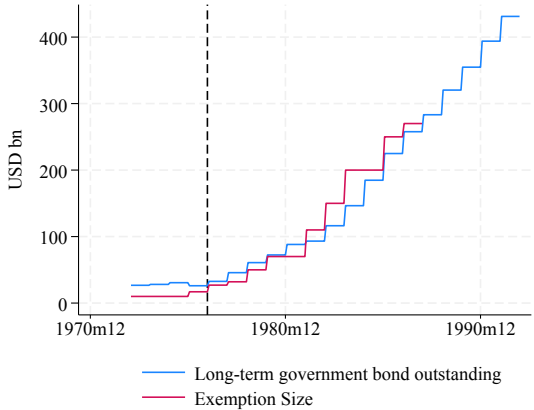
Back

1976-1992: Commitment to restore debt maturity to pre-constraint level



Back

1976-1992: Commitment to restore debt maturity to pre-constraint level



Back

1976-1992: Commitment to restore debt maturity to pre-constraint level

- Significant congress relaxations of statutory constraints on longer-term issuance
  - Quickly, the share of long-term debt issuance converged back to its pre-constraint level.
  - Gradually, the share of long-term debt outstanding converged back to its pre-constraint level.
  - Adoption of “regular and predictable offering framework” played a role in pace and persistence
- Expressions in support of the countervailing commitment for restoring debt maturity
  - Assistant Secretary Altman (1978): “we have been using the long-term market [...] to make further progress toward [...] reestablishing the overall market for Treasury long term securities.”
  - The Treasury “seeks to have the ability to finance long-term issues because they have helped to reverse the shortening of the average maturity of the Federal debt”.
  - 1982: Treasury asked, unsuccessfully, for the repeal: “Treasury believes it **must continue to issue bonds to maintain a presence in all maturity sectors of the bond market and to resist shortening the maturity of the public debt**”

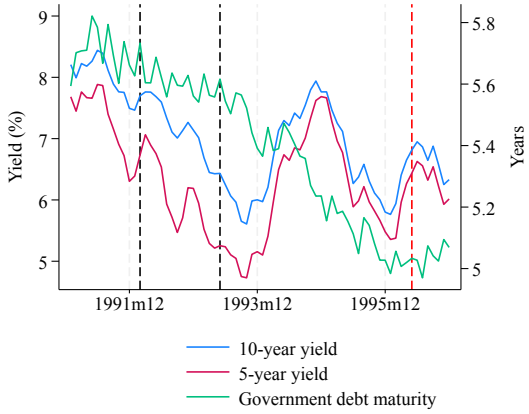
Back

1992-1996: Political view about the cost of long-term debt financing

- Before 1992 election: Bush administration's one-off reduction in long-term bond issuance
- May 1993: Clinton Administration permanently reduced long-term bond issuance by half
  - Tax reduction plan: "A Vision of Change for America". Justification: "not dependent on [...] interest rates across the yield curve [...]; dependent on the existence over time of [...] the risk premium in longer-term rates."
  - Surprised market participants, goes against the rubric of predictable offerings
  - Firm opposition of TBAC: "runs the risk of [...] undoing the gains, earned over years".
- Persistence of decision due to institutional inertia + cautious stance not to surprise markets
  - "not engaged in market-timing [...]; do not intend to flip-flop [...]; strategy for the long term."
  - Repeated recommendations by TBAC to reintroduce long-term issuances (1994, 1995):
    - "present pace of decline will increase the Treasury's exposure to variations in interest rates"
  - Reintroduction correlates w/ seeking TBAC advice on how to handle a reduction in size of issuances

Back

1992-1996: Political view about the cost of long-term debt financing



Back

1996-2001: Commitment to restore long-term debt issuance

- Rationale for reintroduction of long-term bond issuances relates to why the constraint surprised markets in the first place.
  - Treasury responds favourably to concerns that a decline in debt maturity would undo the benefits of the previous recovery from situation under the statutory constraint
  - “An arresting of the pace of decline in the average length of the debt.”
  - Reintroduction of previous issuance distribution

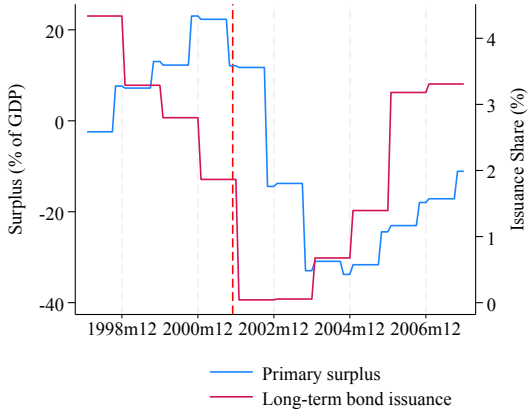
Back

2002-2007: Suspension of the long-term bond

- Fifth trend is related to the suspension of long-term bond offering between 2002 and 2006
- Rationale: pay off debt during times of fiscal surpluses, one of TBAC's recommendations
  - "Consolidating our long-term borrowing at the 10-year point is the most effective way for us to maintain a reasonable yield curve and to provide the supply necessary for adequate liquidity."
- Delayed decision surprised market participants
  - Consistent with institutional inertia, it occurred when the U.S. was expected to run deficits
  - Extent of the surprise: yield on 30-year bond fell 33 basis point, biggest one-day move since 1987
- Suspension persists until 2006 despite TBAC repeated recommendations to re-issue LT bonds.
  - TBAC concerns: "Treasury should increase issuance of longer-term debt given that the average length of maturity of Treasury debt outstanding is projected to continue to decline."
  - Evidence of new Secretary's preference for predictable issuance patterns (Garbade 2015)
  - So much that the reintroduction surprised market participants: "Treasury officials had repeatedly squelched speculation about 30-year bond reissuance, . . . so yesterday's news surprised the market."

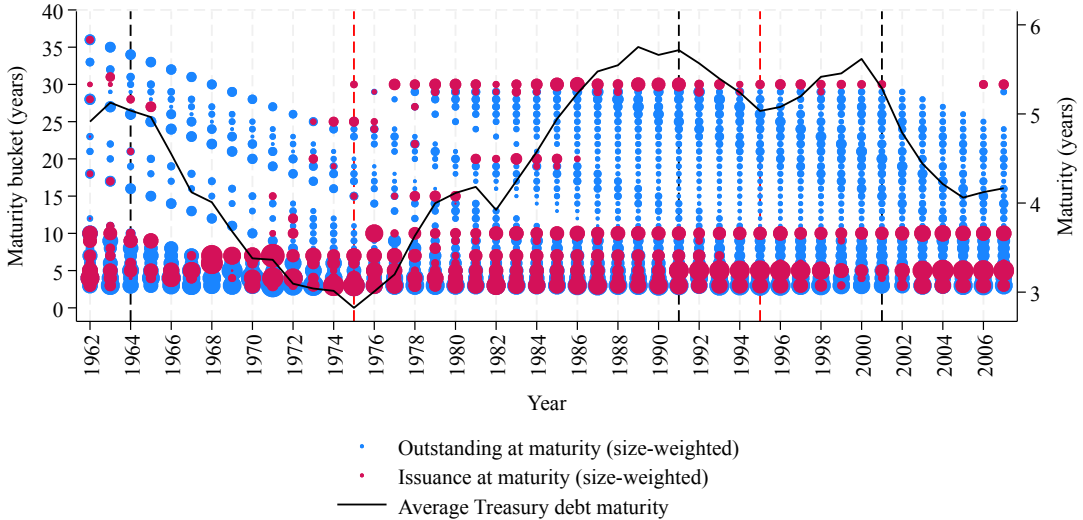
Back

2001-2007: Suspension of the long-term bond



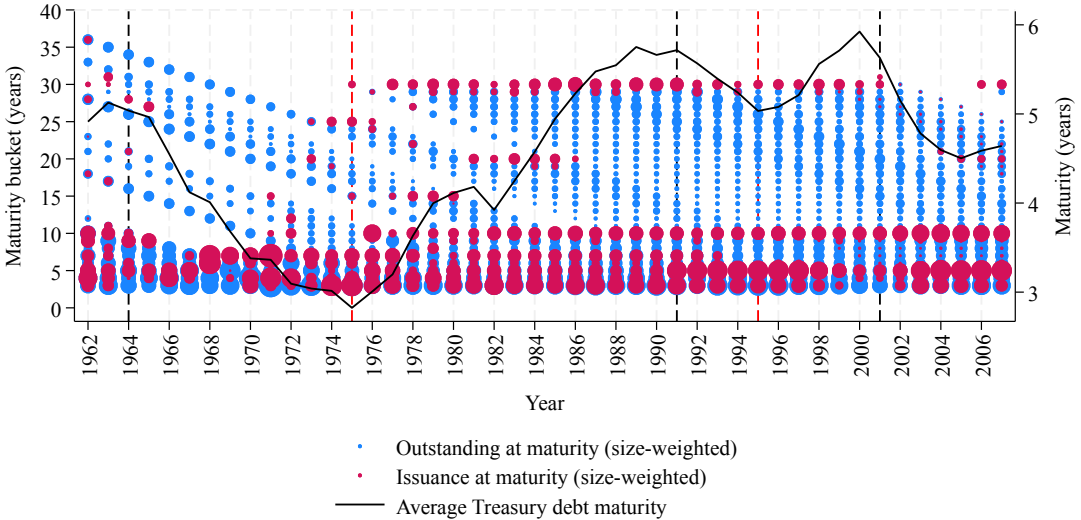
Back

Issuance profiles (excluding TIPS)



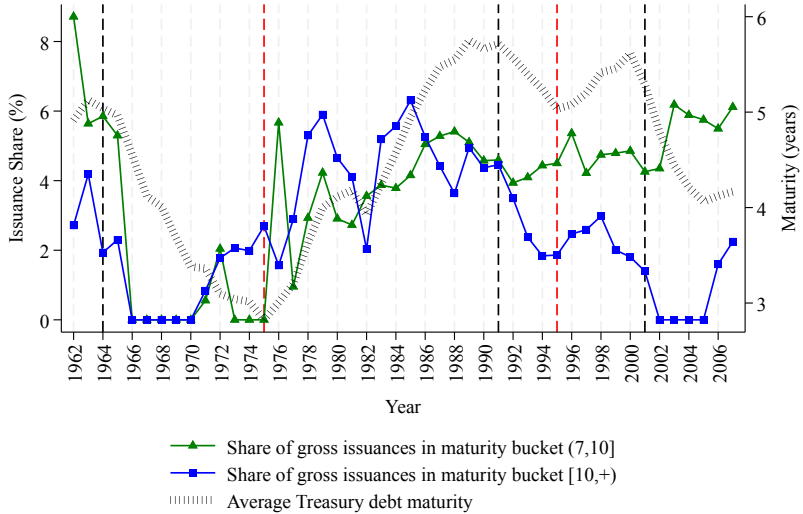
Back to identification

Issuance profiles (including TIPS)



Back to identification

Issuance shares (excluding TIPS)



Back to identification

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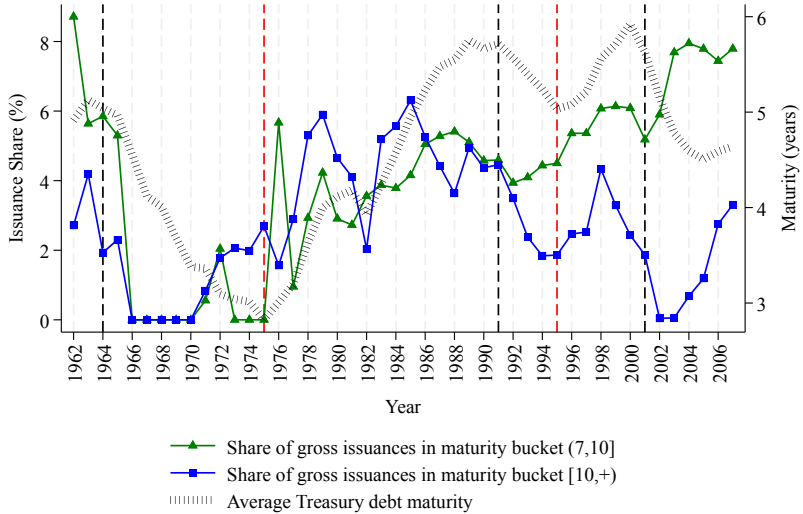
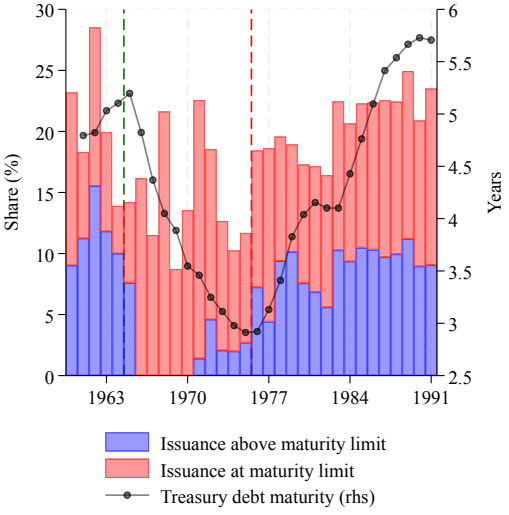
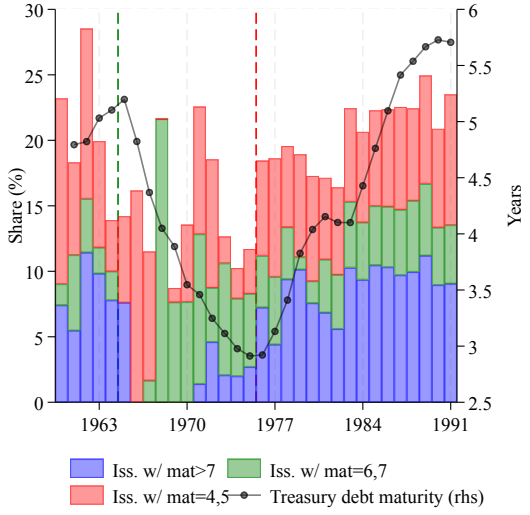


Back to identification

Treasury debt maturity (1965-1991)

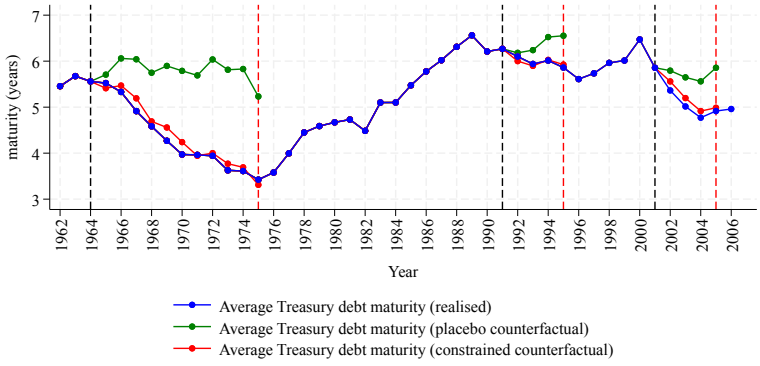




Back to identification

Quantitative relevance of policy regime shifts

- Average maturity implied by counterfactual issuance patterns (w/ same total debt issuance)
  - placebo: distribution of new issuances across maturities constant at pre-limit level
  - constrained: placebo shares redistributed to reflect limit



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Quantitative relevance of policy regime shifts

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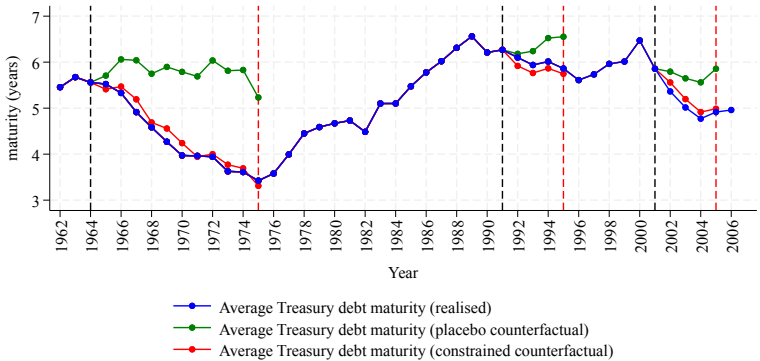
  - constrained: placebo shares redistributed to reflect limit (lower bound for 1992-1995)



Back to identification

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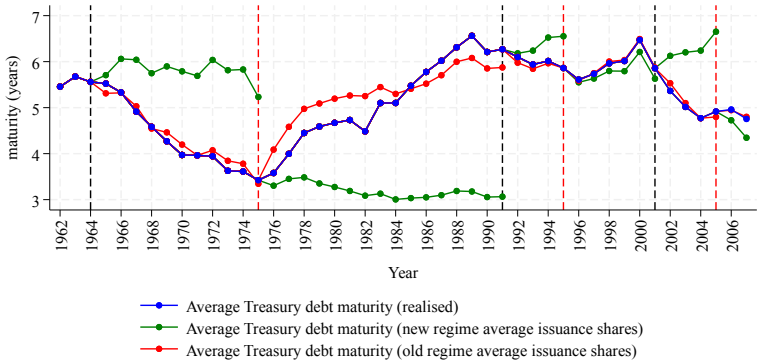

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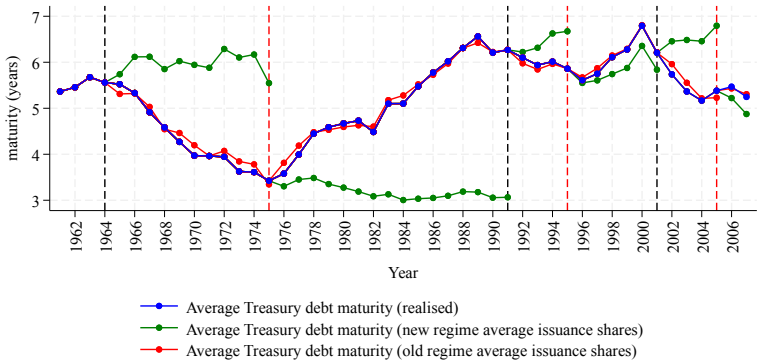

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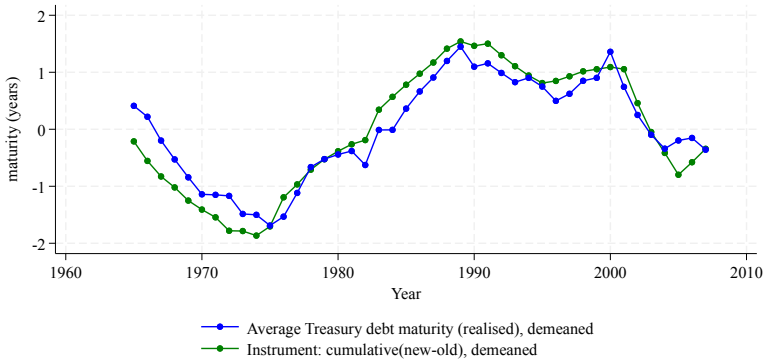

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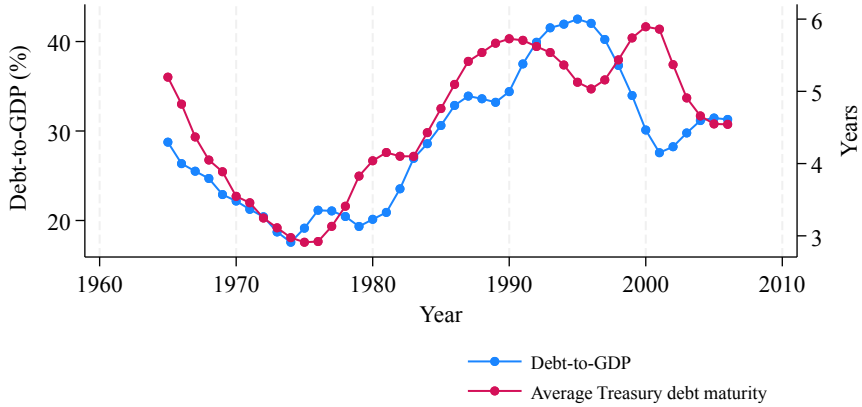
Debt-to-gdp driving Treasury debt maturity?



- Government debt size to GDP unlikely to drive maturity variation over 1965-2007
  - Policymakers highlight role of ceiling in explaining decline and recovery over 1965-1985
  - Correlation is insignificant over 1985-2007

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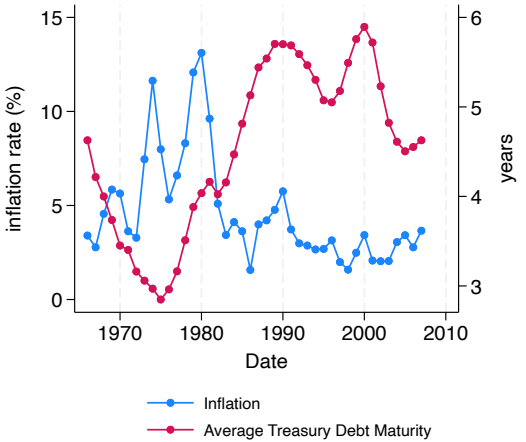
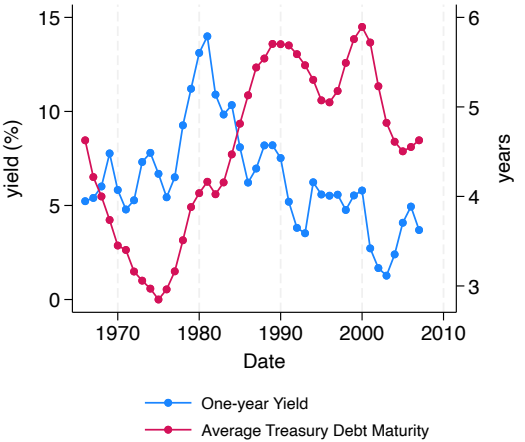
Treasury debt maturity and business cycles





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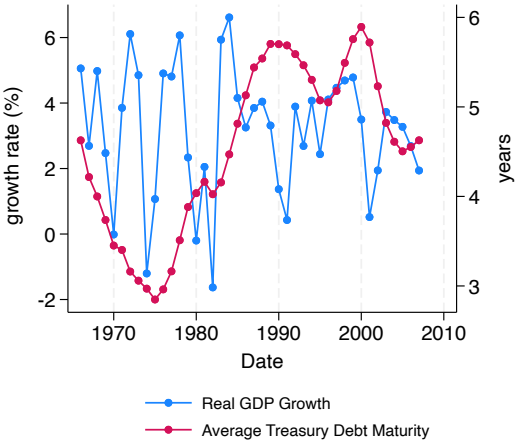
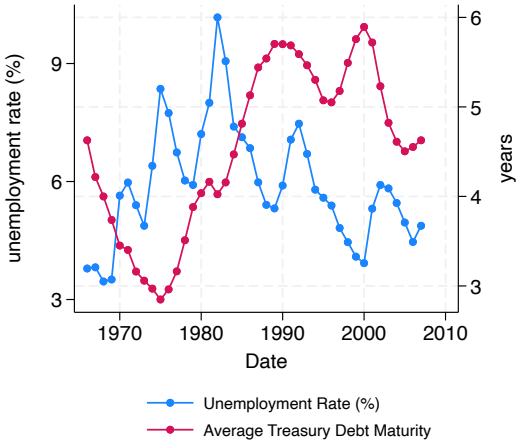
Treasury debt maturity and business cycles





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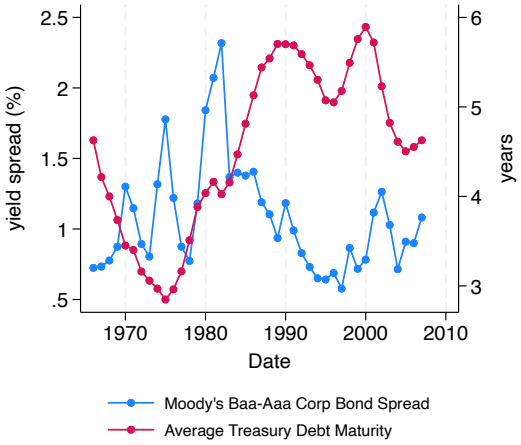
Treasury debt maturity and business cycles



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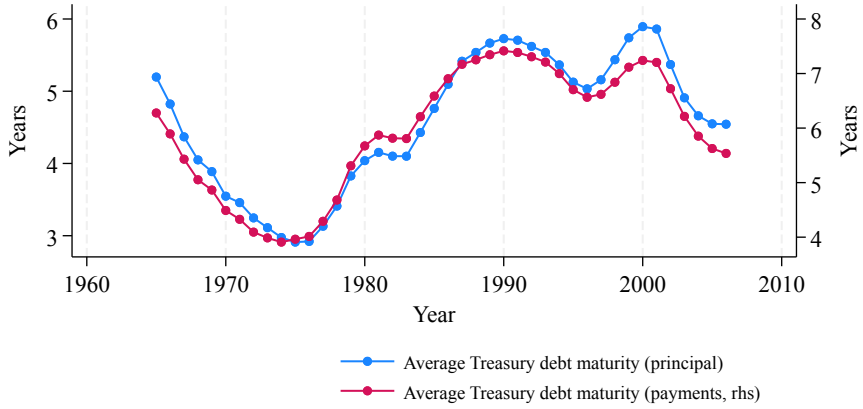
Treasury debt maturity: payments-weighted average



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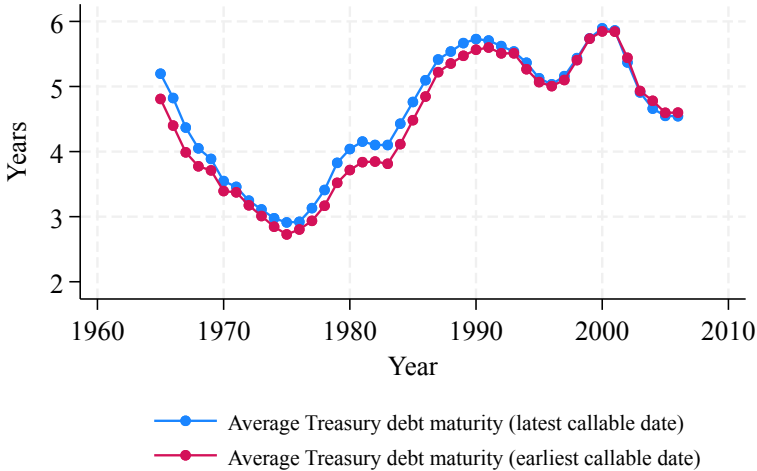
Treasury debt maturity: callable bonds



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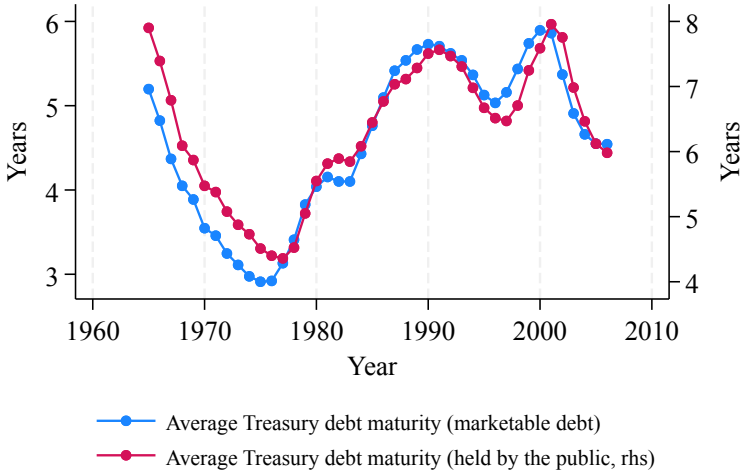
Treasury debt maturity: debt held by the public



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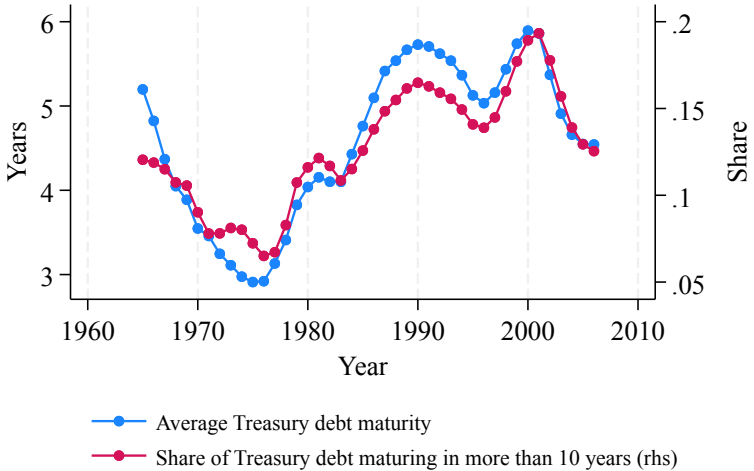
Treasury debt maturity: long-term debt share



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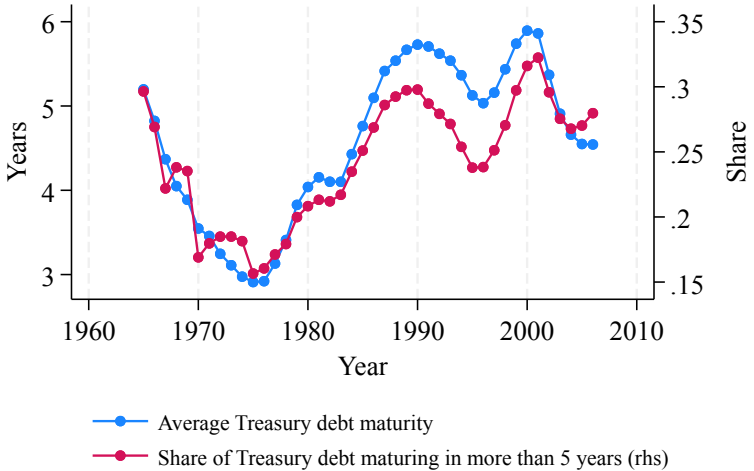
Treasury debt maturity: long-term debt share



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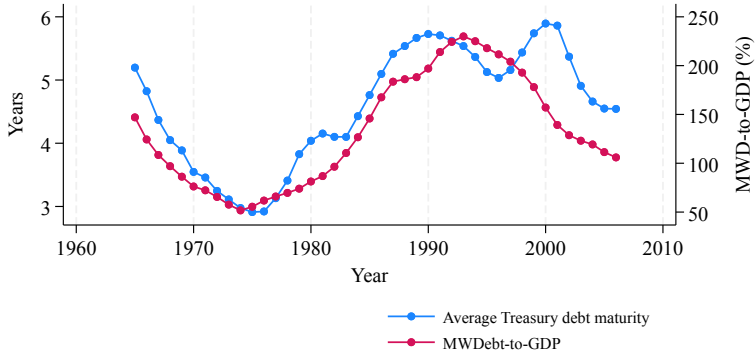
Treasury debt maturity



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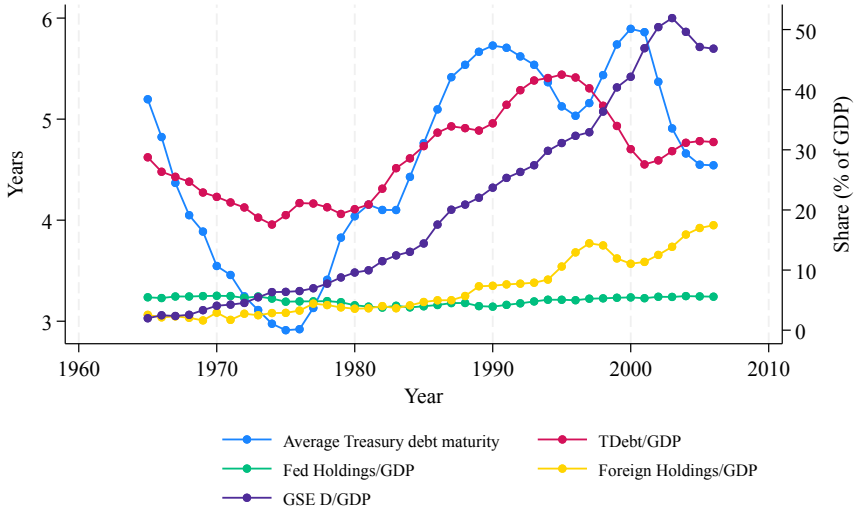
Government debt maturity and other bond demand/supply measures



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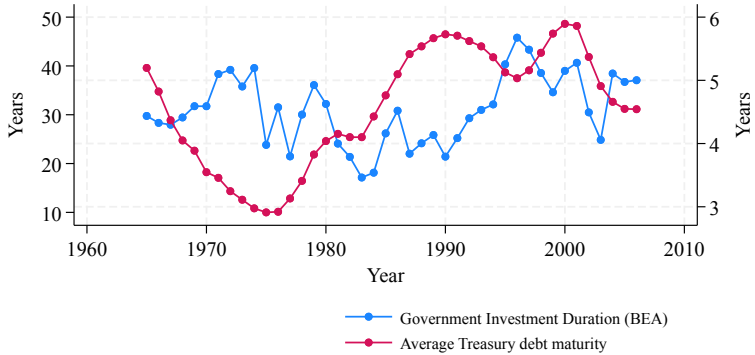
Treasury debt maturity and government investment duration



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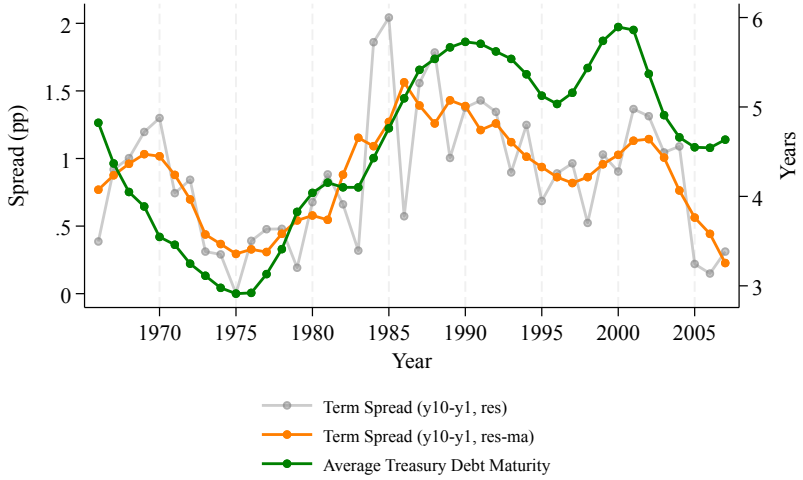
Government debt maturity and the term spread



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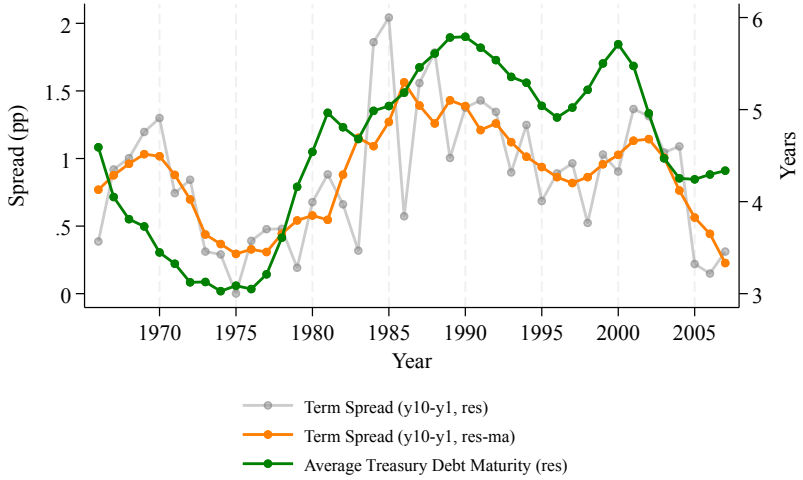
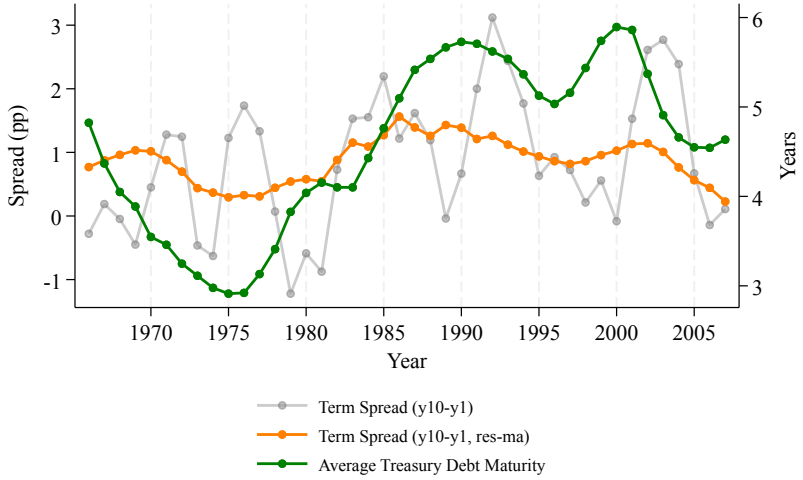
Government debt maturity and the term spread



Back to validation

Government debt maturity and the term spread



Back to validation

Roadmap

Appendix: Simple conceptual framework

Appendix: Government debt maturity

Appendix: Duration measures

Appendix: Investment reallocation

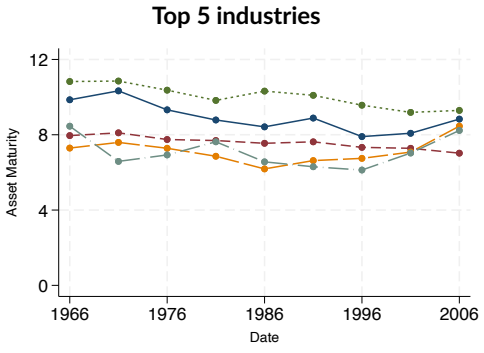
Appendix: Mechanism

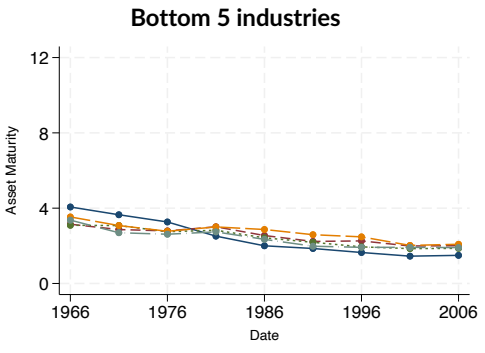
Appendix: Debt reallocation

Appendix: UK shock

Appendix: Conceptual framework

Asset Maturity: bottom and top industries





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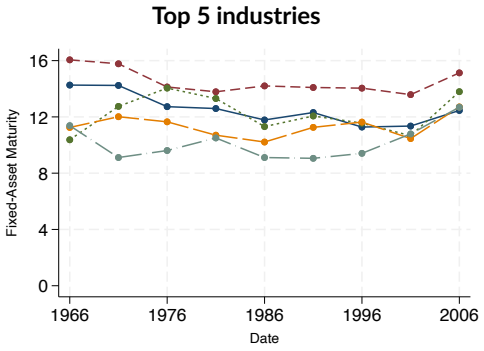
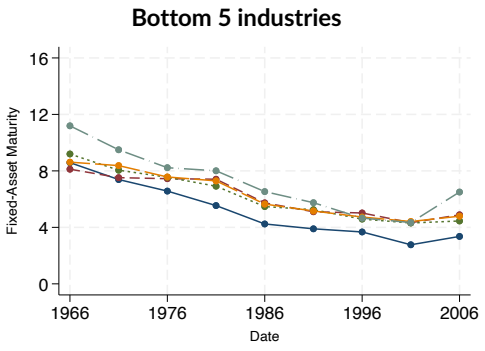
Fixed-Asset Maturity: bottom and top industries





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Asset Maturity: breaking-down variation

	Asset Maturity (firm)					
	(1)	(2)	(3)	(4)	(5)	(6)
Fixed-Asset Mat.				0.6***	0.4***	
				(0.0)	(0.0)	
Fixed-Asset Sh.					5.3***	
					(0.1)	
log(Assets)						-0.8***
						(0.0)
log(PPE)						1.4***
						(0.0)
log(Emp)						-0.6***
						(0.0)
Average year FE	✓	✓	✓	✓	✓	✓
NAICS3 FE	–	✓	–	–	–	–
NAICS FE	–	–	✓	✓	✓	✓
Observations	13208	13200	12905	12905	12905	12834
Adjusted R^2	0.040	0.494	0.580	0.887	0.938	0.710

Back

Asset Maturity: breaking-down variation

	Asset Maturity (firm)				
	(1)	(2)	(3)	(4)	(5)
Buildings to FA	7.8***		5.2***		4.9***
	(0.3)		(0.3)		(0.3)
Equipment to FA	-2.1***		-1.2***		-1.1***
	(0.2)		(0.1)		(0.1)
Leases to FA	-3.2***		-3.0***		-2.1***
	(0.4)		(0.3)		(0.3)
Construction to FA	18.8***		12.5***		10.8***
	(1.7)		(1.4)		(1.4)
Land to FA	19.6***		11.6***		8.7***
	(1.7)		(1.4)		(1.5)
Other to FA	-7.8***		-5.3***		-4.1***
	(0.7)		(0.7)		(0.7)
No FE	✓	–	–	–	–
Average year FE	–	✓	✓	✓	✓
NAICS3 FE	–	✓	✓	–	–
NAICS FE	–	–	–	✓	✓
Observations	4601	4592	4592	4289	4289
Adjusted R^2	0.322	0.457	0.569	0.567	0.644

Back

Mapping investment maturity to asset maturity

- Assumptions
  - Investments depreciate linearly over M years
  - Firm invests 1 $ every year
- Investment t period from now contributes to net stock of assets and depreciation:

$$\text{Remaining stock} = 1 - \frac{t+1}{M}, \quad \text{Depreciation} = \frac{1}{M}.$$

- The ratio $\frac{\textit{Net PP\&E}}{\textit{Depreciation}}$ reflects the average **effective maturity** of the asset stock.

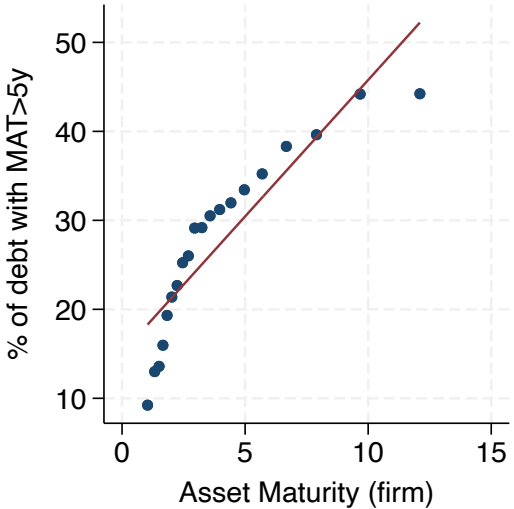
$$\textit{Net PP\&E} = \sum_{t=0}^{M-1} \left(1 - \frac{t+1}{M}\right) = \frac{M-1}{2}, \ \textit{Depreciation} = \sum_{t=0}^{M-1} \frac{1}{M} = 1 \implies \frac{\textit{Net PP\&E}}{\textit{Depreciation}} = \frac{M-1}{2}.$$

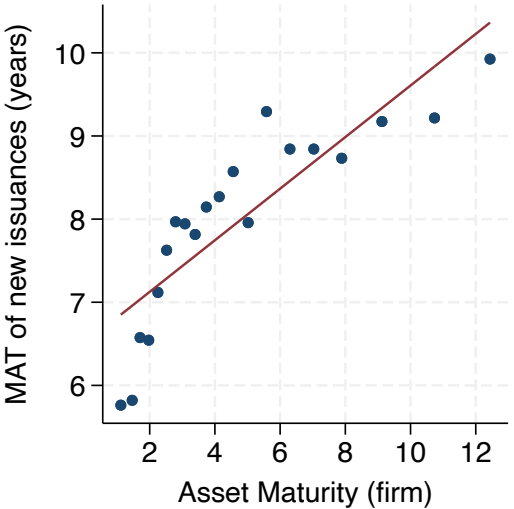
- Relaxing assumption from annual to biennial investment

$$\frac{\textit{Net PP\&E}}{\textit{Depreciation}} = M - \lceil \frac{M}{2} \rceil \approx M/2$$

Back

Assets-liabilities maturity matching





▸ Back to measurement
▸ Back to debt financing channel
▸ Back to Debt Reallocation Channel

Outstanding corporate debt maturity and investment duration

	LT debt share (5y)					
	(1)	(2)	(3)	(4)	(5)	(6)
AssetMat (firm)	3.286***	3.000***	3.000***	2.390***	1.377***	1.534***
	(0.090)	(0.089)	(0.089)	(0.092)	(0.080)	(0.109)
Profitability				8.930***	1.205***	1.238***
				(0.669)	(0.319)	(0.316)
M/B Ratio				-0.189**	0.147**	0.140**
				(0.089)	(0.060)	(0.060)
Sales Growth				0.014***	0.003	0.003
				(0.002)	(0.002)	(0.002)
Book Leverage				23.393***	22.989***	22.640***
				(1.069)	(0.925)	(0.918)
log(Assets)					5.654***	5.481***
					(0.120)	(0.122)
constant	14.764***	15.907***	15.907***	12.264***	-10.006***	-9.735***
	(0.422)	(0.414)	(0.414)	(0.484)	(0.546)	(0.613)
No FE	✓	–	–	–	–	–
Time FE	–	✓	✓	✓	✓	✓
Industry FE	–	–	–	–	–	✓
Observations	76942	76942	76942	76942	76942	76942
Adjusted R^2	0.092	0.129	0.129	0.165	0.291	0.304

▸ Back to measurement ▸ Back to debt financing channel ▸ Back to Debt Reallocation Channel

Maturity of new issuances and investment duration

	Issuance Maturity					
	(1)	(2)	(3)	(4)	(5)	(6)
AssetMat (firm)	0.345***	0.254***	0.244***	0.241***	0.149***	0.181***
	(0.029)	(0.024)	(0.023)	(0.024)	(0.022)	(0.031)
Issuance amount			0.000***	0.000***	0.000	0.000
			(0.000)	(0.000)	(0.000)	(0.000)
Profitability				2.955***	1.494***	1.584***
				(0.350)	(0.293)	(0.307)
M/B Ratio				0.026	0.033	0.031
				(0.037)	(0.034)	(0.034)
Sales Growth				0.000	0.004***	0.004**
				(0.002)	(0.001)	(0.001)
Book Leverage				-0.341	0.232	0.037
				(0.279)	(0.251)	(0.247)
log(Assets)					0.756***	0.719***
					(0.041)	(0.039)
constant	6.098***	6.521***	6.441***	6.327***	1.581***	1.748***
	(0.149)	(0.126)	(0.124)	(0.171)	(0.256)	(0.273)
No FE	✓	–	–	–	–	–
Time FE	–	✓	✓	✓	✓	✓
Industry FE	–	–	–	–	–	✓
Observations	9481	9439	9439	9439	9439	9439
Adjusted R^2	0.040	0.280	0.287	0.294	0.353	0.361

▸ Back to measurement ▸ Back to debt financing channel ▸ Back to Debt Reallocation Channel

Roadmap

Across-firms reallocation: intercept

$$\frac{Capex_{f,t}}{Assets_{f,t-1}} = \beta \cdot TSYMAT_t \cdot HighAssetMat_f + \alpha_f + \delta \cdot TSYMAT_t \cdot X_{f,t} + \theta \cdot HighAssetMat_f \cdot Z_t + \epsilon_{f,t}$$

	Capital Expenditures			
	(1)	(2)	(3)	(4)
TSYMAT	-0.598***	0.422***	0.217**	
	(0.133)	(0.125)	(0.108)	
TSYMAT × High AssetMat	-0.631***	-0.533***	-0.692***	-0.798***
	(0.135)	(0.158)	(0.160)	(0.155)
Linear Trend × High AssetMat		-0.008	0.007	0.003
		(0.015)	(0.014)	(0.014)
Time FE	–	–	–	✓
Firm FE	✓	✓	✓	✓
High AssetMat x Macro Controls	–	–	✓	✓
Observations	120275	120275	120275	120275
Adjusted R^2	0.387	0.416	0.428	0.438

Back

Across-firms reallocation: policy regime shift instrument

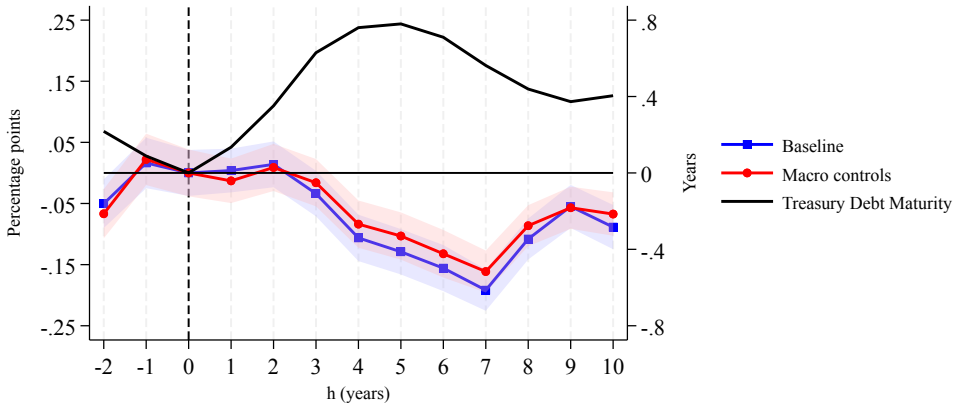
$$Capex_{f,t}/Assets_{f,t-1} = \beta \cdot TSYMAT_t \cdot AssetMat_f + \alpha_f + \gamma_t + \theta \cdot AssetMat_f \cdot Z_t + \varepsilon_{f,t}$$

	Capital Expenditures (OLS)		Capital Expenditures (2SLS)	
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.121***	-0.142***	-0.141***	-0.140***
	(0.023)	(0.026)	(0.026)	(0.028)
Firm FE	✓	✓	✓	✓
Time FE	✓	✓	✓	✓
AssetMat x Macro Controls	–	✓	–	✓
Observations	120275	120275	120275	120275

▸ Back to reallocation ▸ Shift-Share

Local projections (control for macro conditions at time of policy shifts)

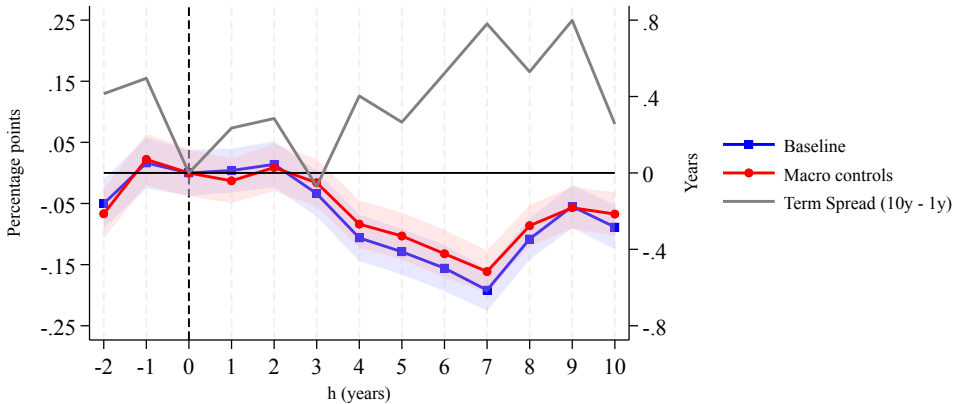
$$\forall h, \frac{Capex_{f,t+h}}{Assets_{f,t+h-1}} = \beta^{(h)} \cdot s_t \cdot AssetMat_f + \delta^{(h)} \cdot s_t \cdot X_{f,t} + \theta^{(h)} \cdot Z_t \cdot AssetMat_f + \alpha_f^{(h)} + \gamma_t^{(h)} + \epsilon_{f,t}^{(h)}$$



Back

Local projections (control for macro conditions at time of policy shifts)

$$\forall h, \frac{Capex_{f,t+h}}{Assets_{f,t+h-1}} = \beta^{(h)} \cdot s_t \cdot AssetMat_f + \delta^{(h)} \cdot s_t \cdot X_{f,t} + \theta^{(h)} \cdot Z_t \cdot AssetMat_f + \alpha_f^{(h)} + \gamma_t^{(h)} + \epsilon_{f,t}^{(h)}$$

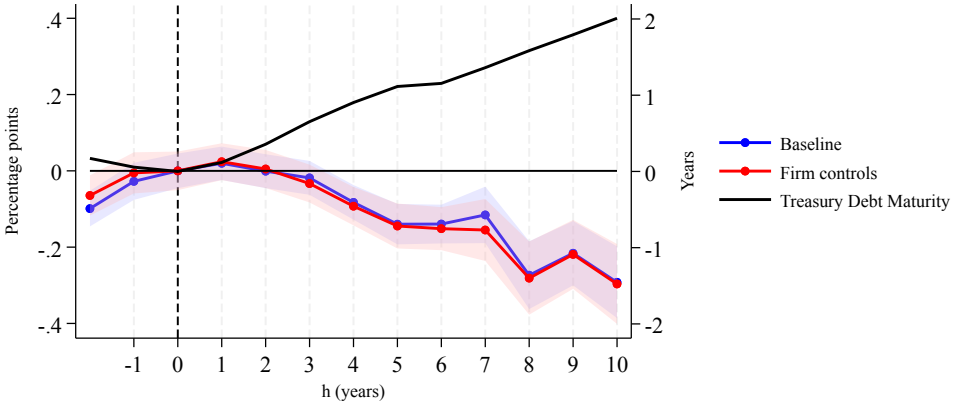


Back

Stacked differences-in-differences

$$\frac{Capex_{f,t+h}}{Assets_{f,t+h-1}} = \beta^{(h)} \cdot s_t \cdot AssetMat_f + \delta^{(h)} \cdot s_t \cdot X_{f,t} + \alpha_f^{(h)} + \gamma_t^{(h)} + \epsilon_{f,t}^{(h)}$$

where $t = \{1964, 1975, 1991, 1995, 2001\}$ and $\forall$ h s.t. no overlapping periods



Back

Across-firms reallocation of investment: other outcomes

$$Y_{f,t} = \beta \cdot TSYMAT_t \cdot AssetMaturity_f + \alpha_f + \gamma_t + \delta \cdot TSYMAT_t \cdot X_{f,t} + \epsilon_{f,t}$$

	Capex	R&D	Acq	Emp Gwth
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.154***	-0.047***	-0.011	-0.115*
	(0.025)	(0.011)	(0.008)	(0.063)
Time FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm Controls x TSYMAT	✓	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓	✓
Observations	120275	120275	120275	101676
Adjusted R^2	0.471	0.844	0.244	0.254

Back to Robustness

Breaking down reallocation by investments (1985-2007)

$$Y_{f,t} = \beta \cdot TSYMAT_t \cdot AssetMaturity_f + \alpha_f + \gamma_t + \delta \cdot TSYMAT_t \cdot X_{f,t} + \epsilon_{f,t}$$

	Capex	FA (Total)	FA (Machinery and Equip.)	FA (Real Estate)
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.142***	-0.152	-0.134	-0.062*
	(0.041)	(0.092)	(0.088)	(0.032)
Time FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
AssetMat x linear trend	✓	✓	✓	✓
Observations	42378	42378	42378	42378
Adjusted R^2	0.454	0.248	0.243	0.222

Back to Robustness

Robustness to different time periods

	1965-2007	1965-1985	1986-2007	Constraints	Constraints (IV)	Relaxations
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × AssetMat	-0.117***	-0.098***	-0.115**	-0.085**	-0.128***	-0.172***
	(0.024)	(0.037)	(0.052)	(0.036)	(0.040)	(0.039)
Time FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Controls x TSYMAT	✓	✓	✓	✓	✓	✓
AM x Linear Trend	✓	✓	✓	✓	✓	✓
Observations	120275	42068	77649	42228	42228	70701
Adjusted R^2	0.470	0.529	0.481	0.535	0.035	0.486

Back to Robustness

Alternative measure of duration: horizon of business plans

- Horizon of business plans disclosed by managers in regulatory filings
  (Dessaint et al., 2023)
  - e.g. “3-year business plan” or “5-year strategic plan”
  - Systematic search through all SEC filings (10Ks, 10Qs, 8Ks,...) for 1994-2015: “year business plan”, “year strategic plan”, “year growth plan”, “year investment plan”, “year capital expenditure plan”, “year expansion plan”, “year development plan”, “year extension plan”, “year plan”
- Consistent with tangible investment duration measure
  - highly persistent, clusters by industry, corr=.3
- **Does not discriminate between tangibles and intangibles**
  - Top4 of SIC-2d industries increases in ranking: Chemicals and Allied Products, Industrial and Commercial Machinery and Computer Equipment, Business Services, Electronic & Other Electrical Equipment & Components

▸ Back to Measurement ▸ Back to Robustness

Alternative measure of duration: horizon of business plans

$$\frac{Capex_{f,t}}{Assets_{f,t-1}} \text{ or } \frac{R\&DExpense_{f,t}}{Assets_{f,t-1}} = \beta \cdot TSYMAT_t \cdot InvestmentDuration_f + \alpha_f + \gamma_t + \delta \cdot TSYMAT_t \cdot X_{f,t} + \epsilon_{f,t}$$

	Capital Expenditures			R&D Expense		
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × AssetMat	-0.154***			-0.047***		
	(0.025)			(0.011)		
TSYMAT × BusPlanHorizon		-0.251**			-0.129***	
		(0.124)			(0.045)	
TSYMAT × BusPlanHorizon (Res.)			-0.170			-0.106**
			(0.122)			(0.045)
Time FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Firm Controls x TSYMAT	✓	✓	✓	✓	✓	✓
Horizon x Macro Controls	✓	✓	✓	✓	✓	✓
Observations	120275	120275	120275	120275	120275	120275
Adjusted R^2	0.471	0.469	0.469	0.844	0.843	0.843

Back to Robustness

Alternative measures of long-term bond supply

	Capital Expenditures						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TSYMAT × AssetMat	-0.14***						-0.15***
	(0.02)						(0.03)
TSYMAT (excl. TIPS) × AssetMat		-0.12***					
		(0.02)					
TSY WAD × AssetMat			-0.11***				
			(0.02)				
TSY MWD × AssetMat				-0.08***			
				(0.02)			
TSY MWD (excl Fed.) × AssetMat					-0.09***		
					(0.02)		
TSY D/GDP × AssetMat						-0.01***	0.00
						(0.00)	(0.00)
Time FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Supply x Firm Controls	✓	✓	✓	✓	✓	✓	✓
Observations	120275	120275	120275	120275	120275	120275	120275
Adjusted R^2	0.470	0.470	0.469	0.470	0.471	0.468	0.471

Back to Robustness

Macroeconomic conditions

	Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × AssetMat	-0.136***	-0.151***	-0.132***	-0.136***	-0.112***	-0.154***
	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)	(0.025)
Baa-Aaa Spread × AssetMat	0.002					-0.042
	(0.040)					(0.069)
U-rate × AssetMat		-0.029**				-0.043***
		(0.011)				(0.016)
1y yield × AssetMat			0.017**			0.024***
			(0.007)			(0.008)
Real GDP Gwth × AssetMat				-0.015**		-0.029***
				(0.006)		(0.008)
Inflation (yoy) × AssetMat					0.018***	-0.007
					(0.006)	(0.007)
Linear trend × AssetMat						-0.002
						(0.003)
Firm Controls x TSYMAT	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Observations	120275	120275	120275	120275	120275	120275
Adjusted R^2	0.470	0.470	0.470	0.470	0.470	0.471

Back to Robustness

Macroeconomic conditions

	Capital Expenditures							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSYMAT × AssetMat	-0.14***	-0.11***	-0.14***	-0.14***	-0.13***	-0.12***	-0.16***	-0.13***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
GSE D/GDP × AssetMat		-0.00*						
		(0.00)						
TSY Foreign Hold. (%) × AssetMat			0.00					
			(0.01)					
Fed Hold. (%) × AssetMat				-0.01				
				(0.04)				
Govt. Inv. Duration × AssetMat					0.01***			
					(0.00)			
CPI Gwth Exp. × AssetMat						0.02**		
						(0.01)		
Real GDP Gwth Exp. × AssetMat							-0.04***	
							(0.01)	
Macro Uncertainty × AssetMat								0.54*
								(0.27)
Financial Uncertainty × AssetMat								-0.05
								(0.33)
Firm Controls x TSYMAT	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	120275	120275	120275	120275	120275	120275	114586	120275
Adjusted R^2	0.470	0.470	0.470	0.470	0.470	0.470	0.474	0.470

Back to Robustness

Investment measures

	CapEx/LaggedAssets	(CapEx-Dep)/LaggedNetPPE	NetPPEChange/LaggedAssets
	(1)	(2)	(3)
TSYMAT × AssetMat	-0.102***	-0.168**	-0.076**
	(0.029)	(0.080)	(0.032)
Industry FE	✓	✓	✓
Time FE	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓
Observations	106308	106308	106301
Adjusted R^2	0.455	0.302	0.195

Back to Robustness

Intensive and Extensive margin

	Capital Expenditures			
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.144***			
	(0.022)			
TSYMAT × FixedAssetMat		-0.052***		
		(0.018)		
TSYMAT × FixedAssetShare			-0.023***	
			(0.003)	
TSYMAT × FixedAssetMat (residualized)				-0.092***
				(0.031)
TSYMAT × FixedAssetShare (residualized)				-0.038***
				(0.005)
Time FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Firm Controls x TSYMAT	✓	✓	✓	✓
Observations	120275	120275	120275	120275
Adjusted R^2	0.470	0.469	0.471	0.471

Back to Robustness

Investment response: duration vs irreversibility

	Redeployability (Kim & Kung 2017)			Asset-specificity (Kermani & Ma 2023)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TSYMAT × AssetMat	-0.15***	-0.14**	-0.15**	-0.16***	-0.15***	-0.16***	-0.16***
	(0.05)	(0.06)	(0.06)	(0.03)	(0.03)	(0.03)	(0.03)
TSYMAT × Redep.		0.12					
		(1.01)					
TSYMAT × Redep. (e-w)			-0.38				
			(1.34)				
TSYMAT × Mobility					-10.57*		
					(5.58)		
TSYMAT × Customization						14.35**	
						(7.08)	
TSYMAT × Recov. Rate							-0.68
							(0.61)
Time FE	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓
Controls x TSYMAT	✓	✓	✓	✓	✓	✓	✓
AM x Macro Controls	✓	✓	✓	✓	✓	✓	✓
Observations	78834	78834	78834	117541	117541	117541	117541
Adjusted R^2	0.483	0.483	0.483	0.470	0.471	0.471	0.471

Back to Robustness

Investment response: robustness to collateral channel

	Capital Expenditures				
	(1)	(2)	(3)	(4)	(5)
TSYMAT × AssetMat	-0.169***	-0.169***	-0.134***	-0.171***	-0.127***
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
RE price (State) × AssetMat		-0.000	-0.000		
		(0.000)	(0.000)		
RE price (MSA) × AssetMat				-0.000	-0.001
				(0.000)	(0.000)
Time FE	✓	✓	–	✓	–
Firm FE	✓	✓	✓	✓	✓
State x Time FE	–	–	✓	–	–
MSA x Time FE	–	–	–	–	✓
Firm Controls x TSYMAT	✓	✓	✓	✓	✓
Observations	84420	84420	84249	84420	84364
Adjusted R^2	0.482	0.483	0.496	0.483	0.500

Back to Robustness

Investment response: controlling for cyclicality

	Capital Expenditures		
	(1)	(2)	(3)
TSYMAT × AssetMat	-0.136***	-0.128***	-0.123***
	(0.022)	(0.023)	(0.021)
TSYMAT × Capex Cyclicality Quintile		0.187	
		(0.211)	
Time FE	✓	✓	–
Firm FE	✓	✓	✓
Capex cyclicality quintile x Time FE	–	–	✓
Firm Controls x TSYMAT	✓	✓	✓
Observations	120275	120275	120219
Adjusted R^2	0.470	0.470	0.475

Back to Robustness

Across-firms reallocation: within and across industries

	Capital Expenditures		
	(1)	(2)	(3)
TSYMAT × AssetMat (firm)	-0.136***		-0.100**
	(0.022)		(0.049)
TSYMAT × AssetMat (NAICS6)		-0.122***	
		(0.034)	
Firm Controls x TSYMAT	✓	✓	✓
Firm FE	✓	✓	✓
Time FE	✓	✓	–
NAICS6 x Time FE	–	–	✓
Observations	120275	120275	82372
Adjusted R^2	0.470	0.470	0.524

- Comparable relative investment elasticities within and across industries

Across-firms reallocation: within and across industries

	Capital Expenditures		
	(1)	(2)	(3)
TSYMAT × AssetMat (firm)	-0.136***		-0.100**
	(0.022)		(0.049)
TSYMAT × AssetMat (NAICS6)		-0.122***	
		(0.034)	
Firm Controls x TSYMAT	✓	✓	✓
Firm FE	✓	✓	✓
Time FE	✓	✓	–
NAICS6 x Time FE	–	–	✓
Observations	120275	120275	82372
Adjusted R^2	0.470	0.470	0.524

- Comparable relative investment elasticities within and across industries
- Across-industries reallocation affect duration of aggregate investment (Compustat or BEA Tables)
  - time series regressions: 1y ↑ TSYMAT → 0.12y (1-sd) ↓ AssetMat

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Across-firms reallocation: Across industries

	CapEx	CapEx (deflated)	Investment goods price index (base 100 in 2000)
	(1)	(2)	(3)
TSYMAT × AssetMat	-0.154**	-0.167***	-0.572**
	(0.066)	(0.056)	(0.250)
Industry FE	✓	✓	✓
Time FE	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓
Observations	2984	2984	2984
Adjusted R^2	0.479	0.444	0.858

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Within-firm reallocation: multi-division firms

- Within-firm analysis using Compustat Segment file (1976-2007) w/ divisions agg. at SIC-2digits

$$\frac{Capex_{f,d,t}}{Assets_{f,d,t-1}} = \beta \cdot TSYMAT_t \cdot AssetMaturity_{s(d)} + \alpha_{f,t} + \gamma_{f,d} + \delta \cdot TSYMAT_t \cdot X_{f,d,t} + \epsilon_{f,d,t}$$

	Capital Expenditures			
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat (firm)	-0.211***			
	(0.0667)			
TSYMAT × AssetMat (division)		-0.264***	-0.247***	-0.252***
		(0.0719)	(0.0624)	(0.0626)
TSYMAT × Profitability				0.966**
				(0.459)
Time FE	✓	✓	–	–
Firm x Division FE	✓	✓	✓	✓
Firm x Time FE	–	–	✓	✓
Observations	48515	48515	48307	48307
Adjusted R^2	0.420	0.419	0.433	0.434

▸ Back to robustness ▸ Back to discounting channel

Aggregate across industries effects: Compustat/BEA data

Aggregate across industries effects: Compustat/BEA data

- Compustat: weighted-average of asset-maturity (weights= industry capital expenditures)
  - BEA industry definitions

Aggregate across industries effects: Compustat/BEA data

- Compustat: weighted-average of asset-maturity (weights= industry capital expenditures)
  - BEA industry definitions
- BEA: weighted-average of asset-maturity (weights=industry investment)
  - Collect data on **aggregate private investment** across BEA industries
  - Aggregate across-industry reallocation channel
    - Public and private firms
    - Includes intellectual property investments

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Aggregate effects: Compustat vs BEA data

	Duration (Compustat)		Duration (BEA)		Duration (BEA dep.)	
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT	-0.12***	-0.11***	-0.10***	-0.08***	-0.15***	-0.13***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)
Linear trend	-0.00	-0.00	-0.01***	-0.01**	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Macro Controls	–	✓	–	✓	–	✓
Observations	43	43	43	43	43	43
R-squared	0.57	0.68	0.68	0.88	0.59	0.68

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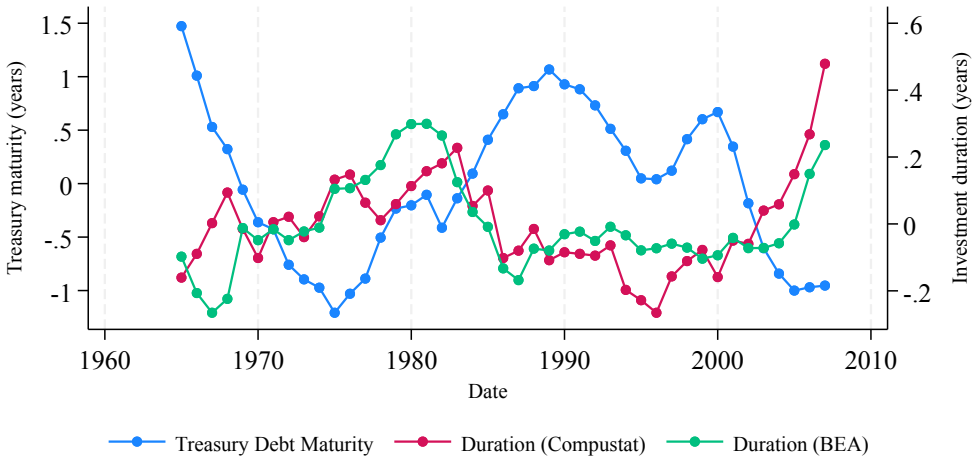
Aggregate effects

time series regressions: **1y ↑ TSYMAT → 0.1y ↓ AssetMat (Compustat or BEA)**



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Across-firms reallocation: tax policies

	Capital Expenditures							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSYMAT × AM	-0.11***	-0.17***	-0.13***	-0.12***	-0.13***	-0.12***	-0.13***	-0.13**
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.06)
Corp. Tax Rate × AM		-0.02***						-0.01
		(0.01)						(0.01)
Investment Tax Credit × AM					0.00			-0.00
					(0.01)			(0.01)
PV(DepAllow) (struct.) × AM						-0.01		-0.01
						(0.01)		(0.02)
PV(DepAllow) (equip.) × AM							-0.01	0.00
							(0.01)	(0.03)
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓
AssetMat x Linear Trend	✓	✓	✓	–	–	–	–	–
Observations	120275	120275	87064	51860	51860	51860	51860	51860
Adjusted R^2	0.437	0.437	0.455	0.447	0.447	0.447	0.447	0.447

- Column 3 excludes 1981-1986 and 2001-2004
- Column 4 studies the sample with data from Cummins, et al. (1994) on ITC and PV of dep. allowances

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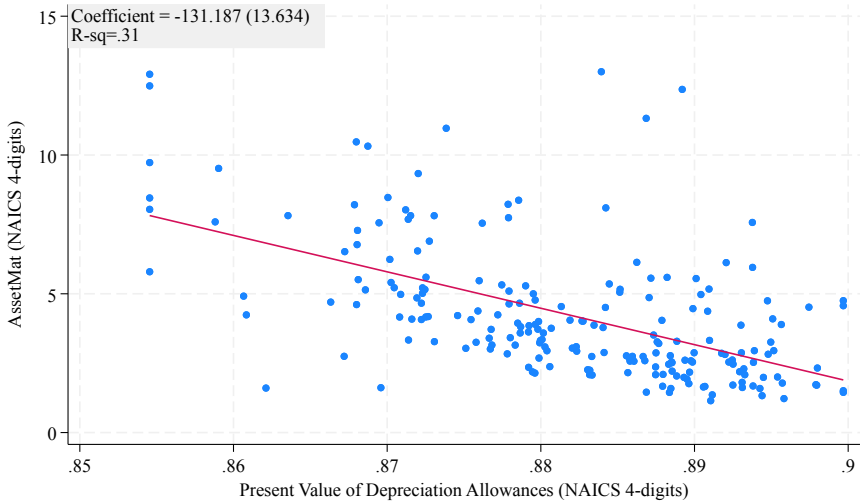
Across-firms reallocation: tax policies



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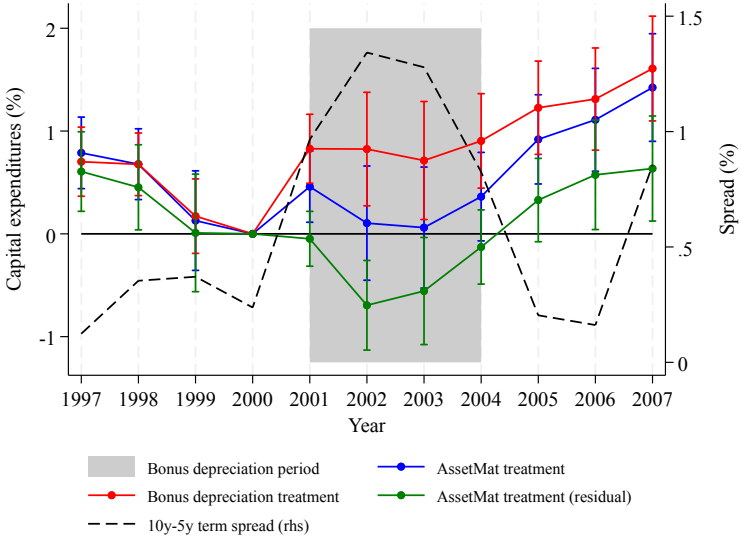
Across-firms reallocation: tax policies



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Roadmap

↑ gov. debt maturity ⟹ ↑ LT Treasury & Corporate yields

	Treas.				Corp.	Treas.	Corp.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$y10-y1$	$y10-y1$	$y10-E[y1]$	$y10-y1$	$y10-y1$	$y10-y1$	$y10-y1$	$y10-y1$
TSYMAT	0.34*	0.28***	0.43***	0.42**	0.29	0.40***	0.31***	0.27***
	(0.19)	(0.07)	(0.07)	(0.19)	(0.34)	(0.05)	(0.05)	(0.05)
1-year yield		-0.31***	0.10***	-0.27***	-0.36***	-0.30***	-0.31***	-0.14***
		(0.03)	(0.03)	(0.05)	(0.08)	(0.04)	(0.02)	(0.02)
Unemployment Rate		0.58***	0.60***	0.78***	0.52***	0.55***	0.28***	0.29***
		(0.05)	(0.06)	(0.07)	(0.14)	(0.05)	(0.06)	(0.03)
constant	-0.70	-1.93***	-4.05***	-3.95***	-1.01	-2.26***	-0.11	-1.30***
	(0.89)	(0.59)	(0.54)	(1.08)	(2.01)	(0.47)	(0.46)	(0.36)
Observations	516	516	516	276	276	300	300	300
Sample Years	65-07	65-07	65-07	85-07	85-07	73-97	73-97	73-97
Data					HQM Corp		Lehman	Lehman
Rating					>= A-		Aaa	Baa
R-squared	0.07	0.79	0.76	0.81	0.66	0.80	0.84	0.69

▸ Back to validation ▸ Back to debt financing channel

Treasury debt maturity and term spread: macro controls

	(1)	(2)	(3)	(4)
	$y10 - y1$	$y10 - y1$	$y10 - y1$	$y10 - y1$
TSYMAT	0.34*	0.36***	0.32**	0.29*
	(0.19)	(0.11)	(0.14)	(0.16)
1-year yield		-0.32***	-0.31***	-0.34***
		(0.03)	(0.04)	(0.04)
Unemployment Rate		0.60***	0.60***	0.50***
		(0.05)	(0.05)	(0.09)
Linear Trend		-0.00	-0.00	-0.00
		(0.00)	(0.00)	(0.00)
D/GDP			0.61	1.06
			(1.22)	(1.53)
Credit Spread				0.39*
				(0.22)
GDP Growth				0.05
				(0.05)
π				-6.13
				(5.57)
$E[\pi]$				0.12
				(0.10)
constant	-0.70	-2.04***	-2.04***	-2.07**
	(0.89)	(0.51)	(0.51)	(0.84)
Observations	516	516	516	516
R-squared	0.07	0.79	0.79	0.81

Back to validation

Treasury debt maturity and term spread: debt supply measures

	$y10 - y1$ (Treasuries)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
TSY MAT	0.28***				0.27***	0.42**		0.45***
	(0.07)				(0.10)	(0.19)		(0.17)
TSY DUR		0.24***						
		(0.06)						
TSY MWD			0.23***					
			(0.06)					
TSY D/GDP				2.99**	0.16		-2.20*	-2.70**
				(1.16)	(1.22)		(1.27)	(1.05)
1-year yield	-0.31***	-0.31***	-0.30***	-0.30***	-0.30***	-0.27***	-0.24***	-0.26***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.05)	(0.03)	(0.04)
Unemp.	0.58***	0.56***	0.54***	0.55***	0.58***	0.78***	0.81***	0.82***
	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.07)	(0.08)	(0.06)
constant	-1.93***	-1.84***	-0.95***	-1.36***	-1.92***	-3.95***	-1.27	-3.44***
	(0.59)	(0.57)	(0.37)	(0.50)	(0.59)	(1.08)	(0.83)	(1.15)
Observations	516	516	516	516	516	276	276	276
Sample Years	65-07	65-07	65-07	65-07	65-07	85-07	85-07	85-07
Data								
Rating								
R-squared	0.79	0.79	0.79	0.77	0.79	0.81	0.79	0.83

Back to validation

Treasury debt maturity and term spread: maturities

	Treasuries					
	(1)	(2)	(3)	(4)	(5)	(6)
	$y2 - y1$	$y3 - y1$	$y5 - y1$	$y7 - y1$	$y10 - y1$	$y15 - y1$
TSY MAT	0.10***	0.17***	0.28***	0.36***	0.43***	0.50***
	(0.03)	(0.04)	(0.06)	(0.07)	(0.07)	(0.07)
Observations	432	432	432	432	432	432
Sample Years	72-07	72-07	72-07	72-07	72-07	72-07
Data						
Rating						
R-squared	0.61	0.68	0.75	0.79	0.82	0.83

Back to validation

Treasury debt maturity and term spread: supply predictability

	$y10 - y1$					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT(t)	0.36***	0.36***	0.36***	0.37***	0.38***	0.36***
	(0.11)	(0.11)	(0.11)	(0.12)	(0.12)	(0.13)
TSYMAT(t+1, res)		0.15				
		(0.25)				
TSYMAT(t+2, res)			0.23			
			(0.19)			
TSYMAT(t+3, res)				0.18		
				(0.16)		
TSYMAT(t+4, res)					0.12	
					(0.14)	
TSYMAT(t+5, res)						0.02
						(0.17)
Unemp.	0.60***	0.60***	0.58***	0.57***	0.57***	0.60***
	(0.05)	(0.05)	(0.06)	(0.06)	(0.06)	(0.07)
1-year yield	-0.32***	-0.32***	-0.33***	-0.33***	-0.33***	-0.32***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Observations	516	516	516	516	516	516
R-squared	0.79	0.79	0.80	0.80	0.79	0.79

Back to validation

Treasury debt maturity and term premium: maturities

	Treasuries				
	(1)	(2)	(3)	(4)	(5)
	$y2 - E[y1]$	$y3 - E[y1]$	$y5 - E[y1]$	$y7 - E[y1]$	$y10 - E[y1]$
TSY MAT	0.23***	0.29***	0.37***	0.43***	0.49***
	(0.03)	(0.04)	(0.05)	(0.06)	(0.06)
Observations	432	432	432	432	432
Sample Years	72-07	72-07	72-07	72-07	72-07
Data					
Rating					
R-squared	0.67	0.71	0.73	0.74	0.75

Back to validation

Treasury debt maturity and three-year excess returns

	log 3y-holding return over 3y note return			3y cum. log 3m-holding return over 3m bill return		
	(1)	(2)	(3)	(4)	(5)	(6)
	*rx*5	*rx*10	*rx*15	*rx*5	*rx*10	*rx*15
TSY MAT	3.49***	10.02***	15.84***	9.24***	15.15***	20.47***
	(1.08)	(2.93)	(4.78)	(2.88)	(4.52)	(6.34)
Observations	432	432	432	432	432	432
Sample Years	72-07	72-07	72-07	72-07	72-07	72-07
R-squared	0.71	0.46	0.43	0.37	0.40	0.40

Back to validation

Treasury debt maturity and two-year excess returns

	log 2y-holding return over 2y note return			2y cum. log 3m-holding return over 3m bill return		
	(1)	(2)	(3)	(4)	(5)	(6)
	*rx*5	*rx*10	*rx*15	*rx*5	*rx*10	*rx*15
TSY MAT	3.53***	7.72***	11.39***	6.44***	10.40***	13.99***
	(1.13)	(2.17)	(3.25)	(1.98)	(2.91)	(3.96)
Observations	432	432	432	432	432	432
Sample Years	72-07	72-07	72-07	72-07	72-07	72-07
R-squared	0.38	0.27	0.25	0.27	0.27	0.27

Back to validation

Treasury debt maturity and convenience spreads

	(B5-B1)-(A5-A1)	(B10-B1)-(A10-A1)	(A5-A1)-(T5-T1)	(A10-A1)-(T10-T1)
	(1)	(2)	(3)	(4)
TSYMAT	-0.03	-0.05	-0.05*	-0.14***
	(0.03)	(0.06)	(0.03)	(0.04)
Controls	✓	✓	✓	✓
Observations	300	300	300	300
Sample Years	73-97	73-97	73-97	73-97
R-squared	0.34	0.50	0.41	0.37

Back to validation

Term structure and cross-section of investment

	OLS			2SLS		
	(1)	(2)	(3)	(4)	(5)	(6)
Term Spread × AssetMat	-0.109***	-0.111***		-0.254***	-0.276***	
	(0.022)	(0.020)		(0.052)	(0.051)	
Term Spread × High AssetMat			-0.667***			-2.034***
			(0.118)			(0.399)
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓	✓	✓	✓
Firm Controls x TermSpread	–	✓	✓	–	–	–
Firm Controls x TSYMAT	–	–	–	–	✓	✓
Observations	120275	120275	120275	120275	120275	120275
Adjusted R^2	0.438	0.471	0.471	0.001	0.059	0.056

▸ Back to investment reallocation ▸ Back to Robustness

Debt financing channel: ↑ gov. debt maturity $\Longrightarrow$ ↑ debt cost of LT firms

	Baseline sample		Bond panel sample	
	(1) IntExp	(2) IntExp	(3) YTM	(4) YTM
TSYMAT × AssetMat	0.045*	-0.109	0.042***	0.009
	(0.024)	(0.084)	(0.013)	(0.033)
TSYMAT × AssetMat × 1(DebtShareAbove5y > p33)		0.173**		
		(0.086)		
TSYMAT × AssetMat × 1(DebtMat > p33)				0.039
				(0.035)
Time FE	✓	–	✓	–
Firm FE	✓	–	✓	–
Firm FE x High Mat	–	✓	–	✓
Time FE x High Mat	–	✓	–	✓
AssetMat x Macro Controls	✓	✓	✓	✓
AssetMat x Macro Controls x High Mat	–	✓	–	✓
Observations	75307	75259	7881	7842
Adjusted R^2	0.307	0.322	0.896	0.910

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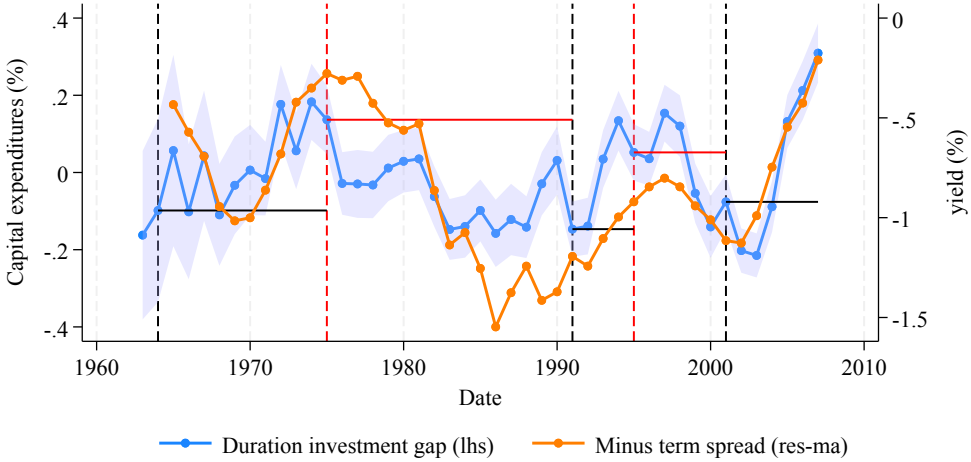
Across-firms reallocation: event studies



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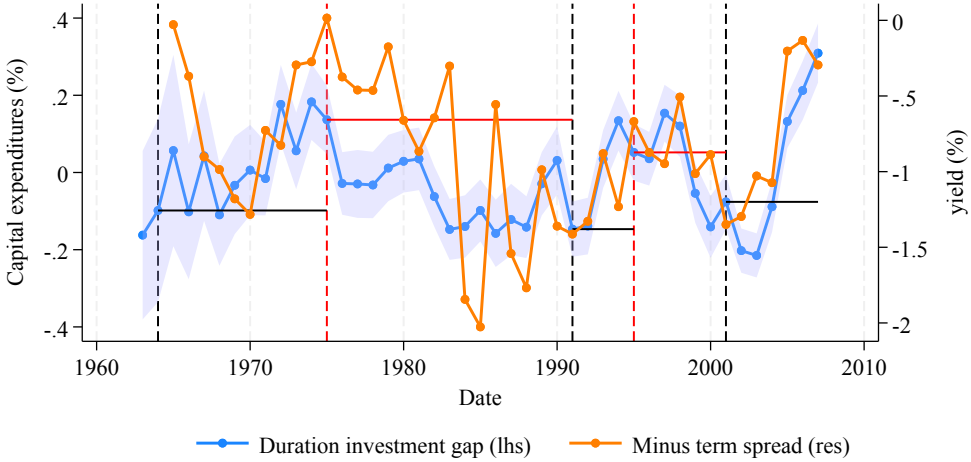
Across-firms reallocation: event studies



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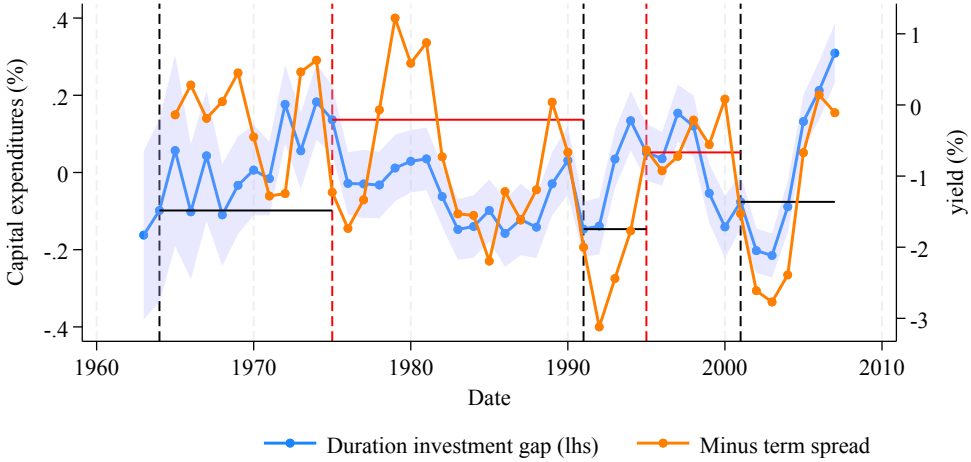
Across-firms reallocation: event studies



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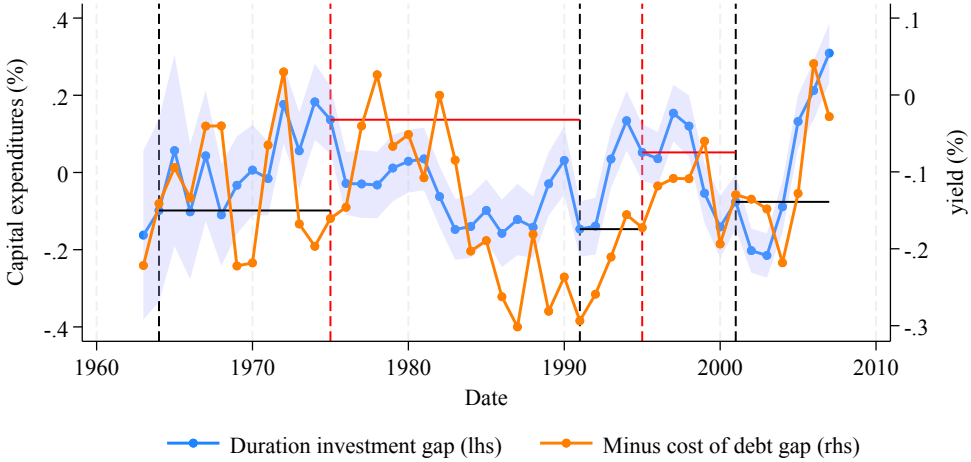
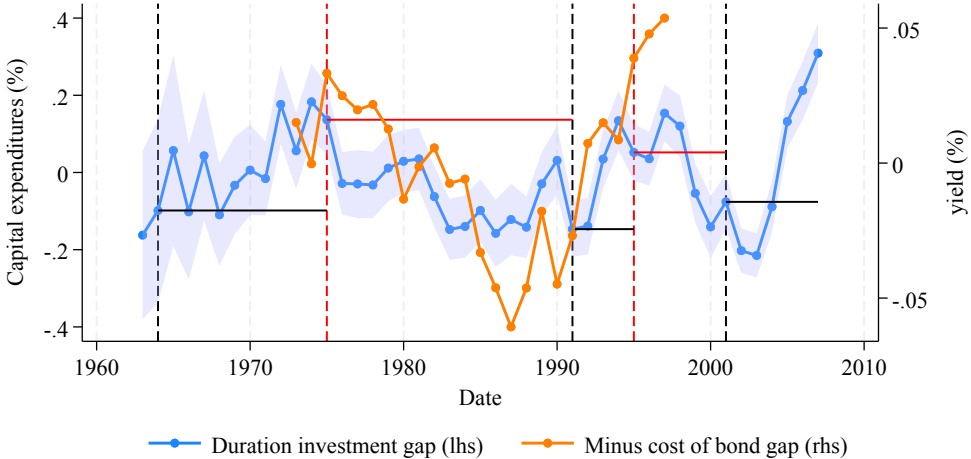
Across-firms reallocation: event studies



Back to financing channel

Across-firms reallocation: event studies



Back to financing channel

Investment, net debt issuance and cost of outstanding debt

	Bond panel sample			Full sample		
	(1) Capex	(2) NetIss	(3) YTM	(4) Capex	(5) NetIss	(6) Interest Expense
TSYMAT × AssetMat	-0.119*	-0.159	0.044***	-0.121***	-0.053*	0.047**
	(0.061)	(0.111)	(0.015)	(0.022)	(0.030)	(0.020)
Time FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓	✓	✓	✓
Observations	8237	8237	8237	106439	106439	106439
Adjusted R^2	0.587	0.217	0.892	0.442	0.059	0.313

▸ Back to financing channel ▸ Back to elasticities ▸ Back to debt reallocation

Breaking down the response of firms' assets and liabilities

	Long-Term Assets		Current Assets			Book Liabilities		Book Equity
	(1) PPE	(2) Other LT	(3) Cash	(4) Receiv.	(5) Invent.	(6) Debt	(7) Other	(8) Equity
TSYMAT × AMat	-0.17***	-0.07***	-0.02	0.04**	0.07***	-0.12***	-0.01	-0.06
	(0.02)	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.05)
Controls x TSYMAT	✓	✓	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	120035	120035	120035	120035	120035	120035	120035	120035
Adjusted R^2	0.269	0.148	0.079	0.241	0.218	0.097	0.154	0.251

▸ Back to financing channel ▸ Back to debt reallocation

Relative change in capital structure?

	Book Leverage	Long-term debt share
	(1)	(2)
TSYMAT	0.596*	-1.742***
	(0.315)	(0.502)
TSYMAT × AssetMat	-0.003	-0.039
	(0.068)	(0.097)
Firm Controls x TSYMAT	✓	✓
AssetMat x Macro Controls	✓	✓
Firm FE	✓	✓
Observations	120168	76111
Adjusted R^2	0.566	0.525

▸ Back to financing channel ▸ Back to leverage sorting

Heterogeneity

	Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × AssetMat	-0.093**	-0.106**	-0.139***	-0.137***	-0.207***	-0.087***
	(0.036)	(0.041)	(0.041)	(0.042)	(0.036)	(0.028)
TSYMAT × AssetMat × High Cash	-0.028					
	(0.046)					
TSYMAT × AssetMat × High LiqRatio		-0.014				
		(0.046)				
TSYMAT × AssetMat × High ExtFinDep			-0.002			
			(0.047)			
TSYMAT × AssetMat × High Size				0.025		
				(0.046)		
TSYMAT × AssetMat × Dividend Payer					0.125***	
					(0.046)	
Firm FE x Split Dummy	✓	✓	✓	✓	✓	✓
Time FE x Split Dummy	✓	✓	✓	✓	✓	✓
Observations	105312	104972	94175	105368	105105	34307
Adjusted R^2	0.476	0.475	0.479	0.475	0.476	0.519

▸ Back to leverage sorting

Discounting channel: reallocation across different capital structures

Discounting channel: reallocation across different capital structures

	Capital Expenditures			
	(1)	(2)	(3)	(4)
TSYMAT × AssetMat	-0.11**	-0.14***	-0.07	-0.10*
	(0.05)	(0.05)	(0.06)	(0.05)
TSYMAT × AssetMat × High Leverage	-0.02			
	(0.06)			
TSYMAT × AssetMat × High Leverage (res.)		-0.01		
		(0.05)		
TSYMAT × AssetMat × High LT Leverage (1y)			-0.05	
			(0.07)	
TSYMAT × AssetMat × High LT Leverage (1y, res.)				-0.03
				(0.06)
Firm FE x LT Leverage Tercile	✓	✓	✓	✓
Time FE x Capital Structure Tercile	✓	✓	✓	✓
Observations	69711	69739	67612	66607
Adjusted R^2	0.484	0.481	0.481	0.484

Back to leverage sorting

Discounting channel: reallocation across different capital structures

	Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × LT Leverage (1y, 1sd)	-0.20***		-0.08			
	(0.06)		(0.06)			
TSYMAT × LT Leverage (5y, 1sd)		-0.09*		0.00		
		(0.06)		(0.05)		
TSYMAT × AM (1sd)			-0.31***	-0.30***	-0.28*	-0.24
			(0.07)	(0.08)	(0.15)	(0.15)
TSYMAT × AM (1sd) × High LT Leverage (1y)					-0.07	
					(0.17)	
TSYMAT × AM (1sd) × High LT Leverage (5y)						-0.12
						(0.17)
Firm FE	✓	✓	✓	✓	–	–
Time FE	✓	✓	✓	✓	–	–
Firm FE x LT Leverage Tercile	–	–	–	–	✓	✓
Time FE x LT Leverage Tercile	–	–	–	–	✓	✓
Observations	101801	83568	101801	83568	66607	54850
Adjusted R^2	0.458	0.469	0.458	0.469	0.484	0.511

Back to leverage sorting

Discounting channel: reallocation across different capital structures

	Capital Expenditures					
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × LTDebtShare (1y, 1sd)	-0.14***		-0.07			
	(0.04)		(0.04)			
TSYMAT × LTDebtShare (5y, 1sd)		-0.06		-0.01		
		(0.05)		(0.05)		
TSYMAT × AM (1sd)			-0.31***	-0.30***	-0.22*	-0.33*
			(0.07)	(0.08)	(0.13)	(0.17)
TSYMAT × AM (1sd) × High LTDebtShare (1y)					0.00	
					(0.16)	
TSYMAT × AM (1sd) × High LTDebtShare (5y)						0.03
						(0.20)
Firm FE	✓	✓	✓	✓	–	–
Time FE	✓	✓	✓	✓	–	–
Firm FE x LTDebtShare Tercile	–	–	–	–	✓	✓
Time FE x LTDebtShare Tercile	–	–	–	–	✓	✓
Observations	101801	83568	101801	83568	66807	55376
Adjusted R^2	0.456	0.468	0.457	0.469	0.491	0.508

▸ Back to leverage sorting

Integrated markets: evidence from equity valuations

	(1) log(MV)	(2) log(MV)	(3) P/D	(4) P/D
TSYMAT × CF Dur.	-0.43***	-0.42***	-0.18***	-0.18***
	(0.07)	(0.07)	(0.05)	(0.05)
TSYMAT × AssetMat		-0.88**		0.39
		(0.35)		(0.30)
Time FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Controls x TSYMAT	✓	✓	✓	✓
Observations	62965	62965	28982	28982
Adjusted R^2	0.676	0.676	0.662	0.662

- equity valuations and price-to-dividend ratios for firms with long payout duration ↓

Back

Integrated markets: evidence from equity returns

	$r(i, t+1, t+12)$		$r(i, t+1, t+24)$		$r(i, t+1, t+36)$	
	(1)	(2)	(3)	(4)	(5)	(6)
TSYMAT × CF Duration (Goncalves)	0.103***		0.111***		0.097***	
	(0.028)		(0.024)		(0.020)	
TSYMAT × CF Duration (Weber)		0.284***		0.228***		0.158**
		(0.098)		(0.085)		(0.071)
Firm FE	✓	✓	✓	✓	✓	✓
Time FE	✓	✓	✓	✓	✓	✓
Observations	315455	293198	285346	265025	261862	243172
Adjusted R^2	0.248	0.237	0.263	0.246	0.309	0.298

- future realized equity returns for firms with long payout duration ↑

Back

↑ gov. debt maturity $\Longrightarrow$ ↑ cost of capital of LT firms

	Interest Expense to Total Debt	Yield-to-Maturity	Implied Cost of Capital
	(1)	(2)	(3)
TSYMAT × AssetMat	0.047**	0.044***	0.051**
	(0.020)	(0.013)	(0.024)
Time FE	✓	✓	✓
Firm FE	✓	✓	✓
AssetMat x Macro Controls	✓	✓	✓
Observations	106439	8237	38680
Adjusted R^2	0.313	0.892	0.557

- Implied cost of capital from Eskildsen, Ibert, Jensen, and Pedersen (2024):
  - Equal-weighted average of 4 measures from accounting literature (Mohanram and Gode, 2013) Gebhardt et al., 2001; Claus and Thomas, 2001; Easton, 2004; Ohlson and Juettner-Nauroth, 2005
  - Implied cost of capital as the internal rate of return that equates the discounted value of future expected cash flows to the current stock price
  - Expected future cash flows using consensus forecasts of EPS and EPS LTG rate, past dividends payout ratios, past return on equity in each industry, and a Treasury yield

Back

Elasticities of investment to the cost of capital: upper bound

- Elasticities as Δ in investment (% of assets) / Δ in maturity-matched cost of new debt (pp)
- *Upper bound* using the change in realized cost of debt under maturity-matching assumption
  1. Imperfect maturity matching + Effect of gov. debt maturity on interest rates increasing in maturities

     $\Longrightarrow$ Δ in true maturity-matched cost of new debt $>$ Δ in realized cost of new debt
  2. Outstanding asset maturity = h $\Longleftrightarrow$ new asset maturity $=2\times h$

     $\Longrightarrow$ Δ in maturity-matched cost of new debt $>$ Δ in maturity-matched cost of outstanding debt
- Using panel data on secondary bond market prices: upper bound$=$ 0.119/ 0.044 $=$ 2.7

Back to financing channel

Elasticities of investment to the cost of capital: lower bound

- *Lower bound* using the maximum change in cost of new debt obtained under

  1. Firms change in cost of new debt = Aaa-rated change in cost of new debt

  2. Effect of gov. debt maturity on interest rates linear in maturities

  3. Outstanding asset maturity duration = $h \iff$ new asset maturity $\approx 2 \times h$

- Using effects on term structure for Aaa-rated issuers : lower bound= 0.119/ (2×0.44/10) = 1.4

Roadmap

Appendix: Simple conceptual framework

Appendix: Government debt maturity

Appendix: Duration measures

Appendix: Investment reallocation

Appendix: Mechanism

Appendix: Debt reallocation

Appendix: UK shock

Appendix: Conceptual framework

Implication for aggregate corporate debt maturity

- $\uparrow$ LT government debt supply $\Longrightarrow \downarrow$ LT corporate debt supply

Implication for aggregate corporate debt maturity

- ↑ LT government debt supply $\Longrightarrow$ ↓ LT corporate debt supply

  1. ↓ investment for firms with LT investments → ↓ contribution to total investment

Implication for aggregate corporate debt maturity

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  2. ↓ debt issuance for firms with LT investments → ↓ contribution to total debt

Implication for aggregate corporate debt maturity

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  2. ↓ debt issuance for firms with LT investments → ↓ contribution to total debt
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- **Relevance** for negative correlation between government and corporate debt maturities

  e.g., Greenwood, Hanson, and Stein, 2010

Implication for aggregate corporate debt maturity

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  2. ↓ debt issuance for firms with LT investments → ↓ contribution to total debt
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- **Relevance** for negative correlation between government and corporate debt maturities
  e.g., Greenwood, Hanson, and Stein, 2010

  - 45% of correlation due to composition effects across firms

▸ Issuance ▸ Maturity Matching ▸ Covariance decomposition ▸ Back

Government and corporate debt maturities: covariance decomposition

- **Covariance** between government debt maturity (g_t) and aggregate corporate debt maturity (m_t)

$$m_t = \sum_i \frac{D_{i,t}}{\sum_i D_{i,t}} \cdot m_{i,t} = \sum_i w_{i,t} \cdot m_{i,t}$$ with $D_{i,t}$ and $m_{i,t}$ the debt quantity and average maturity for firm i at t

$$\underbrace{\frac{Cov(g_t, m_t)}{Var(g_t)}}_{\text{Total covariance}} =$$

-7.3 (2.1)

Back to debt reallocation

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$$\underbrace{\frac{Cov(g_t, m_t)}{Var(g_t)}}_{\text{Total covariance}} = \underbrace{\frac{Cov\left(g_t, \sum_i w_{i,t} \cdot \overline{m}_i\right)}{Var(g_t)}}_{\text{Across-firm covariance}}$$

-7.3 (2.1) **-3.3 (1.2)**

- where $\overline{m}_i = \frac{1}{N_i} \sum_i m_{i,t}$ and $\overline{w}_i = \frac{\overline{D}_i}{\sum_i \overline{D}_i}$

Back to debt reallocation

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$$\underbrace{\frac{Cov(g_t, m_t)}{Var(g_t)}}_{\text{Total covariance}} = \underbrace{\frac{Cov\left(g_t, \sum_i w_{i,t} \cdot \overline{m}_i\right)}{Var(g_t)}}_{\text{Across-firm covariance}} + \underbrace{\frac{Cov\left(g_t, \sum_i \overline{w}_i \cdot (m_{i,t} - \overline{m}_i)\right)}{Var(g_t)}}_{\text{Within-firm covariance}}$$

Total covariance	Across-firm covariance	Within-firm covariance
-7.3 (2.1)	**-3.3 (1.2)**	**-3.6 (0.6)**

- where $\overline{m}_i = \frac{1}{N_i} \sum_i m_{i,t}$ and $\overline{w}_i = \frac{\overline{D}_i}{\sum_i \overline{D}_i}$

Back to debt reallocation

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Total covariance	Across-firm covariance	Within-firm covariance	Cross covariance
-7.3 (2.1)	-3.3 (1.2)	-3.6 (0.6)	-0.4

- where $\overline{m}_i = \frac{1}{N_i} \sum_i m_{i,t}$ and $\overline{w}_i = \frac{\overline{D}_i}{\sum_i \overline{D}_i}$

Back to debt reallocation

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- where $\overline{m}_i = \frac{1}{N_i} \sum_i m_{i,t}$ and $\overline{w}_i = \frac{\overline{D}_i}{\sum_i \overline{D}_i}$

Back to debt reallocation

Government and corporate debt maturities: covariance decomposition

- **Covariance** between government debt maturity (g_t) and aggregate corporate debt maturity (m_t)

$$m_t = \sum_i \frac{D_{i,t}}{\sum_i D_{i,t}} \cdot m_{i,t} = \sum_i w_{i,t} \cdot m_{i,t} \quad \text{with } D_{i,t} \text{ and } m_{i,t} \text{ the debt quantity and average maturity for firm } i \text{ at } t$$

$$\underbrace{\frac{Cov(g_t, m_t)}{Var(g_t)}}_{\text{Total covariance}} = \underbrace{\frac{Cov\left(g_t, \sum_i w_{i,t} \cdot \overline{m}_i\right)}{Var(g_t)}}_{\text{Across-firm covariance}} + \underbrace{\frac{Cov\left(g_t, \sum_i \overline{w}_i \cdot (m_{i,t} - \overline{m}_i)\right)}{Var(g_t)}}_{\text{Within-firm covariance}} + \underbrace{\frac{Cov\left(g_t, \sum_i (w_{i,t} - \overline{w}_i)(m_{i,t} - \overline{m}_i)\right)}{Var(g_t)}}_{\text{Cross covariance}}$$

Total covariance	Across-firm covariance	Within-firm covariance	Cross covariance
-7.3 (2.1)	**-3.3 (1.2)**	**-3.6 (0.6)**	**-0.4**

- where $\overline{m}_i = \frac{1}{N_i} \sum_i m_{i,t}$ and $\overline{w}_i = \frac{\overline{D}_i}{\sum_i \overline{D}_i}$

$\Longrightarrow$ $\approx$ 50% from across-firm covariance, i.e., firms with LT debt contributing less to total debt when $g_t \uparrow$

- of which 90% are explained by changes in investment

Back to debt reallocation

Across-firms reallocation and corporate debt maturity

	Total	Within firm	Across firm		Across firm (IV)	
	(1)	(2)	(3)	(4)	(5)	(6)
	$m(i,t)$	$m(i,t)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$
TSYMAT	-7.3***	-3.6***	-3.3***	-1.8***	-2.9***	-1.9***
	(2.1)	(0.6)	(1.2)	(0.7)	(0.7)	(0.5)
AssetMat				2.7***		3.1***
				(0.4)		(0.2)
constant	48.4***	46.2***	48.1***	31.9***	47.5***	27.4***
	(2.5)	(0.1)	(2.1)	(3.6)	(1.0)	(1.4)
No FE	✓	–	✓	✓	✓	✓
Firm FE	–	✓	–	–	–	–
Observations	76094	76094	76094	76094	76094	76094
Adjusted R^2	0.066	0.417	0.029	0.281	0.017	0.283
weights	w(i,t)	$\overline{w}(i)$	w(i,t)	w(i,t)	$\widehat{w(i,t)}$	$\widehat{w(i,t)}$

1y ↑ TDebtMat → 7.3pp ↓ aggregate share of debt maturing in 5 years or more

Across-firms reallocation and corporate debt maturity

	Total	Within firm	Across firm		Across firm (IV)	
	(1)	(2)	(3)	(4)	(5)	(6)
	$m(i,t)$	$m(i,t)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$
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Firm FE	–	✓	–	–	–	–
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weights	w(i,t)	$\overline{w}(i)$	w(i,t)	w(i,t)	$\widehat{w(i,t)}$	$\widehat{w(i,t)}$

1y ↑ TDebtMat → 7.3pp ↓ aggregate share of debt maturing in 5 years or more

- 50% ↓ within firm (fixing weights + firm FE)

Across-firms reallocation and corporate debt maturity

	Total	Within firm	Across firm		Across firm (IV)	
	(1)	(2)	(3)	(4)	(5)	(6)
	$m(i,t)$	$m(i,t)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$
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No FE	✓	–	✓	✓	✓	✓
Firm FE	–	✓	–	–	–	–
Observations	76094	76094	76094	76094	76094	76094
Adjusted R^2	0.066	0.417	0.029	0.281	0.017	0.283
weights	w(i,t)	$\overline{w}(i)$	w(i,t)	w(i,t)	$\widehat{w(i,t)}$	$\widehat{w(i,t)}$

1y ↑ TDebtMat → 7.3pp ↓ aggregate share of debt maturing in 5 years or more

- 50% ↓ within firm (fixing weights + firm FE)
- 50% ↓ across firms (fixed predicted share within firm + average weight)

Across-firms reallocation and corporate debt maturity

	Total	Within firm	Across firm		Across firm (IV)	
	(1)	(2)	(3)	(4)	(5)	(6)
	$m(i,t)$	$m(i,t)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$
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	(2.5)	(0.1)	(2.1)	(3.6)	(1.0)	(1.4)
No FE	✓	–	✓	✓	✓	✓
Firm FE	–	✓	–	–	–	–
Observations	76094	76094	76094	76094	76094	76094
Adjusted R^2	0.066	0.417	0.029	0.281	0.017	0.283
weights	w(i,t)	$\overline{w}(i)$	w(i,t)	w(i,t)	$\widehat{w(i,t)}$	$\widehat{w(i,t)}$

1y ↑ TDebtMat → 7.3pp ↓ aggregate share of debt maturing in 5 years or more

- 50% ↓ within firm (fixing weights + firm FE)
- 50% ↓ across firms (fixed predicted share within firm + average weight)
  - 40% ↓ are explained by changes in investment (IV)

Across-firms reallocation and corporate debt maturity

	Total	Within firm	Across firm		Across firm (IV)	
	(1)	(2)	(3)	(4)	(5)	(6)
	$m(i,t)$	$m(i,t)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$	$\overline{m}(i)$
TSYMAT	-7.3***	-3.6***	-3.3***	-1.8***	-2.9***	-1.9***
	(2.1)	(0.6)	(1.2)	(0.7)	(0.7)	(0.5)
AssetMat				2.7***		3.1***
				(0.4)		(0.2)
constant	48.4***	46.2***	48.1***	31.9***	47.5***	27.4***
	(2.5)	(0.1)	(2.1)	(3.6)	(1.0)	(1.4)
No FE	✓	–	✓	✓	✓	✓
Firm FE	–	✓	–	–	–	–
Observations	76094	76094	76094	76094	76094	76094
Adjusted R^2	0.066	0.417	0.029	0.281	0.017	0.283
weights	w(i,t)	$\overline{w}(i)$	w(i,t)	w(i,t)	$\widehat{w(i,t)}$	$\widehat{w(i,t)}$

1y ↑ TDebtMat → 7.3pp ↓ aggregate share of debt maturing in 5 years or more

- 50% ↓ within firm (fixing weights + firm FE)
- 50% ↓ across firms (fixed predicted share within firm + average weight)
  - 40% ↓ are explained by changes in investment (IV)
  - 15% ↓ are explained by changes in investment that are stronger for long-duration firms (IV)

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Across-firms reallocation and corporate debt maturity

	LT Debt Share (>3y)			LT Debt Share (>1y)		
	(1)	(2)	(3)	(4)	(5)	(6)
	$share(f,t)$	$share(f,t)$	$share(f)$	$share(f,t)$	$share(f,t)$	$share(f)$
TSYMAT	-5.5***	-3.1***	-2.2*	-3.5**	-1.9***	-1.2
	(1.7)	(0.6)	(1.2)	(1.4)	(0.6)	(1.0)
constant	63.5***	61.7***	62.9***	79.4***	78.0***	78.5***
	(2.5)	(0.1)	(2.2)	(2.0)	(0.1)	(1.9)
No FE	✓	–	✓	✓	–	✓
Firm FE	–	✓	–	–	✓	–
Observations	82086	81582	82086	81897	81386	81897
Adjusted R^2	0.044	0.447	0.014	0.026	0.487	0.005
weights	debt(f,t)	debt(f)	debt(f,t)	debt(f,t)	debt(f)	debt(f,t)

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Roadmap

Demand shock for LT bonds: UK Pension fund reform

- **UK Pensions Act of 2004:**
  - introduces fines for underfunded pension plans and take-over of “risky” funds
  - based on "accounting deficit" = MV or assets - MV or liabilities
  - regulatory discount curve for liabilities: LT government bonds

    → incentives to buy LT bonds to hedge variation in market value of liabilities

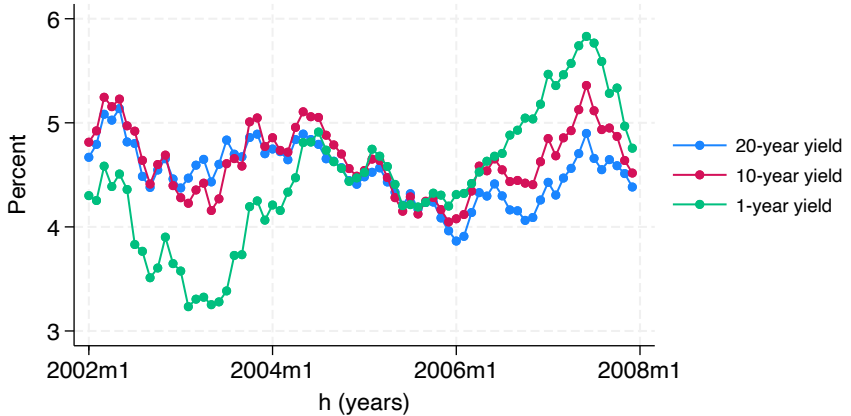
- **Buying pressures over 2005-2006:**
  - Pension funds net purchase of LT bonds + net increase in swap activity: GBP60 bn
  - ≈ UK govt issuance of LT bonds in April 2005-March 2007

    → dramatic yield curve inversion

▸ Back to robustness

Demand shock for LT bonds: yield curve inversion

- Data: estimated yield curves data from the BoE

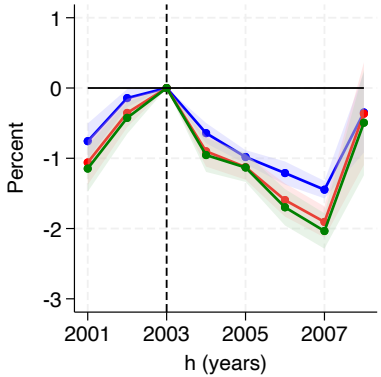


Back to robustness

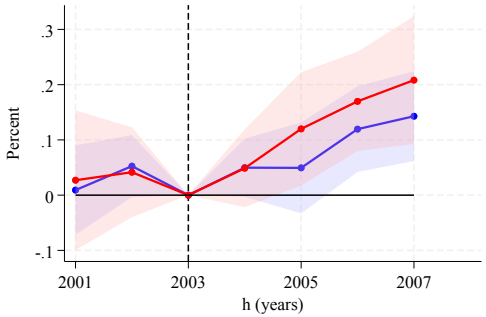
Demand shock for LT bonds: long-term investment

- Data: UK public firms from Compustat Global. 9,163 firm-year observations for 2001-2008.

$$Spread_t^{10y-1y,20y-1y,25y-1y} = \gamma_t$$



$$\frac{Capex_{f,s,t}}{Assets_{f,s,t-1}} = \beta_t \cdot AssetMaturity_s + \gamma_t + \alpha_f + \varepsilon_{f,s,t}$$



Back to robustness

UK shock: Investment semi-elasticities across-industries

- Cross-sectional semi-elasticity of investment to term spread over 2004-2008:

  ≈ **-0.7pp to -1pp of assets** for 1-sd higher *AssetMat* for 1-pp higher Term Spread

  - compares with ≈ **-0.8pp of assets** for US shocks

▸ Back to Main

▸ Back to robustness ▸ US-IV

Roadmap

Appendix: Simple conceptual framework

Appendix: Government debt maturity

Appendix: Duration measures

Appendix: Investment reallocation

Appendix: Mechanism

Appendix: Debt reallocation

Appendix: UK shock

Appendix: Conceptual framework

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