Long-Term Bond Supply, Term Premium, and the Duration of Corporate Investment

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Using large and plausibly exogenous shocks to the maturity structure of US government debt, I find that a higher supply of long-term government bonds, holding the overall supply of government bonds constant, increases firms' financing costs at long horizons leading to a crowding-out of long-duration investment. I show that this crowding out occurs through reallocations of capital away from long-duration investment towards short-duration investment, not only *across industries* but also *within industries across firms* and *within firms across divisions*. I show that these changes to the average duration of investment map into changes to the average maturity of corporate debt. These results identify important real effects of policies which affect the net supply of long-term bonds, such as quantitative easing by central banks.

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I Introduction

In the aftermath of the Great Financial Crisis, central banks have resorted to unprecedented bond purchase programs to stimulate economic activity. A standard feature of these programs has been to reduce the supply of long-term bonds available in secondary markets so as to lower long-term yields and as a result the financing costs of firms. While the literature has highlighted that large shocks to the supply of long-term bonds affect the term structure of interest rates, evidence of real effects on corporate investment is scarce.[1] Beyond identification concerns related to the endogeneity of bond purchase programs to the state of the economy, one important aspect that has not received much attention is that shocks to the supply of long-term bonds may have distributional effects. This is because the supply of long-term bonds affects long-term interest rates *relative* to short-term interest rates. Textbook capital budgeting tells us that the value of investment opportunities with distant cash-flows is more sensitive to changes in long-term rates and less to changes in short-term rates compared to the value of investment opportunities with less distant cash-flows. Hence government interventions that impact the net supply of long-term bonds in secondary markets may have consequences for the relative valuation of long-term investment opportunities and the duration of corporate investment.[2] Uncovering and quantifying such mechanisms is useful in providing policy guidance on alternatives for governments to spur long-duration investments.[3]

In this paper, I provide the first causal evidence that supports a mechanism through which exogenous shocks to the relative supply of long-term bonds affect the duration of corporate investment. Using financial data on public US corporates over 1970-2010 and exogenous shocks to the supply of long-term government bonds, I find that a higher

[1] See for instance Vayanos and Vila (2021) for a theoretical framework and Greenwood and Vayanos (2014) and Krishnamurthy and Vissing-Jorgensen (2011) for empirical evidence.

[2] Beyond central banks's bond purchase programs, government debt management and financial regulation may impact the supply or steer the demand for long-term bonds.

[3] Long-term investments are typically considered critical for productivity gains, economic growth, and social objectives that may be unattainable with short-term investments. Relatedly, governments provide tax incentives for R&D, promote investment in infrastructure through Public-Private Partnerships (PPPs), and promote climate change transition investments.

supply of long-term bonds - relative to overall bond supply - increases firms' financing costs at long horizons leading to a crowding-out of long-duration investment. I show that this crowding out occurs through a reallocation of capital on the basis of cash-flow duration, both *across firms* and *within firms across divisions*.

My empirical analysis relies on the framework of limited arbitrage across bond markets in Vayanos and Vila (2021): shocks to the net supply of long-term bonds which are large relative to arbitrageurs' capital affect the interest rate risk borne by arbitrageurs and therefore the return on long-term bonds relative to the return on short-term bonds, namely the term premium. I introduce heterogeneous firms that differ in the cash-flow duration of their investments and are owned by the same risk-averse agents arbitraging bond markets. In equilibrium, a higher net supply of long-term bonds increases the term premium. This leads to a decrease in the investment of firms with a long cash-flow duration of investments (hereafter long-duration firms) as these firms experience an increase in effective discount rates relative to short-duration firms. I refer to this mechanism as the *across-firms channel*.

The causal identification of this *across-firms channel* is challenging due to endogeneity concerns. Long-term bond supply may be endogenous to long-duration investment opportunities. For instance, better long-duration investment opportunities may increase long-term borrowing. Similarly, central bank asset purchases are typically implemented during bad times, when credit constraints are likely to deter long-duration investments (Aghion et al., 2010).

To address these issues, I exploit five policy shocks which are driving most of the variation in the supply of long-term debt by the US government over 1970-2010 and are plausibly exogenous to long-duration corporate investment. I show that these policy shocks and the resulting variation in government debt maturity are not driven by changes in Treasury borrowing costs nor by changes in government refinancing risk, and are not systematically correlated with business cycle fluctuations or the size of government debt. In a "stacked" event-study setting centered on these shocks, I confirm the relevance of my instrument. I show that the shocks, when interpreted as positive supply shocks to long-term bonds, are associated with a steady increase in the average maturity of US Treasury debt. The average lengthening of the maturity of the stock of Treasury debt is equal to 0.9 years and is associated with an increase in the term spread of 0.9pp.

An additional challenge to identification is related with the measurement of the duration of real investments. Following the literature, I proxy the duration of a firm's investments by the firm's *asset maturity*, a measure which interacts the firm-level share of fixed-assets out of total assets and the firm-level maturity of fixed-assets. I measure the latter by the inverse of the depreciation rate on fixed assets.[4] I average the *asset maturity* measure over time at the SIC-2 digit industry classification level. I show that this measure is (i) well-aligned with the general intuition about which industries are characterised by long-duration investments, (ii) correlates strongly with the horizon of business plans measured using SEC filings textual information obtained from Dessaint et al. (2023), and (iii) is a strong predictor of the maturity of corporate debt issuances.

As a validation exercise of the theoretical framework and the measurement assumptions, I compare the evolution of discount rates used by firms across industries obtained from Gormsen and Huber (2023) with the evolution of the slope of the term structure of interest rates. I show that when long risk-free interest rates increase, discount rates in long-duration industries increase more than discount rates in short-duration industries. In other words, the average discount rate used by longer-duration firms covaries more with longer-term risk-free discount rates.

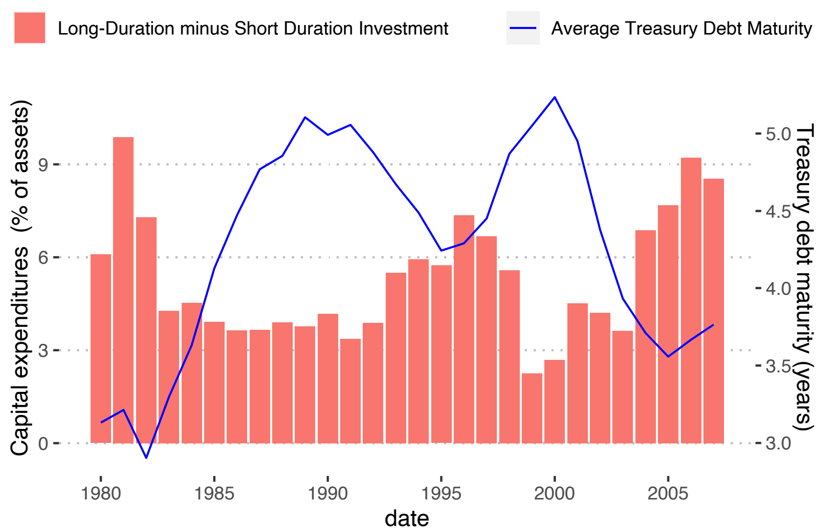
Figure 1 previews the evidence consistent with the theoretical prediction of the *across-firms channel*. The difference in the investment rate between firms in long- and short-duration industries exhibits a strong negative correlation with the maturity of Treasury debt. In other words, when the supply of long-term bonds is high, long-duration investment drops.

In a "stacked" event-study setting centered on these shocks, I estimate differences-in-differences empirical investment equations including an interaction term

[4] Following Stohs and Mauer (1996), the literature has shown that the measure is consistent with tests of many corporate finance predictions. See Section IV.B for more details.

Figure 1: Treasury debt maturity and long-duration investment rate

The figure presents the yearly time series of average Treasury debt maturity value-weighted by outstanding principal (blue line with values on the right-hand side axis). The red bars correspond to the difference in investment rates (capital expenditures as a % of lagged total assets) between firms in industries with above median investment duration (measured by accounting asset maturity) and firms in industries with below median investment duration.



between a firm's investment duration and the event-study periods. I find that a 1 year higher average maturity of Treasury debt, raises the term spread by 1pp and redistributes yearly about 1.3% of total public firm assets in the form of capital expenditures from firms in long-duration industries towards firms in short-duration industries. This reallocation is economically relevant: evaluated using the sum of total assets over the panel of firms in 2019, the yearly reallocation from long- towards short-duration industries amounts to USD 128bn.[5]

I also find that similar investment reallocations occur across firms within industries and across divisions within firms. In particular, when the maturity of Treasury debt is high, multi-division firms allocate less capital to industry divisions corresponding to industries with long investment duration.

These baseline results hold after controlling for firm-level unobservables (through firm-fixed effects), for firm- or industry-level measures of investment opportunities, and for differential responses to business cycle variables (interactions of *asset maturity* with e.g. credit spreads, GDP growth, debt-to-GDP and short-term interest rates). I also rule

[5]The interpretation follows from the analysis where two groups are built above/below the assets-weighted median of investment duration such that groups are all of equal size.

out alternative explanations for the baseline results. For instance, I am able to rule out that my result arises as long-duration firms respond differently to business cycle shocks or experience a relaxation of financial constraints via an increase in their collateral value (Chaney et al., 2012). Finally, I show that my baseline results remain robust to other measures of the duration of investments, such as the horizon of firms' investment plans (Dessaint et al., 2023).

I confirm my results in a different setting. Using the 2004 reform to the UK's Pensions Act that generates a plausibly exogenous positive shock to the demand for long-term bonds in the UK and a significant drop in the term spread, I find a relative semi-elasticity of investment to the term spread (in the cross-section of investment duration) that is quantitatively comparable to the baseline relative semi-elasticity obtained using the US policy shocks. This shows that the paper's main findings hold with a different instrument, and that they are also externally valid.

Moreover, I find that these real effects affecting the composition of investment can explain the variation in average corporate debt maturity. First, the decrease in investment by long-duration firms following a higher supply of long-term bonds is associated with a decrease in debt financing. Second, I find there is an unconditional positive relationship between the duration of a firm's assets and the maturity of their debt issuances. These two pieces of evidence, when put together, are consistent with real changes in the distribution of investment *across firms* driving changes in the average maturity of corporate debt through the distribution of debt *across firms*.

Overall, this paper makes three main contributions. First, I identify, to the best of my knowledge, the first causal evidence that changes to the supply of long-term debt affect the duration of corporate investment. And I find that this effect goes through a reallocation of capital across investments with different cash-flow duration. Second, my results establish a link between the observed reallocation of investment and time-series variation in the maturity of corporate debt. Third, I present a new potential cost of long-term government financing: when the government issues long-term debt (rather than short-term debt) it crowds out long-duration corporate investment. Conversely, my findings suggest that policies that aim at reducing the supply of outstanding long-term debt, such as quantitative easing, can stimulate long-term corporate investment.

Related Literature. This paper is linked with four strands of the literature. First, it builds on the literature related to segmentation in bond markets arising from imperfect substitutability following Tobin (1958) or the presence of preferred-habitat clienteles as formalised by Vayanos and Vila (2021). I draw on the asset prices implications from the literature and, importantly, extend them to corporate decisions. Relatedly, a strand of this literature has linked variation in long-term government bond supply to corporate financing choices. Baker et al. (2003) provides evidence that the time series variation in the maturity of corporate debt strongly correlates with the term premium. Greenwood et al. (2010) argues that this correlation arises because firms absorb large shocks to the term structure that break the expectations hypothesis. Greenwood et al. (2010) and Badoer and James (2016) provide evidence consistent with this mechanism.[6] Instead of firms arbitraging bond markets, I propose a *real* mechanism linking changes in effective discount rates to capital budgeting decisions and highlight real effects. I also propose that this *real* mechanism has explanatory power for the time series variation in the maturity of corporate debt.

I also contribute to the literature studying the composition of aggregate investment and in particular the determinants of long-term corporate investment. An important strand of this literature identifies the relevance of credit constraints for the composition of aggregate investment following Aghion et al. (2010), which shows that illiquid long-term investment may be rationed in the presence of financial constraints.[7] Another strand, following Stein (1988), stresses that agency problems have an impact on the horizon of investments.[8] In contrast to the streams of work that follow from these two papers, my results do not rely on financial frictions at the level of the firm but instead on supply and demand shocks in segmented markets that change the relative valuation of long-duration investments.

[6]Relatedly, Foley-Fisher et al. (2016) finds that the Federal Reserve's maturity extension program (MEP) may have helped reducing financial constraints of firms more dependent on long-term debt.

[7]See, for instance, Garicano and Steinwender (2016) and Mendes (2020) for empirical evidence.

[8]See, for instance Terry (2015) and Dessaint et al. (2023).

To the best of my knowledge, the only paper that is related to my envisioned channel is Dew-Becker (2012). In the latter, the author shows that the term spread correlates with one-year ahead average duration of investment using the Bureau of Economic Analysis (BEA)'s fixed-assets tables and the BEA depreciation rates for each of the 36 fixed-assets classes. My contribution is to provide causal evidence for a mechanism that has the potential to explain the correlation observed by Dew-Becker (2012): a higher supply of long-term government debt increases the term premium (and the term spread holding the expectations of future short rates constant) and lowers the average duration of investment by redistributing investment *across firms and industries* and *within firm across divisions*.

This paper also contributes to two important strands of the macroeconomic literature. The first of these, following Friedman (1978), focuses on the implications of government borrowing for corporate investment. My paper is about changes to the supply of government debt *across maturities*, as opposed to changes in government borrowing quantities (see, e.g., Graham et al., 2014; Demirci et al., 2019; Akkoyun et al., 2020; Pinardon-Touati, 2021). In contrast with this first strand, I argue that focusing on the supply of government debt *across maturities* allows to tackle the critical challenge of endogeneity:(i) by looking into the difference in investment response between long- and short-duration firms, I control for aggregate investment opportunities; (ii) I document that the time series variation in government debt maturity is plausibly exogenous to investment opportunities for long-duration investments. The second strand in macroeconomics looks at the optimal maturity of government debt. Several properties of short-term and long-term financing have been proposed: for instance, long-term financing favours tax-smoothing (e.g. Bohn, 1990, Angeletos, 2002), or provides a hedge against the risk of refinancing outstanding debt at variable rates (e.g. Angeletos, 2002) at the expense of an historically positive term premium and excessive short-term debt issuance by the financial sector (Greenwood et al., 2015). In contrast, I highlight a new potential cost of long-term financing: when the government issues more long-term debt it may crowd-out long-duration corporate investment.

The rest of the paper proceeds as follows. Section II gives theoretical predictions. Section III explains the main identification choices for the analysis. Section IV presents the data and measurement choices. Section V outlines the empirical strategy and reviews the results for investment. Section VI uncovers the mechanism and highlights the consequences for corporate debt maturity. Section VII outlines the internal and external validity of the baseline results. Section VIII concludes and elaborates on policy implications of the main findings.

II Theory

In this section, I lay out the theoretical framework that will guide my empirical strategy. The model builds on the bond market framework in Greenwood et al. (2010) to which I add a continuum of firms making real investment decisions.

This model has three dates labeled 0, 1, and 2. There are two types of assets. There are one-period bonds with exogenous one-period returns (determined for instance by monetary policy). The return on such bond from time 0 to 1, denoted R_1, is known at time 0. Instead the return on one-period bonds from time 1 to 2, denoted R_2 is random as of time 0, with mean $E[R_2]$ and variance $Var[R_2]$, and is known as of time 1. There are also default-free long-term bonds that trade at an endogenously determined price at time 0 and offer a deterministic payoff at time 2 with return from time 0 to time 2 denoted R_{LT}. It is useful to write: $R_{LT} = R_1 \cdot E[R_2] + \pi$. That is, one can decompose the return on the long-term bond into an (exogenous) component $R_1 E[R_2]$, equal to the expected return from investing in short-term bonds over two periods, and an endogenously determined term premium, denoted π.

There are three types of actors in the model: preferred-habitat investors, the government, and risk-averse households. The preferred-habitat investors inelastically demand a dollar quantity L of long-term bonds at time 0.[9] The government

[9] The natural preference of some investors for bonds with specific characteristics, e.g. pension funds and life insurers with a preference for long-duration assets, can be the result of both underlying aggregate households' life cycle decisions and agency frictions in financial intermediation.

inelastically issues a dollar quantity G of long-term bonds. I denote g $(= G - L)$ the exogenous net supply of long-term bonds as of time 0 .

Risk-averse households invest in both types of bonds. They have zero initial wealth such that they borrow a dollar amount X_{LT} of long bonds at time 0 to invest it in short-term bonds. Conversely, when X_{LT} is negative, households finance the purchase of long-term bonds by selling short-term bonds. Households have mean-variance preferences with risk tolerance γ such that in the model without corporations, households' optimal time 0 borrowing in long-term bonds would be given by

$$X_{LT}^{*} = \gamma \frac{R_1 \cdot E\left[\tilde{R_2}\right] - R_{LT}}{(R_1)^2 Var\left[R_2\right]} = \gamma \frac{-\pi}{(R_1)^2 Var\left[R_2\right]}. \tag{1}$$

Intuitively, households borrow using long-term bonds to invest in short-term bonds when the term premium, π, is negative and vice-versa.

Households also own a mass one continuum of firms $i \in [0, 1]$ that are heterogeneous with respect to their cash-flow duration of investment $d_i \in [0, 1]$. The cash flows from investing I_i in the technology of firm i at time 0 are $(1-d_i) \cdot f(I_i)$ at time 1 and $d_i \cdot f(I_i)$ at time 2 with $f(I) = I^{\alpha}$ and $\alpha \in (0, 1)$. The duration d_i of the investment opportunity that each firm is endowed with is fixed and reflects business specificities, such as the useful life and mix of assets exploited for production.[10] As households have no cash in hand, they finance corporate investments by issuing short- and long-term bonds.[11]

Equilibrium. Households maximise final period consumption $\tilde{C_2}$ by investing in bonds and firms. They choose the scale of investment I_i for each firm i at time 0, the dollar quantity of long-term borrowing (X_{LT}) and of short-term borrowing for first and second periods (X_1 and X_2) to maximise expected utility under resource constraints at each

[10] Dessaint et al. (2023) shows that most of the variation in the horizon of firms' investment plans is found in the cross-section of firms. This is consistent with the fact that firms' investment duration is a rather fixed economic attribute that arises from the firm's business model.

[11] In the version of their model with corporations, Greenwood et al. (2010) introduce firms, with an exogenous financing need, acting as arbitrageurs. In my model households are arbitraging the market possibly through trades outside of firms or through firms financing. The key contribution is to introduce real investment decisions to study real effects.

period. That is, households solve:

$$\begin{aligned}
&argmax_{\{I_i\}_{i\in[0,1]},X_{LT},X_1,X_2} \quad E\left[\tilde{C_2}\right]-(2\gamma)^{-1}Var\left[\tilde{C_2}\right]\\
&\text{s.t.} \quad (BC_1): \qquad \int_0^1 I_i\,di = X_1 + X_{LT}\\
&\qquad\quad (BC_2): \qquad X_1\cdot R_1 = X_2 + \int_0^1 \left[(1-d_i)\cdot f(I_i)\right]\,di\\
&\qquad\quad (BC_3): \qquad \tilde{C_2} + X_2\tilde{R_2} + X_{LT}\cdot R_{LT} = \int_0^1 \left[d_i\cdot f(I_i)\right]\,di
\end{aligned}$$

Substituting first for X_1 into (BC_2) using (BC_1), and then X_2 into (BC_3) using (BC_2), we get the following first-order conditions for the investment scale (I_i) of each firm i:

$$1 = \frac{d_i\cdot f'(I_i)}{R_{LT}} + \frac{(1-d_i)\cdot f'(I_i)}{R_1} \tag{2}$$

and for the amount of borrowing in long-term bonds:

$$X_{LT} = \gamma\frac{R_1\cdot E\left[\tilde{R_2}\right]-R_{LT}}{(R_1)^2 Var\left[\tilde{R_2}\right]} + \int_0^1 I_i\,di - \frac{\int_0^1 \left[(1-d_i)\cdot f(I_i)\right]\,di}{R_1} \tag{3}$$

Equation 2 states that the optimal investment schedule on firm i's investment satisfies that the marginal cost of investment incurred at time 0 is equal to the marginal revenue from investment technology at time 1 and time 2, respectively discounted by the interest rates on the one-year and two-year bonds.

Equation 3 states that households take the same level of interest rate risk as in the case without corporations. The additional terms in the long-term borrowing equation (relative to the case without corporations in Eq. 1) correspond to the quantity of long-term borrowing that exactly offsets firms' total refinancing risk at time 1. More precisely, households borrow $(\int_0^1 \left[(1-d_i)\cdot f(I_i)\right]\,di)/R_1$ dollar amount of short-term bonds such that time 1 cash-flows from corporations cover repayments for short-term bonds and raise the remaining financing need, $\int_0^1 I_i di - (\int_0^1 \left[(1-d_i)\cdot f(I_i)\right]\,di)/R_1$, by issuing long-term bonds.

Equation 2 yields the optimal investment scale for firm i:

$$I_i^* = \left[\frac{\alpha d_i}{R_{LT}} + \frac{\alpha\left(1-d_i\right)}{R_1}\right]^{\frac{1}{1-\alpha}} = \left[\frac{\alpha d_i}{\left(R_1 E[R_2] + \pi\right)} + \frac{\alpha\left(1-d_i\right)}{R_1}\right]^{\frac{1}{1-\alpha}} \tag{4}$$

Differentiating optimal investment with respect to the term premium and investment duration gives $\frac{\partial \log(I_i^*)}{\partial \pi} < 0$ and $\frac{\partial^2 \log(I_i^*)}{\partial \pi \partial d_i} < 0$: a higher term premium is associated with lower corporate investment and, in the cross-section of firms, this effect is stronger for the long-duration firms.[12]

The market for the long-term bond market clears by equating households demand for long-term bonds (Equation 3) to government bond (net) supply: $-X_{LT}^* = g$. Assuming without loss of generality that $R_1 = E[R_2] = 1$ and differentiating the terms of the market clearing conditions with respect to g, I obtain:

Proposition 1 (Identical to Greenwood et al., 2010)**:** *A higher net supply of long-term government bonds raises the term premium:*

$$\frac{d\pi}{dg} = \left[\frac{\gamma}{Var[R_2]} - \int_0^1 \frac{\partial I_i^*}{\partial \pi}\left(1 - (1-d_i)\cdot \alpha I^{\alpha-1}\right)\, di\right]^{-1} > 0$$

This proposition replicates the result in Greenwood et al. (2010) and Greenwood and Vayanos (2014): supply shocks in the long-term bond market have stronger effects when the risk-tolerance of the marginal investor is lower (lower γ), or when the marginal investor faces more interest rate risk (higher $Var[R_2]$).[13] Proposition 1 implies the following prediction for corporate investment:

Proposition 2 (Average effect)**:** *A higher net supply of long-term government bonds*

[12] By analogy, one can show that $\frac{\partial \log(I_i^*)}{\partial E[R_2]} < 0$ and $\frac{\partial^2 \log(I_i^*)}{\partial E[R_2] \partial d_i} < 0$: long investment-duration firms invest more when the interest rate on the long-term bond is low either because the expected future short rate ($E[R_2]$) is low or the term premium (π) is low. In the empirical analysis I test the latter comparative statics, as supply and demand shocks in segmented bond markets affect the term premium rather than future short rates.

[13] $\frac{d\pi}{dg} > 0$ in the case of positive long-term financing need, $I_i^* - (1-d_i)\cdot f(I_i^*) > 0$, and as $\frac{\partial I_i^*}{\partial \pi} = \frac{d_i}{\alpha(\alpha-1)\left(d_i+(1+\pi)(1-d_i)\right)^2}\left[\frac{1}{\alpha}\frac{(1+\pi)}{d_i+(1+\pi)(1-d_i)}\right]^{\frac{2-\alpha}{\alpha-1}} < 0$

lowers corporate investment:

$$\frac{d\log(I_i^*)}{dg} = \frac{\partial\log(I_i^*)}{\partial\pi} \cdot \frac{d\pi}{dg} < 0.^{14}$$

A higher net supply of long-term debt raises the term premium ($\frac{d\pi}{dg} > 0$) and lowers corporate investment ($\frac{\partial log(I_i)}{d\pi} > 0$) provided that the cash-flow duration is not fully short-term.

Most relevant for distributional effects is the cross-sectional proposition:

Proposition 3 (Across-firms channel)**:** *A higher net supply of long-term government bonds lowers corporate investment more for firms with a longer investment duration:*

$$\frac{\partial^2\log(I_i^*)}{\partial g\partial d_i} = \frac{\partial^2\log(I_i^*)}{\partial\pi\partial d_i} \cdot \frac{d\pi}{dg} < 0.^{15}$$

Proposition 3 highlights an *across-firms channel*: in response to an increase in the term premium, firms with a higher duration of investment decrease investment relative to firms with a short-duration of investment, as the former experience a relatively higher cost of capital.

In the rest of the paper, I will test this *across-firms* channel by looking at investment in the cross-section of firms following changes to the net supply long-term bonds that are plausibly exogenous to corporate investment opportunities.

III Long-Term Bond Supply and Term Premium

To test the theoretical implications sketched in Section II in the US context, I use instruments to the quantity g, the net supply of long-term bonds, which come from shocks to the quantity of long-term US Treasury debt available in public markets. I show below that the variation in the supply of long-term US government debt arising

14 $\frac{d\log(I_i^*)}{dg} < 0$ as $\frac{\partial\log(I_i^*)}{\partial\pi} = \frac{1}{\alpha-1}\left[\frac{d_i}{d_i(1+\pi)+(1+\pi)^2(1-d_i)}\right] < 0$ and $\frac{d\pi}{dg} < 0$.

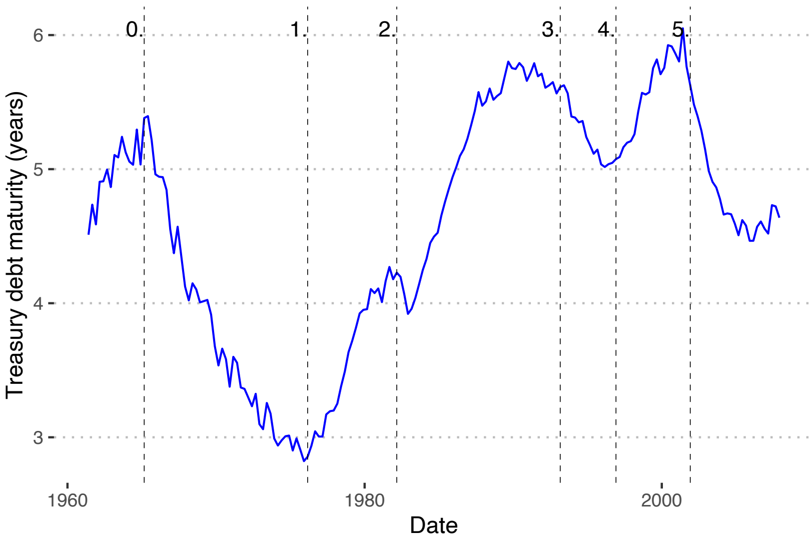
15 $\frac{\partial^2\log(I_i^*)}{\partial g\partial d_i} < 0$ as $\frac{\partial^2\log(I_i^*)}{\partial\pi\partial d_i} = \frac{1}{\alpha-1}\frac{(1+\pi)^2}{\left(d_i(1+\pi)+(1+\pi)^2(1-d_i)\right)^2} < 0$ and $\frac{d\pi}{dg} < 0$.

from these shocks affects the difference between long-term and short-term interest rates - i.e. the term spread - via the term premium and is plausibly exogenous to long-duration corporate investment opportunities.

US government debt maturity in a predictable framework. I proxy for the relative supply of long-term US government debt with the average maturity of Treasury debt instruments.[16] Figure 2 presents the quarterly time series over the period 1961-2007 of the average maturity of Treasury debt value-weighted by outstanding principal, obtained from the CRSP's daily Treasury bond database.[17][18]

Figure 2: Treasury debt average maturity and main policy decisions

The figure presents the quarterly time series of *TreasuryDebtMaturity*, the average maturity of Treasury debt value-weighted by outstanding principal. The vertical dotted lines indicate the 6 policy decisions (one pre-sample and 5 in-sample) detailed in the body of the text and in Appendix C.



It is visually clear that the time series variation in US Treasury debt maturity is not occuring at high frequency. The latter is at odds with the idea of government debt maturity choices driven by the Treasury chasing short-term market opportunities.

[16] Appendix C shows that the conclusions drawn from using the average maturity of Treasury debt are unchanged when using alternative proxies for long-term bond supply such as the shares of Treasury debt with residual maturity above 5 years or above 10 years.

[17]The CRSP US Treasury and Inflation Series include end-of-day price observations for nearly 7,000 US Treasury bills, notes, and bonds from 1961. I replace issue-level missing outstanding amounts by the earliest available issue-level information.

[18] Appendix Table A.5 presents the descriptive statistics. The time series of the average maturity of Treasury debt has a sample average of 4.8 years. *TreasuryDebtMaturity* varies significantly over time with a standard-deviation is 0.86 years.

Indeed, the US Treasury has been systematically “reluctant to embrace opportunistic debt management programs” (Garbade, 2015) and effectively adopted a ”regular and predictable offering” framework in the 1970’s.[19] The US Treasury has consistently emphasised the role of predictability in reducing financing costs by improving the liquidity of Treasury debt instruments and minimising surprises to investors demanding these instruments.[20]

Narrative approach to identify maturity management shocks. The careful examination of Treasury debt management actions from the 1960s to 2000s shows that the bulk of the variation in the average maturity of Treasury debt can be traced back to 6 specific policy shocks.[21]

These specific policy decisions described in Appendix C are either exogenous to economic activity or come in response to the mechanical effects from the previous exogenous policy decisions in order to maintain the implicit objective to keep maturity of Treasury debt within some “bounds” (Garbade, 2020).

I provide below a short summary of the extended description of the shocks available in Appendix C:

0. Pre-sample 1965 shock: The 1919 Second Liberty Bond amendment prescribed Treasury debt issues with an initial maturity above 5 years to be priced at an interest rate higher than a 4.25pp ceiling. The ceiling only become a permanent binding constraint as the general level of interest rates rose in the 1960s leading to a drop in the average maturity of Treasury debt.

1. March 1976 shock: Major first steps in the staggered removal of 1917 prescription are undertaken. In March 1976 Congress extended the maximum exempted maturity to ten years and increased the exemption from the ceiling to

[19] See (Garbade, 2015) and Appendix C for careful examinations of Treasury debt management actions and communications.

[20] Other motives include the Treasury being a very large issuer: the price impact due to the scale of its issuances limit the gain from seizing market opportunities. For instance, in 2019, US Treasury debt issuances represented 60% of total US debt securities issuances.

[21] I focus on policy shocks before the Great Financial Crisis of 2007-2008 as following 2007, due to the endogeneity to the state of the economy of the Fed’s quantitative easing programmes and the Treasury’s dramatic increase in the maturity of Treasury debt issuances following the crisis.

USD 12bn, followed by a series of increasing exemptions.

2. September 1982 shock: Large increase to the exemption in September 1982 after Congress failed to increase the exemptions in April and July. This marks the second phase of the staggered repeal associated with larger exemptions and a full repeal of the ceiling in 1988.

3. May 1993 shock: Announcement by newly installed Clinton Administration of reduction of 30-year bond offerings against the advice of the advisory committee to the Treasury. As a result of the policy, the average maturity of Treasury debt is predicted to be one year lower five years ahead.

4. May 1996 shock: Policy reversal by increasing the Treasury's offering of 10-year notes and 30-year bonds justified by the pace of decline in Treasury debt maturity that could become a subject of worry in the long-run and by the "noticeable adverse impact on liquidity" of long-term Treasury instruments.

5. October 2001 shock: In October 2001, US Treasury Secretary Fisher announces a suspension of debt issues of 30-year US Treasury bond on the basis of preserving liquidity for the 10-year segment in the long run that surprises market participants.

Consistent with the "regular and predictable offering" framework adopted by the US Treasury since the 1970's, these policy decisions to swap long-term bonds for short-term bonds (and vice versa) generate steady trends in government debt maturity for as long as the policy is not reversed (Figure 2). These trends characterise persistent and economically significant variation (over three to ten years). The fact that the level of US Treasury debt maturity is itself a long-term consequence of the specific (plausibly exogenous) policy decisions sharpens identification.

Hence in my empirical analysis I follow an event-study methodology around these shocks and study the dynamics for respectively, US Treasury debt maturity, the relative costs of long-term bonds (i.e. the term premium), and the cross-section of investments with different cash-flow duration.

US Treasury debt maturity shocks and the term premium: event studies. I provide evidence that the policy shocks I use generate statistically and economically significant variation in the average maturity of government debt and the term premium.

My first measure of the term premium is the term spread, i.e. the contemporaneous differences between yields on long-term and short-term rates.[22] In order to isolate the risk premium component of the term spread, I also use estimates for the term premium derived from the term structure model in Adrian et al. (2013).[23]

I follow a "stacked" event-study methodology. I create event-specific datasets that include the time series of the outcome variable around the shocks (20 quarters prior to the shock and 40 quarters after the shock). I then stack these event-specific datasets by the relative time distance to each shocks. This allows me to calculate an average effect across all 5 events using a single set of treatment indicators. These "stacked" regressions are of the form:

$$Y_{t,z} = \sum_{h \in \{-5,\dots,10\}} \beta_h \cdot \mathbb{1}_h[t - t_z = h] \cdot Sign_z + \alpha_z + \epsilon_{t,z} \tag{5}$$

where $Y_{t,z}$ is the time series outcome variables measured at quarterly frequency for date t in event-specific dataset z. The outcome variables are the average maturity of outstanding Treasury debt and the proxies for the term premium based on the 10-year Treasury bond. The coefficients of interest are the β_h which measure the average effect in the year h that follows from the first quarter-year date t_z preceding the shock across all sign-adjusted shocks from the event-specific datasets.[24]

Figure 3 plots for each yearly horizon h the estimated coefficients, β_h. The dependent variables include Treasury debt maturity and the two proxies for the term premium. Table 1 shows the estimates for the corresponding regressions when bundling the event-study dummies into period dummies.

[22] I use yield curve data US Treasury bonds available on the Federal Reserve website. In the baseline, I measure the term spread as the yields difference between the 10-year bond and the 1-year bond.

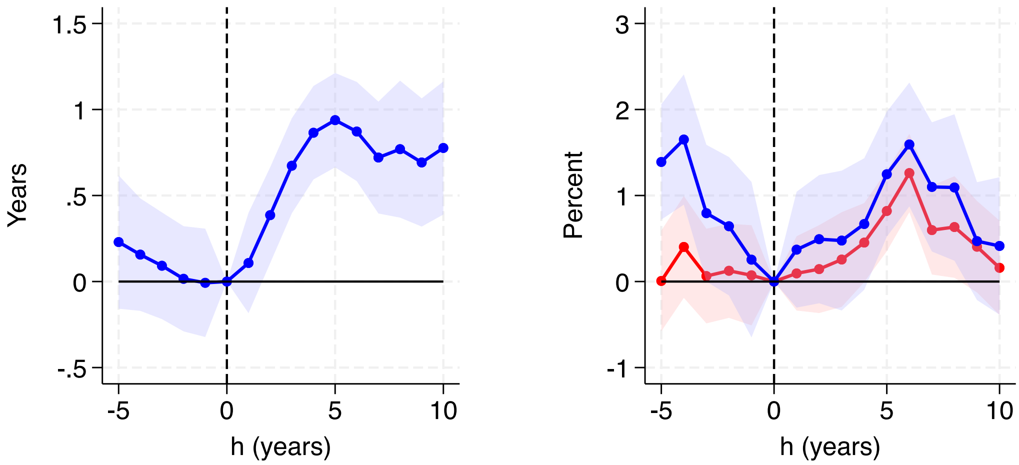
[23] The data for the estimated term premium on US Treasury bonds is available on the NY Fed website.

[24] The sign of shock z (denoted $Sign_z$) is defined such that shocks with positive signs are policies that "tilt" towards long-term debt issuance (i.e. the shocks of 1976, 1982, 1996) and shocks with negative signs are policies that "tilt" towards short-term debt issuance (i.e. the shocks of 1993, 2001).

Figure 3: Event study for Treasury debt maturity and term premium

The figures plot the (stacked) event-study coefficients β_h from estimations of Equation 5 with dependent variables highlighted above each figure using quarterly yield curve data on Treasury bonds (1970-2010).The quarter-end date preceding the shock acts as the baseline period. Confidence intervals are built at the 95 percent confidence level based on robust standard errors. Details for variable definition in Appendix A.

(a) Treasury Debt Maturity (b) Term Spread (blue), Term Premium (red)



Predictably from the nature of the shocks and consistent with eyeballing the quarterly time series of average maturity of Treasury debt (Figure 2), panel (a) of Figure 3 shows that, on average, the policy shocks, which are sign-adjusted to reflect tilts toward longer-maturity of issuance, predict a higher maturity of outstanding Treasury debt. The average maturity of Treasury debt increases, on average, for 5 years. It is, on average, 0.9 years higher, in the fourth to the seventh year following the shock, relative to the quarter date of the shock. Panel (b) shows that the (sign-adjusted) shocks also predict higher values for the term premium proxies: a lengthening of the maturity of the stock of Treasury debt by 0.9 year is associated with an increase in the term spread by 0.9 pp and in the term premium by 0.6 pp. In other words, a 1-standard-deviation increase in the average maturity of government debt is associated with a 0.5-standard-deviation increase in the term spread and a 0.6-standard-deviation increase in the term premium.

The time series proxies are on opposite trends prior to the shock. Indeed 4 out of the 5 shocks in the sample generate reversals in trends as highlighted in Figure 2. The theory would indeed predict that reversals in the supply of long-term debt would be associated with reversals in the relative price of long-term bonds.

Table 1: Event study for Treasury debt maturity and term premium

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 5 with dependent variables in column heads and using quarterly yield curve data on Treasury bonds (1970-2010). The quarter-end date preceding the shock acts as the baseline period. The sample for the Treasury Term Spread (TS) starts in August 1971. The sample for the Treasury Term Premium (TP) starts in 1970. The sample for the Corporate Term Spread (CorpTS) starts in 1984. Robust standard errors in parentheses. Details for variable definition in Appendix A.

	(1) TDebtmat	(2) TDebtmat	(3) TS	(4) TS	(5) TP	(6) TP	(7) CorpTS	(8) CorpTS
$[-5;-1]$ × Shock	0.0943	0.122	0.730*	0.389	0.0368	0.538*	1.480***	0.458*
	(0.131)	(0.134)	(0.440)	(0.308)	(0.329)	(0.309)	(0.230)	(0.273)
$[1;3]$ × Shock	0.361***	0.348**	0.411	0.389	0.0975	0.450	0.261	0.190
	(0.131)	(0.137)	(0.441)	(0.306)	(0.329)	(0.305)	(0.222)	(0.252)
$[4;7]$ × Shock	0.878***	0.882***	0.948**	0.714**	0.628*	0.889***	1.427***	0.723***
	(0.126)	(0.129)	(0.440)	(0.299)	(0.325)	(0.301)	(0.226)	(0.255)
$[8;10]$ × Shock	0.786***	0.757***	0.719	0.819***	0.329	0.874***	0.333	-0.00713
	(0.151)	(0.153)	(0.457)	(0.313)	(0.338)	(0.313)	(0.281)	(0.277)
Credit Spread		-0.223***		1.144***		1.203***		0.0615
		(0.0753)		(0.221)		(0.211)		(0.382)
Real GDP Gwth		-0.0191		0.0663**		0.0633**		0.0691*
		(0.0140)		(0.0293)		(0.0285)		(0.0404)
Debt-to-GDP		0.0263***		0.0342***		0.0385***		-0.00721
		(0.00449)		(0.00796)		(0.00770)		(0.00902)
1-year Yield		0.0337***		-0.393***		0.0436**		-0.475***
		(0.00955)		(0.0209)		(0.0194)		(0.0344)
Shock FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	300	300	299	299	300	300	223	223
Adjusted R^2	0.720	0.754	0.109	0.642	0.304	0.482	0.268	0.675

Robustness. I further address the concern that the path of government debt maturity following the shocks may be spuriously correlated with the business cycle or directly responding to other fiscal developments, which may be correlated with the business cycle. A visual inspection suggests that there does not seem to be any robust time series correlation between my instrument and other macroeconomic time series of interest such as the real GDP growth, credit spreads, or the US debt-to-GDP ratio (see Appendix Figure C.1).[25] The results are also robust to controlling for macroeconomic time series.[26]

Appendix Table C.1 shows that other metrics of long-term bond supply share the same

[25] Greenwood and Vayanos (2014), Badoer and James (2016), and Krishnamurthy and Vissing-Jorgensen (2012) instrument government debt maturity with debt-to-gdp with the intuition that a higher debt burden raises roll-over risk that can be hedged with longer-term debt issuance. Appendix Figure C.1 shows that while such instrument is relevant at very low frequency it performs poorly over 1980-2010.

[26] I choose not to use the coefficient from these regressions for quantification as I may be including "bad controls": the macroeconomic time series may be endogenously determined with the outcomes of the long-term bond supply shocks.

pattern around the shocks as for the average maturity of Treasury debt.[27]

In the last two columns of Table 1, I confirm the baseline results when computing term spreads on bonds using estimated yield curve data for high quality US corporate bonds.[28] Appendix Table C.1 shows that the baseline correlations are qualitatively unchanged and statistically significant when I proxy the long-term bond using 15-year or 20-year constant maturity bonds instead of the 10-year bond.

IV Data and measurement

In order to test the model's predictions that link shocks to the net supply of long-term debt to changes in the duration of corporate investment, I construct a yearly panel of financial and accounting variables for U.S. (non-financial) corporations with publicly traded securities for the 5-year preceding each shock and the 10-year following each shock, i.e. firms financials over 1970-2010.

IV.A Panel of US public firms

The financial statement-based variables are extracted from Compustat Fundamentals database for US firms accessed through WRDS. I exclude financial firms (SIC 6000 to 6999) and public utilities (SIC 4900 to 4999). All financial variables that are in the levels are adjusted to 2007 dollars using the Bureau of Labor's price index (for all urban consumers). I also collect the fiscal year-end bond or stock market conditions, such as debt-to-GDP, real GDP growth, credit risk premia and short-term yields from the CRSP's daily Treasury bond database, the interpolated yield curve data for US Treasury bonds from the Federal Reserve website, and the FRED database of the Federal Reserve Bank of St. Louis. Appendix A presents the sample's descriptive statistics for the financials of firms.

[27] I show that the shocks are associated with a 5 pp (4 pp) increase in the share of Treasury debt with residual maturity above 5 years (10 years).

[28] The data is from the US Treasury's High Quality Market (HQM) Corporate Bond Yield Curve database available on the US Treasury's website. The sample starts in 1984 due to data availability.

IV.B Measuring the duration of real investments

One important challenge related to testing the implications presented in Section II lies in the measurement of duration of the cash flow of firms' new projects.[29]

My baseline measure of the duration of firms' investments, denoted *Asset Maturity*, is inspired from the value-weighted average asset maturity measure defined by Stohs and Mauer (1996). It is calculated as the (book) value-weighted average maturity of current assets (*CA*) and of net property, plant and equipment (*PP&E*) such that:

$$Asset\ Maturity := \frac{CA}{CA\ + PP\&E} \cdot 1 + \frac{PP\&E}{CA + PP\&E} \cdot \frac{PP\&E}{Depreciation}.$$

I assume that current assets have a maturity of one year which assumes that all current assets will be used for production in a given fiscal year.[30]

The maturity of fixed assets is measured as *PP&E* divided by depreciation expense net of amortisation (*Depreciation*), which can be interpreted as the inverse of a firm's depreciation rate on its stock of fixed-assets.[31] Intuitively, assuming straight-line depreciation for each asset, a higher depreciation rate would translate into a lower weighted-average remaining life for the concerned asset stock.[32]

Intuitively, the measure combines two different margins of the cash-flow duration of a firm's investments. The first one is the extensive margin of long-term investments, defined as the ratio of *PP&E* to the sum of *PP&E* and current assets. It measures the

[29] Note that the relevant source of heterogeneity underlying the capital budgeting predictions in the theoretical framework is the cash-flow duration of a firm's new investment rather than the cash-flow duration of a firm's equity. The equity duration reflects both the cash-flow duration of new investments and the residual cash-flow duration resulting from the sequence of investments made in the past and expected to be made in the future.

[30] In Stohs and Mauer (1996), the maturity of current assets is measured as current assets, divided by costs of goods sold. Stohs and Mauer (1996) argues that "current assets support production, where production is measured by the costs of goods sold". I do not use the measure of the maturity of current assets because it is very volatile within firm across time.

[31] Appendix Table B.2 shows that other construction choices, such as including amortisation or focussing only on firms using straight-line depreciation rules do not change the results of my analysis.

[32] Livdan and Nezlobin (2021) notes that "firms overwhelmingly use the straight-line depreciation rule to account for their fixed assets, and under this rule, the ratio of gross PP&E to the depreciation expense should be roughly equal to the useful life assumed by the accountants". This would validate the use of the ratio of net PP&E to the depreciation expense as the measure of the remaining life.

importance of long-term assets in the firm's current investment mix: the average fixed-asset is more likely to be associated with longer-duration cash flows than the asset used for production in the current year. The second one is the intensive margin of long-term investments, defined as the inverse of the depreciation rate on fixed-assets. For a given dollar invested in a fixed-asset, the motivations for pinning down a higher depreciation rate for that asset are likely to correlate negatively with the duration of cash-flows tied to this asset, in other words how close is the bulk of the asset's cash-flows.

Measures based on reported depreciation by firms have been shown to correlate with debt maturity (Stohs and Mauer, 1996), to be consistent with replacement investment rates in the data and have comparable economic significance to that of Tobin's Qs (Livdan and Nezlobin, 2021), and to fit well the maturity matching debt dynamics and duration of financing cycle at the firm level and in the aggregate (Geelen et al., 2023). Furthermore, Dessaint et al. (2023) shows that accounting maturity measures correlate strongly with the horizon of business plans measured using textual information from SEC filings.

Figure 4 reports the time series of *Asset Maturity* averaged at the industry-level (SIC-2digits) over 5-year periods from 1976 to 2010. Represented industries are those with most extreme average values for the three measures over 2001-2005. The industries with the seven highest values are represented with continuous lines and the industries with the seven lowest are represented with dotted lines.

Figure 4: Industry averages for Asset Maturity

The figure reports the time series of *Asset Maturity* averaged at the industry-level (SIC-2digits) by 5-year periods from 1966 to 2010 for the universe of firms in Compustat. Only the industries with the most extreme average values for 2001-2005 and with at least 50 underlying firms are represented. The industries with the seven highest of such values are represented with continuous lines and the industries with the seven lowest are represented with dotted lines.

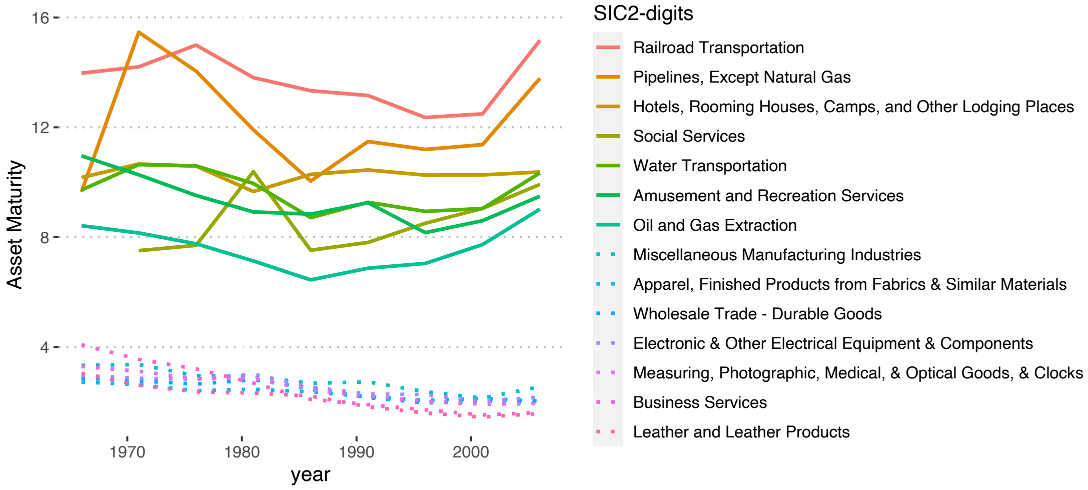


Figure 4 suggests that the measure is persistent when aggregated by industry at low frequency. The measure is well-aligned with the intuition about the identity of industries characterised by large and long-duration investments: these are industries, such as transportation or mining, with very large upfront costs as opposed to industries offering trading or business services.[33]

In addition, Appendix Table E.1 shows that aggregating the firm-year measure at the firm-level or industry-level by averaging over time by firm or industry helps significantly in reducing measurement error. Indeed the measure might be polluted by deviations from simple accounting policies following, for instance, changes in tax incentives, potentially reducing the correlation between accounting depreciation and economic depreciation on which the identification hinges.

I provide an indirect test of the correlation between *Asset Maturity* and cash-flow duration by running linear debt maturity choice regressions based on a dataset of corporate debt issues extracted from the Thomson Reuters LPC Dealscan and

[33] Appendix Table A.1 details the mean and standard deviation of the duration measure and the decomposition in both its intensive and extensive margins for each industry over the sample.

Thomson Reuters SDC Platinum New Issues databases.[34] Appendix Table E.2 shows that the duration of firm's assets correlate very strongly with the maturity of a firm's debt issuances.

Finally, Appendix Table A.2 shows that the bulk of the firm-level variation is explained at the industry-level: 45% percent of the firm-level variation in *Asset-Maturity* is explained at the SIC-2 digit level. For this reason, I use *Asset Maturity* averaged at the SIC-2 digit level over the sample as my baseline measure in the test of the empirical predictions.

IV.C Asset maturity, term structure and discount rates: validation

An important feature of the theoretical framework in Section II is that long-term cash flows are discounted with long-term interest rates. As a consequence longer-duration firms average discount rate reflects more longer-term risk-free discount rates.

In this section, I provide evidence consistent with the framework's predictions by comparing the evolution of discount rates of firms in different industries with the evolution in the slope of the corporate bond yield curve.

The discount rates data comes from predicted values of firm's discount rates developed in Gormsen and Huber (2023) which builds on a dataset obtained from manual reading of corporate conference calls over the period 2002-2021. To identify discount rates, authors rely on explicit manager statements about the minimum required IRR that they want to earn on new investment projects. They create out of sample predicted values of firms' discount rates from the dataset of communicated discount rates following a Lasso procedure in which they feed in a large list of firm-level risk factors and macroeconomic variables.[35][36]

[34] The dataset construction is detailed in Appendix E.

[35] Variables include the factor zoo, country fixed effects, and discount rate predictors documented in Gormsen and Huber (2022): a year trend, option-implied volatility, a financial frictions index, and a market power index.

[36] Gormsen and Huber (2023) demonstrate the relevance of the predicted data: regressing the values of the discount rate from the Duke CFO data on their new predicted values they find a coefficient that is not statistically different from 1.

Figure 5: Term spread and corporate discount rates gap

The figure reports the yearly averages of the monthly time series for the term spread (yield spread between 10-year and 1-year constant maturity bonds) for bonds issued by high quality corporate issuers and the difference in the yearly averages in discount rates for industries with above median *Asset Maturity* relative to industries with below median *Asset Maturity* as defined in Section IV.

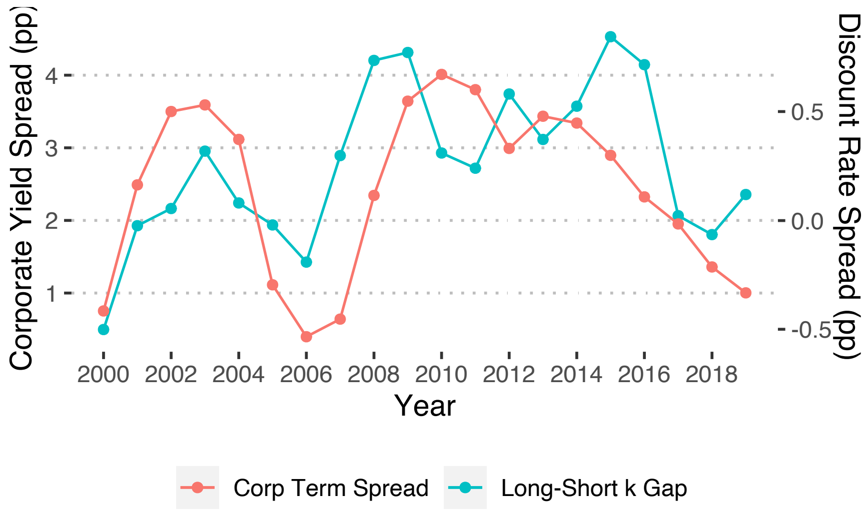


Figure 5 shows that a higher corporate term spread is associated with a higher difference in discount rates for firms in industries with long investment duration relative to firms in industries with short investment duration. In other words, when long risk-free interest rates increase relative to short risk-free interest rates, discount rates in long-duration industries increase relative to discount rates in short-duration industries.

More formally, in Appendix B, I test the covariance between the the term structure of risk-free interest rates and the duration structure of firms' discount rates by running, in a yearly panel of industries, regressions of discount rates on an interaction term between the corporate term spread and measures of industries' duration of investment. Overall, I found a strong, positive, and robust relationship between the term structure of risk-free interest rates and the duration structure of discount rates.[37]

[37] The statistical significance of the relationship is robust to sample selection once two outlier industries are removed: SIC2-digits industries 40 (Railroad Transportation) and 83 (Social Services). Including these two industries does not change the economic significance of the covariance.

V Long-Term Bond Supply and Investment

As explained in Section II, shocks to the net supply of long-term bonds may affect the aggregate duration of investment through an *across-firms channel*: when the supply of long-term bonds is high, the term premium is high, and investment is low for firms with long-duration investments. In this section, I test this channel empirically.

V.A Empirical Strategy

I follow a "stacked" difference-in-differences event-study methodology. I focus on the investment of firms in industries sorted by duration of investment (first difference) around the policy shocks (second difference). I create event-specific datasets that include the panel of outcome variables across firms around the shocks (from 5 years before the shock to 10 years after the shock). I then stack these event-specific datasets by shock-specific relative time to the shocks. This allows me to calculate an average effect across all 5 events using a single set of treatment indicators. The "stacked" specifications follow the form:

$$\begin{aligned} Investment_{f,s,t,z} = & \sum_{h \in \{-5,\ldots,10\}} \beta_h \cdot \mathbb{1}_h[t - t_z = h] \cdot Sign_z \cdot AssetMaturity_s \\ & + \sum_{h \in \{-5,\ldots,10\}} \gamma_h \cdot \mathbb{1}_{h,z}[t - t_z = h] + \theta \cdot Sign_z \cdot AssetMaturity_s \\ & + \epsilon_{f,s,t,z} \end{aligned} \quad (6)$$

where $Investment_{f,s,t,z}$ is investment of firm f, in industry s, measured at fiscal year t in event-specific dataset z. *Investment* is measured by the capital expenditures at t normalised by total assets at $t-1$. The coefficients of interest are the β_h which measure the effect on investment in the fiscal year h that follows from the fiscal year t_z[38] of shock z averaged across all sign-adjusted shocks from the event-specific datasets.[39] My

[38] If a shock occurs in year t, I assigned $t_z = t - 1$ to make sure I am not capturing the effect of the shock in the fiscal year-end figures.

[39] The sign of shock z (denoted $Sign_z$) is defined such that shocks with positive signs are policies that "tilt" towards long-term debt issuance (i.e. the shocks of 1976, 1982, 1996) and shocks with negative signs are policies that "tilt" towards short-term debt issuance (i.e. the shocks of 1993, 2001).

baseline measure for investment duration is *Asset Maturity*$_s$ averaged over time at the level of the firm's two-digits SIC industry s. Standard errors are clustered at the level of the variation of the treatment: industry.

The coefficients of interest, β_h, measures the change in investment rate following the shock (first difference) for firms in industries with long-duration investments relative to firms in industries with short-duration investments (second-difference).

The main identifying assumption is that the policy shocks should not predict better or worse investment opportunities for firms in long-duration industries. Instead only the outcome of the (sign-adjusted) shocks, i.e. a higher supply of long-term debt, should have predictive power for the relative change in investment rate for firms in industries specialised in long-duration investments through the effect on discount rates.

As discussed in Section III, the policy shocks are arguably either exogenous to economic activity or come in response to the mechanical effects from the previous exogenous policy decisions in order to maintain the implicit objective to keep maturity of Treasury debt within some "bounds". Nevertheless I also control for investment opportunities at the time of the shock and for the differential response of firms in industries with different duration to macroeconomic fluctuations by interacting the measure of investment duration with various contemporaneous macroeconomic controls such as the level of interest rates, credit spreads, or the size of government debt.

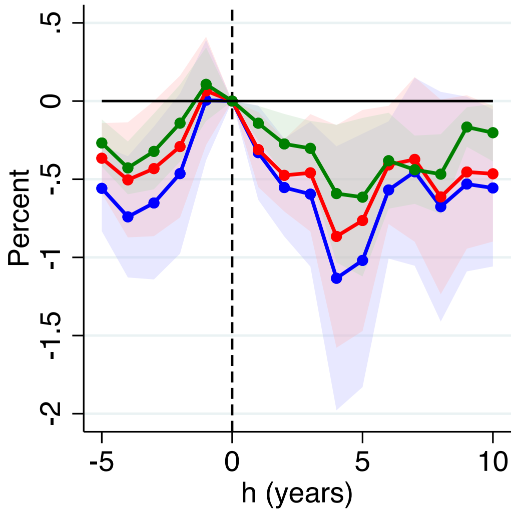
V.B *Across-industries* change in investment duration

Baseline results. Figure 6 presents the estimates for the parameters of interest, β_h for each event-study horizon (h) across three specifications: the first one corresponds to Equation 6, the second one includes shock$\times$industry, and the third one includes shock$\times$firm fixed effects to control for the composition of industries and firms across shocks.

The shocks predict a persistent decrease in investment in long-duration industries looking forward. The effect is significant at the one-year horizon and peaks

Figure 6: Event study for investment by long-duration industries

The figure plots the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. The specifications in blue, red, and green correspond to the specifications in the second, third and fourth columns of Table 2. The year-end date preceding the shock acts as the baseline period . Confidence intervals are built at the 95 percent confidence level based on standard errors clustered by industry. Details for variable definition in Appendix A.



approximatively five-year after the shock. Overall the dynamics for the cross-section of investment are very well aligned with the dynamics of the supply of long-term debt and the term premium as shown in Figure 3.

Table 2 presents the estimates of the event-study regressions with similar specifications but which bundle yearly horizons in periods: $[-5;-1]$, $\{0\}$, $[1;3]$, $[4;7]$, and $[8;10]$. The first three columns correspond to respectively the specifications underlying the blue, red, and green lines in Figure 6.

Following the shock that predicts a 0.948pp higher term spread on average at yearly horizons $h \in [4;7]$, firms in long-duration industries (firms at the 75th percentile of the *Asset Maturity* distribution) on average reduce yearly capital expenditures by 1.5% of assets relative to firms in short-duration industries (at the 25th percentile of the distribution).[40]

In the fourth column, I include firm and industry level controls for investment opportunities at the time of the shock (measured at $h = 0$) or at the time of the first non missing observation in the event study if the firm's observation is missing at the time

[40] $-\beta \times (p75(AMat) - p25(AMat)) = 0.613 \times (4.94 - 2.47) \approx 1.51$.

Table 2: Event study for investment by long-duration industries

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. The year-end date preceding the shock acts as the baseline period. Standard errors clustered by industry. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	All sample					Balanced
	(1)	(2)	(3)	(4)	(5)	(6)
	Capex	Capex	Capex	Capex	Capex	Capex
$[-5;-1]$ × AssetMat (sign-adj)	-0.506**	-0.478**	-0.285	-0.172**	-0.0597	-0.0353
	(0.191)	(0.188)	(0.175)	(0.0747)	(0.0729)	(0.0786)
$[1;3]$ × AssetMat (sign-adj)	-0.487***	-0.491***	-0.405***	-0.224***	-0.134*	-0.125*
	(0.181)	(0.175)	(0.132)	(0.0555)	(0.0716)	(0.0701)
$[4;7]$ × AssetMat (sign-adj)	-0.801**	-0.800**	-0.613**	-0.502***	-0.473***	-0.450***
	(0.316)	(0.319)	(0.280)	(0.181)	(0.173)	(0.166)
$[8;10]$ × AssetMat (sign-adj)	-0.564*	-0.588*	-0.530*	-0.274***	-0.161*	-0.216**
	(0.294)	(0.301)	(0.268)	(0.0710)	(0.0859)	(0.0839)
AssetMat (sign-adj)	1.944***					
	(0.682)					
Shock=2 × AssetMat (sign-adj)	-0.156					
	(0.137)					
Shock=3 × AssetMat (sign-adj)	-2.498***					
	(0.846)					
Shock=4 × AssetMat (sign-adj)	-0.170					
	(0.162)					
Shock=5 × AssetMat (sign-adj)	-2.750***					
	(1.033)					
Shock x Period FE	✓	✓	✓	✓	✓	✓
Shock x Industry FE	–	✓	✓	✓	✓	✓
Shock x Firm FE	–	–	✓	✓	✓	✓
Firm Controls x Shock x Period FE	–	–	–	✓	✓	✓
AssetMat x Macro Controls	–	–	–	–	✓	✓
Observations	393100	393100	389545	389545	389545	166538
Adjusted R^2	0.041	0.085	0.318	0.342	0.345	0.321

of the shock. The controls include the firm-level sales growth rate, the industry-level sales growth rate, a dummy equal to one if a firm issues dividends, a dummy equal to one for investment-grade firms, and the firm-specific market-to-book ratio. As a result, the baseline result is qualitatively unchanged and the estimates appear more precise.

In the fith column, I control for the differential response of firms in industries with different duration to the macroeconomy by interacting *Asset Maturity* with proxies for the business cycles: real GDP Growth, Treasury Debt-to-GDP, Moody's LT BBB-AAA corporate bond credit spread, and the one-year Treasury yield.[41]

In the last column of Table 2, I show that the result is quantitatively unchanged when focussing on firms observed for all 10 years following a shock. This result combined with the baseline result highlights that both the intensive and extensive margins matter, i.e. pre-existing long-duration firms reduce investment relative to pre-existing short-

[41] Note that these controls may act as "bad controls": the macroeconomic time series may be endogenously determined with the outcomes of the long-term bond supply shocks.

duration firms, and new publicly traded long-duration firms also invest less than short-duration firms.

Economic significance. To assess the economic significance of the results, I re-run the regressions of Table 2 replacing the continuous measure of industry's *Asset Maturity* by a dummy (*High Asset Maturity*) indicating firms with *Asset Maturity* above the (total assets-weighted) median across all industries.The Table is available in Appendix D. The analogue to my preferred specification indicates that following a one standard-deviation increase in Treasury debt maturity, firms in industries with above median asset maturity, decrease capital expenditures by 2.3pp of assets per year on average relative to firms in industries with below median asset maturity at yearly horizons $h \in [4; 7]$.

This implies that a 0.9 years higher average maturity of Treasury debt, raises the term spread by 0.9pp redistributes yearly about 1.1% of total public firm assets from firms in long-duration industries towards firms in short-duration industries. Evaluated using the sum of total assets over the panel of firms in 2019 (11.2tn in 2019 USD), this amounts to a USD 128bn reallocation from long- towards short-duration industries per year.

V.C *Within-industry across-firms* change in investment duration

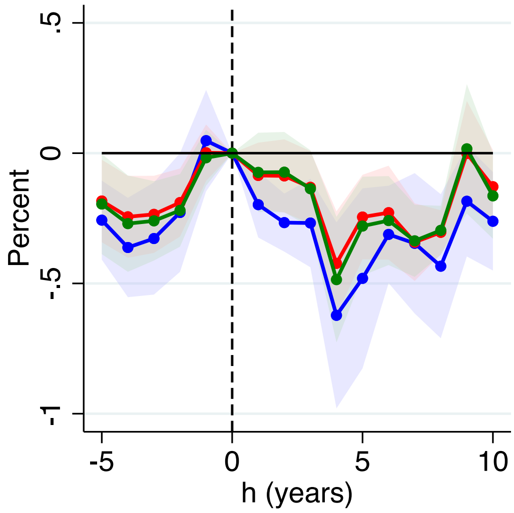
I show that reallocations also occur within industries *across firms*. To get to this conclusion I first estimate a modified version of Equation 6 which measures *Asset Maturity* at the level of the firm. I then saturate this specification with industry×horizon fixed-effects.

Figure 6 presents the estimates for the parameters of interest, β_h for each event-study horizon (h) across three specifications which use *Asset Maturity* measured at the level of the firm. The first specification is the standard two-way fixed effects (in blue), the second one includes SIC-2digits×Period fixed effects (in red), and the third one includes SIC-3digits×Period fixed effects (in green).

In summary, I find qualitatively similar estimates for all three specifications and the estimates for the dynamics mimick the baseline dynamics across-industries: the drop in long-duration investment occurs unconditionally across firms and also within-industries

Figure 7: Event study for investment by long-duration firms *within industries*

The figure plots the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. Investment duration is measured at the firm-level. The specifications in blue, red, and green correspond to the specifications in the first, third and fifth columns of Table 3. The year-end date preceding the shock acts as the baseline period. Confidence intervals are built at the 95 percent confidence level based on standard errors clustered by firm. Details for variable definition in Appendix A.



across-firms and it peaks approximatively five-year after the shock.

For quantification purposes, Table 3 presents the estimates of the event-study regressions for the same specifications when bundling yearly horizons in periods. The first, third, and fourth columns correspond to respectively the specifications underlying the blue, red, and green lines in Figure 6. The second, fourth, and sixth columns include the firm-level controls for investment opportunities and highlight that the results are robust to controlling for firm's ex-ante investment opportunities.

Following the shock that predicts a 0.948pp higher term spread on average at yearly horizons $h \in [4; 7]$, a firm with a one-year longer duration of investment reduces yearly capital expenditures by 0.45% of assets. Within-industry (SIC2-digits), a firm with a one-year longer duration of investment reduces yearly capital expenditures by 0.31% of assets. This implies that (within-industry) firms with a one standard-deviation higher duration of investment reduce yearly capital expenditures by 0.7%.[42]

By controlling for time-varying factors that are specific to each industry (SIC-2digits or SIC-3digits), I highlight that increases to the supply of long-term debt, which raise

[42] $-\beta \times (sd(AMat|SIC2)) = 0.308 \times 2.23 \approx 0.69$.

Table 3: Event study for investment by long-duration firms *within industries*

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. Investment duration is measured at the firm-level. The year-end date preceding the shock acts as the baseline period. Standard errors clustered by firm. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	(1) Capex	(2) Capex	(3) Capex	(4) Capex	(5) Capex	(6) Capex
[–5; –1] × AssetMat (sign-adj) (firm)	-0.212***	-0.143***	-0.162***	-0.143***	-0.186***	-0.171***
	(0.0386)	(0.0396)	(0.0488)	(0.0497)	(0.0558)	(0.0561)
[1; 3] × AssetMat (sign-adj) (firm)	-0.238***	-0.115***	-0.0977*	-0.0529	-0.0890	-0.0440
	(0.0386)	(0.0387)	(0.0512)	(0.0514)	(0.0582)	(0.0577)
[4; 7] × AssetMat (sign-adj) (firm)	-0.446***	-0.390***	-0.308***	-0.302***	-0.343***	-0.334***
	(0.0430)	(0.0438)	(0.0549)	(0.0554)	(0.0618)	(0.0619)
[8; 10] × AssetMat (sign-adj) (firm)	-0.309***	-0.153***	-0.156***	-0.112**	-0.161***	-0.105*
	(0.0408)	(0.0399)	(0.0536)	(0.0542)	(0.0603)	(0.0602)
Shock x Firm FE	✓	✓	✓	✓	✓	✓
Shock x Period FE	✓	✓	–	–	–	–
Shock x SIC2 FE	✓	✓	✓	✓	–	–
Shock x SIC2 x Period FE	–	–	✓	✓	–	–
Shock x SIC3 FE	–	–	–	–	✓	✓
Shock x SIC3 x Period FE	–	–	–	–	✓	✓
Firm Controls x Shock x Period FE	–	✓	–	✓	–	✓
Observations	384991	384991	384973	384973	384920	384920
Adjusted R^2	0.311	0.336	0.324	0.344	0.324	0.344

the term premium, have distributive consequences across firms within industries. This result also confirms, with a finer test, the broader prediction of distributional effects for investment *across-firms* on the basis of firms' cash-flow duration.

V.D *Within-firm across-divisions* change in investment duration

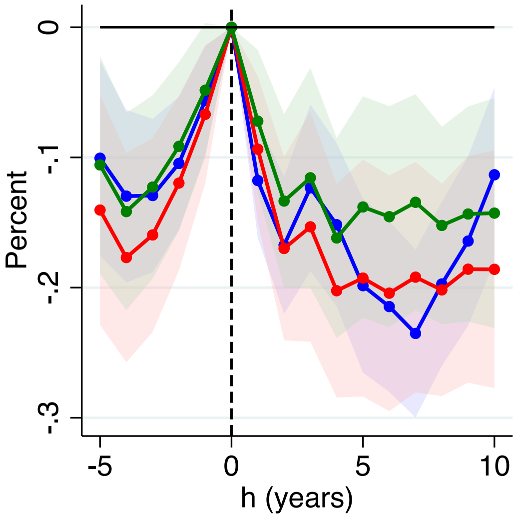
Changes to the duration of investment may also occur *within-firm*. A higher term premium may push firms to reallocate investment away from long-duration investment opportunities towards short-duration investment opportunities.

I study multi-division firms operating across several industries for two main reasons. First, it offers a useful setting to study *within-firm* adjustments to investment duration given changes in the cost of capital as I am able to assign a duration of investment to a firm's division based on the industry in which this division operates. Second, it refines the test of the *across-firms channel* by allowing me to study individual business units and control for a firm's investment level by including firm × time fixed effects, which allows me to control for time-varying unobservables at the firm-level.

To test the prediction of reallocation within firm across divisions, I estimate a modified

Figure 8: Event study for investment allocation *within firm*

The figure plots the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is segment-level capital expenditures normalised by lagged total assets based on the yearly panel of Compustat Segment divisions for multi-division firms for 1970-2010. Investment duration is measured at the division-level using the associated industry measure. The specifications in blue, red, and green correspond to the specifications in the first, second and third columns of Table 4. The year-end date preceding the shock acts as the baseline period. Confidence intervals are built at the 95 percent confidence level based on standard errors clustered by firm. Details for variable definition in Appendix A.



version of the specification in Equation 6 using division-level data from Compustat Segment yearly data for all U.S. firms with at least two divisions in a given year. I define divisions by aggregating firms' segments financials at the two-digit SIC level. I drop firms with divisions active in the financial or utility sectors and keep firms with non-missing and non-negative assets and sales. Appendix A presents summary statistics for this sample and variable definitions.

I regress division-level capital expenditures normalised by lagged firm's total assets on the interaction of division's investment duration and the event-study indicators. A division's investment duration is defined as the *Asset Maturity* measure corresponding to the industry of the division.

Figure 8 shows that the *within-firm* prediction is supported by the data. Multi-division firms shorten the duration of their investments by allocating less investment to divisions with long duration of investment when the maturity of outstanding Treasury debt increases. The same pattern is observed when including firm × time fixed effects (in red), or when controlling for the size of each segments and cash flows (in green).[43]

[43] As in the across-firms analysis, controls are measured at the time of the shock (measured at $h = 0$)

Table 4: Event study for investment allocation *within firm*

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is segment-level capital expenditures normalised by lagged total assets based on the yearly panel of Compustat Segment divisions for multi-division firms for 1970-2010. Investment duration is measured at the division-level using the associated industry measure. The year-end date preceding the shock acts as the baseline period. Standard errors clustered by firm. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	(1) Capex	(2) Capex	(3) Capex
[–5; –1] × AssetMat (sign-adj)	-0.0973***	-0.117***	-0.0876***
	(0.0229)	(0.0294)	(0.0280)
[1; 3] × AssetMat (sign-adj)	-0.134***	-0.125***	-0.0940***
	(0.0236)	(0.0314)	(0.0300)
[4; 7] × AssetMat (sign-adj)	-0.193***	-0.194***	-0.143***
	(0.0277)	(0.0371)	(0.0343)
[8; 10] × AssetMat (sign-adj)	-0.154***	-0.187***	-0.145***
	(0.0289)	(0.0385)	(0.0361)
Shock x Firm x Division FE	✓	✓	✓
Shock x Period FE	✓	–	–
Shock x Firm x Period FE	–	✓	✓
Shock x Period FE x Division Controls	–	–	✓
Observations	121297	119853	119853
Adjusted R^2	0.568	0.590	0.595

Table 4 formally presents the results when budnling the event-study horizons into periods. A 0.948pp higher term spread driven by the average supply shock is associated with a yearly lower capital expenditures of 0.6% of a multidivision firm's total assets in the division at the 75th percentile of the Asset Maturity distribution relative to the division at the 25th percentile of the distribution.[44]

VI Long-Term Bond Supply and Corporate Debt

Changes in investment financed with debt. Evidence above suggests that a higher supply of long-term Treasury bonds is associated with lower investment by long-duration firms. One assumption of the model (Section II) is debt financing. In particular a higher supply of long-term Treasury bonds should be associated with lower debt financing by long-duration firms as it is associated with lower investment by long-duration firms.

Table 5 presents the estimates for the parameters of interest, β_h when bundling event-study horizons into periods. The first set of three specifications corresponds to

or at the time of the first non missing observation in the event study if the segment-level observation is missing at the time of the shock.

[44] $-\beta \times (p75(AMat_{s(d)}) - p25(AMat_{s(d)})) = 0.194 \times (5.52 - 2.61) \approx 0.56$.

Equation 6 with the change in the stock of long-term debt normalised by lagged total assets as the dependent variable. The second set of three specifications corresponds to Equation 6 with the change in the stock of short-term debt normalised by lagged total assets as the dependent variable.

Table 5: Event study for change in debt stock by long-duration industries

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is the one period change in the stock of long or short-term debt normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. The year-end date preceding the shock acts as the baseline period. Standard errors clustered by industry. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	(1) Δ LT Debt	(2) Δ LT Debt	(3) Δ LT Debt	(4) Δ ST Debt	(5) Δ ST Debt	(6) Δ ST Debt
[−5; −1] × AssetMat (sign-adj)	-0.252**	-0.224*	-0.160	-0.0772	-0.0750**	-0.0663*
	(0.102)	(0.121)	(0.105)	(0.0504)	(0.0353)	(0.0344)
[1; 3] × AssetMat (sign-adj)	0.0135	0.120	0.0953	-0.119**	-0.116***	-0.0767**
	(0.113)	(0.0997)	(0.0745)	(0.0520)	(0.0357)	(0.0340)
[4; 7] × AssetMat (sign-adj)	-0.374**	-0.355***	-0.338**	-0.0842*	-0.106***	-0.103***
	(0.143)	(0.134)	(0.132)	(0.0494)	(0.0386)	(0.0373)
[8; 10] × AssetMat (sign-adj)	-0.151	-0.0317	-0.0869	-0.0616	-0.0671*	-0.00916
	(0.105)	(0.0795)	(0.0888)	(0.0585)	(0.0387)	(0.0343)
Shock x Period FE	✓	✓	✓	✓	✓	✓
Shock x Industry FE	✓	✓	✓	✓	✓	✓
Shock x Firm FE	✓	✓	✓	✓	✓	✓
Firm Controls x Shock x Period FE	–	✓	✓	–	✓	✓
AssetMat x Macro Controls	–	–	✓	–	–	✓
Observations	381058	381058	381058	379317	379317	379317
Adjusted R^2	0.055	0.060	0.061	-0.003	-0.001	-0.001

Overall, long-duration firms also reduce their debt financing after the shock and the dynamics line up with the ones for investment. The coefficients at the peak of the asset pricing and corporate investment response (at yearly horizons $h \in [4; 7]$) indicate that a 1 dollar decrease in investment is matched by a 0.61 cents decrease in the stock of long-term debt and a 0.14 cents decrease in the stock of short-term debt.

Implications for corporate debt maturity. Drawing on the investment and financing results, I propose a new explanation for the correlation highlighted in the aggregate between the time series variation in the maturity of corporate debt and the term premium.[45]

Assuming that firms pursue assets-liabilities maturity matching, i.e. each firm choses a financing mix across maturities such that they avoid refinancing risk, a new prediction

[45] Baker et al. (2003) provides evidence that the time series variation in the maturity of corporate debt strongly correlates with the predictability of bond market returns. That is, the long-term debt share (measured as the ratio of long-term debt to total debt) is high when the term premium is low.

arises for the duration of corporate debt. A lower investment by long-duration firms is associated with lower debt financing by long-duration firms. If long-duration firms rely more on long-term financing, the decrease in the duration of aggregate corporate investment should be associated with a decrease in the duration of aggregate corporate debt.

First, I have shown that following shocks to the supply of long-term government debt that raise the term premium, long-duration firms invest less and lower their stock of debt. Second, I providence evidence in Appendix Table E.2 of a strong unconditional correlation between a firm's investment duration and the maturity of its debt issuances. Consistent with maturity-matching, the changes in financing associated with the changes in investment are much more important for long-term debt as seen in Table 5.

These two pieces of evidence are sufficient to explain a decrease in the maturity of corporate debt that is driven by *real* changes to the composition of investment *across firms*, namely a *real view*.

This *real view* contrasts with the *arbitrage view* proposed by the literature following Greenwood et al. (2010) whereby financially unconstrained firms adjust the maturity of their issuances *only* to minimise the financing costs following changes in the term premium. Importantly, I show that this *real* channel exists above and beyond the *arbitrage* channel as changes in the stock of debt of long-duration firms following changes in long-term bond supply are not driven by financially unconstrained firms (columns 3 and 6 of Table 5).[46] The latter is thus inconsistent with my result being driven by an *arbitrage view*.[47]

[46]I control for balance sheet strength with measures drawing on Greenwood et al. (2010) and Badoer and James (2016): dividend distribution, market-to-book ratio, or S&P ratings.

[47]Note that the *within-firm* changes to the duration of investment I provided evidence for are also consistent with *within-firm* changes to the maturity of corporate debt, and may also explain variation in the aggregate maturity of corporate debt. Hence the *real* view proposed in Section V has the potential to drive the time series in the maturity of corporate debt through both *within-firm* variation and *across-firms* variation in corporate debt maturity.

VII Robustness

VII.A Confounding factors

I rule out that my results could be explained by long-duration firms responding to other macroeconomic shocks in a different way than the average firm and that such shocks may correlate with my instrument. The absence of correlation between the instrument and macroeconomic series (Appendix Figure C.1) and the stability of the coefficients when including interaction terms between theses series and firm's duration of investment strongly mitigates this concern.

I also rule out that my results are driven by a "collateral channel". Chaney et al. (2012) finds that increases in the value of a firm's real estate relax financial constraints and increase corporate investment. They exploit local variations in real estate prices over a time sample (1993-2007) that is included in mine. In Internet Appendix B, I control for the possibility that a change in the term premium may translate into changes in real estate prices which, in turn, may affect differentially long-duration firms. In particular, I show that the baseline results are robust to controlling for the heterogeneous response of firms across industriesx with different duration of investment to real estate prices at the MSA-level .

VII.B Measurement and sample choices

I show in Internet Appendix B that my results are robust to measuring the duration of investment using the horizon of business plans that firms publicly disclose in their 10Ks (Dessaint et al., 2023).[48] Specifically the authors retrieve information about 13,908 SEC filings for 3,925 distinct firms between 1994 and 2015.[49]

[48] I am very grateful to the authors for sharing their data.

[49] They measure the horizon of business plans by "systematically searching for the terms "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", and "year plan" through the content of all SEC filings and manually collecting the information about the horizon in number of years when it is explicitly mentioned (e.g., "3-year")".

Internet Appendix B shows the robustness of the main analysis to using alternative industry taxonomies such as The Global Industry Classification Standard (GICS), and the North American Industry Classification System (NAICS). It also shows that the baseline results are robust to alternative measures of the duration of investment. In particular, the results are qualitatively unchanged when I use separately the measures identifying the intensive and extensive margins of specialisation into long-duration investments (*Fixed-Asset Maturity* and *Fixed-Asset Share*). I also show that while both margins are correlated, they each matter in isolation.

My results are also robust to sample selection. The point estimates are robust to excluding any of the policy shocks (Internet Appendix B), are symmetric across positive and negative shocks, and are robust to excluding firm$\times$date duplicates from overlapping events by only selecting, out of the duplicated firm$\times$date observations, the ones that appear for the first time (across all shocks) at a positive horizon.

VII.C An alternative instrument and external validity

In this section, I exploit another plausibly exogenous demand shock to the net supply for long-term bonds in the UK.

The demand shock. The Pensions Act of 2004 established a government fund to protect the benefits of pension scheme members from the risk of a pension fund bankruptcy. One of the introduced criteria for the newly created pension fund regulator to take over the funds perceived to be at risk is a pension plan's "accouting deficit": the difference between the market values of a plan's assets and its liabilities.

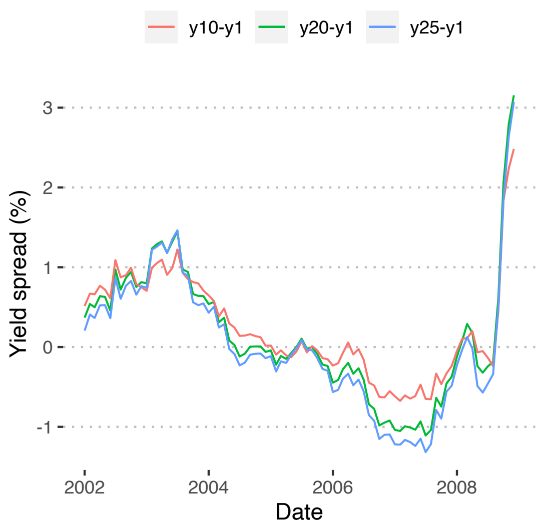
A pension fund can reduce the volatility of its "accouting deficit" by investing in long-term government bonds. Indeed, the assets providing the best hedge for variation in the present value of pension liabilities are the same assets whose price is used to discount these liabilities.[50] As the Pensions Act of 2004 also instituted fines for underfunded pension plans, it provided strong incentives to pension funds to buy more long-term UK government bonds.

[50] Pension funds' liabilities have a long-duration and are mostly comprised of inflation linked pension benefits.

Greenwood and Vayanos (2010) shows that as a consequence of the 2004 reform, pension funds increased their exposure to long-term government bonds and reduced that to equities. They provide evidence that between 2005 and 2006, pension funds bought approximately GBP 11 billion of inflation linked bonds as well as bonds with maturities longer than 15 years and swapped as much as GBP 50 billion of interest rate exposure so as to increase the duration of their assets. The authors highlight that the increase is substantial in comparison with the GBP 73 billion of net government issuance of inflation linked and long-term bonds between April 2005 and March 2007.

Figure 9: Term spread on UK government bonds (2002-2008)

The figure plots the yield spreads between long-term bonds (resp. 10-year, 20-year and 25-year maturities) and the yield on the 1-year maturity bond. The estimated yield curves data can be found on the Bank of England website.



The drop in the term premium. This increase in demand is matched by a dramatic drop in the yields on both inflation-linked and nominal long-term government bonds. Figure 9 documents the dramatic inversion of the UK nominal yield curve, highlighted in the first panel by the spread between the yields on long-term bonds (resp. 10-year, 20-year and 25-year maturities) and the yield on the 1-year maturity bond. Greenwood and Vayanos (2010) concludess that this yield curve inversion cannot be rationalised based on the expectations hypothesis as it would rely on unrealistic expectations of significant drops in short-term interest rates in the very distant future.[51]

[51]Consistent with a "demand shock" interpretation, the authors report that pension-fund managers

Increase in investment by long-duration firms. The reform allows me to test, in a different setting, the effect of the net supply of long-term bonds for the duration of corporate investment. I focus on a panel of UK firms with publicly traded securities from 2001 to 2009 obtained from Compustat Global. Appendix Table A.7 presents the summary statistics.

I run event-study difference-in-differences (DiD) regressions that compare the investment of firms after and before the policy shock (first difference), for long-duration firms relative to short-duration firms (second difference). I regress investment (measured by capital expenditures scaled by lagged total assets) on event-study dummies interacted with the treatment variable: firm-level *Asset Maturity*. Across the specifications, I include industry and time fixed-effects. Standard errors are clustered at the level of the firm.

Figure 10: UK event study for investment by long-duration firms

The figure plots the event-study coefficients on the interactions of year dummies and firm-level *Asset Maturity* in the regression where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat Global UK firms for 2001-2009. The specification in blue corresponds to the specification in the second column of Table F.1a. The year 2003 acts as the baseline period. Confidence intervals are built at the 95 percent confidence level based on standard errors clustered by firm. Details for variable definition in Appendix A.

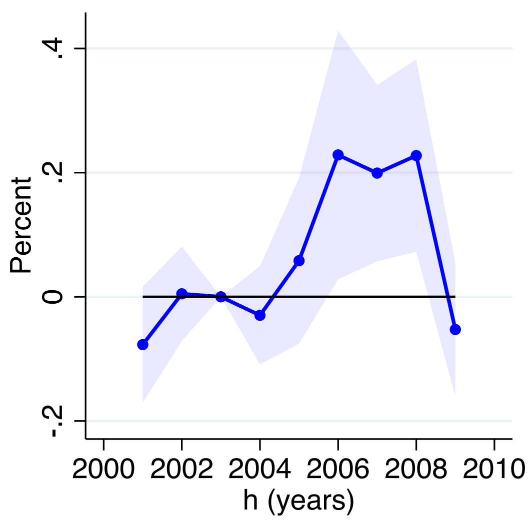


Figure 10 presents the DiD estimates for investment from the specification that includes

and the UK Debt Management Office have agreed with the the attribution of these changes in price to the policy-driven changes in demand for long-term bonds.

industry and time fixed effects. After the shock, long-duration firms invest relatively more. The dynamics of the effect are consistent with the cumulative net purchases of long-term bonds by UK pension fund reported in Greenwood and Vayanos (2010) (i.e. growing steadily until at least end of 2006) and the price pressures highlighted in Figure 9 to persist until 2008. Importantly, the parallel trends assumption holds prior to the shock.

The first panel of Appendix Table F.1a presents the related DiD estimates when bundling the event-study dummies into periods. Relative to 2003, firms at the 75th percentile of the *Asset Maturity* distribution on average increase yearly capital expenditures by 1% of assets relative to firms at the 75th percentile of the *Asset Maturity* distribution over 2006-2008 where the yield curve inversion is the most severe.[52]. As for the US policy shocks, the last column of Table F.1a indicates that the same qualitative results hold within-industries across firms.

The second panel of Appendix Table F.1a quantifies the changes in term spreads for the UK yield curve (long-term yields over 1-year yield) over the same periods. Relative to 2003 averages, term spreads for resp. 10-year, 20-year, and 25-year yields have dropped by 1, 1.29, and 1.41pp on average for 2006-2008.

Hence the shock predicts an relative semi-elasticity of investment across investment duration[53] to the term spread equal to –0.97.[54] This compares with the relative semi-elasticity of investment across investment duration of –1.57 which I derived from the US policy shocks.[55]

Overall, I find that a plausibly exogenous shock to the demand for long-term bonds in the UK depressed long-term yields and in turn increased the investment of UK public firms in long-duration industries. The exercise confirms the external validity of my

[52] $\beta \times (p75(AMat_{UK}) - p25(AMat_{UK})) = 0.218 \times (5.84 - 1.37) \approx 0.97$.

[53] Semi-elasticity of investment at the 75th percentile of the *Asset Maturity* distribution to a 1pp level increase in the term spread (10-year minus 1-yield yield) relative to the semi-elasticity of investment at the 25th percentile of the distribution to a level change in the term spread.

[54] $-\beta_{Investment,UK} \times (p75(AMat_{UK}) - p25(AMat_{UK}))/(-\beta_{TermSpread,UK}) = -0.218 \times (5.84 - 1.37)/(1.002) \approx -0.97$.

[55] $\beta_{Investment,US} \times (p75(AMat_{US}) - p25(AMat_{US}))/(\beta_{TermSpread,US}) = -0.446 \times (5.10 - 1.77)/(0.948) \approx -1.57$.

baseline results in another plausibly exogenous setting.

VIII Conclusion

In this paper, I show that large shocks to the supply of long-term bonds have redistributive effects on capital across investments with a different cash-flow duration, both *across firms* and *within firm across divisions*. Using plausibly exogenous variation in the maturity structure of US government debt, I find that a higher supply of long-term bonds increases firms' financing costs at long horizons leading to a crowding-out of long-duration investment. I also show that these changes in the duration of investment map into changes in the maturity of corporate debt. Overall, these results are important because they highlight new real effects of government interventions on corporate investment. In particular, the evidence presented in this paper can be a relevant input to the trade-offs faced by policy makers for decisions over the maturity of government debt issues. Furthermore, it contributes to the understanding of the implications of central bank purchases of long-term obligations for corporate investment.

References

Tobias Adrian, Richard K. Crump, and Emanuel Moench. Pricing the term structure with linear regressions. *Journal of Financial Economics*, 110(1):110–138, 10 2013. ISSN 0304-405X. doi: 10.1016/J.JFINECO.2013.04.009.

Philippe Aghion, George-Marios Angeletos, Abhijit Banerjee, and Kalina Manova. Volatility and growth: Credit constraints and the composition of investment. *Journal of Monetary Economics*, 57(3):246–265, 2010.

Cagri Akkoyun, Nuri Ersahin, and Christopher M. James. Crowded out from the Beginning: Impact of Government Debt on Corporate Financing. *SSRN Electronic Journal*, 1 2020. doi: 10.2139/SSRN.3528945.

George Marios Angeletos. Fiscal Policy with Noncontingent Debt and the Optimal Maturity Structure. *The Quarterly Journal of Economics*, 117(3):1105–1131, 8 2002. ISSN 0033-5533. doi: 10.1162/003355302760193977.

Dominique C. Badoer and Christopher M. James. The Determinants of Long-Term Corporate Debt Issuances. *Journal of Finance*, 71(1):457–492, 2016. ISSN 15406261. doi: 10.1111/jofi.12264.

Malcolm Baker, Robin Greenwood, and Jeffrey Wurgler. The maturity of debt issues and predictable variation in bond returns. *Journal of Financial Economics*, 70(2):261–291, 2003. ISSN 0304405X. doi: 10.1016/S0304-405X(03)00147-8.

Henning Bohn. Tax Smoothing with Financial Instruments. *The American Economic Review*, 80(5):1217–1230, 1990.

Thomas Chaney, David Sraer, and David Thesmar. The Collateral Channel: How Real Estate Shocks Affect Corporate Investment. *American Economic Review*, 102(6):2381–2409, 10 2012. ISSN 0002-8282. doi: 10.1257/AER.102.6.2381.

Sudheer Chava and Michael R. Roberts. How Does Financing Impact Investment? The Role of Debt Covenants. *The Journal of Finance*, 63(5):2085–2121, 10 2008. ISSN 00221082. doi: 10.1111/j.1540-6261.2008.01391.x.

Irem Demirci, Jennifer Huang, and Clemens Sialm. Government debt and corporate leverage:

International evidence. *Journal of Financial Economics*, 133(2):337–356, 2019. ISSN 0304405X. doi: 10.1016/j.jfineco.2019.03.009.

Olivier Dessaint, Thierry Foucault, and Laurent Frésard. The Horizon of Investors' Information and Corporate Investment. *SSRN Electronic Journal*, 3 2023. doi: 10.2139/SSRN.4276832.

Ian Dew-Becker. Investment and the Cost of Capital in the Cross-Section: The Term Spread Predicts the Duration of Investment. 2012.

Nathan Foley-Fisher, Rodney Ramcharan, and Edison Yu. The impact of unconventional monetary policy on firm financing constraints: Evidence from the maturity extension program. *Journal of Financial Economics*, 122(2):409–429, 11 2016. ISSN 0304-405X. doi: 10.1016/J.JFINECO.2016.07.002.

Benjamin M. Friedman. Crowding Out or Crowding In? Economic Consequences of Financing Government Deficits. *Brookings Papers on Economic Activity*, 1978(3):593, 1978. ISSN 00072303. doi: 10.2307/3217952.

Kenneth Garbade. *Treasury debt management under the rubric of regular and predictable issuance: 1983-2012*. Federal Reserve Bank of New York, 2015.

Kenneth Garbade. Managing the Maturity Structure of Marketable Treasury Debt: 1953-1983. Technical Report 936, 7 2020.

Luis Garicano and Claudia Steinwender. Survive another day: Using changes in the composition of investments to measure the cost of credit constraints. *Review of Economics and Statistics*, 98(5):913–924, 12 2016.

Thomas Geelen, Jakub Hajda, Erwan Morellec, and Adam Winegar. Financing Cycles. *SSRN Electronic Journal*, 1 2023. doi: 10.2139/SSRN.4025812.

Niels Joachim Gormsen and Kilian Huber. Equity Factors and Firms' Perceived Cost of Capital. *SSRN Electronic Journal*, 1 2023. doi: 10.2139/SSRN.3712699. URL `https://papers.ssrn.com/abstract=3712699`.

John R. Graham, Mark T. Leary, and Michael R. Roberts. How Does Government Borrowing Affect Corporate Financing and Investment? *SSRN Electronic Journal*, 2014. ISSN 0898-2937. doi: 10.2139/ssrn.2425916.

Robin Greenwood and Dimitri Vayanos. Price pressure in the government bond market.

American Economic Review, 100(2):585–590, 5 2010. ISSN 00028282. doi: 10.1257/AER.100.2.585.

Robin Greenwood and Dimitri Vayanos. Bond supply and excess bond returns. *Review of Financial Studies*, 27(3):663–713, 2014. ISSN 08939454. doi: 10.1093/rfs/hht133.

Robin Greenwood, Samuel Hanson, and Jeremy C. Stein. A gap-filling theory of corporate debt maturity choice. *Journal of Finance*, 65(3):993–1028, 2010. ISSN 00221082. doi: 10.1111/j.1540-6261.2010.01559.x.

Robin Greenwood, Samuel G. Hanson, and Jeremy C. Stein. A Comparative-Advantage Approach to Government Debt Maturity. *The Journal of Finance*, 70(4):1683–1722, 8 2015. ISSN 1540-6261. doi: 10.1111/JOFI.12253.

Arvind Krishnamurthy and Annette Vissing-Jorgensen. The Effects of Quantitative Easing on Interest Rates: Channels and Implications for Policy. *Brookings Papers on Economic Activity*, 42(2 (Fall)):215–287, 2011.

Arvind Krishnamurthy and Annette Vissing-Jorgensen. The aggregate demand for Treasury debt. *Journal of Political Economy*, 120(2):233–267, 2012. ISSN 00223808. doi: 10.1086/666526.

Dmitry Livdan and Alexander Nezlobin. Investment, capital stock, and replacement cost of assets when economic depreciation is non-geometric. *Journal of Financial Economics*, 142 (3):1444–1469, 12 2021. ISSN 0304405X. doi: 10.1016/j.jfineco.2021.05.021.

Diogo Mendes. Financial Constraints and Product Market Decisions: The Role of Production Cycles. *SSRN Electronic Journal*, (March), 2020. ISSN 1556-5068. doi: 10.2139/ssrn.3596061.

Noémie Pinardon-Touati. Does Government Debt Crowd Out Corporate Investment? A Bank Lending Channel. *SSRN Electronic Journal*, 3 2021. doi: 10.2139/ssrn.3805640.

Jeremy C. Stein. Takeover Threats and Managerial Myopia. *Journal of Political Economy*, 96 (1):61–80, 2 1988. doi: 10.1086/261524.

Mark Hoven Stohs and David C Mauer. The Determinants of Corporate Debt Maturity Structure. *The Journal of Business*, 69(3):279–312, 4 1996. ISSN 00219398, 15375374.

Stephen J. Terry. The Macro Impact of Short-Termism. *Stanford Institute for Economic Policy Research, Discussion Papers*, 2015.

James Tobin. Liquidity Preference as Behavior Towards Risk. *Review of Economic Studies*, 25 (2):65–86, 1958. doi: 10.2307/2296205.

Dimitri Vayanos and Jean-Luc Vila. A Preferred-Habitat Model of the Term Structure of Interest Rates. *Econometrica*, 89(1):77–112, 2021. ISSN 0012-9682. doi: 10.3982/ecta17440.

Appendix

Appendix A Variables

Variables Description

Firms' financials	**Variable description**
Total Assets	Total assets measured with Compustat variable *at* in 2007 USD million equivalents.
PP&E	Net fixed assets measured with Compustat variable *ppent* in 2007 USD million equivalents.
Employment	Total employment measured with Compustat variable *emp* in thousands of employees.
Sales	Total net sales measured with Compustat variable *sale* in 2007 USD million equivalents.
Market Value of Equity	Market value of equity measured with Compustat variables as the product of *prcc* and *csho* in 2007 USD million equivalents.
Debt	Debt measured with Compustat variables as $\frac{dltt + dlc}{dltt + dlc + prcc * csho}$.
Market to Book Ratio	Market-to-book ratio measured with Compustat variables as $\frac{at + prcc\_c * csho - ceq - txdb}{at}$.
EBIT to Assets	Earnings before interest and taxes, scaled by total assets measured with Compustat variables as $\frac{in + xint + txt}{at}$
Market-Debt Ratio	Market-Debt ratio measured with Compustat variables as $dltt + dlc$.
Sales Growth	Change of a firm's sales in percentage points of previous year's sales.
Sales Growth (2digits SIC)	Yearly average of yearly firm observations for *Sales Growth* aggregated at two-digits SIC industry
Dividend Dummy	Dummy variable taking a value of one if the firm declared dividends on common stock (Compustat variable *dvc*).
IG Rating Dummy	Dummy variable taking a value of one if the firm has a S&P long-term credit rating of BBB- or higher or if it has a S&P short-term credit rating of A-3 or higher. Measured with the S&P ratings database variables *splticrm* and *spsticrm*
Asset Maturity (firm)	Book-value-weighted average maturity of assets measured with Compustat Annual variables as $\frac{act}{act + ppent} \cdot 1 + \frac{ppent}{act + ppent} \cdot \frac{ppent}{dp - am}$. Missing amortisation observations (*am*) are replaced by zeros.
Asset Maturity (firm avg)	*Asset Maturity* averaged over the sample by firm.
Asset Maturity (SIC2d avg)	*Asset Maturity* averaged over the sample by two-digits SIC industry .
Fixed-Asset Maturity (SIC2d avg)	maturity of fixed assets measured with Compustat variables as $\frac{ppent}{dp - am}$ and averaged over the sample by two-digits SIC industry. Missing amortisation observations (*am*) are replaced by zeros.
Fixed-Asset Share (SIC2d avg)	The ratio of *PP&E* to the sum of *PP&E* and *Current Assets* averaged over the sample by two-digits SIC industry.
Business Plan Horizon	Two-digits SIC industry's average of the horizon of the business plan that managers disclose from SEC filings obtained from Dessaint et al. (2023).

Macroeconomic and asset prices series	**Variable description**
TreasuryDebtMaturity	Dollar-weighted average maturity of Treasury debt at monthly frequency and expressed in years.
TreasuryDebtMaturity (5-year demeaned)	The residual on the regression of *TreasuryDebtMaturity* on 5-year period indicators
Moody's LT BAA-AAA Spread	Spread in percentage points between yields on the Moody's Seasoned BBB- and AAA-rated corporate bond indices (based on bonds with maturities 20 years and above). The data is retrieved at the monthly frequency from FRED, Federal Reserve Bank of St. Louis.
Total GDP 4Q Growth	Real GDP growth over the past four quarters measured quarterly and expressed in percentage points.
Treasury Debt to GDP	Sum of principals of outstanding Treasury debt from CRSP Treasury scaled by nominal GDP from FRED and expressed in percentage points.
N-y TSY Yield	The yield-to-maturity on the *N*-year maturity Treasury bond using the US Treasury constant maturity zero-coupon bond yield curve from the Federal Reserve (in percentage points).
H-y Excess Return on N-y TSY	The *H*-year horizon excess return on the *N*-year Treasury bond calculated as the holding-period return from buying a *N*-year bond and selling it *H*-year later in excess of the return on the *H*-year bond, computed with the monthly data on US Treasury constant maturity zero-coupon bond yield curve from the Federal Reserve (in percentage points).
Term Spread (10y-1y)	The spread between the yield-to-maturity on the 10-year maturity Treasury bond and the yield-to-maturity on the 1-year maturity Treasury bond using the US Treasury constant maturity zero-coupon bond yield curve from the Federal Reserve (in percentage points).
Term Premium (ACM)	Estimates for the term premium from the term structure model in Adrian et al. (2013) available at monthly frequency from the NY Fed website.

Issuance characteristics	**Variable description**
Years to Maturity	Maturity of the issue at issuance date in years.
Deal Amount	Loan principal amount (*facilityamt*) for issues in Dealscan and Total principal amount of the issue (*totdolamt*) in USD mn.
Dealscan Flag	Dummy for deal observations that come from the Dealscan dataset (mostly bank loans) as opposed to the SDC dataset (public bonds).

Descriptive Statistics

Table A.4: Summary statistics for the panel of public firms

Variable	N	Mean	Std. Dev.	Min	p10	p25	p50	p75	p90	Max
Total Assets*	202937	1338.65	4592.56	0.00	6.54	26.91	125.90	590.14	2553.43	60486.54
PPE*	202649	530.79	2113.52	0.00	0.64	4.08	26.95	161.70	875.85	35585.16
Employment*	191543	5.27	14.83	0.00	0.025	0.12	0.64	3.10	12.14	319.21
Capital Expenditures to lagged Assets*	202958	8.76	14.20	0.00	0.65	2.00	4.71	9.72	19.07	248.59
Sales*	202915	1344.20	4203.81	0.00	3.37	24.67	141.26	685.97	2784.59	76707.96
MV of Equity*	176045	1281.46	4889.49	0.034	7.24	25.24	107.33	527.03	2266.15	69948.09
Debt*	195562	384.82	1366.68	0.00	0.00	1.66	18.71	150.16	761.97	17714.61
Market to Book Ratio*	175653	3.17	14.71	0.37	0.81	1.00	1.35	2.19	4.14	881.68
Market Debt Ratio*	171363	0.26	0.25	0.00	0.00	0.028	0.18	0.43	0.66	0.99
Sales Growth*	196406	12.62	40.13	-69.53	-24.15	-6.64	4.99	20.97	54.38	293.50
Sales Growth (SIC 2-digits)**	202958	12.65	12.44	-47.51	-0.14	5.13	11.16	18.04	26.54	154.21
Dividend Dummy	202958	0.33	0.47	0.00	0.00	0.00	0.00	1.00	1.00	1.00
IG Rating Dummy	202958	0.11	0.32	0.00	0.00	0.00	0.00	0.00	1.00	1.00
Asset Mat. (firm)**	77030	3.65	3.21	0.98	1.12	1.45	2.49	4.41	8.03	15.70
Asset Mat. (firm avg)**	200478	3.99	3.00	0.98	1.26	1.77	2.97	5.10	8.53	17.05
Asset Mat. (SIC 2d avg)**	202958	3.98	2.01	1.35	2.02	2.47	3.31	4.94	7.48	13.70
Fixed-Asset Mat. (SIC 2d avg)**	202958	7.65	2.28	2.38	4.29	5.92	7.21	9.08	10.49	19.73
Fixed-Asset Share (SIC 2d avg)**	202958	0.35	0.15	0.13	0.22	0.24	0.27	0.43	0.61	0.80
Business Plan Horizon (SIC 2d)	198786	4.35	0.53	1.00	3.71	3.99	4.32	4.68	4.92	8.00

Note: This table reports summary statistics for the main variables in the panel of Compustat firms from 1970-2010. Dollar amounts are expressed in December 2019 US dollars using the Bureau of Labor price index (all urban consumers). All variables are defined in Appendix A.
* To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 1st and 99th percentiles of the yearly distributions of the variables in the sample of issuing firms.
** To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 5th and 95th percentiles of the yearly distributions of the variables.

Table A.5: Macroeconomic conditions in the panel of public firms

Variable	N	Mean	Std. Dev.	Min	p10	p25	p50	p75	p90	Max
TreasuryDebtMaturity	300	4.83	0.86	2.82	3.38	4.2	5.06	5.57	5.76	6.05
Moody's LT BAA-AAA Spread	300	1.07	0.45	0.55	0.64	0.76	0.91	1.25	1.68	3.38
Total GDP 4Q Growth	300	3	2.18	-3.92	0	1.76	3.29	4.33	5.25	8.58
Treasury Debt to GDP	300	21.11	9.99	4.53	7.15	13.89	22.25	26.87	30.32	57.04
1y TSY Yield	300	6.06	3.23	0.15	2.06	4.17	5.68	7.83	10.29	15.69
10y TSY Yield	294	7.21	2.55	1.98	4.28	5.38	6.74	8.44	11.48	14.89
3y Excess Return on 10y TSY	300	11.12	20.34	-68.57	-8.29	2.94	11.92	23.74	32.74	57.04
Term Premium (ACM)	300	2.2	1.08	0.27	0.83	1.42	2.07	2.87	3.84	5.03
Term Spread (10y minus 1y)	294	1.15	1.32	-3.19	-0.4	0.19	1.02	2.11	3.07	3.79

Note: This table reports summary statistics of end of quarter values for the main macroeconomic variables in the firm panel over 1970-2010. All variables are defined in Appendix A.

Table A.6: Summary statistics for the panel of multi-division public firms

Variable	N	Mean	Std. Dev.	Min	p10	p25	p50	p75	p90	Max
Total Assets*	69765	4179.76	10441.73	0.92	37.64	134.26	648.35	3086.14	10071.27	140767.62
PPE*	69741	1613.82	4360.85	0.036	7.76	34.15	180.47	1037.45	3851.41	37534.82
Employment*	68061	13.61	25.94	0.00	0.23	0.80	3.30	12.70	39.50	192.00
Capex*	69765	244.33	616.18	0.0012	1.32	6.02	31.56	166.30	637.14	9615.28
Capex (Segment)*	69765	85.97	265.76	0.0012	0.23	1.29	8.20	45.36	191.63	4112.36
Capex (Segment) to lagged Total Assets*	69765	2.87	4.24	0.002	0.15	0.47	1.37	3.45	7.12	37.62
Cash-flow (Segment)*	69765	131.37	384.70	-1022.16	-2.22	1.37	14.34	84.47	309.87	4648.89
Employment (Segment)*	15486	7.31	16.88	0.00	0.081	0.31	1.33	5.59	19.84	185.18
Cash-flow to Assets (Segment)*	69763	0.082	1.81	-349.00	-0.068	0.041	0.12	0.20	0.31	4.96
ln(Assets) (Segment)*	69723	5.00	2.24	-6.73	2.08	3.43	5.06	6.63	7.89	10.73
Assets to Total Assets (Segment)*	69765	0.35	0.27	0.00	0.055	0.12	0.29	0.55	0.78	1.00
Asset Mat. (Segment)**	69765	4.40	2.43	1.35	2.37	2.61	3.57	5.52	8.37	19.31

Note: This table reports summary statistics for the main variables in the yearly panel of firms in Compustat Segments from 1970 to 2010. Dollar amounts are expressed in December 2019 US dollars using the Bureau of Labor price index (all urban consumers). All variables are defined in Appendix A.

* To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 1st and 99th percentiles of the yearly distributions of the variables in the sample of issuing firms.

** To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 5th and 95th percentiles of the yearly distributions of the variables.

Table A.7: Summary stats of the panel of UK public firms

Variable	N	Mean	Std. Dev.	Min	p10	p25	p50	p75	p90	Max
Total Assets*	12613	769.71	2839.91	0.025	3.25	10.04	42.20	205.10	1383.22	33990.44
PPE*	12613	262.04	1035.87	0.00	0.12	0.64	6.00	47.57	323.04	9046.74
Sales*	12613	603.33	1981.41	0.00	0.66	5.79	35.83	215.49	1245.34	20751.52
Capital Expenditures to Lagged Total Assets*	12613	7.24	13.80	0.00	0.47	1.28	3.18	7.08	15.73	151.24
Sales Growth*	11919	46.64	220.64	-100.00	-22.88	-4.10	8.71	30.22	85.54	3533.95
Ebit Growth*	11630	-13.37	420.25	-3319.19	-169.62	-70.78	-11.84	27.47	139.45	3201.13
Asset Mat. (firm)*	12613	5.44	6.85	1.00	1.10	1.37	2.65	5.84	14.76	42.66
Asset Mat. (SIC2d avg)**	12613	5.51	4.60	1.12	2.16	2.47	3.44	8.68	12.97	27.47

Note: This table reports summary statistics for the main variables in the yearly panel of Compustat Global UK firms from 2001 to 2009. Amounts are expressed in current GBP. All variables are defined in Appendix A.

* To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 1st and 99th percentiles of the yearly distributions of the variables in the sample of issuing firms.

** To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 5th and 95th percentiles of the yearly distributions of the variables.

Appendix B Term Spread and Discount Rates

Table B.1: Term spread and discount rates in the cross-section of industries

The table presents the estimates based on least squares regressions of industries' average discount rates (k)*. The term spread is the difference between the 10-year interest rate and the 1-year interest rate for bonds issued by high quality corporate issuers. First two columns are using dummy for above median asset maturity measure at industry-level, last two columns are using continuous measure. The last column excludes SIC2-digits 40 and 83. T-stats reported in parentheses are clustered by industry.

	All industries			Excluding SIC2=40,83
	(1)	(2)	(3)	(4)
	k	k	k	k
TermSpread	-0.0753			
	(-1.75)			
High AssetMat	-0.133			
	(-0.46)			
TermSpread × High AssetMat	0.162*	0.136		
	(2.07)	(1.74)		
TermSpread × AssetMat			0.0233	0.0253**
			(1.69)	(3.20)
constant	15.35***	15.14***	14.94***	14.95***
	(91.85)	(169.32)	(71.93)	(134.05)
No FE	✓	–	–	–
Year FE	–	✓	✓	✓
Industry FE	–	✓	✓	✓
Observations	1131	1131	1131	1096
Adjusted R^2	0.012	0.516	0.520	0.538

Figure B.1: Term spread and discount rates in the cross-section of industries: Leave-One-Out regressions

The figure presents the estimates based on least squares regressions of industries' average discount rates corresponding to the specification of column 3 of Table B.1. Each point estimate corresponds to the estimate for the interaction term in the regression sample where a SIC2-digits industry is left out (x-axis). Confidence intervals are built at the 95 percent confidence level and based on standard errors clustered at the industry-level.

Appendix C Identification

In this section, I provide details about the management over the maturity of debt issues by the US Treasury and about the 6 policy shocks driving most of the variation in the average maturity of outstanding Treasury debt. I also argue that these policy shocks are not determined endogenously with long-duration corporate investment opportunities.

Objective function of the US Treasury's office of Debt Management

The long-standing goal of the US Treasury's office of Debt Management (oDM) is to "maintain the lowest cost of borrowing over time"[56] and the strategies to pursue this goal are:

(1) Offer high quality products through regular and predictable issuance

(2) Promote a robust, broad, and diverse investor base

[56] See the Overview of Treasury's Office of Debt Management.

(3) Support market liquidity and market functioning
(4) Keep a prudent cash balance
(5) Maintain manageable rollovers and changes in interest expense

In this context, the objective and strategy (5) highlight the general trade-off between issuing short-term debt to save an historically positive term premium and issuing long-term debt to maintain rollover risk sufficiently low.[57]

However, in support of strategies (1) and (2), the Overview of Treasury's Office of Debt Management makes clear that the Treasury is not "a market timer" and "doesn't react to current rate levels or short-term fluctuations in demand". This owes notably to one central characteristic of the Treasury as an issuer: it is "too large an issuer to behave opportunistically in debt markets".

An examination of Treasury debt management from the 1960s confirms the historical salience of such message in the practice and alleviate the concerns that variation in Treasury debt maturity is exogenous to corporate investment opportunities.

US Treasury debt maturity: Policy shocks

In this section, I provide a summary of the main decisions by the US Treasury affecting the average maturity of marketable government debt and in particular the 6 policy shocks driving most variation in Treasury debt maturity. This summary draws heavily on Garbade (2015) and Garbade (2020).

Pre-sample shock: Binding WWI Interest rate ceiling constrains debt maturity in the 60s and 70s. Before 1917 the Congress was the main debt management authority for the Federal government and the US Treasury had little discretion. The large amounts of borrowing during World War I brought a change in this situation and the Treasury became the main debt management authority. Importantly, from 1918 following the Second Liberty Bond amendment, US law prescribed marketable Treasury debt to have an interest rate above 4.25pp. The extra need for government financing in 1919 led to an

[57] Roll-over risk is the risk of unexpected changes in rates coming from two main sources: one the one hand unanticipated and persistent strengthening of the economy, and on the other hand the exposure to short-term market disruptions.

exclusion of medium-term notes from the prescription, therefore allowing debt issues with an initial maturity lower than 5 years to be priced at an interest rate higher than the ceiling. As noted in Garbade (2015), with only two brief exceptions, the ceiling was not a binding constraint on Treasury debt management actions before the middle of 1965.

But as the general level of interest rates rose in the 1960's, the interest ceiling on new bonds became binding. The statutory constraints effectively lowered the maturity of new issuances and de facto the maturity of outstanding Treasury debt. Despite any reference to changes in expectations about future economic outcomes the congress recognised several times the need for flexibility[58] by subsequently increasing in 1967 the maximum maturity on exempted Treasury notes from 5 years to 7 years, authorising in 1971 to issue up to USD 10 billion of bonds without ceiling, and allowing several increases in the former limit.

These policies were not sufficient to halt the fall in the average maturity of marketable Treasury debt to a (post-WWII) low of about three years by the end of 1975 (see Figure 2).

1976 policy shock: Repeal of the statutory constraints and regular predictable openings. The situation began to change in 1976 following new interventions by the Congress. Two major changes were undertaken.

First, in March 1976 Congress extended the maximum maturity of a note from seven years to ten years and increased the exemption from the ceiling to USD 12bn. This increase in the exemption precedes repeated liftings of ceiling exemptions. The Congress increased the exemption several times from USD 17bn in 1976 to USD 70bn in 1980.

Second is the regularisation of long-term debt offerings over 1975-1977 which paved the way for predictable offerings and suppressed the ability of Treasury debt managers to pursue "tactical issuance decisions". By 1983, the US Treasury was regularly issuing 4-, 5-, and 7-year notes and 20-year bonds quarterly, and 3-year and 10-year notes and

[58] See, for instance, the 1967 statement of US Treasury Secretary Simon before the US Senate's Committee on Finance as he calls for additional measures to "arrest the decline in the average maturity" that spur the "need for frequent refinancings".

30-year bonds in mid-quarter refundings.

These changes effectively halted the drop in Treasury debt maturity and helped it predictably recover until the late 1980s. Garbade (2015) collects anecdotal evidence in the form of discussions and communication (notably by the Treasury Borrowing Advisory Committee) showing that the rate ceiling, in turn, generated a "countervailing commitment" to Treasury debt maturity lengthening that persisted into the early 1990s. Thus, in the first part of the sample and until 1992, the steady increase in debt maturity is therefore effectively driven by (1) the "countervailing commitment" to regain flexibility that was lost as the results of the statutory constraint, and the (2) the policy change towards regular and predictable offerings that restrict opportunistic issuances.

1982 policy shock: Large changes to the size of exemptions after Congress's failure to increase the 1982 April and July exemptions. In early 1982 Congress failed to increase the exemption from the ceiling in time to allow the issuance of 20 and 30-year bonds in April and July. The effect is evident is visually evident (see Figure 2). A large increase (USD 110bn) in September 1982 allowed the Treasury to restart issuance.

This marks the second phase of the staggered repeal with much larger exemptions being granted in the subsequent years (up to $270bn in 1987) before finally removing the ceiling in 1988.

1993 policy shock: Reduction of 30-year bond offerings. In the second part of the sample, the mechanical increase leads Treasury debt maturity to reach historical highs in the early 1990s. The flexibility regained, the first discussions about the potential costs implications of the latter maturity extension program emerge. They coincide with an historical long maturity leaving the Treasury and other government officials believe there was room to take advantage of the historical discount on short-term debt.

The Treasury takes a few decisions that slow down and stop the increase in debt maturity by increasing the issuance of 3-year notes more rapidly than 10-year notes and 30-year bonds 30s in 1990 and 1991, and marginally reducing longer-term offerings in February 1992. the Treasury justifies the latter with the following statement: "taxpayer financing costs can be lowered at the margin by a modest reduction in the maturity structure of the debt" (Garbade, 2015).

However it is only in 1993 that events triggered the subsequent drift to a downward trajectory for the maturity of Treasury debt. In mid-February 1993: the White House released *A Vision of Change for America*, setting the political agenda of the newly installed Clinton Administration and including a statement about potential savings over 1994-1998 from shortening issuance maturities. The lack of details over the assumptions underlying the statement left market participants confused. In early March, the advisory committee to the Treasury recommended continued issuance of 30-year bonds in light of the "near perpetual nature of existing Treasury debt," and the importance of 30-year bonds serving "as a vital benchmark for state and local governments" as well as corporate issuers. In particular, lowering 30-year bonds issuance would lower outstanding long-term bonds liquidity and "impair such markets". Consistent with regular and predictable issuances implying persistent changes rather than short-term opportunism, the committee did not identify any advantages from shortening permanently the maturity structure of Treasury debt highlighted the higher roll-over risks induced by changing the rules.

Nevertheless on May 5, the Treasury announced that it would reduce the offering of 30-year bonds in May 1993, and would no longer offer 30-year bonds in subsequent May and November refundings. Statements highlighted that the change in offerings was not dependent on current interest rates but on the existence over time of something variously called [. . .] the risk premium in longer-term rates." and officials insisted that they would not reverse course looking ahead. A Treasury official stated that, as a result of the new policy, the average maturity of Treasury debt would be one year lower in five years.

Hence the decision to reduce 30-year bond offerings leads to a predictable and mechanical decrease in the average maturity of Treasury debt up until late 1995 as highlighted in Figure 2.

1996 Policy shock: Reversing the 1993 decision. The following decrease in the average maturity of Treasury debt is halted by the decision to increase the Treasury's offering of 10-year notes and 30-year bonds in May 1996. As documented by Garbade (2015), advices over the course of 1995 from the Treasury Borrowing Advisory Committee point at two reasons underlying the policy decision. First, the pace of decline in Treasury debt maturity if not halted over the course of 1996 and beyond could become a subject of worry to investors and be costly for the government in the long-run. Garbade (2015) notes: "the decision may instead have reflected an assessment by Treasury officials that five years was the lower limit of their comfort zone with respect to average maturity." Second, the committee highlights that the 1993 decision to issue 30-year bonds semiannually had had "a noticeable adverse impact on liquidity" and again recommended the reintroduction of quarterly 30-year bond offerings to restore liquidity.

Thus, the policy change appears to only be dictated by the need to reverse the past policy decision, rather than being driven by changes in market conditions or macroeconomic outcomes. The following resurgence of long-term debt issuances contributes to a mechanical increase in the maturity of Treasury debt highlighted in Figure 2.

The improvements in the US fiscal position in the late 90s mechanically decreased the offerings along the maturity curve and raised liquidity concerns for the main debt instruments (e.g. 10-year), despite the reintroduction of long-term issuances. The Treasury reacted by halting the offer of 30-year bonds of November 1999 and concentrate offerings on the 10-year maturity segments before announcing long-term debt buybacks in January 2000. This series of action only contributed to lowering the growth in the maturity of US government debt and did not generate any shift in the maturity of Treasury debt.

2001 Policy shock: Suspension of 30-year debt issues. In October 2001, US Treasury Secretary Fisher announces a suspension of debt issues of 30-year US Treasury bond on the basis of preserving liquidity for the 10-year segment in the long run that surprises market participants, as the fiscal position was deteriorating and the US had returned to a net borrower position (Badoer and James, 2016). The latter unanticipated decision is the main driver of the subsequent decrease in the average maturity of Treasury debt.

Once again, the policy change seems to be driven by policymakers expectations over potential long-term costs (in this case liquidity for the 10-year instrument) rather than market timing considerations.

Post-sample: Roll-over risk resurgence and post-financial crisis consensus on roll-over risk. As the average maturity of publicly held debt dropped well below five years, the trade-off focus shifted again towards an emphasis on rollover risk in the mid 2000s leading to the announcement of reintroduction of the 30-year bonds debt issues in August 2005. Discussions point again against any reference to an observed changed in neither the relative cost of long-term issuances, or materialisations of roll-over risk but the need to reverse the 2001 policy decision. The extension in the average maturity of Treasury debt is comforted in the aftermath of the financial crisis amid consensus in Treasury committees over growing concerns of roll-over risk.

Treasury debt maturity and macroeconomic series

Figure C.1: Treasury debt maturity over 1976-2007

The subfigures present the quarterly time series of *TreasuryDebtMaturity*, the average maturity of Treasury debt value-weighted by outstanding principal (in blue) in perspective with other macroeconomic time series (in red).

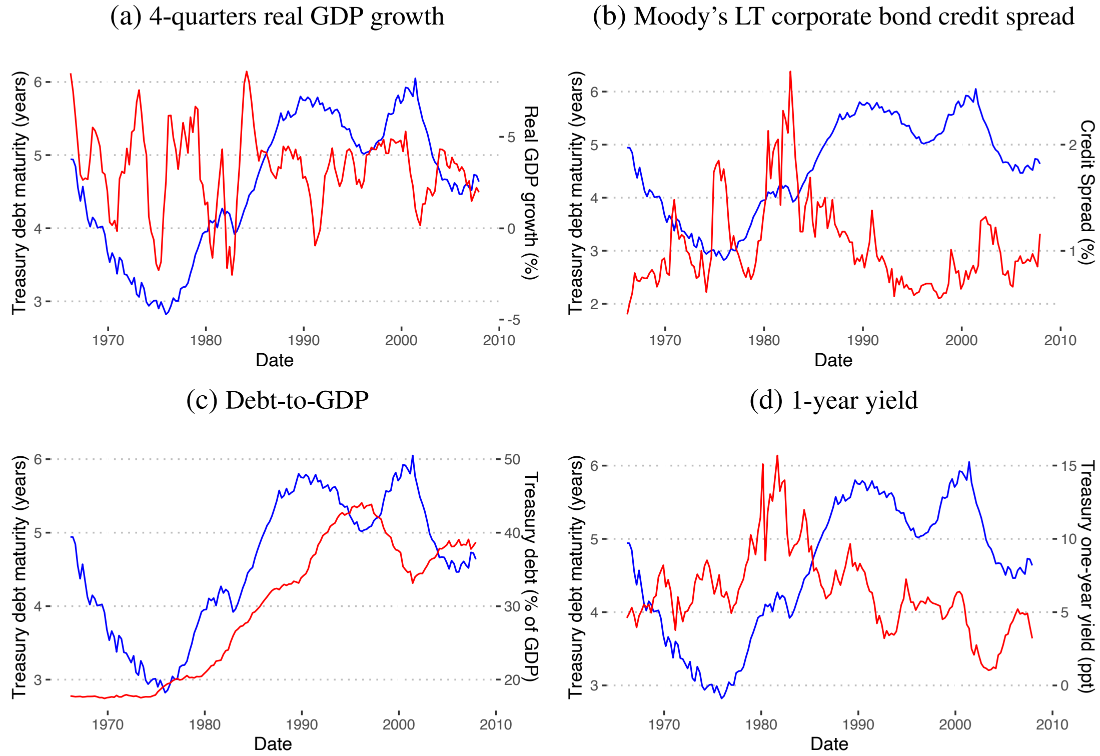


Table C.1: Event study for Treasury debt maturity and term spreads

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 5 with dependent variables in column heads using quarterly yield curve data on Treasury bonds (1970-2010). Dependent variables in column 1, 2, and 3 are resp. the share of principal on Treasury debt with residual maturity above 5 years, 10 years, and 20 years. Dependent variables in column 4, 5, and 6 are resp. the yield spread on Treasury debt with residual maturity equal to 10 years, 15 years, and 20 years relative to Treasury debt with residual maturity equal to one year. The quarter-end date preceding the shock acts as the baseline period. The sample for the 10- and 15-year Treasury Term Spread (TS) start in August 1971. The sample for the 20-year Treasury Term Spread (TS) start in 1981. Robust standard errors in parentheses. Details for variable definition in Appendix A.

	(1)	(2)	(3)	(4)	(5)	(6)
	Tdebt$>5y$	Tdebt$>10y$	Tdebt$>20y$	TSpread10	TSpread15	TSpread20
$[-5;-1]\times$ Shock	0.843	0.485	0.119	0.730*	0.886*	2.059***
	(0.688)	(0.883)	(0.664)	(0.440)	(0.486)	(0.424)
$[1;3]\times$ Shock	2.326***	1.117	1.102*	0.411	0.452	0.834**
	(0.703)	(0.894)	(0.645)	(0.441)	(0.486)	(0.400)
$[4;7]\times$ Shock	4.704***	3.745***	2.675***	0.948**	1.120**	1.804***
	(0.669)	(0.875)	(0.644)	(0.440)	(0.486)	(0.406)
$[8;10]\times$ Shock	3.811***	3.297***	2.500***	0.719	0.816	1.206***
	(0.780)	(0.949)	(0.740)	(0.457)	(0.507)	(0.434)
Shock FE	✓	✓	✓	✓	✓	✓
Observations	300	300	300	299	298	243
Adjusted R^2	0.627	0.651	0.570	0.109	0.142	0.121

Appendix D Economic significance

Table D.2: Event study for investment of firms in industries with above-median duration

The table presents the (stacked) event-study coefficients β_h from estimations of Equation 6 where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat firms for 1970-2010. Investment duration is measured with a dummy indicating the group of industries with *Asset Maturity* above (assets-weighted) median. The year-end date preceding the shock acts as the baseline period. Standard errors clustered by industry. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	All sample					Balanced
	(1)	(2)	(3)	(4)	(5)	(6)
	Capex	Capex	Capex	Capex	Capex	Capex
[–5; –1] × High-AssetMat (sign-adj)	-2.484**	-1.763**	-1.186*	-0.830***	-0.368	-0.0906
	(0.987)	(0.749)	(0.643)	(0.259)	(0.255)	(0.264)
[1; 3] × High-AssetMat (sign-adj)	-0.157	-1.590**	-1.417**	-0.898***	-0.614**	-0.440*
	(0.695)	(0.772)	(0.576)	(0.250)	(0.273)	(0.246)
[4; 7] × High-AssetMat (sign-adj)	-2.209*	-2.845**	-2.288**	-1.976***	-1.873***	-1.627***
	(1.265)	(1.351)	(1.126)	(0.721)	(0.684)	(0.606)
[8; 10] × High-AssetMat (sign-adj)	-0.500	-2.186*	-1.975*	-1.253***	-0.893***	-0.920***
	(1.019)	(1.190)	(1.061)	(0.278)	(0.329)	(0.334)
High-AssetMat (sign-adj)	2.335**					
	(1.123)					
[–5; –1]	-0.337					
	(0.280)					
[1; 3]	-0.543**					
	(0.223)					
[4; 7]	0.129					
	(0.206)					
[8; 10]	-1.952***					
	(0.336)					
constant	9.458***	9.089***	9.021***	12.54***	8.567***	8.300***
	(0.860)	(0.0477)	(0.0396)	(0.397)	(0.785)	(0.508)
No FE	✓	–	–	–	–	–
Shock x Period FE	–	✓	✓	✓	✓	✓
Shock x Industry FE	–	✓	✓	✓	✓	✓
Shock x Firm FE	–	–	✓	✓	✓	✓
Firm Controls x Shock x Period FE	–	–	–	✓	✓	✓
AssetMat x Macro Controls	–	–	–	–	✓	✓
Observations	393100	393100	389545	389545	389545	166538
Adjusted R^2	0.005	0.085	0.318	0.342	0.345	0.321

Appendix E Maturity Matching

I construct a dataset of debt issues by non-financial firms over 1987-2007 aggregated at the firm-month level from debt issue-level observations extracted from the Thomson Reuters LPC Dealscan and SDC Platinum New Issues databases. The debt issue-level observations are extracted from the Thomson Reuters LPC Dealscan and Thomson Reuters SDC Platinum New Issues databases. I extract detailed terms and conditions for individual corporate loans from Dealscan and for individual debt securities including non-convertible debt securities, debt shelf registrations, U.S. Rule 144A non-convertible debt, and medium-term note programs from SDC (Thomson). Following Badoer and James (2016), I exclude asset- and mortgage-backed debt, secured debt, pass-through securities, equipment trust certificates, lease obligations, convertible debt, preferred stock that has been misclassified as debt, equity-linked certificates, and perpetual debt. I only keep US-dollar denominated deals with non-missing positive deal amounts and account for inflation by adjusting dollar amounts to 2007 dollars using the Bureau of Labor price index (all urban consumers). I discard duplicates entry within and across both databases - identified as observations with the same issuer, issuance and maturity dates, deal amount and maturity. I exclude credit lines as they are less likely to isolate the timing of large investments as opposed to term loans.

I merge the issue-level information with fiscal year-end financial information data of public US firms using the CRSP/Compustat Merged - Fundamentals Annual database obtained from WRDS. The merge is completed for the Dealscan dataset using the 2017 version of the link file from Chava and Roberts (2008) which matches individual loan facilities to the corresponding borrowing firm's unique company identifier (variable *gvkey*) on Compustat. For the SDC dataset, I use the DSENAMES database from WRDS to merge unique historical identifiers specific to each issuer in SDC (first 6 digits of variable *cusip*) to unique identifiers in Compustat (variable *gvkey*).

Appendix A presents the sample's descriptive statistics for debt issues' properties and financial characteristics of issuing firms, as well as macroeconomic conditions at issuance. The dataset consists of 14,208 firm-month-level aggregate debt issues, 60% of which aggregate at least one individual issuance collected from Dealscan's loan debt issue dataset.[59] The average debt issue has a maturity of about 7.5 years and amounts to approximately USD 335 million.

Table E.1: Summary statistics for SDC/Dealscan issuances (1987-2007)

Variable	N	Mean	Std. Dev.	Min	p10	p25	p50	p75	p90	Max
Deal Amount	16863	334.68	1241.69	0.02	5.19	19.20	82.84	238.10	619.57	54850.09
Intitial Maturity (months)	16863	7.46	6.26	0.00	1.92	4.00	6.00	10.00	12.08	60.08
Dealscan Dummy	16863	0.60	0.49	0.00	0.00	0.00	1.00	1.00	1.00	1.00
Total Assets*	16863	3382.84	6036.36	0.12	36.25	135.93	724.96	3561.89	10441.08	38956.73
PPE*	16863	1475.21	2750.71	0.00	7.16	34.07	230.95	1483.32	5153.67	17141.43
Employment*	16605	12.88	20.98	0.00	0.21	0.78	3.28	13.97	45.01	118.74
Sales*	16863	2738.89	4809.10	0.00	35.74	135.10	624.46	3080.60	8069.90	33872.69
MV of Equity*	16863	2529.15	5803.18	0.062	14.54	58.74	373.91	1952.63	6858.11	47095.63
Debt*	16815	1107.51	1945.18	0.00	5.17	33.83	238.59	1170.21	3547.16	10845.43
Market to Book Ratio*	16863	1.44	0.92	0.36	0.87	1.00	1.19	1.56	2.20	31.07
Ebit to Assets*	16863	0.068	0.17	-7.98	-0.03	0.045	0.086	0.13	0.17	0.57
ln(Assets)*	16863	6.48	2.13	-2.16	3.59	4.91	6.59	8.18	9.25	10.57
ln(MV of Equity)*	16863	5.80	2.36	-2.79	2.68	4.07	5.92	7.58	8.83	10.76
Sales Growth*	14422	173.16	497.76	-97.76	1.09	26.83	59.46	130.43	324.23	8397.76
Sales Growth (SIC 2-digits)**	16863	174.93	143.55	-82.65	55.92	89.11	136.25	213.88	333.53	3021.19
Dividend Dummy	16863	0.49	0.50	0.00	0.00	0.00	0.00	1.00	1.00	1.00
IG Rating Dummy	16863	0.38	0.49	0.00	0.00	0.00	0.00	1.00	1.00	1.00
Asset Mat. (firm S/M 1996)*	16829	7.48	37.69	0.21	1.21	2.13	4.23	8.36	15.43	2517.45
Asset Mat. (firm)*	16863	6.78	7.45	0.85	1.42	2.32	4.39	8.43	15.45	232.21
Asset Mat. (firm avg)*	16863	6.59	5.48	1.00	1.68	2.66	4.56	8.32	16.62	24.25
Asset Mat. (SIC 2d avg)**	16863	6.16	4.58	2.11	2.38	2.93	4.38	7.47	16.94	19.55
Fixed-Asset Mat. (SIC 2d avg)**	16863	9.87	4.65	4.43	5.95	7.11	8.12	10.52	20.82	23.91
Fixed-Asset Share (SIC 2d avg)**	16863	0.43	0.20	0.17	0.21	0.25	0.39	0.59	0.78	0.82
Business Plan Horizon (SIC 2d)	16757	4.66	1.00	1.00	3.71	3.99	4.38	4.88	7.11	8.00

Note: This table reports summary statistics for the main variables in issuance dataset (1987-2007). Dollar amounts are expressed in December 2009 US dollars using the Bureau of Labor price index (all urban consumers). All variables are defined in Appendix A.
* To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 1st and 99th percentiles of the yearly distributions of the variables in the sample of issuing firms.
** To mitigate the influence of extreme outliers, the variables have been winsorised at the latest stage with tail cuts at the 5th and 95th percentiles of the yearly distributions of the variables.

The maturity of corporate debt

The first four column of Table E.2 highlight that the duration of firm assets correlate very strongly with the maturity of a firm debt issuance. This is true for both the time varying firm measures and the measures averaged over time by firm or industry. Consistent with a reduction in noise, the statistical significance of the correlation increase when the measure is averaged by unit over time (third and fourth columns). As presented in the fifth column, the correlation is robust to the inclusion of controls

[59] Appendix Appendix A describes the construction of the Dealscan Dummy and of all other variables.

considered in the literature to have explanatory power for debt maturity choice. The sixth column shows that the correlation also holds *within-industry across firms* by controlling for Time×Industry fixed effects. Finally, I show that, by adding firm fixed effects, that the time series variation *within-firm* in the accounting-based investment duration measure does not have much explanatory power for the maturity of a firm's new issuances. The latter is consistent with two hypotheses: the *within-firm* time series variation in accounting-based investment duration measures is very noisy (e.g. due to deviation from simple accounting policies following changes in tax incentives) and if most of the economic heterogeneity in firm's asset maturity is cross-sectional. The latter hypothesis is consistent with Dessaint et al. (2023) which finds that the bulk of the variation in business plan horizon varies only *across firms* and not *within firm*.

Table E.2: Corporate debt issuance maturity and investment duration

The table presents the reduced-form estimates based on linear models of debt maturity choice where the dependent variable is the maturity of the issuance. The issuance dataset is detailed in Appendix E. Covariates are measured at first preceding year-end. Details for variable definition and winsorising rules in Appendix A. Firm financials are measured at previous fiscal year-end and their construction is detailed in Appendix Appendix A. Standard errors reported in parentheses are clustered by firm.

	(1) Iss. Mat.	(2) Iss. Mat.	(3) Iss. Mat.	(4) Iss. Mat.	(5) Iss. Mat.	(6) Iss. Mat.	(7) Iss. Mat.
Asset Mat. (SM1996)	0.00423						
	(0.00303)						
Asset Mat.		0.133***					
		(0.0200)					
Asset Mat. (firm avg)			0.247***		0.131***	0.138***	0.145***
			(0.0209)		(0.0209)	(0.0209)	(0.0401)
Asset Mat. (SIC2 avg)				0.245***			
				(0.0249)			
log(Deal Amount)					0.332***	0.390***	0.368***
					(0.0420)	(0.0435)	(0.0538)
log(MVEq)					0.0431	0.167***	0.0546
					(0.0562)	(0.0619)	(0.0694)
Leverage					-0.529*	-0.296	-1.048***
					(0.271)	(0.264)	(0.361)
EBIT/Assets					1.059***	0.673**	0.435
					(0.326)	(0.278)	(0.339)
M/B ratio					-0.277***	-0.193***	-0.215***
					(0.0703)	(0.0673)	(0.0798)
Div. paying					0.979***	0.780***	0.979***
					(0.154)	(0.150)	(0.200)
IG rating					2.316***	1.953***	2.019***
					(0.195)	(0.190)	(0.258)
constant	7.432***	6.565***	5.834***	5.955***	4.100***	3.144***	4.136***
	(0.1000)	(0.137)	(0.130)	(0.154)	(0.230)	(0.257)	(0.373)
Month-Year FE	–	–	–	–	–	✓	–
Month-Year x Industry FE	–	–	–	–	–	–	✓
No FE	✓	✓	✓	✓	✓	–	–
Observations	16829	16829	16829	16829	16829	16828	13436
Adjusted R^2	0.001	0.024	0.047	0.032	0.132	0.165	0.149

Appendix F UK 2004 Pensions Act

Table F.1: Event-study estimates for the UK Pensions Act of 2004

(a) Differences-in-Differences: Investment

The panel presents the event-study coefficients on the interactions of period dummies and firm-level *Asset Maturity* in the regression where the dependent variable is capital expenditures normalised by lagged total assets based on the yearly panel of Compustat Global UK firms for 2001-2009. The year 2003 acts as the baseline period. Standard errors clustered by firm. Lower-level interactions not reported for ease of presentation. Details for variable definition in Appendix A.

	(1) Capex	(2) Capex	(3) Capex
[2001; 2002] × AssetMat (firm)	-0.0500	-0.0356	-0.0892
	(0.0408)	(0.0400)	(0.0586)
[2004; 2005] × AssetMat (firm)	0.0341	0.0138	0.00999
	(0.0450)	(0.0439)	(0.0633)
[2006; 2008] × AssetMat (firm)	0.307***	0.218***	0.225*
	(0.0668)	(0.0640)	(0.0946)
[2009] × AssetMat (firm)	0.0885	-0.0528	0.0752
	(0.0544)	(0.0549)	(0.0730)
AssetMat (firm)	0.197***	0.0880	0.0917
	(0.0406)	(0.0467)	(0.0527)
constant	5.594***	6.427***	6.414***
	(0.208)	(0.270)	(0.272)
Year FE	✓	✓	–
Industry FE	–	✓	–
Year x Industry FE	–	–	✓
Observations	12613	12613	12589
Adjusted R^2	0.035	0.099	0.092

(b) Differences: Term Spread

The panel presents the event-study coefficients on the period dummies in the regression where the dependent variables are different definitions for the term spread on the UK yield curve for 2001-2009. The year 2003 acts as the baseline period. Robust standard errors. Details for variable definition in Appendix A.

	(1) TS (10y-1y)	(2) TS (20y-1y)	(3) TS (25y-1y)
[2001; 2002]	-0.450***	-0.707***	-0.786***
	(0.100)	(0.133)	(0.143)
[2004; 2005]	-0.812***	-1.013***	-1.043***
	(0.0643)	(0.0954)	(0.106)
[2006; 2008]	-1.002***	-1.289***	-1.409***
	(0.134)	(0.188)	(0.195)
[2009]	2.137***	2.719***	2.785***
	(0.0731)	(0.101)	(0.112)
constant	0.922***	1.038***	0.998***
	(0.0445)	(0.0845)	(0.0967)
Observations	108	108	108
Adjusted R^2	0.777	0.776	0.785

(c)

Internet Appendix

The Internet Appendix is available at this link.