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Quantitative Easing, Investment, and Safe Assets: The Corporate-Bond Lending Channel

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Abstract

We show that Quantitative Easing (QE) stimulates investment via a corporate-bond lending channel. Fed's large-scale purchases of MBS and treasuries creates a vacuum of safe assets, prompting safer firms to invest by issuing relatively "safe" bonds. Using micro-data around QE, we find that QE increases firm-level investment by 7.4 percentage points for firms with bond market access. Results hold excluding the financial crisis period. This growth is financed with senior bonds. We find no evidence of higher shareholders' payouts. The robust findings support a stylized model in which reducing the supply of treasuries lowers "safe" corporate bond yields, stimulating investment.

JEL Classification Numbers: E5, G01, G31, G32, G38.
Keywords: Quantitative Easing (QE), Corporate-Bond Lending Channel, Investment, Safe Assets, Financing.

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1 Introduction

As the Great Recession started to hit the world economy in the second half of 2007, central banks around the world responded by cutting interest rates to historical lows. By December 16, 2008, the Fed Funds Rate in the U.S. had reached 0.17%, compared to 4.24% a year earlier. In this environment of effectively zero interest rates, the U.S. Federal Reserve and other central banks around the world quickly turned to Quantitative Easing (QE) to stimulate the economy. By mid-2014, the balance sheet of the Federal Reserve reached the unprecedented level of $4 trillion (including $1.6 trillion of mortgage-backed securities (MBS) and $2.4 trillion of treasuries) compared to $0.5 trillion prior to QE. Following this massive reduction in the net supply of MBS and treasury securities, the yields on long-term treasury bonds and AAA corporate bonds converged (Figure 1) – in line with investors viewing long-term treasury securities and investment grade corporate bonds as similar in the provision of safety. Notably, we have seen similar dynamics following the Covid-19 crisis: Fed massive QE (in this case even buying corporate debt) increasing its balance sheet by nearly $3 trillion dollars in a very short period of time (from $3.7 trillion at the end of 2019 to $6.4 trillion as of September 30, 2020), and yields on corporate debt increasing and then again decreasing, especially for the relatively safer corporates.

Despite evidence that QE successfully lowered long-term bond yields (e.g., Krishnamurthy and Vissing-Jorgensen, 2011; Wright, 2012; Jakl, 2017; Dell'Ariccia, Rabanal, and Sandri, 2018; Todorov, 2019), the jury is still out on whether the QE-induced reduction in bond yields stimulated corporate investment. The media's view has generally been that QE has hurt the real economy. On October 27, 2015, the Wall Street Journal published an article titled, "The Fed Has Hurt Business Investment", and the Financial Times indicated that QE could have long-lasting harming effects on living standards ("QE Likely to Impair Living Standards for Generations", March 26, 2015). On March 19, 2020, the Wall Street Journal suggested that the junk corporate bond market, which supposedly grew disproportionately because of QE, could exacerbate the economic contraction caused by the pandemic ("The Next Coronavirus Financial Crisis: Record Piles of Risky Corporate Debt"). The media has gone as far as to suggest that firms have used cheaper credit simply to buy back their own stocks, rather than to invest ("The Seeds of the Next Debt Crisis", Financial Times, March 4, 2020).

This view echoes recent academic research arguing that, by lowering interest rates, QE might encourage firms to increase payouts to equity-holders but is detrimental to investment (Acharya and

Plantin, 2019), facilitates access to credit to non-viable firms, so-called "zombie companies" (Acharya et al. 2019), and either hinders (Chakraborty, Goldstein, and MacKinlay, 2020) or has no effect (Rodnyanski and Darmouni, 2017) on corporate investment through a balance sheet channel.

The concept that lower interest rates might simply translate in a capital structure adjustment without consequences for corporate investment is clearly summarized by the following excerpt from a talk that Jeremy Stein (the then Governor at the Federal Reserve Board) gave at The Brookings Institution in 2012 (Stein, 2012a):

> *A risk-neutral firm [...] should take advantage of the cheap long-term debt by issuing bonds. But it is less obvious that [such bond issuance] should exert any influence on its capital spending plans. After all, it can take the proceeds of the bond issue and use these to pay down short-term debt, repurchase stock, or buy short-term securities. [...]. In other words, the negative term premium matters a lot for financing behaviour, but in this stylized world, investment spending is decoupled from the term premium [...].*

Our paper shows – with a stylized model and micro-data around QE – that QE stimulates corporate investment when firms can issue relatively "safe" debt. In our model, the ability of firms to issue safe long-term bonds prompts them to invest more when the reduction in the net supply of long-term treasuries lowers the yield on safe corporate bonds: the corporate-bond lending channel. This occurs because higher quality firms can invest in relatively safe assets (or seen by the market as relatively safe assets) that can be used to back the issuance of new safe corporate debt and lower the cost of debt when long-term treasuries are in short supply.

Our model builds on Stein (2012b), adding three novel ingredients. First, the lending market is segmented into risk-neutral and risk-averse investors (Gennaioli, Shleifer, and Vishny, 2013; Caballero and Farhi, 2018), who are willing to accept a lower return in exchange for safety. This creates a spread between risky and safe debt yields that is decreasing in the net supply of treasury bonds. Second, firms can act as safety providers by issuing safe long-term bonds backed by the minimum value of their assets in all states. As a result, safer firms are able to access the bond market and reduce their cost of capital, while riskier firms are relegated to the risky debt market. Third, the minimum value of a firms' assets depends on its capital expenditures, tying the financial and investment decisions of firms with access to the bond market. Thus, a reduction in the net supply of long-term treasuries increases the return spread between safe and risky debt, prompting firms with bond market access to increase investment while using their built-up capital to back safe debt issuance, further reducing their cost of capital.

In our identification strategy, the unprecedented increase in the demand of MBS and treasuries by the Fed created a vacuum in the market for safe debt instruments, opening an opportunity for companies with access to the bond market to increase capital expenditures by issuing "safe" corporate bonds. Therefore, in line with our model, we should expect investment for firms with access to the bond market to increase relative to firms without access to the bond market during the QE period. A crucial part of our analysis is to show the robustness of our results.

Using micro data, we find robust evidence that investment increases by 7.4 percentage points (pp) for firms with access to the bond market relative to firms without bond market access during the QE period. A common concern is whether the outcome variable of interest was following a parallel trend for both types of firms in the period before QE. In support of parallel trends, we find no indication of a pre-QE trend in investment specific to firms with access to the bond market. We find no effects for the period 2005-2008, and find only significant effects at the end of 2009 (until 2011).

Moreover, we perform many different tests to assess the robustness of our findings. One could be concerned that our investment results are driven by the weakness of the banking sector during 2007-2008, rather than the effect of QE. That is, the increase in investment for the firms with access to bonds following QE is the consequence of less bank credit for firms without access to the bond market, rather than the effect of QE on the ability of the bond-access firms to issue corporate bonds and invest. Importantly, our results hold when we exclude from our sample the years 2007 to 2009, the financial crisis period.

We perform several additional tests to address this concern. We start by noting that in all of our regressions, in addition to firm and year fixed effects, we directly control for the potential effect of the banking sector weakness by including the interactions of an indicator for firms in a lending relationship in the pre-QE period in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers, with year fixed effects. In all our regressions, we also include the interactions of industry and year fixed effects. We find that after adding these fixed effects our investment results become economically stronger and remain statistically significant at the 1% level.

It is worth noting that, after the inclusion of these interaction terms, the R-square of our investment regression and the coefficient on the interaction term increase to 0.489 (compared to the R-squared of 0.156 for the specification without these controls) and 0.079 (compared to 0.074), respectively. In line with Oster (2019) and Altonji, Elder, and Taber (2005), this evidence suggests

that our results are not driven by unobservables.

We also note that when we estimate our investment regression by interacting the bond-market access indicator with year dummies, we find the interactions to be statistically insignificant and economically small for each of the years from 2005 to 2008, being statistically significant and economically sizable in each year from 2009 to 2011. The insignificance of the bond-market access indicator with the 2007 and 2008 dummies suggests that the weakness of the banking sector is unlikely to drive our results. In effect, the banking crisis – which reached its pick with the bankruptcy of Lehman Brothers on September 15, 2008 – started to wind down thanks to the numerous initiatives put in place by the Fed to provide liquidity to the banking system and took a positive turning point on October 3, 2008, when the federal government authorized the $700 billion Troubled Asset Relief Program (TARP) to support the financial sector. Because a significant number of firms in our sample have a fiscal year end date in December, this means that the 2009, 2010, and 2011 interactions are capturing effects on investment that are more than one, two, and three years away, respectively, from when the banking crisis took a positive tuning point, and outside the economic recession.

To further shore up our results, we take advantage of a newly developed measure of distance-to-default tailored to banks (Nagel and Purnanandam, 2020) to assess whether having a lending relationship with a bank near default in the years preceding QE could be responsible for our investment results. We find that our results are largely unchanged, both economically and statistically, when we performed this additional robustness test. Altogether, the robustness tests discussed thus far mitigate the concern that the weakness of the banking sector rather than QE is the driving force for our investment results.

Finally, the banking channel could also affect our results if QE stimulated banks' ability to originate commercial loans. As discussed above, the Fed purchased a sizable amount of MBS to conduct QE. Arguably, banks with a larger exposure to MBS could have benefited more from QE leading to an increase in loan originations (Rodnyanski and Darmouni, 2017; Chakraborty, Goldstein, and MacKinlay, 2020). To control for this channel, we measure the pre-QE MBS exposure of the banks in a syndicated loan relationship with the firms in our sample. We then interact this exposure with either our QE period indicator or year fixed effects and add these interaction terms in our investment regression. We find that these interaction terms are for most part statistically insignificant. More importantly, we find that our investment results hold both economically and statistically in these additional robustness tests. Overall, these findings suggest that our investment results are not driven

by the effect of QE on banks' commercial lending.

In additional robustness tests, we assess whether differences in firm characteristics in the pre-QE period, rather than access to the bond market, could drive our investment results. We follow two different approaches. In the first approach, we add to our base investment regression the interactions of pre-QE firm characteristics with either an indicator for the QE period (i.e., years 2008-2011) or year fixed effects. In the second approach, we match bond and non-bond firms based on relevant characteristics using the propensity score matching and the Abadie and Imbens (2006) matching estimator. We then estimate our investment regressions for the matched samples. Our investment results are robust to either of these approaches, suggesting that pre-QE differences in firm characteristics are not driving our main results. In addition, to the extent that pre QE differences are driven completely or in part by the 2007-2008 banking crisis, matching on these characteristics adds to the robustness tests discussed above in mitigating the concern that weak banks, rather than QE are behind our investment results.

Altogether, the robustness tests discussed here and the additional robustness tests discussed in the body of the paper suggest that QE stimulated investment through the bond-lending channel. Moreover, consistent with our theory that investment grade firms should benefit the most from QE because they can issue a larger amount of safe debt, these firms increased investment by roughly twice as much as speculative grade firms. Notably, this channel appears to be linked to job creation, as the employment growth rate was up between 1.2 and 3 pp for the bond firms relative to the non-bond firms following QE.

In our identification strategy, QE allows firms with access to the bond market to invest more by issuing safer long-term debt at a lower yield. In line with this conjecture, we find significantly large increases in long-term debt and senior bonds and notes for the bond-market access firms relative to the non-bond firms in the QE period, leading to a concomitant increase in leverage for the bond firms. Our evidence also suggests that the bond firms keep their dividend policy unchanged, but decrease stock repurchases relative to the non-bond group in the QE period. These findings indicate that firms in the bond group do not use their higher access to funds in the QE period to relatively increase payouts to equity holders. We likewise find that interest expenses decreased by nearly 1 pp for the bond firms following QE, consistent with the evidence that QE was successful in lowering corporate bond yields. These findings help further validate our identification strategy that QE opened up an opportunity for companies with access to the bond market to increase capital expenditures by issuing

relatively "safe" corporate bonds and other long-term debt securities.

Our results further reveal that QE increased the value and profitability of firms with bond market access. Altogether, our empirical findings identify the corporate bond market as an important channel for the transmission of monetary policy into the real economy (firm investment).

In addition to the literature discussed above, our paper is also related to a broader literature on the effect of government borrowing and monetary policy on bank lending and on corporate policies. Swanson (2011), Krishnamurthy and Vissing-Jorgensen (2011, 2012), Wright (2012) and Jakl (2017), Dell'Ariccia, Rabanal, and Sandri (2018), among others, find that changes in the supply of treasuries affect corporate yields. Todorov (2019) finds a similar effect focusing on the European Central Bank's corporate sector purchase program. Dell'Ariccia and Marquez (2013) and Adrian, Estrella, and Shin (2019) further analyze how monetary policy affects risk taking incentives and corporate credit supply of financial institutions.

Focusing on corporate policies, Lo Duca, Nicoletti, and Martinez (2016) find a positive relation between the asset purchase activities by the Fed during QE and corporate bond issuances. Foley-Fisher, Ramacharan, and Yu (2016) show that firms dependent on long-term debt were able to tap the long-term debt market in 2012 (when the effect of the Fed's maturity extension program was strongest).[1] Using data for public firms over the last century, Graham, Leary, and Roberts (2014) document a negative relation between government debt and corporate debt and investment. Relatedly, Badoer and James (2016) document a negative relation between the maturity of treasury securities and the maturity of corporate debt. A related literature find that the impact of monetary policy is mitigated when banks have accessibility to wholesale funding (Choi and Choi, 2020) or are less subject to political pressure (Morck, Yavuz, and Yeung, 2019). Further, financial, and non-financial firms can attenuate the effect of monetary policy through trade credit (Biais and Gollier, 1997) and equity issuance (Levine, Lin, and Xie, 2016; McLean and Zhao, 2014).

Our paper complements this literature by showing that QE boosted corporate investment by allowing higher quality firms to issue relatively "safe" corporate bonds and notes at a lower yield: the corporate-bond lending channel. To our knowledge, our study is the first to identify the corporate bond market as an important channel for the transmission of monetary policy on real outcomes (such

[1]The effect of QE on market liquidity and the auction channels through which the Fed conducted its QE program are analyzed in Christensen and Gillan (2018) and Song and Zhu (2018), respectively.

as firm investment and employment) (for the bank lending channel, see, e.g., Kashyap and Stein (2000) and Jiménez et al. (2012)). Moreover, it also shows the limits of QE before the Covid-19 crisis as it mainly benefited top quality firms, and hence the potential need to directly pursue QE via large-scale asset purchases of *lower quality* firms as done by the Fed starting in early May 2020.

Our model is related to the theoretical literature on the role of firms and intermediaries as providers of safe and liquid securities. Stein (2012b) develops a model in which banks exploit the additional monetary services that safe claims generate to risk-neutral households by producing some amount of riskless debt, thereby reducing financing costs. The author shows that banks create an excessive number of safe claims as they do not internalize the fire sales cost in bad states of the world. Krishnamurthy and Vissing-Jorgensen (2015) examine how the supply of treasury affects bank lending in a model where the demand for safe securities by the households generates a safety premium, which banks exploit by issuing safe and liquid claims on risky and illiquid assets. They show that an increase in supply of treasury bonds crowds out bank loans.

Greenwood, Hanson, and Stein (2010) study the effect of the government debt maturity structure on the maturity of corporate bonds. They find that an increase in government funding through long-term debt increases the yield on long-term corporate bonds, leading firms to fill the gap by issuing more short-term debt. In an economy where safe assets are in zero net supply and the market is segmented into risk-neutral and infinitely risk-averse agents, Caballero and Farhi (2018) show that a shortage of safe assets may emerge at the zero lower bound, giving rise to a deflationary safety trap. In this environment, QE has a real effect on output by stimulating aggregate demand. We contribute to this literature by showing that a decrease in the net supply of treasuries increases corporate investment, but only of firms with access to the corporate bond market: the bond-lending channel.

The rest of the paper is organized as follows: The theory is in Section 2. Section 3 presents data and main empirical findings. Robustness tests are discussed in Section 4. Section 5 concludes.

2 On the Mechanics of the Bond-Lending Channel

2.1 A Simple Model of Safety Provision

We consider a simple model that lasts for three dates $t = 0, 1, 2$. The economy is populated by the government and a continuum of firms, infinitely risk-averse investors, and risk-neutral investors,

each with mass one.

Each firm is endowed with a project that yields output $y(\omega, K)$ at $t = 2$ if an investment K is made at $t = 0$, where $\omega \in \{H, M, L\}$ is the performance of the project. With probability p, the performance is high ($\omega = H$) and output equals $y(H, K) = K^{\alpha}$, where $\alpha \in (0, 1)$. With probability $(1 - p) q$, the performance is medium ($\omega = M$) and output equals $y(M, K) = \frac{K}{q}$. With probability $(1 - p)(1 - q)$ the performance is low ($\omega = L$) and output equals $y(L, K) = 0$. Project performance is i.i.d. across firms such that there is no aggregate uncertainty.

At the beginning of $t = 1$ agents receive a public signal $s \in \{\{H\}, \{M, L\}\}$ that reveals the realization of either state H ($s = \{H\}$), or states M or L ($s = \{M, L\}$). After the signal is observed by all agents and before $t = 2$, firms can liquidate up to a fraction $\ell \in [0, 1]$ of the investment for a value of ℓK. If a fraction $f \in [0, \ell]$ is liquidated, the firm receives fK and the project yields $y(\omega, (1 - f) K)$ at $t = 2$. The parameter ℓ captures the safe portion of the assets when $s = \{M, L\}$.

The firm turns to investors in order to finance the project. The project can be financed with either riskless bonds or risky debt that mature at $t = 2$, with endogenous rate of returns respectively given by r and i. Riskless bonds pay one unit of the consumption good with certainty, whereas risky debt pays one unit if $s = \{H\}$ and nothing if $s = \{M, L\}$.[2] Thus, firms have access the safe bond market only if a positive fraction of their assets is absolutely safe ($\ell > 0$).

The main friction of the model is segmentation in the lending market. Each investor is endowed with one unit of the one good in the economy. They can either consume their endowment at $t = 0$, or invest part of it in financial assets and consume the proceeds at $t = 2$. The utility function of risk-neutral investors is linear in consumption and given by

$$U^n = C_0^n + \beta E\left[C_2^n\right], \tag{1}$$

where $\beta \in (0, 1)$ is the discount factor. The utility function of infinitely risk-averse investors is

$$U^a = C_0^a + \theta \min_s C_{2,s}^a, \tag{2}$$

where $\theta \in (\beta, 1)$ is the discount factor. The assumption that $\theta > \beta$ reflects the idea that risk-intolerant

[2] As will be clear in the equilibrium analysis, there is no loss of generality in assuming that risk debt pays nothing if $s = \{M, L\}$.

investors are more willing to postpone consumption in exchange of absolute safety.

To close the model, we specify the exogenous components of the supply of riskless bonds. The government offers safe treasury bonds at $t = 0$ that promise the riskless rate of return r at $t = 2$. The net supply of treasury securities (overall supply net of securities held by the Fed) equals s_b^g.

2.2 Equilibrium and Empirical Implications

We start with the investors' maximization problems. Infinitely risk averse investors purchase financial assets only if they are absolutely safe. It is easy to show that their demand for riskless bonds is given by

$$d_b^a = \begin{cases} 1+r, & \text{if } 1+r > \theta^{-1} \\ [0, 1+r], & \text{if } 1+r = \theta^{-1} \\ 0, & \text{if } 1+r < \theta^{-1} \end{cases}. \tag{3}$$

Risk-neutral investors may purchase either safe or risky financial assets, depending on their returns. Given their linear utility function, it is easy to verify that their demand for riskless bonds is given by

$$d_b^n = \begin{cases} 1+r, & \text{if } 1+r > \max\left\{\beta^{-1}, p(1+i)\right\} \\ [0, 1+r], & \text{if } 1+r = \max\left\{\beta^{-1}, p(1+i)\right\} \\ 0, & \text{if } 1+r < \max\left\{\beta^{-1}, p(1+i)\right\} \end{cases}, \tag{4}$$

whereas their demand for risky debt equals

$$d_d^n = \begin{cases} 1+i, & \text{if } p(1+i) > \max\left\{\beta^{-1}, 1+r\right\} \\ [0, 1+i], & \text{if } p(1+i) = \max\left\{\beta^{-1}, 1+r\right\} \\ 0, & \text{if } p(1+i) < \max\left\{\beta^{-1}, 1+r\right\} \end{cases}. \tag{5}$$

We now turn to firms' maximization problems. Each firm's expected profit is given by:

$$\Pi(K, \phi) = \left\{K^\alpha + (1-p)K - Kp(1+i)\right\} + \phi K\left[p(1+i) - (1+r)\right], \tag{6}$$

where the first term on the right-hand side represents the NPV of the project if it is fully financed with

risky debt, and the second term is the reduction in financing costs resulting from issuing a fraction ϕ of safe bonds.

Each firm solves:

$$\max_{K,\phi\geq 0} \Pi(K,\phi) \tag{7}$$

subject to

$$\phi K(1+r) \leq \ell K.$$

The solution to this problem (K^*, ϕ^*) is characterized as follows. For $p(1+i) \geq 1+r$,

$$p\alpha K^{*\alpha-1} + 1 - p = (1-\phi^*)\, p(1+i) + \phi^*(1+r) \tag{8}$$

$$\phi^* = \begin{cases} (1+r)^{-1}\ell, & \text{if } p(1+i) > 1+r \\ [0, (1+r)^{-1}\ell], & \text{if } p(1+i) = 1+r \end{cases}. \tag{9}$$

For $p(1+i) < 1+r$,

$$p\alpha K^{*\alpha-1} + 1 - p = p(1+i) \tag{10}$$

$$\phi^* = 0. \tag{11}$$

Each firm's supply of bonds equals $s_b^f = \phi^* K^*(1+r)$, while the supply of risky debt equals $s_d^f = (1-\phi^*)K^*(1+i)$. The market clearing conditions imply

$$s_b^f + s_b^g = d_b^a + d_b^n \text{ (Safe Debt Market)} \tag{12}$$

$$s_d^f = d_d^n \text{ (Risky Debt Market)}. \tag{13}$$

Note that because of the safety constraint, the supply of risky debt by firms is always positive in equilibrium. As a result, $p(1+i) \geq \max\left\{\beta^{-1}, 1+r\right\}$, since otherwise the demand for risky debt is zero and the market does not clear. Moreover, because $\alpha K^{\alpha-1} > 1$ only if $K < 1$, it follows that $K^* < 1$. This implies that $p(1+i) = \beta^{-1}$, as $p(1+i) > \beta^{-1}$ yields a demand for risky debt greater than the supply, $d_d^n = 1+i > (1-\phi^*)K^*(1+i) = s_d^f$. Therefore, we must have $p(1+i) = \beta^{-1} \geq 1+r$

in equilibrium.

In addition, there exists an equilibrium with $\beta^{-1} \geq 1 + r > \theta^{-1}$ if and only if the supply of treasury bonds by the government is large enough, but not too large. When $\beta^{-1} \geq 1 + r > \theta^{-1}$, the demand for bonds by infinitely risk-averse investors is $d_b^a = 1 + r$, while that by risk-neutral investors equals $d_b^n \in \left[0, \beta^{-1}\right]$, with $d_b^n = 0$ for $\beta^{-1} > 1 + r$. The supply of bonds by firms is $s_b^f = \phi^* K^* (1 + r)$, where $\phi^* \in [0, (1 + r)^{-1}]$ with $\phi^* = (1 + r)^{-1}$ for $\beta^{-1} > 1 + r$. Because the net demand for bonds $\eta(r) \equiv d_b^a + d_b^n - s_b^f$ is positive and increasing in r, there is a price for bonds that clears the market if and only if government supply of bonds is such that $\eta\left(\theta^{-1} - 1\right) < s_b^g \leq \eta\left(\beta^{-1} - 1\right)$. In equilibrium, the yield spread of risky debt over bonds $p(1 + i) - (1 + r)$ is decreasing in the net supply of treasury bonds by the government.

Finally, an equilibrium with $\beta^{-1} > 1 + r = \theta^{-1}$ exists so long as the net supply of bonds by the government is low. When $\beta^{-1} > 1 + r = \theta^{-1}$, the demand for bonds by infinitely risk-averse investors is $d_b^a \in \left[0, \theta^{-1}\right]$, whereas that of risk-neutral investors is $d_b^n = 0$. The supply of bonds by firms is $s_b^f = K^*$. Thus, the market for bonds clears if and only if the supply of government bonds is such that $s_b^g \leq \theta^{-1} - K^* = \eta\left(\theta^{-1} - 1\right)$.

We formalize these results in the propositions below.

Proposition 1 (Equilibrium) *There exists an equilibrium if and only if the net supply of treasury bonds is not too large ($s_b^g \leq \eta\left(\beta^{-1} - 1\right)$). The following is true in equilibrium:*

(i) If the net supply of treasury bonds is low ($s_b^g \leq \eta\left(\theta^{-1} - 1\right)$), the market clearing returns satisfy $\beta^{-1} = p(1 + i) > 1 + r = \theta^{-1}$ and the return spread ($p(1 + i) - (1 + r)$) is maximal.

(ii) If the net supply of treasury bonds is high ($s_b^g > \eta\left(\theta^{-1} - 1\right)$), the market clearing returns satisfy $\beta^{-1} = p(1 + i) \geq 1 + r > \theta^{-1}$ and the return spread ($p(1 + i) - (1 + r)$) is decreasing in the net supply of treasury bonds (s_b^g).

Proposition 2 (Bond-Lending Channel) *The following is true in equilibrium:*

(i) Investment (K^*) is decoupled from the return spread ($p(1 + i) - (1 + r)$) if the net supply of treasury bonds is low ($s_b^g \leq \eta\left(\theta^{-1} - 1\right)$) or firms do not have bond market access ($\ell = 0$).

(ii) If the net supply of treasury bonds is high ($s_b^g > \eta\left(\theta^{-1} - 1\right)$) and firms have bond market access ($\ell > 0$), then investment (K^*) and the ratio of bonds to total debt (ϕ^*) decrease in the net

supply of treasury bonds, while interest expenses ($(1-\phi^*)\,p\,(1+i)+\phi^*\,(1+r)-1$) increase. Moreover, the magnitude of these effects is increasing in ℓ (higher for safer firms).

Propositions 1 and 2 shed light on several important aspects of QE. In summary, a decrease in the net supply of treasury bonds reduces the bond yield (r), raising the spread relative to risky debt ($p\,(1+i)-(1+r)$. As a result, firms with bond market access are able to reduce their average cost of capital by boosting investment (K^*) and using the additional capital spending to back the issuance of safe bonds. This reaction is stronger for safer firms (investment grade rating), which experience a greater increase in the proportion of safe bonds to total debt (ϕ^*) and a sharper decrease in interest expenses ($(1-\phi^*)\,p\,(1+i)+\phi^*\,(1+r)-1$). Meanwhile, investment and financial policies of firms without bond market access are decoupled from changes in the net supply of treasury bonds.

3 Empirical Results

3.1 Data and Variable Construction

We obtain our data from several sources: (1) firm level data is from COMPUSTAT; (2) syndicated loan data is from DealScan; (3) bank level data is from SNL Financial; (4) data on debt composition is from Capital IQ; (5) the Nagel-Purnandam's bank's distance-to-default measure is from Amiyatosh Purnanandam's website (http://webuser.bus.umich.edu/amiyatos/research.htm); (6) aggregate data on treasury and mortgage backed securities held by the Federal Reserve and corporate bond yields are from the FED Database; (7) data on Treasury bond yields are from the Department of the Treasury; (8) the VIX Index is the annual CBOE Volatility Index from the CBOE website. We restrict our sample period to the years 2004-2011; an equal split between the pre-QE period (2004-2007) and the during-QE period (2008-2011). We exclude firm-year observations for which assets are less than $50 million.

Our main dependent variable is Investment, defined as the ratio of capital expenditures (COMPUSTAT's item capx) to lagged property, plant, & equipment (COMPUSTAT's item ppent). Our control variables includes the following company characteristics: (1) Size is the natural logarithm of sales (COMPUSTAT's item sale); (2) Tobin's q is the ratio of market assets to book assets; (3) Profitability is the ratio of earnings before interest, taxes, depreciation and amortization (COMPU-

STAT's item oibdp) to book assets; (4) EarningsVolatility is the ratio of the standard deviation of earnings before interest, taxes, depreciation and amortization using 4 years of consecutive observations to the average book value of total assets estimated over the same time horizon; (5) Tangibility is the ratio of property, plant, & equipment to book assets. This selection of control variables comes from some of the most cited corporate finance papers, including Titman and Wessels (1988), Rajan and Zingales (1995), Barclay and Smith (1995), Baker and Wurgler (2002), Johnson (2003), MacKay and Phillips (2005), Faulkender and Petersen (2006), Flannery and Rangan (2006), Billett, King, and Mauer (2007), Lemmon, Roberts, and Zender (2008), Byoun (2008), and Sibilkov (2009).

We also analyze the following corporate policies: (1) Employment is the growth in the number of employees defined as the ratio between number of employees at t (COMPUSTAT's item emp) minus the number of employees at $t-1$ to the number of employees at $t-1$; (2) Leverage is the ratio of total debt (COMPUSTAT's items dltt + dlc) to market assets (COMPUSTAT's items at + prcc_f $\times$ csho $-$ ceq $-$ txditc); (3) Senior Bonds & Notes/Debt is the ratio of senior bond and notes (from Capital IQ) to total debt; (4) Long-Term Debt/Debt is the ratio of debt maturing in more than one year (COMPUSTAT's item dltt) to total debt; (5) Interest Expenses/Debt is the ratio of interest expenses (COMPUSTAT's item xint) to total debt.

Table 1 reports sample averages for the main variables used in the paper, separately for the bond-access and non-bond access firms. The unconditional difference in mean test in Table 1, column 5 shows that bond and non-bond firms are different in terms of corporate policies and control variables. As discussed by Imbens and Wooldridge (2009), p-values are not reliable with large samples because they would lead to overly rejecting the null hypothesis that the difference in means between two samples are equal to zero unless this difference is exactly zero. These authors suggest standardizing the variables separately for the two groups in order to obtain a scale-free version of the variables and then estimate the difference between the standardized variables.

As column 6 shows, with the exception of Employment all the others standardized differences in mean are above 0.25, a generally accepted threshold to reject the null hypothesis that standardized differences are equal to zero (Rubin, 2001), suggesting that differences between bond and non-bond firms persist with the standardized variables.

The tests in Table 1, columns 5 and 6 are unconditional differences between bond and non-bond firms. To assess the relation between firm characteristics and bond market access in a conditional

framework, we estimate a linear probability model in which the dependent variable is a time-varying indicator for firms with access to the bond market and the set of control variables include all the variables in Table 1 (size, Tobin's q, profitability, earnings volatility, tangibility, investment, employment, leverage, interest expenses, senior bonds & note, long-term debt), as well as firm and year fixed effects. Column 7 reports the coefficient estimates from this regression, together with standard errors clustered at the firm level.

This regression-based analysis suggests that firms with access to the bond market differ from firms that do not have access to such market because they are larger, have higher leverage, more senior bonds and notes, and more long-term debt. However, in this regression framework, we do not find any significant relation between whether a firm has access to the bond market and Tobin's q, profitability, earnings volatility, tangibility, investment, employment, and interest expenses. Altogether, these regression based findings suggest that while bond and non-bond firms differ in terms of size and financing, they are similar in several other characteristics, such as Tobin's q and profitability, that are typically associated with a firm's propensity to invest and thus could play an import role in our investment regressions.

To mitigate the risk that differences between bond and non-bond firms could affect our results, in all of our regressions we control for firm characteristics and we account for time invariant unobservable differences with firm fixed effects. As we discuss later, we further perform a series of robustness tests in which we account for pre-QE differences between bond and non-bond firms. For example, we match the two groups based on relevant characteristics using propensity score matching and nearest-neighborhood matching and find that our main results hold.

Table 1 About Here

3.2 The Effects of QE on Investment: Evidence on the Bond-Lending Channel

In this section, we study whether investment decisions changed for firms with access to the bond market relative to non-bond firms following QE. We carry out estimations according to the following

model:

$$Investment_{i,t} = \beta_1 \left(Bond\ Market\ Access_i \times QE\ Period \right) + \mathbf{Controls}'_{i,t}\gamma + y_i + z_t + \epsilon_{i,t}, \quad (14)$$

where $Investment_{i,t}$ is the investment of firm i in year t, $Bond\ Market\ Access_i$ is an indicator that equals 1 if firm i has a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007, the year before QE started, $QE\ Period$ is an indicator that equals 1 if year t belongs to fiscal years 2008 – 2011, and y_i and z_t are respectively firm and year fixed-effects. Standard errors are clustered at the firm level. Tables 2 reports results from investment regressions based on equation (14), for the base sample period 2004 – 2011, and for two additional sample periods excluding the financial crisis: 1) 2004 – 2006 (pre) and 2010 – 2012 (post); 2) 2005 – 2006 (pre) and 2010 – 2011 (post). Our variable of interest is the interaction between the Bond Market Access indicator and the QE Period indicator. Across all four estimations in Table 2, for the base sample period, the coefficient estimate on the interaction term is positive, highly significant and economically large. Column (3) presents the results with all the standard controls variables, firm fixed-effects, and time-fixed affects. The coefficient of interest is economically sizable and statistically significant at the 1 percent: firms with bond market access increased investment by 7.4 pp following QE (or by 35.4% relative to the average investment of 20.9% for bond firms).

In column (4), we present results controlling for lending relationships with troubled banks in the years leading to the banking crisis of 2007, as well as the interactions of industry (2-digit SIC codes) with year fixed effects. This specification reduces the concern that our results are driven by firms that relied on "weak-lenders" and, as such, were adversely affected around the time of QE by the banking crisis. Specifically, we use indicators for firms that relied on Lehman Brothers, Merrill Lynch, or Bear Stearns as their lead-loan arrangers for syndicated loans originated or still outstanding in 2004-2007 (as reported by DealScan). We interact these weak lender indicators with year fixed effects. We also include the interactions of industry and year fixed effects, where industry fixed effects are based on the 2-digit SIC code.

We find that after adding the interactions of the weak lender and industry indicators with year fixed effects to the investment regression, the coefficient on Bond Market Access × QE Period increases to 0.079 (from 0.074 in column 3) and remains statistically significant at the 1% level. We also note

that after the inclusion of these interaction terms, the R-2 of our investment regression increases to 0.489 (compared to the R-2 of 0.156 for the specification with only firm and year fixed effects, column 7). In line with Oster (2019) and Altonji, Elder, and Taber (2005), this evidence suggests that our results are not driven by unobservables.

Importantly, Table 2, columns 5 and 6 show that our investment results hold for the two samples excluding the financial crisis years 2007 to 2009. The coefficients on the interaction terms remain sizable (and both statistically significant at the 1% level) indicating that investment increased for the bond firms relative to the non-bond firms during the QE period by 5.3 pp (column 5) and 7.1 pp (column 6) (or by 25.4% and 34% relative to the average investment of 20.9% for bond firms), respectively. These findings significantly mitigate the concern that our results could be driven by the banking crisis channel as opposed to the Fed QE intervention we are interested in. Later we discuss several robustness tests, which further contribute to mitigate the concern that our investment results could be driven by the banking crisis channel.

TABLE 2 ABOUT HERE

In Table 3, we re-estimate our investment regression by replacing the QE Period indicator with dummies for each year from 2005 to 2011, with 2004 being the omitted case (e.g., Autor, 2003; and Gormley and Matsa, 2011). The advantage of this specification vis-a-vis our base line estimation is that it allows us to link the change in investment to the different stages of QE, as well as identifying any potential trend in investment for bond firms prior to QE. Focusing on column 7, specification with all control variables and interactions of weak lender and industry indicators with years fixed effects, we find that the interactions of the bond market access indicator with year dummies are all insignificant and economically small for the years from 2005 to 2008, but become economically sizable and statistically significant at the 1% level for each of the years from 2009 to 2011.

The pattern documented in column 7 is consistent with the increase in investment for bond-market access firms being a consequence of QE rather than the effect of a pre-QE trend in the investment for the bond firms or some other channels. In fact, the coefficients on the interactions between the bond market access indicator and the dummies for the years 2005, 2006, and 2007 are all economically small and statistically insignificant, suggesting that our investment results are not driven by a violation of

the parallel trend assumption.

Notably, the coefficient on the interaction of the bond market access indicator with the 2008 dummy is positive, but economically small and statistically insignificant. This is further reassuring because QE only started on November 25, 2008 and given that a significant number of firms have a fiscal year end month in December (for 2008, 72% of the firms in our sample have a fiscal year end month in December), our sample only includes a limited number of firms that could have benefitted from the effect of QE already in 2008. The effect of QE on investment started to be strong in 2009, when QE was fully in effect. Figure 2 provides a visual representation of these patterns for the years 2005 to 2011, together with ninety five percent confidence intervals.

TABLE 3 ABOUT HERE

FIGURE 2 ABOUT HERE

We further note that the insignificance of the interactions of the bond group indicator with the 2007 and 2008 dummies provides additional evidence that the weakness of the banking sector is unlikely to be a main driver of our investment results. The banking crisis of 2007-2008, which reached its pick with the bankruptcy of Lehman Brothers on September 15, 2008, had started to wind down by the end of 2007 thanks to the numerous initiatives put in place by the Fed since August 10, 2007 to provide liquidity to the banking system and took a positive turning point on October 3, 2008, when the federal government authorized the $700 billion Troubled Asset Relief Program (TARP) to support the financial sector. Because the vast majority of firms file their annual reports in December, this means that for the 2009, 2010, and 2011 interactions are capturing effects on investment that are more than one year, more than two years, and more than three years away, respectively, from when the banking crisis took a positive tuning point.

3.2.1 Additional Robustness Tests

In all of our regressions, we include the interactions of week lender and industry indicators with year fixed effects to control for weakness of the banking sector in 2007-2008. As we have noted, the evidence that the interactions of the bond market access dummy with the 2007 and 2008 indicators

are both economically and statistically significant is further reassuring that our investment results are driven by QE rather than the weakness of the banking sector in 2007-2008 or other channels. More importantly, perhaps, Table 2, columns 5 and 6 show that our investment results hold when we exclude from the sample the years 2007 to 2009. In this section, we discuss additional robustness tests that further mitigates the concern that our results could be driven by a channel other than the effect of QE on firms with bond market access.

First, we take advantage of a newly developed measure of distance-to-default tailored to banks (Nagel and Purnanandam, 2019) to assess whether having a lending relationship with a bank near default in the years preceding QE could be responsible for our investment results. To be specific, we interact the Nagel-Purnanadam's distance-to-default in 2007 (the year before QE began) and 2008, $BankDD_{2007}$ and $BankDD_{2008}$, respectively, for the lead arrangers of the syndicated loans in DealScan to the firms in our sample with either the QE Period indicator or year fixed effects. We then add these interaction terms to our base investment regression specification in Table 2, column 4.

As shown in Table 4, having a relationship lending in 2007 with a "strong" bank (high distance to default) helps borrowers invest more in the years from 2008 to 2011. For example, this is suggested by the significantly positive coefficients on the interaction of $BankDD_{2007}$, with dummies for the years 2009 to 2011 (columns 2 and 4). Most importantly, however, the coefficient on the interaction term of interest suggests that investment increased by a sizable 7.1 pp for the bond firms relative to non-bond firms during QE (statistically significant at the 1% level), compared to the 7.9 pp in our base specification in Table 2, column 4. Overall, this robustness test provides additional evidence that QE rather than the weakness of the banking sector is the driving force for our investment results.

TABLE 4 ABOUT HERE

Our next robustness test checks if the increase in investment of firms with bond market access resulted from greater access to long-term credit or from better financing terms. If only the former were true, then one would be concerned that our results could still be driven by the banking crisis channel disproportionately affecting firms without bond market access or a possible effect of QE on firms that depend for their funding on long-term debt. Table 5 shows regression results when we add several

measures of long-term debt issuance and long-term debt outstanding (either time varying or fixed in 2007) interacted with the QE period indicator or indicators for each of the years from 2008 to 2011.

As documented by Foley-Fisher, Ramcharan, and Yu (2016), the Fed's maturity extension program dated September 21, 2011 allowed firms dependent on long-term debt to tap the long-term debt market, leading to an increase in property, plant, and equipment holdings for these firms. However, our QE period includes the years 2008 to 2011 (mainly encompassing the first and second round of QE), and as such the maturity extension program could have operated through the long-term dependence channel in our analysis only in 2011, in line, for example, with the significantly positive coefficient on Long-Term Debt/Total Debt > median 2007 × QE Period in Table 5, Panel A, column 8, or the significantly positive coefficient on Long-Term Debt/Total Debt > median 2007 × 2011 in Table 5, Panel B, column 8.

More importantly, the estimated coefficients of interest are always very sizable, ranging from 7.7 pp to 9.2 pp (always statistically significant at the 1% level) in Table 5, Panel A, compared to 7.9 pp in our baseline regression in Table 2, column 4, suggesting that the potential greater access to long-term credit for the bond firms through bank lending cannot explain our results. Instead, our findings are consistent with our theory that the bond-lending channel arises from safer firms being able to invest more and use built-up capital to issue safer and cheaper long-term debt.

Table 5 About Here

The banking channel could also affect our results if QE stimulated banks' ability to originate commercial loans. As discussed above, the Fed purchased a sizable amount of MBS and treasuries to conduct QE. Arguably, banks with a larger exposure to MBS and treasuries could have benefitted more from QE leading to an increase in loan originations (e.g., Rodnyanski and Darmouni, 2017; Chakraborty, Goldstein, and MacKinlay, 2020).

To assess this channel, we measure the pre-QE MBS and treasury exposures of the lead lender in a syndicated loan relationship with the firms in our sample for loan originated in 2007 or earlier but still outstanding in 2007. We obtain the bank level exposure data from the SNL Financial database, while syndicated loan information is from DealScan. We scale these variables with either total securities held by the lender or the lender's total assets. We then interact these exposure measures with year

fixed effects and add these interaction terms to our investment regression.

As shown in Table 6, we find that our investment results are practically unchanged in these additional robustness tests, with the coefficient on the interaction term of interest ranging from 0.078 to 0.079 (depending on the model specification), compared to 0.079 in our base estimation in Table 2, column 4, and always statistically significant at the 1% level. We also find that the interactions of our MBS and treasury exposure measures with the year fixed effects are all statistically insignificant. The only exception is the interaction of the ratio of the sum of MBS and treasuries to total securities with the year 2007 dummy, which is negative and statistically significant at the 10% level, suggesting that a high exposure to treasuries and MBS for syndicated lenders led to a reduction in investment for the borrowing firm in 2007.

Overall, these findings suggest that our investment results are not driven by the effect of QE on banks' commercial lending and are perhaps unsurprising in light of the evidence in Rodnyanski and Darmouni (2017) and Chakraborty, Goldstein, and MacKinlay (2020) who document that QE led to an increase in mortgage originations for banks exposed to MBS, but not to an increase in commercial loan originations, which are the typical bank funding source for corporate investment.

Table 6 About Here

Is it possible that pre-QE differences in firm characteristics rather than the QE program are the reason that investment increased for firms with access to the bond market channel following QE? To address this concern, we create indicators for large firms, high Tobin's q, high profitability, high earnings volatility, and high tangibility. For example, the large firm dummy is equal to 1 for firms with size above the sample 80th percentile in 2007. We define similarly all the other firm characteristic indicators. These firm characteristic indicators resemble the bond market access indicator, which takes the value of 1 for firms with a bond rating on 2007. Next, we interact these indicators with the QE period indicator and add these interactions to our investment regression.

Table 7 reports these results. Focusing on column 6 (specification with the full set of interaction terms), we note that the coefficient on our interaction term of interest remains significantly positive at the 1% level and economically very sizable, albeit smaller than the coefficient for our base estimation in Table 2, column 4: 0.066 vs. 0.079.

Column 6 also shows that the interactions of Large Firm and High Tobin's q with the QE period indicator are both statistically insignificant. On the other hand, the coefficient on High Profitability × QE Period is significantly positive, suggesting that internal funds are important for investment following the 2007 crisis. Finally, the interactions of High Earnings Volatility and High Tangibility with the QE period indicator are both negatively significant, suggesting that cash flow uncertainty and high level of tangible assets led to less investment following the crisis. Overall, the evidence in Table 6 suggests that while some pre-QE firm characteristics are important for investment after the 2007-2008 crisis, they are not the reason why investment increased for firms with access to the bond market during the QE period.

TABLE 7 ABOUT HERE

In addition to the interaction approach in Table 7, we also match bond and non-bond firms based on relevant characteristics using the propensity score matching and the Abadie and Imbens (2006) nearest neighborhood matching estimators. Our matching variables include those statistically different between bond and non-bond firms in our regression-based differences reported in Table 1, column 7: Size, Leverage, Senior Bonds & Notes/Debt, and Long-Term Debt/Debt.

Table 8, columns 3 and 8, for the propensity score matching and the Abadie and Imbens (2006) nearest neighborhood matching estimators, respectively, shows that in the matched samples bond and non-bond firms appear different across several dimensions based on the unconditional differences in mean. However, as discussed, Imbens and Wooldridge (2009) advice against using unconditional means because in large sample this leads to overly reject the null hypothesis of no statistical difference and suggest using standardized differences instead. As columns 4 and 9 show, these standardized differences are all below 0.25, indicating that we cannot reject the null hypothesis that the standardized differences are equal to zero (Rubin, 2001). We also find no indication of differences between bond and non-bond firms in our regression-based approach in columns 5 and 10.

TABLE 8 ABOUT HERE

Next, we estimate our investment regressions for the matched samples. Table 9 shows that our investment results are robust with both propensity score matching and the Abadie and Imbens (2006)

nearest neighborhood matching samples. For example, column 2 shows that investment increased by 7.7 pp in the matched sample (statistically significant at the 1% level), compared to 7.9 pp in our base estimation in Table 2, column 4. The documented increase in investment is economically smaller but still a very sizable 5 pp (statistically significant at the 1% level) for the Abadie-Imbens matched sample (column 4).

TABLE 9 ABOUT HERE

In line with the findings in Table 6, the combined evidence in Tables 8 and 9 suggests that the QE program conducted by the Fed, and not pre-QE differences between bond and non-bond firms, is the reason that investment increased for firms with bond market access following QE. We further note that to the extent that these pre-QE differences are driven completely or in part by the effect of the banking crisis in 2007, matching on these characteristics helps mitigate the concern that weak banks, rather than QE are behind our investment results, which add to the series of robustness tests discussed above to rule out the effect of the banking crisis.

Is it possible that the stock market uncertainty concomitant to the QE program is driving our investment results? To address this concern, we use the natural logarithm of the annual VIX Index from the Chicago Board Options Exchange (CBOE) and a continuous version of our QE period indicator defined as either the natural logarithm of the sum of MBS and treasuries held by the Fed at the end of each year or the ratio of the sum of MBS and treasuries held by the Fed to GDP. We then interact these variables with our bond market access indicator and re-estimate our investment regression. The advantage of using interactions with continuous VIX and QE variables is that they reflect stock market uncertainty and QE program intensity as they vary over time and thus provide a suitable setting to identify the effect of QE relative to stock market uncertainty.

Table 10, Panel A reports results from these estimations. Across all four estimations, the coefficient on the interaction term of interest is always positive and statistically significant at the 1% level. The effect is also economically very large. For example, the coefficient of 0.691 for the variable of interest in column 2 suggests that a 1 pp point increase in the ratio of MBS & Treasuries Held by Fed/GDP translated into a 0.691 pp higher investment for the bond group relative to the non-bond group. The interaction of the log of the VIX index with the bond market access indicator is also significantly positive, indicating that firms with access to the bond market were able to resort to the bond market

to borrow and invest when the implied stock market volatility was highly.

In columns 3 and 4, we re-estimate the models in columns 1 and 2 after adding the interactions of the firm characteristic indicators used in Table 6 with either of the two continuous QE variables and the VIX index. This test allows us to assess whether the time varying effects of QE and stock market uncertainty operated through other firm characteristics that were spuriously captured by our interaction term of interest: Bond Market Access $\times$ Log of MBS & Treasuries Held by Fed (or MBS & Treasuries Held by Fed/GDP). As columns 3 and 4 show some of these additional interaction terms are statistically significant. However, our interaction term of interest remains positive, sizable, and statistically significant at the 1% level in these estimations. In Table 10, Panel B, we reach very similar conclusions when we build our two continuous QE variables based only on treasuries held by the Fed. Overall, the evidence in Table 10 suggests that QE and not the stock market uncertainty is the channel beneath our investment results.

Table 10 About Here

In Table 11, we replace the Bond Market Access indicator with two indicators, one for whether the firm has access to the Investment Grade Market and the other for whether the firm has access to the Speculative Market. According to our theory, investment grade firms should benefit the most from QE because they can issue a larger amount of relatively safe debt backed by the minimum value of their assets. As a result, they have a stronger incentive to invest and use built-up capital to back additional issuance of safer debt when the spread between risky and relatively safe debt increases. In line with this prediction, column 2 shows that investment increased by 9.6 pp for investment grade firms, compared to 6.7 pp for speculative grade firms. The latter effect suggests that QE has positive spillover effects on lower quality firms.

Table 11 About Here

Throughout our analysis we use the ratio of capital expenditures to lagged property, plant, & equipment as our investment proxy. In Table 12, we use three alternative proxies proposed by the investment literature: (1) the ratio of capital expenditures to contemporaneous property, plant, &

equipment; (2) the ratio of capital expenditures to contemporaneous assets; and (3) the ratio of capital expenditures to lagged assets. We find that across these alternative investment measures the coefficient on Bond Market Access × QE Period is positive ad statistically significant at the 1% level. Finally, Table 12 shows that merger and acquisition expenses and total assets also increased for the bond firms relative to the non-bond firms in the QE period. Altogether, the evidence in Table 12 further supports our claim that QE spurred investment activities for firms with access to the bond market.

TABLE 12 ABOUT HERE

Did the increase in capital expenditures result in job creation for the bond-market access firms relative to the non-bond firms during the QE period? To address this question, we replace Investment with Employment in equation (14). Our regression results are presented in Table 13. Focusing on column (7), the positive coefficient on the interaction term of interest indicates that employment increased by a sizable 1.2 percentage points for bond firms during QE. Altogether, our results suggest that QE stimulated investment linked to job creation.

TABLE 13 ABOUT HERE

Lastly, Table 14 shows that firms with bond market access experience an increase in Tobin's q of 17.5 percentage points (column 1), a rise in (operating) profitability of 1.1 percentage points (column 2), and a rise in net income of 1.2 percentage points (column 3). These effects are economically large and statistically significant (at the 1% level). Overall, the evidence in Table 14 suggested that QE stimulated profitable investment that led to value creation.

TABLE 14 ABOUT HERE

3.3 How Bond-Market Access Firms Financed Investment During QE

In our theory, QE allows firms with access to the bond market to invest more by issuing safer long-term debt at a lower yield. In line with this prediction, Table 15, columns 1 and 2 show that long-term debt and senior bonds & notes increased for the bond group relatively to the non-bond

group during the QE period by 19.7% and 40.5%, respectively. As a result, long-term leverage and leverage increased by 2.1 pp (column 3) and 1.8 pp (column 4), respectively. Relatedly, we also find that long-term debt and senior bonds & notes, both as a proportion of total debt, increased by 4 pp (column 5) and 8 pp (column 6), respectively. All these effects are statistically significant at the 1% level.

We also find that the bond-market access firms do not change their dividend policy (column 11), but decrease stock repurchases (column 10) relative to the non-bond group in the QE period. Overall equity and reserves did not change (column 9). These findings do not indicate that bond firms used their higher access to credit in the QE period to increase payouts to equity holders.

We further find that interest expenses decreased by 0.8 pp (statistically significant at the 1% level) for firms with bond market access relative to non-bond firms during the QE period (column 7), consistent with the evidence that QE was successful in lowering corporate bond yields (e.g., Krishnamurthy and Vissing-Jorgensen, 2011; Wright, 2012; Jakl, 2017; Todorov, 2019). We do not find any change in short-term debt (column 8).

In line with the insights from our model, these findings suggest that the reduction in the net supply of safe debt instruments generated by the Fed QE program, created an opportunity for higher quality firms to pay a lower yield on newly issued relatively "safe" corporate bonds and increase investment.

Table 15 About Here

4 Concluding Remarks

How does Quantitative Easing (QE) affect corporate investment? Our analysis reveals a new channel through which QE can affect corporate investment: the bond-lending channel. We find that investment increased by 7.4 percentage points for firms with bond market access (relative to those without such access) during the QE period. We find that our investment results are robust to a sample period that excludes the years 2007 to 2009, the financial crisis period. A battery of robustness tests further allows us to rule out that our results are due to the banking crisis that started in 2007 or other confounding events. We also find that the increase in investment was accompanied by a rise in employment, pointing to a surge in capital spending related to job creation. We find further that

firms financed investment during the QE period by issuing relatively "safe" bonds & notes.

The empirical evidence is consistent with our simple theory of safety provision. In the model, a decrease in the net supply of treasury bonds reduces the safe bond yields, raising the spread relative to risky debt. This prompts firms with bond market access to increase investment and use built-up capital to issue safer bonds backed by the minimum value of their assets: the bond-lending channel. As a result, these firms experience a greater increase in the proportion of relatively "safe" bonds to total debt and a larger decrease in interest expenses. Meanwhile, investment and financial policies of firms without bond market access are decoupled from changes in the yield of safe bonds.

While there is a growing literature on the effect of QE on corporate bond yields (Krishnamurthy and Vissing-Jorgensen, 2011; Wright, 2012; Jakl, 2017; Dell'Ariccia, Rabanal, and Sandri, 2018; Todorov, 2019), research has also suggested that lower interest rates do not necessarily translate into higher corporate investment (Acharya and Plantin, 2019; Acharya et al. 2019; Chakraborty, Goldstein, and MacKinlay, 2020; Rodnyanski and Darmouni, 2017). We complement this literature by showing that QE can stimulate investment by lowering the yield on relatively "safe" bonds issued by higher quality firms: the bond-lending channel. To our knowledge, our study is the first to identify the corporate bond market as an important channel for the transmission of unconventional monetary policy.

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Table 1 - Descriptive Statistics: Bond Market Access Firms and No Bond Market Access Firms

This table reports sample average and standard deviation for the main variables used in the paper. The sample includes non-financial firms for the period 2004-2011. Firm level data are from the COMPUSTAT and Capital IQ. Bond Market Access firms are those with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. Size is the natural logarithm of sales (COMPUSTAT's item sale measured in billions of 2011 dollars using the Producer Price Index published by the U.S. Department of Labor as the deflator). Tobin's q is the ratio of market assets to book assets. Profitability is the ratio of operating income before expenses, and depreciation and amortization (COMPUSTAT's item oibdp) to book assets. EarningsVolatility is the ratio of the standard deviation of operating income before expenses, and depreciation and amortization using 4 years of consecutive observations to the average book value of total assets estimated over the same time horizon. Tangibility is the ratio of property, plant, & equipment to book assets. Investment is the ratio of capital expenditures (COMPUSTAT's item capx) to lagged property, plant, & equipment (COMPUSTAT's item ppent). Employment is the ratio between number of employees at t (COMPUSTAT's item emp) minus the number of employees at *t-1* to the number of employees at *t-1*. Leverage is the ratio of total debt (COMPUSTAT's items dlc + dltt) to market assets (COMPUSTAT's items at + prcc_f × csho – ceq – txditc). Interest Expenses/Debt is the ratio of interest expenses (COMPUSTAT's item xint) to total debt. Senior Bonds & Notes/Debt is the ratio of senior bond and notes (from Capital IQ) to total debt. Long-Term Debt/Debt is the ratio of debt maturing in more than one year (COMPUSTAT's item dltt) to total debt. Standard errors are in parentheses. We also report standardized differences in mean between samples, a scale-free measure of the difference in distributions that, unlike the traditional t-stat, is less affected by sample size. An absolute standardized difference equal to or less than 0.25 is considered evidence of no significant difference between two samples (Rubin, 2001; Imbens and Wooldridge, 2009). Finally, in the last column we report regression-based difference in means between samples from a linear probability model in which we regress an indicator for whether the firm has access to the bond market on all the variables in this table. The regression includes also firm and year fixed effects, with standard errors in parentheses clustered at the firm level.

	Bond Market Access		**No Bond Market Access**		Difference in Mean between Samples	Standardized Difference in Mean between Samples	Regression-Based Difference in Mean between Samples
	Mean	Obs.	Mean	Obs.			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Size	7.883	9,194	5.626	17,578	2.257***	1.495	0.111***
					(0.020)		(0.018)
Tobin's q	1.566	6,863	1.987	15,703	-0.421***	-0.352	-0.008
					(0.019)		(0.014)
Profitability	0.128	9,187	0.075	17,566	0.052***	0.381	0.004
					(0.002)		(0.007)
EarningsVolatility	0.039	9,185	0.085	17,550	-0.046***	-0.457	0.008
					(0.001)		(0.009)
Tangibility	0.383	9,192	0.243	17,576	0.140***	0.564	-0.008
					(0.003)		(0.011)
Investment	0.209	9,194	0.413	17,578	-0.204***	-0.436	0.004
					(0.007)		(0.006)
Employment	0.024	8,570	0.063	15,761	-0.039***	-0.203	-0.002
					(0.003)		(0.003)
Leverage	0.262	6,853	0.131	15,618	0.131***	0.756	0.044***
					(0.002)		(0.007)
Interest Expenses/Debt	0.073	8,954	0.095	12,394	-0.023***	-0.272	-0.005
					(0.001)		(0.004)
Senior Bonds & Notes/Debt	0.582	8,524	0.234	14,716	0.349***	0.968	0.021***
					(0.005)		(0.005)
Long-Term Debt/Debt	0.887	9,058	0.710	13,524	0.177***	0.643	0.014***
					(0.004)		(0.003)

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 2 – Investment for Firms with Bond Market Access in the Quantitative Easing Period

This table presents estimates from investment regressions. The sample includes non-financial firms for the periods 2004-2011 (columns 1 – 4), the period 2004-2006 and 2010-2012 (column 5), and the period 2005-2006 and 2010-2011 (column 6). All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. In columns 1 – 4, QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. In column 5, QE Period is a dummy variable equal to one for the years 2010-2012, and zero for the years 2004-2006. In column 6, QE Period is a dummy variable equal to one for the years 2010-2011, and zero for the years 2005-2006. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Investment					
	Base Sample Period				**Periods Excluding Financial Crisis**	
	2004 – 2011				2004 – 2006 & 2010 – 2012	2005 – 2006 & 2010 – 2011
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.113***	0.104***	0.074***	0.079***	0.053***	0.071***
	(0.012)	(0.012)	(0.012)	(0.013)	(0.014)	(0.016)
Size		-0.062***	-0.081***	-0.081***	-0.057***	-0.028
		(0.018)	(0.020)	(0.021)	(0.021)	(0.030)
Tobin's q			0.025***	0.025***	0.027***	0.033***
			(0.008)	(0.008)	(0.009)	(0.011)
Profitability			0.261***	0.209***	0.190*	-0.049
			(0.071)	(0.074)	(0.100)	(0.132)
EarningsVolatility			1.078***	1.082***	0.831***	0.930***
			(0.148)	(0.150)	(0.184)	(0.243)
Tangibility			0.042	0.046	0.013	-0.015
			(0.092)	(0.094)	(0.099)	(0.133)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	No	No	No
Weak-Lender × Year FEs	No	No	No	Yes	Yes	Yes
2-Digit SIC × Year FEs	No	No	No	Yes	Yes	Yes
Obs.	26,776	26,772	22,542	22,014	16,037	10,514
R-2	0.001	0.068	0.156	0.489	0.539	0.615

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 3 – Investment for Firms with Bond Market Access before and during the Quantitative Easing Period

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. 2011 (QE-2) is a dummy variable equal to one for the year 2011, and zero for all other years. 2010 (QE-2), 2009 (QE-1), 2008 (QE-1), 2007, 2006, 2005 are defined similarly. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Investment						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bond Market Access × 2011 (QE-2)	0.092***	0.075***	0.085***	0.060***	0.093***	0.049**	0.060***
	(0.018)	(0.020)	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)
Bond Market Access × 2010 (QE-2)	0.106***	0.099***	0.101***	0.077***	0.107***	0.072***	0.084***
	(0.018)	(0.019)	(0.018)	(0.018)	(0.018)	(0.019)	(0.018)
Bond Market Access × 2009 (QE-1)	0.150***	0.129***	0.145***	0.122***	0.151***	0.107***	0.109***
	(0.018)	(0.020)	(0.018)	(0.017)	(0.018)	(0.019)	(0.019)
Bond Market Access × 2008 (QE-1)	0.047**	0.025	0.041**	0.024	0.047**	0.010	0.011
	(0.020)	(0.021)	(0.020)	(0.019)	(0.020)	(0.021)	(0.021)
Bond Market Access × 2007	-0.007	-0.005	-0.011	-0.024	-0.006	-0.022	-0.010
	(0.020)	(0.021)	(0.020)	(0.020)	(0.020)	(0.021)	(0.020)
Bond Market Access × 2006	-0.007	-0.009	-0.012	-0.022	-0.007	-0.020	-0.033
	(0.019)	(0.020)	(0.019)	(0.018)	(0.019)	(0.020)	(0.022)
Bond Market Access × 2005	-0.012	-0.008	-0.011	-0.024	-0.011	-0.021	-0.014
	(0.018)	(0.020)	(0.018)	(0.018)	(0.018)	(0.020)	(0.019)
Size	-0.061***	-0.064***	-0.092***	-0.049***	-0.061***	-0.081***	-0.081***
	(0.018)	(0.019)	(0.019)	(0.017)	(0.018)	(0.020)	(0.021)
Tobin's q		0.047***				0.025***	0.026***
		(0.008)				(0.008)	(0.008)
Profitability			0.409***			0.263***	0.212***
			(0.068)			(0.071)	(0.074)
EarningsVolatility				1.201***		1.077***	1.080***
				(0.137)		(0.148)	(0.150)
Tangibility					-0.048	0.041	0.047
					(0.090)	(0.092)	(0.094)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	No
Weak-Lender × Year FEs	No	No	No	No	No	No	Yes
2-Digit SIC × Year FEs	No	No	No	No	No	No	Yes
Obs.	26,772	22,566	26,753	26,735	26,768	22,542	22,014
R-2	0.070	0.101	0.072	0.167	0.076	0.157	0.490

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 4 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Controlling for Lead Lender Distance-to-Default

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. 2011 is a dummy variable equal to one for the year 2011, and zero for all other years. 2010, 2009, 2008, 2007, 2006, 2005 are defined similarly. Bank DD_{2007} is the distance to default in 2007 for the lead lender in a syndicated loan to the firms in our sample originated or still outstanding in 2004–2007 (as reported in DealScan). The distance to default data is obtained directly from Amiyatosh Purnanandam's website (http://webuser.bus.umich.edu/amiyatos/research.htm) and is defined as the 5-year risk-neutral default probability for an individual bank. Bank DD_{2008} is defined similarly. We link each individual firm with its largest lead lender bank in 2007 and 2008 (as reported in DealScan) for Bank DD_{2007} and Bank DD_{2008}, respectively. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variables:	Investment			
	(1)	(2)	(3)	(4)
Bond Market Access × QE Period	0.071***	0.071***	0.071***	0.071***
	(0.013)	(0.013)	(0.013)	(0.013)
Bank DD_{2007} × QE Period	0.050***		0.050***	
	(0.011)		(0.014)	
Bank DD_{2007} × 2011		0.044***		0.042**
		(0.017)		(0.019)
Bank DD_{2007} × 2010		0.043**		0.035*
		(0.017)		(0.019)
Bank DD_{2007} × 2009		0.054***		0.041**
		(0.017)		(0.019)
Bank DD_{2007} × 2008		0.022		0.017
		(0.019)		(0.022)
Bank DD_{2007} × 2007		-0.002		-0.021
		(0.019)		(0.023)
Bank DD_{2007} × 2006		-0.020		-0.019
		(0.018)		(0.020)
Bank DD_{2007} × 2005		-0.017		-0.026
		(0.017)		(0.020)
Bank DD_{2008} × QE Period			-0.001	
			(0.024)	
Bank DD_{2008} × 2011				0.008
				(0.029)
Bank DD_{2008} × 2010				0.027
				(0.030)
Bank DD_{2008} × 2009				0.039
				(0.030)
Bank DD_{2008} × 2008				0.015
				(0.036)
Bank DD_{2008} × 2007				0.060
				(0.037)
Bank DD_{2008} × 2006				-0.001
				(0.030)
Bank DD_{2008} × 2005				0.028
				(0.031)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes
Obs.	22,014	22,014	22,014	22,014
R-2	0.490	0.490	0.490	0.490

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 5 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Controlling for Long-Term Debt Dependence

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. 2011 is a dummy variable equal to one for the year 2011, and zero for all other years. 2010, 2009, 2008 are defined similarly. Long-Term Debt Issuance/Total Asset is the ratio of long-term debt issuance (COMPUSTAT's item dltis) to book assets. Long-Term Debt Issuance/Total Debt is the ratio of long-term debt issuance (COMPUSTAT's item dltis) to total debt (dlc+dltt). Long-Term Debt/Total Asset is the ratio of long-term debt issuance (COMPUSTAT's item dltt) to book assets. Long-Term Debt/Total Debt is the ratio of long-term debt issuance (COMPUSTAT's item dltt) to total debt (dlc+dltt). Long-Term Debt Issuance/Total Asset>median 2007 is a dummy which equals to one if Long-Term Debt Issuance/Total Asset in 2007 is larger than median, zero otherwise. Long-Term Debt Issuance/Total Debt>median 2007, Long-Term Debt/Total Asset>median 2007 and Long-Term Debt/Total Debt>median 2007 are defined similarly. Control variables include Size, Tobin's q, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Panel A:								
Dependent variable:	Investment							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bond Market Access × QE Period	0.082***	0.084***	0.092***	0.077***	0.079***	0.092***	0.093***	0.077***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.013)	(0.014)	(0.014)	(0.014)
Long-Term Debt Issuance/Total Asset × QE Period	-0.026							
	(0.028)							
Long-Term Debt Issuance/Total Debt × QE Period		0.004						
		(0.007)						
Long-Term Debt/Total Asset × QE Period			-0.093**					
			(0.047)					
Long-Term Debt/Total Debt × QE Period				0.040				
				(0.031)				
Long-Term Debt Issuance/Total Asset > median 2007 × QE Period					0.058***			
					(0.020)			
Long-Term Debt Issuance/Total Debt > median 2007 × QE Period						0.021***		
						(0.005)		
Long-Term Debt/Total Asset > median 2007 × QE Period							-0.112***	
							(0.038)	
Long-Term Debt/Total Debt > median 2007 × QE Period								0.066***
								(0.025)
Long-Term Debt Issuance/Total Asset	0.136***							
	(0.031)							
Long-Term Debt Issuance/Total Debt		0.021***						
		(0.007)						
Long-Term Debt/Total Asset			-0.030					
			(0.048)					
Long-Term Debt/Total Debt				0.023				
				(0.024)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	21,316	17,408	21,925	18,071	19,668	15,450	20,580	16,382
R-2	0.489	0.511	0.490	0.510	0.474	0.488	0.472	0.481

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Panel B: **Dependent variable:**	Investment							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bond Market Access × 2011	0.077***	0.092***	0.084***	0.078***	0.077***	0.076***	0.069***	0.066***
	(0.016)	(0.017)	(0.016)	(0.016)	(0.015)	(0.016)	(0.016)	(0.015)
Bond Market Access × 2010	0.103***	0.092***	0.113***	0.094***	0.102***	0.102***	0.094***	0.091***
	(0.016)	(0.017)	(0.017)	(0.016)	(0.015)	(0.016)	(0.017)	(0.015)
Bond Market Access × 2009	0.129***	0.132***	0.135***	0.112***	0.132***	0.122***	0.123***	0.113***
	(0.016)	(0.017)	(0.017)	(0.017)	(0.016)	(0.016)	(0.016)	(0.015)
Bond Market Access × 2008	0.027	0.032	0.042**	0.032	0.037**	0.050***	0.054***	0.052***
	(0.019)	(0.020)	(0.020)	(0.020)	(0.019)	(0.019)	(0.019)	(0.018)
Long-Term Debt Issuance/Total Asset × 2011	-0.017							
	(0.037)							
Long-Term Debt Issuance/Total Asset × 2010	-0.041							
	(0.044)							
Long-Term Debt Issuance/Total Asset × 2009	-0.031							
	(0.046)							
Long-Term Debt Issuance/Total Asset × 2008	-0.026							
	(0.037)							
Long-Term Debt Issuance/Total Debt × 2011		0.006						
		(0.008)						
Long-Term Debt Issuance/Total Debt × 2010		0.001						
		(0.010)						
Long-Term Debt Issuance/Total Debt × 2009		0.001						
		(0.011)						
Long-Term Debt Issuance/Total Debt × 2008		0.006						
		(0.009)						
Long-Term Debt/Total Asset × 2011			-0.071					
			(0.062)					
Long-Term Debt/Total Asset × 2010			-0.105					
			(0.065)					
Long-Term Debt/Total Asset × 2009			-0.076					
			(0.052)					
Long-Term Debt/Total Asset × 2008			-0.114*					
			(0.059)					
Long-Term Debt/Total Debt × 2011				0.076*				
				(0.045)				
Long-Term Debt/Total Debt × 2010				-0.019				
				(0.043)				
Long-Term Debt/Total Debt × 2009				0.099**				
				(0.042)				
Long-Term Debt/Total Debt × 2008				0.010				
				(0.043)				
Long-Term Debt Issuance/Total Asset > median 2007 × 2011					-0.018			
					(0.020)			
Long-Term Debt Issuance/Total Asset > median 2007 × 2010					-0.008			
					(0.019)			

Long-Term Debt Issuance/Total Asset > median 2007 × 2009					-0.012 (0.019)			
Long-Term Debt Issuance/Total Asset > median 2007 × 2008					-0.042* (0.022)			
Long-Term Debt Issuance/Total Debt > median 2007 × 2011						-0.027 (0.019)		
Long-Term Debt Issuance/Total Debt > median 2007 × 2010						-0.026 (0.018)		
Long-Term Debt Issuance/Total Debt > median 2007 × 2009						-0.025 (0.018)		
Long-Term Debt Issuance/Total Debt > median 2007 × 2008						-0.025 (0.020)		
Long-Term Debt/Total Asset > median 2007 × 2011							0.002 (0.023)	
Long-Term Debt/Total Asset > median 2007 × 2010							0.004 (0.022)	
Long-Term Debt/Total Asset > median 2007 × 2009							0.005 (0.022)	
Long-Term Debt/Total Asset > median 2007 × 2008							-0.072*** (0.026)	
Long-Term Debt/Total Debt > median 2007 × 2011								0.035* (0.020)
Long-Term Debt/Total Debt > median 2007 × 2010								0.023 (0.019)
Long-Term Debt/Total Debt > median 2007 × 2009								0.020 (0.018)
Long-Term Debt/Total Debt > median 2007 × 2008								-0.028 (0.022)
Long-Term Debt Issuance/Total Asset	0.135*** (0.031)							
Long-Term Debt Issuance/Total Debt		0.021*** (0.007)						
Long-Term Debt/Total Asset			-0.031 (0.048)					
Long-Term Debt/Total Debt				0.022 (0.024)				
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	21,316	17,408	21,925	18,071	20,114	16,761	20,632	17,313
R-2	0.489	0.512	0.490	0.511	0.472	0.474	0.472	0.473

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 6 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Controlling for Lead Lender Treasury & MBS Exposure

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item spltcrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. 2011 is an indicator for fiscal year 2011. 2010, 2009, 2008, 2007, 2006, 2005 are defined similarly. Treasuries&MBS/Sec is the ratio of total treasuries and MBS to total securities (as reported in SNL Financial) in 2007 of the lead lender in the syndicated loans (as reported in DealScan) originated in 2007 or originated earlier but still outstanding in 2007 to the firms in our sample. Treasuries&MBS/Asset is defined similarly, except that we scale by the lead lender total assets. Control variables include Size, Tobin's q, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Investment			
	(1)	(2)	(3)	(4)
Bond Market Access × QE Period	0.078***	0.078***	0.079***	0.079***
	(0.013)	(0.013)	(0.013)	(0.013)
Treasuries&MBS/Sec × 2011	-0.022			
	(0.057)			
Treasuries&MBS/Sec × 2010	-0.018			
	(0.054)			
Treasuries&MBS/Sec × 2009	-0.001			
	(0.055)			
Treasuries&MBS/Sec × 2008	-0.068			
	(0.065)			
Treasuries&MBS/Sec × 2007	-0.105*			
	(0.059)			
Treasuries&MBS/Sec × 2006	-0.093			
	(0.069)			
Treasuries&MBS/Sec × 2005	-0.073			
	(0.047)			
Treasuries&MBS/Sec × QE Period		0.042		
		(0.035)		
Treasuries&MBS/Asset × 2011			-0.371	
			(0.372)	
Treasuries&MBS/Asset × 2010			-0.275	
			(0.350)	
Treasuries&MBS/Asset × 2009			-0.270	
			(0.372)	
Treasuries&MBS/Asset × 2008			-0.544	
			(0.352)	
Treasuries&MBS/Asset × 2007			-0.538	
			(0.343)	
Treasuries&MBS/Asset × 2006			-0.570	
			(0.378)	
Treasuries&MBS/Asset × 2005			-0.321	
			(0.228)	
Treasuries&MBS/Asset × QE Period				-0.003
				(0.168)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes
Obs.	22,014	22,014	22,014	22,014
R-2	0.489	0.489	0.489	0.489

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 7 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Controlling for Interactive Effects

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. Large Firm is an indicator for firms with Size above the sample 80th percentile in fiscal year 2007. High Tobin's q, High Profitability, High EarningsVolatility, and High Tangibility are defined similarly. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Control variables include Size, Tobin's *q*, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.075***	0.075***	0.074***	0.066***	0.077***	0.066***
	(0.015)	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)
Large Firm × QE Period	0.020*	0.020	0.014	0.016	0.019	0.007
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
High Tobin's q × QE Period		0.006				-0.014
		(0.021)				(0.024)
High Profitability × QE Period			0.080***			0.097***
			(0.014)			(0.017)
High EarningsVolatility × QE Period				-0.091***		-0.100***
				(0.030)		(0.030)
High Tangibility × QE Period					-0.085***	-0.091***
					(0.027)	(0.027)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	19,840	19,246	19,835	19,829	19,840	19,240
R-2	0.456	0.448	0.457	0.457	0.456	0.451

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 8 - Descriptive Statistics: Bond Market Access Firms and No Bond Market Access Firms with Propensity Score Matching and Nearest-Neighborhood Matching

This table reports mean difference tests of firm characteristics for bond firms and non-bond firms. The sample includes non-financial firms for the period 2004-2011. Firm level data are from the COMPUSTAT and Capital IQ. Bond Market Access firms are those with a bond rating (COMPUSTAT's item spilticrm) in fiscal year 2007. Non-Bond Market Access firms selected as the closest match to bond firms based on Size, Leverage, Senior Bonds & Notes/Debt, and Long-Term Debt/Debt, using propensity score matching (Panel A) and the Abadie-Imbens matching estimator (Abadie and Imbens, 2006) (Panel B). Refer to Table 1 for detailed variable definitions. Standard errors are in parentheses. We also report standardized differences in mean between samples, a scale-free measure of the difference in distributions that, unlike the traditional t-stat, is less affected by sample size. An absolute standardized difference equal to or less than 0.25 is considered evidence of no significant difference between two samples (Rubin, 2001; Imbens and Wooldridge, 2009). Finally, in the last column we report regression-based difference in means between samples from a linear probability model in which we regress an indicator for whether the firm has access to the bond market on all the variables in this table. The regression includes also firm and year fixed effects, with standard errors in parentheses clustered at the firm level.

	Panel A: Propensity Score Matching					**Panel B: Nearest-Neighborhood Matching**				
	Bond Market Access	**No Bond Market Access**	Difference in Mean between Samples	Standardized Difference in Mean between Samples	Regression-Based Difference in Mean between Samples	**Bond Market Access**	**No Bond Market Access**	Difference in Mean between Samples	Standardized Difference in Mean between Samples	Regression-Based Difference in Mean between Samples
	Mean	Mean				Mean	Mean			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Size	7.946	7.728	0.219***	0.172	-0.001	7.946	7.655	0.291***	0.232	-0.005
			(0.023)		(0.007)			(0.022)		(0.007)
Tobin's q	1.556	1.448	0.108***	0.140	-0.001	1.556	1.459	0.097***	0.130	0.035
			(0.014)		(0.005)			(0.013)		(0.013)
Profitability	0.133	0.117	0.016***	0.202	0.004	0.133	0.121	0.012***	0.161	-0.028
			(0.001)		(0.006)			(0.001)		(0.013)
EarningsVolatility	0.043	0.041	0.003***	0.052	-0.004	0.043	0.041	0.003***	0.056	0.002
			(0.001)		(0.002)			(0.001)		(0.008)
Tangibility	0.362	0.346	0.016***	0.065	0.003	0.362	0.339	0.023***	0.091	0.006
			(0.005)		(0.009)			(0.004)		(0.008)
Investment	0.217	0.240	-0.023***	-0.079	0.004	0.217	0.229	-0.012***	-0.046	-0.013
			(0.005)		(0.006)			(0.005)		(0.005)
Employment	0.027	0.034	-0.006*	-0.035	-0.026	0.027	0.028	-0.001	-0.006	-0.032
			(0.003)		(0.006)			(0.003)		(0.014)
Leverage	0.264	0.287	-0.022***	-0.120	0.002	0.264	0.247	0.017***	0.097	0.003
			(0.003)		(0.009)			(0.003)		(0.013)
Interest Expenses/Debt	0.072	0.077	-0.005***	-0.076	-0.004	0.072	0.073	-0.001	-0.012	0.002
			(0.001)		(0.006)			(0.001)		(0.004)
Senior Bonds & Notes/Debt	0.564	0.499	0.065***	0.176	-0.005	0.564	0.537	0.027***	0.073	0.002
			(0.007)		(0.011)			(0.007)		(0.010)
Long-Term Debt/Debt	0.886	0.881	0.005	0.026	-0.003	0.886	0.869	0.017***	0.087	0.005
			(0.004)		(0.006)			(0.004)		(0.004)

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 9 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Matched Samples

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. Firm level data are from the COMPUSTAT and Capital IQ. Bond Market Access firms are those with a bond rating (COMPUSTAT's item spltcrm) in fiscal year 2007. Non-Bond Market Access firms are selected as the closest match to bond firms based on Size, Leverage, Senior Bonds & Notes/Debt, and Long-Term Debt/Debt, using propensity score matching (Panel A) and the Abadie-Imbens matching estimator (Abadie and Imbens, 2006) (Panel B). Control variables include Size, Tobin's q, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Panel A: Propensity Score Matching		Panel B: Nearest-Neighborhood Matching	
	Investment		Investment	
	(1)	(2)	(3)	(4)
Bond Market Access × QE Period	0.071***	0.077***	0.051***	0.050***
	(0.020)	(0.022)	(0.017)	(0.017)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Weak-Lender × Year FEs	No	Yes	No	Yes
2-Digit SIC × Year FEs	No	Yes	No	Yes
Obs.	8,434	8,424	8,519	8,502
R-2	0.441	0.472	0.455	0.486

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 10 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Controlling for Macroeconomic Variables

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. Large Firm is an indicator for firms with Size above the sample 80th percentile in fiscal year 2007. High Tobin's q, High Profitability, High EarningsVolatility, and High Tangibility are defined similarly. Log of MBS & Treasuries Held by Fed is the natural logarithm of the sum of MBS and Treasuries Held by Federal Reserve in a given year ($ trillion). MBS & Treasuries Held by Fed/GDP is the ratio of the sum of Mortgage Backed Security and Treasuries Held by Federal Reserve in a given year to annual GDP. Log of Treasuries Held by Fed is the natural logarithm of the Treasuries Held by Federal Reserve in a given year ($ trillion). Treasuries Held by Fed/GDP is the ratio of Treasuries Held by Federal Reserve in a given year to annual GDP. Log of VIX Index is the natural logarithm of the annual CBOE Volatility Index. Control variables include Size, Tobin's *q*, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Panel A: **Dependent variable:**	Investment			
	(1)	(2)	(3)	(4)
Bond Market Access × Log of MBS & Treasuries Held by Fed	0.104***		0.055***	
	(0.018)		(0.017)	
Bond Market Access × MBS & Treasuries Held by Fed/GDP		0.691***		0.382***
		(0.123)		(0.117)
Bond Market Access × Log of VIX Index	0.074***	0.075***	0.078***	0.078***
	(0.020)	(0.020)	(0.021)	(0.021)
Large Firm × Log of MBS & Treasuries Held by Fed			-0.010	
			(0.015)	
Large Firm × MBS & Treasuries Held by Fed/GDP				-0.075
				(0.102)
Large Firm × Log of VIX Index			0.020	0.020
			(0.016)	(0.016)
High Tobin s q × Log of MBS & Treasuries Held by Fed			-0.094**	
			(0.040)	
High Tobin s q × MBS & Treasuries Held by Fed/GDP				-0.623**
				(0.267)
High Tobin s q × Log of VIX Index			0.027	0.026
			(0.037)	(0.037)
High Profitability × Log of MBS & Treasuries Held by Fed			0.107***	
			(0.026)	
High Profitability × MBS & Treasuries Held by Fed/GDP				0.724***
				(0.175)
High Profitability × Log of VIX Index			0.095***	0.095***
			(0.025)	(0.025)
High EarningsVolatility × Log of MBS & Treasuries Held by Fed			-0.077*	
			(0.043)	
High EarningsVolatility × MBS & Treasuries Held by Fed/GDP				-0.482*
				(0.292)
High EarningsVolatility × Log of VIX Index			-0.118***	-0.119***
			(0.044)	(0.044)
High Tangibility × Log of MBS & Treasuries Held by Fed			-0.020	
			(0.032)	
High Tangibility × MBS & Treasuries Held by Fed/GDP				-0.149
				(0.216)
High Tangibility × Log of VIX Index			-0.128***	-0.128***
			(0.044)	(0.044)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes
Obs.	22,014	22,014	19,240	19,240
R-2	0.489	0.489	0.451	0.451

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Panel B: **Dependent variable:**	Investment			
	(1)	(2)	(3)	(4)
Bond Market Access × Log of Treasuries Held by Fed	0.120*** (0.028)		0.069** (0.027)	
Bond Market Access × Treasuries Held by Fed/GDP		0.912*** (0.224)		0.573*** (0.213)
Bond Market Access × Log of VIX Index	0.104*** (0.019)	0.108*** (0.019)	0.094*** (0.021)	0.097*** (0.021)
Large Firm × Log of Treasuries Held by Fed			-0.019 (0.023)	
Large Firm × Treasuries Held by Fed/GDP				-0.181 (0.179)
Large Firm × Log of VIX Index			0.017 (0.017)	0.016 (0.017)
High Tobin s q × Log of Treasuries Held by Fed			-0.102* (0.062)	
High Tobin s q × Treasuries Held by Fed/GDP				-0.775 (0.487)
High Tobin s q × Log of VIX Index			0.001 (0.035)	-0.003 (0.035)
High Profitability × Log of Treasuries Held by Fed			0.139*** (0.040)	
High Profitability × Treasuries Held by Fed/GDP				1.092*** (0.312)
High Profitability × Log of VIX Index			0.125*** (0.024)	0.130*** (0.025)
High EarningsVolatility × Log of Treasuries Held by Fed			-0.055 (0.069)	
High EarningsVolatility × Treasuries Held by Fed/GDP				-0.285 (0.542)
High EarningsVolatility × Log of VIX Index			-0.135*** (0.043)	-0.135*** (0.043)
High Tangibility × Log of Treasuries Held by Fed			-0.036 (0.049)	
High Tangibility × Treasuries Held by Fed/GDP				-0.302 (0.388)
High Tangibility × Log of VIX Index			-0.134*** (0.042)	-0.136*** (0.042)
Control Variables	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes
Obs.	22,014	22,014	19,240	19,240
R-2	0.489	0.489	0.451	0.451

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 11 – Investment for Firms with Access to Investment Grade and Speculative Bond Markets in the Quantitative Easing Period

This table presents the coefficient estimates from OLS regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Investment Grade Market is an indicator for firms with investment grade ratings in fiscal year 2007 using information in COMPUSTAT's item splticrm. Speculative Market is an indicator for firms with speculative grade ratings in fiscal year 2007 using information in COMPUSTAT's item splticrm. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Control variables include Size, Tobin's q, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level. Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Dependent variable:	Investment	
	(1)	(2)
Investment Grade Market × QE Period	0.102***	0.096***
	(0.011)	(0.012)
Speculative Market × QE Period	0.053***	0.067***
	(0.014)	(0.016)
Control Variables	Yes	Yes
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	No
Weak-Lender × Year FEs	No	Yes
2-Digit SIC × Year FEs	No	Yes
Obs.	22,031	22,014
R-2	0.479	0.489

Table 12 – Investment for Firms with Bond Market Access in the Quantitative Easing Period: Different Investment Measures

This table presents estimates from investment regressions. The sample includes non-financial firms for the period 2004-2011. Acquisitions/Lagged Assets is the ratio of acquisitions (COMPUSTAT's item acq) to assets. Change in Assets/Lagged Assets is the ratio of assets minus lagged assets to lagged assets. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Other control variables include Tobin's q, Profitability, EarningsVolatility, and Tangibility. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Capital Expenditures/Property, Plant, & Equipment		Capital Expenditures/Assets		Capital Expenditures/Lagged Assets		Acquisitions/Lagged Assets		Change in Assets/Lagged Assets	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Bond Market Access × QE Period	0.029***	0.022***	0.006***	0.004***	0.014***	0.010***	0.018***	0.017**	0.098***	0.047***
	(0.004)	(0.004)	(0.001)	(0.002)	(0.003)	(0.003)	(0.006)	(0.007)	(0.019)	(0.017)
Size	-0.011**	-0.008	-0.001	-0.000	-0.012***	-0.012***	0.005	-0.001	-0.155***	-0.140***
	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)	(0.005)	(0.006)	(0.030)	(0.026)
Other Control Variables	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	26,984	22,054	27,122	22,117	26,212	22,105	22,752	19,974	26,253	22,131
R-2	0.694	0.690	0.762	0.791	0.688	0.720	0.253	0.288	0.358	0.503

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively

Table 13 – Change in Employment for Firms with Bond Market Access in the Quantitative Easing Period

This table presents estimates from employment regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the Weak-Lender × Year FEs and 2-Digit SIC × Year FEs level.

Dependent variable:	Employment						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Bond Market Access × QE Period	0.030***	0.020***	0.029***	0.028***	0.031***	0.019***	0.012**
	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Size	0.024***	0.028***	0.012*	0.026***	0.024***	0.021***	0.024***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Tobin's q		0.027***				0.021***	0.020***
		(0.003)				(0.003)	(0.003)
Profitability			0.169***			0.111***	0.070
			(0.026)			(0.028)	(0.046)
EarningsVolatility				0.305***		0.235***	0.250***
				(0.039)		(0.038)	(0.037)
Tangibility					-0.104***	-0.071*	-0.059
					(0.036)	(0.038)	(0.042)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	No
Weak-Lender × Year FEs	No	No	No	No	No	No	Yes
2-Digit SIC × Year FEs	No	No	No	No	No	No	Yes
Obs.	24,446	21,289	24,434	24,396	24,442	21,232	20,669
R-2	0.001	0.015	0.006	0.011	0.002	0.041	0.386

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 14 – Value and Profitability for Firms with Bond Market Access in the Quantitative Easing Period

This table presents estimates from value and profitability regressions. The sample includes non-financial firms for the period 2004-2011. All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Tobin's q	Profitability	Net Income/Assets
	(1)	(2)	(3)
Bond Market Access × QE Period	0.175***	0.011***	0.012***
	(0.031)	(0.003)	(0.004)
Size	-0.139***	0.063***	0.050***
	(0.038)	(0.004)	(0.005)
EarningsVolatility	1.557***	0.074***	0.115***
	(0.290)	(0.019)	(0.024)
Tangibility	-0.532***	-0.054***	-0.301***
	(0.157)	(0.017)	(0.025)
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes
Obs.	22,154	26,203	26,217
R-2	0.727	0.805	0.596

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

Table 15 – The Financing of Firms with Bond Market Access in the Quantitative Easing Period

This table presents estimates from debt financing regressions. The sample includes non-financial firms for the period 2004-2011. Log of Equity & Reserves is the natural logarithm of equity and reserves (COMPUSTAT's item ceq). Log of Stock Repurchases is the natural logarithm of stock repurchases (COMPUSTAT's item prstkc). Log of Dividends is the natural logarithm of dividends (COMPUSTAT's item dvt). All firm level data are from COMPUSTAT industrial database. Bond Market Access is an indicator for firms with a bond rating (COMPUSTAT's item splticrm) in fiscal year 2007. QE Period is a dummy variable equal to one for the years 2008-2011, and zero for the years 2004-2007. Weak-Lender is indicator for firms that borrowed through a syndicated loan originated or still outstanding in 2004–2007 (as reported in DealScan) in which Lehman Brothers, Merrill Lynch, or Bear Stearns were the lead arrangers. 2-Digit SIC are indicators for two-digit SIC industry codes. Refer to Table 1 for detailed variable definitions. Standard errors reported in parentheses are clustered at the firm level.

Dependent variable:	Log of Long-Term Debt	Log of Senior Bonds & Notes	Long-Term Leverage	Leverage	Long-Term Debt/Debt	Senior Bonds & Notes/Debt	Interest Expenses/Debt	Log of Short-Term Debt	Log of Equity & Reserves	Log of Stock Repurchases	Log of Dividends
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Bond Market Access × QE Period	0.197***	0.405***	0.021***	0.018***	0.040***	0.080***	-0.008***	-0.060	-0.010	-0.153**	0.028
	(0.057)	(0.083)	(0.004)	(0.004)	(0.009)	(0.012)	(0.003)	(0.055)	(0.026)	(0.071)	(0.046)
Size	0.550***	0.439***	0.020***	0.023***	0.009	0.027***	-0.005*	0.356***	0.369***	0.155***	0.113***
	(0.042)	(0.064)	(0.003)	(0.004)	(0.007)	(0.008)	(0.003)	(0.033)	(0.025)	(0.034)	(0.026)
Tobin's q	-0.162***	-0.103***	-0.016***	-0.018***	-0.019***	-0.004	0.008***	-0.042***	-0.063***	0.010	0.034***
	(0.018)	(0.032)	(0.002)	(0.002)	(0.004)	(0.004)	(0.002)	(0.014)	(0.011)	(0.014)	(0.011)
Profitability	-1.321***	-1.412***	-0.123***	-0.186***	0.077**	-0.092***	0.046***	-1.220***	0.326***	1.435***	0.258***
	(0.182)	(0.230)	(0.014)	(0.015)	(0.038)	(0.031)	(0.015)	(0.145)	(0.086)	(0.158)	(0.092)
EarningsVolatility	0.422***	-0.152	0.027***	0.020*	0.068**	0.018	-0.022*	0.204**	0.001	-0.474***	0.085
	(0.124)	(0.237)	(0.009)	(0.011)	(0.033)	(0.041)	(0.012)	(0.103)	(0.071)	(0.131)	(0.099)
Tangibility	0.352	-0.493	0.084***	0.112***	0.020	-0.063	-0.018	0.367*	-1.166***	0.062	-0.352**
	(0.248)	(0.375)	(0.024)	(0.024)	(0.043)	(0.053)	(0.016)	(0.220)	(0.128)	(0.216)	(0.163)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No	No	No	No	No	No
Weak-Lender × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2-Digit SIC × Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,046	17,049	22,054	22,046	18,153	19,078	17,049	22,135	21,023	20,391	22,067
R-2	0.895	0.837	0.818	0.846	0.630	0.774	0.465	0.783	0.945	0.705	0.892

Note: ***, ** and * indicate statistical significance at the 1%, 5%, and 10% (two-tail) test levels, respectively.

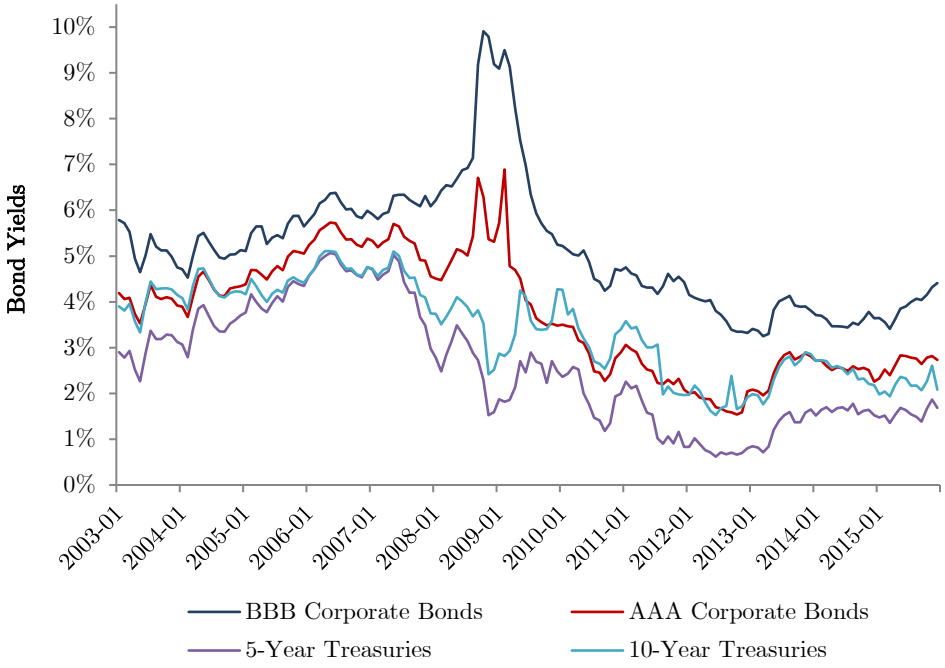

Figure 1: This figure shows corporate bond (Source: FRED Database) and Treasuries bond yields (Source: Department of the Treasuries).

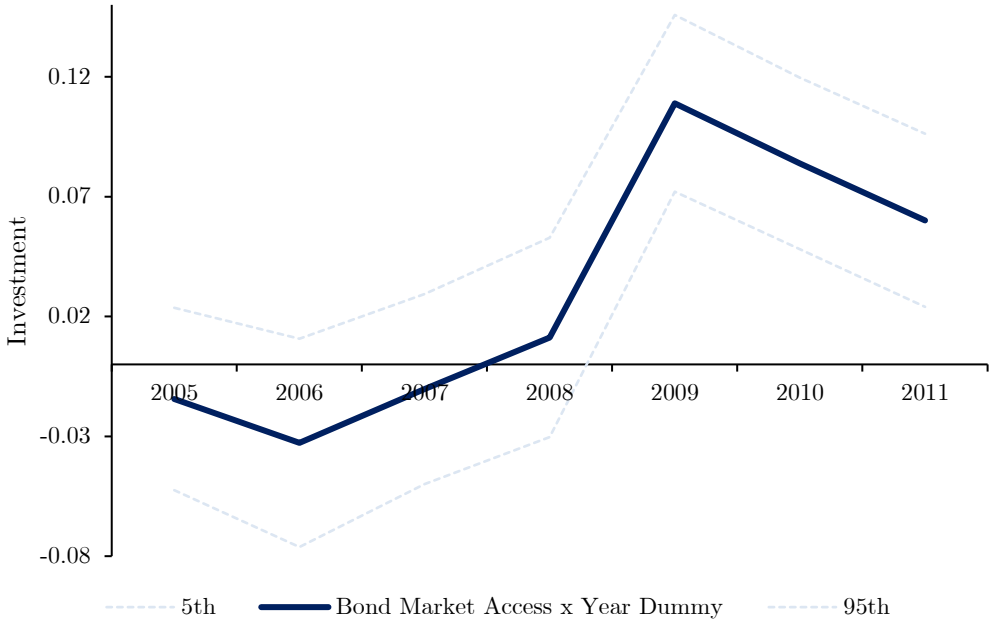

Figure 2: This figure reports the point estimates from an investment specification where the effect of bond market access is allowed to vary by year for each year starting three years prior to the beginning QE period and ending four years after the start of the QE period (Table 3, column 7). Ninety-five-percent confidence intervals are also plotted.