The Effects of Quantitative Easing on Corporate Investment, Employment, and Financing: Theory and Evidence from the Bond Lending Channel

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Motivation: Why Central Banks Turned to QE

❑ As the Great Recession 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 0.25%, the lowest Fed Funds Rate possible (compared to 4.25% 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:

   ❑ Fed (Nov. 2008), Bank of England (March 2009), Bank of Japan (April 2013), ECB (March 2015)

Motivation: Treasury Bonds and MBS

By mid-2014, the balance sheet of the Federal Reserve reached the unprecedented level of $4 trillion (including $1.6 trillion of mortgage-backed bonds and $2.4 trillion of treasuries) compared to $0.5 trillion prior to QE
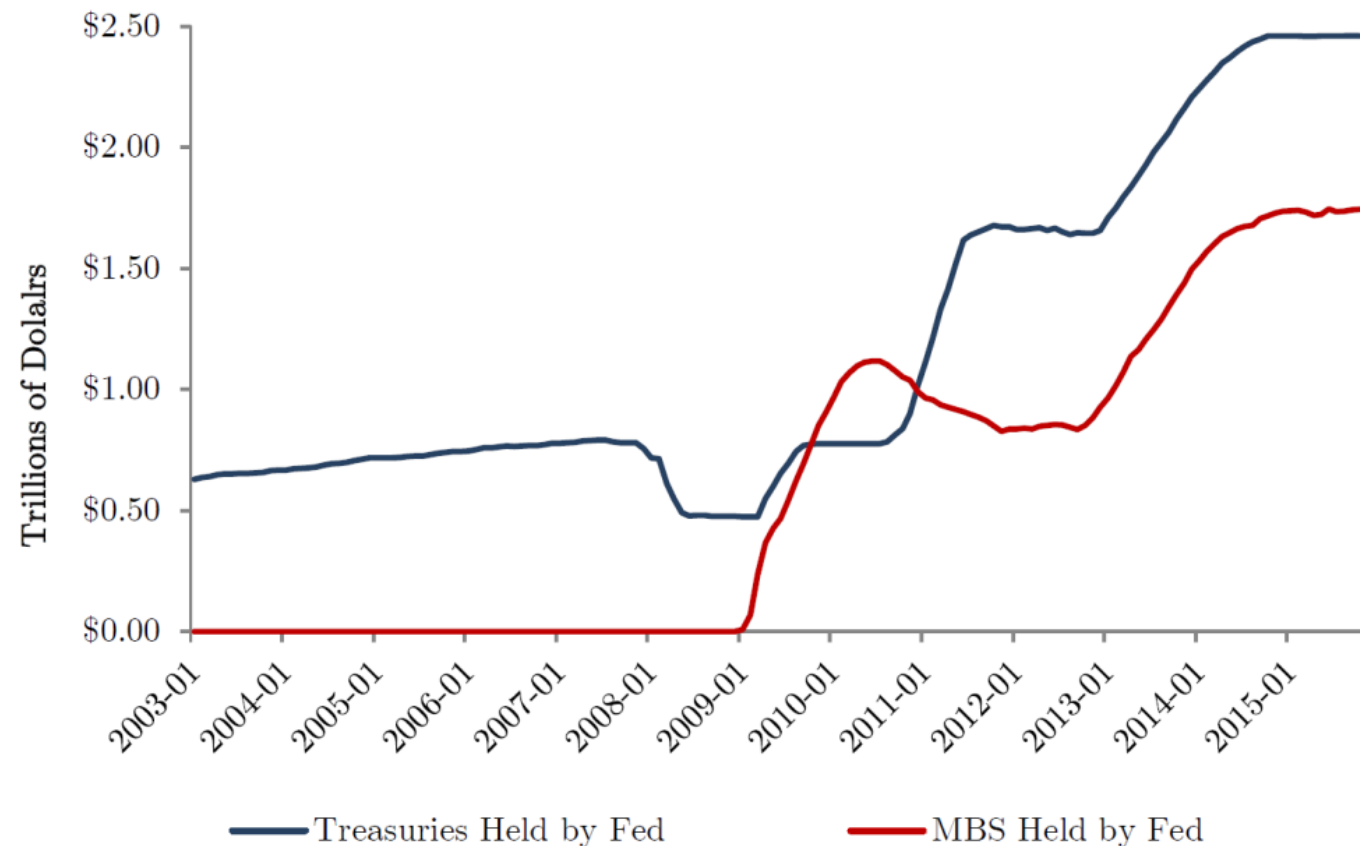

Figure 1: This figure shows treasury and mortgage backed securities ($ trillion) held by the Federal Reserve (Source: FRED Database).

Motivation

❑ In spite of this massive monetary policy intervention, the jury is still out on whether QE has been able to fuel the U.S. economy

❑ The media, for instance, are either skeptical on QE or suggest that QE might have been harmful to the real economy:

  ❑ Has quantitative easing worked in the US? – **BBC**, October 2014

  ❑ Will eurozone QE be too little, too late? – **The Guardian**, January 2015

  ❑ Reality check: does quantitative easing work? – **The Guardian**, 2016

  ❑ The Fed Has Hurt Business Investment – **WSJ**, October 2015

  ❑ QE Likely to Impair Living Standards for Generations – **Financial Times**, March 2015

❑ In this paper, we provide theory and evidence suggesting that QE stimulated corporate investment and employment by expanding firms' access to the corporate bond market, while also lowering the cost of debt financing:

  ❑ the bond-lending channel

Quantitative Easing and Bond Yields

❑ Figure shows that corporate and treasury bond yields started to diverge at the end of 2007 (Great Recession): "flight-to-quality"

❑ Yields started to converge as soon as the Fed started QE at the end of 2008

❑ By mid-2009, yields on AAA corporate bonds were practically identical to yields on 10-year treasury bonds
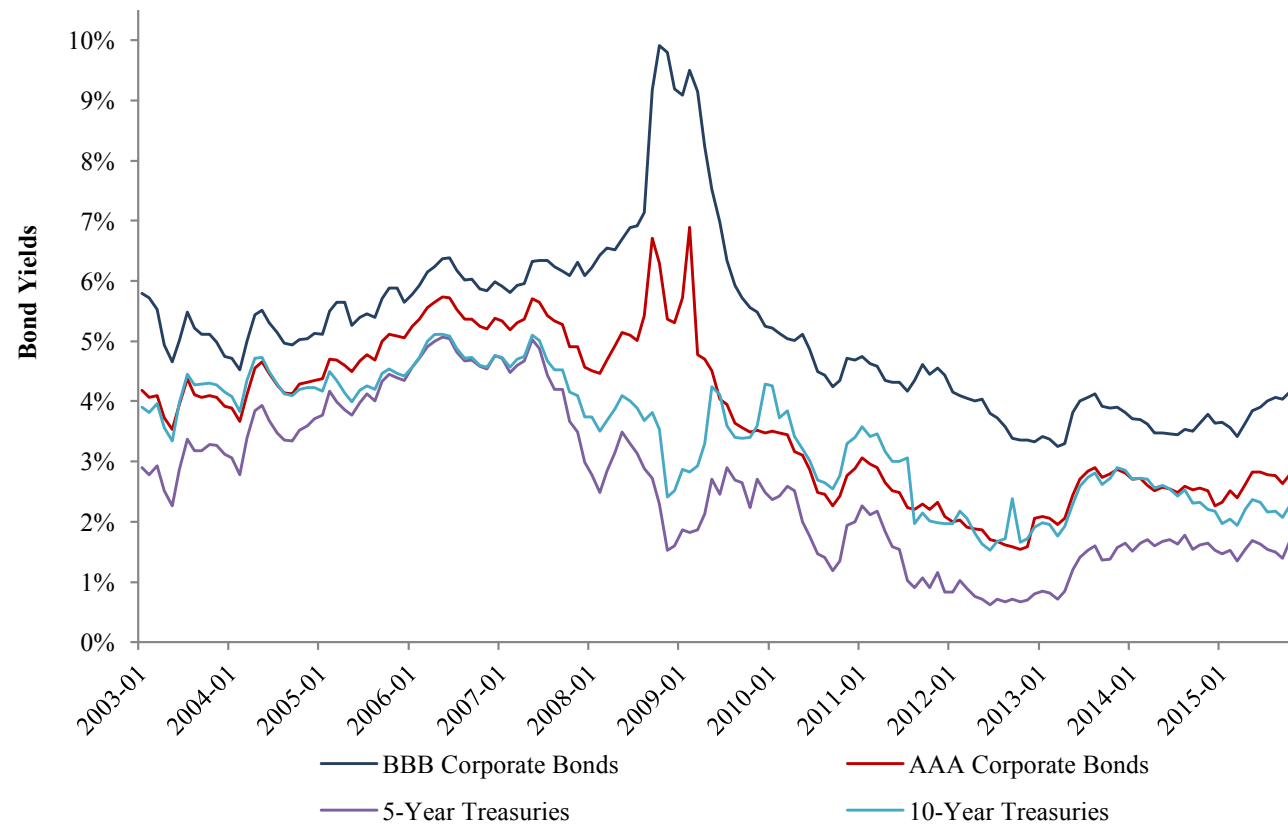
U.S. Corporate Bond Issuance (Source: SIFMA)

Corporate bond issuance increased after the Fed started QE at the end of 2008
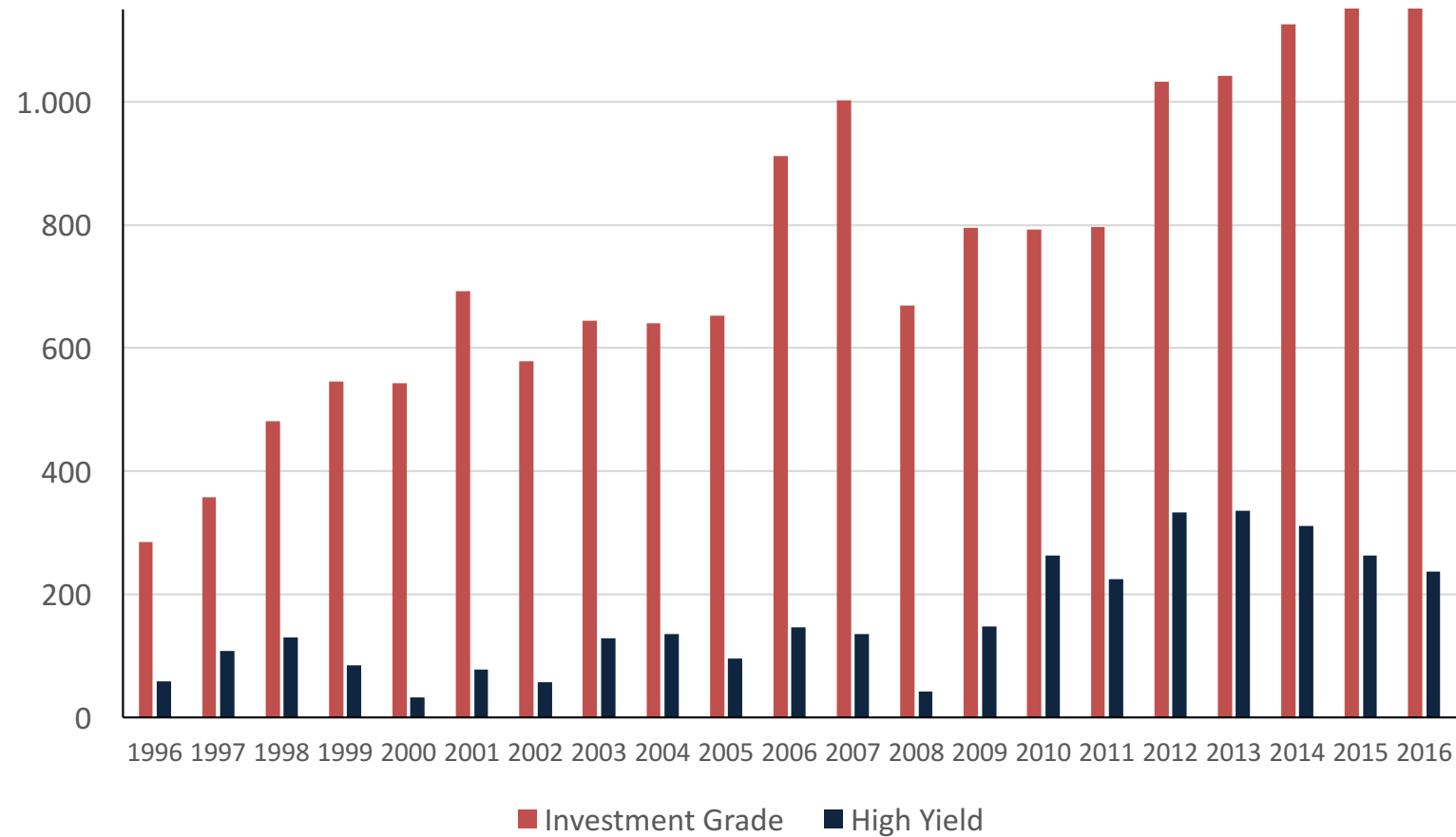
C&I Loans (Source: Survey of Terms of Business Lending)

C&I loans (especially secured) start to increase in 2010-Q4 (fiscal year 2010), they continue to increase in 2011 Q1-Q3 (fiscal year 2010, and bit of 2011), decline again in 2011-Q4 and 2012-Q1 (fiscal year 2011), and start to increase once again from 2012-Q2
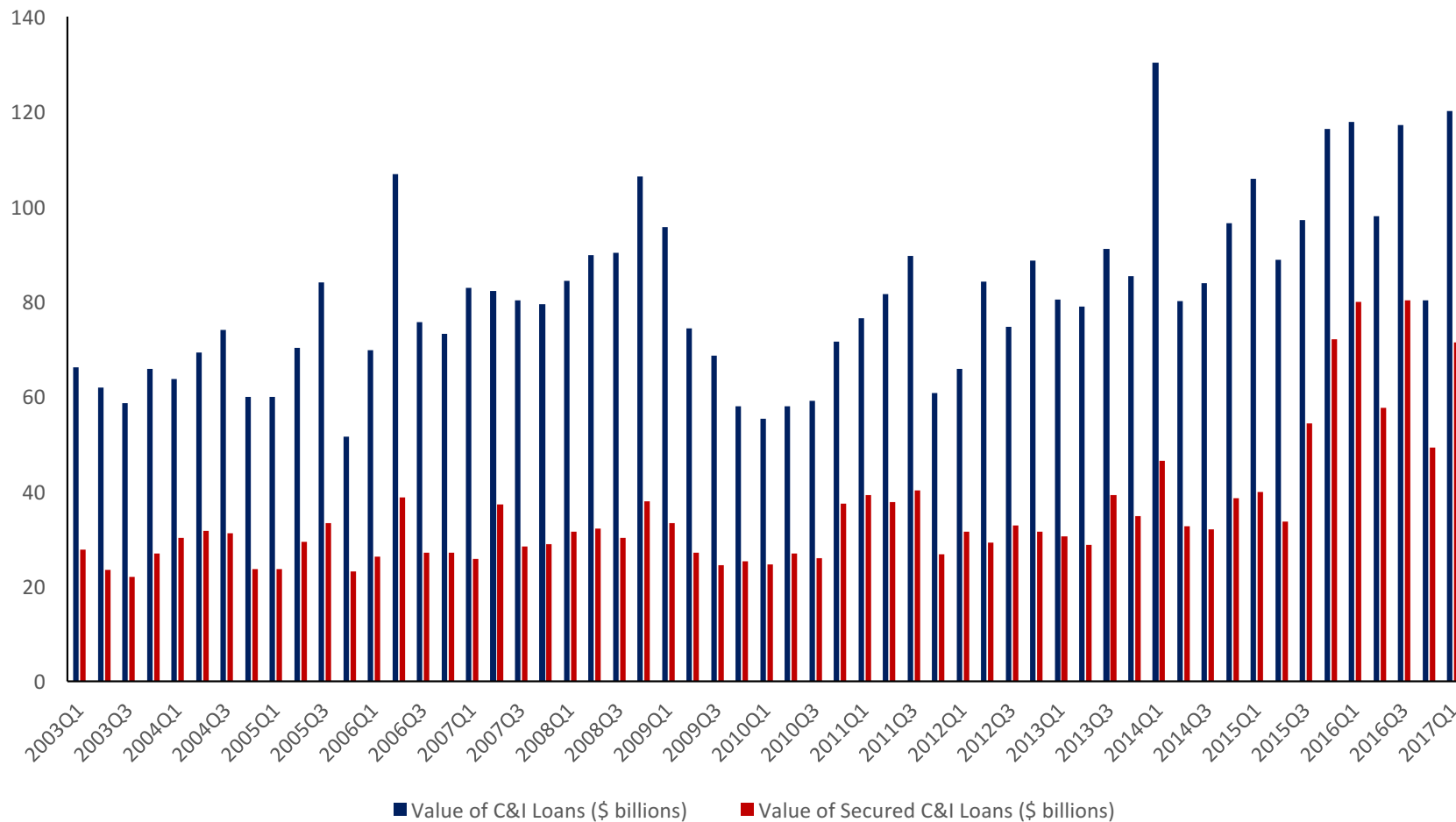
Transmission Mechanism of Quantitative Easing though Treasuries

❑ Through QE, the Fed buys treasury bonds from banks and institutional investors

❑ This reduces the supply of long-term safe debt, creating an excess demand for long-term safe bonds by institutional investors (e.g., pension funds, insurance companies, and endowments)

❑ The excess demand for long-term safe bond reduces their yield

❑ In turn, this prompts firms to "fill the gap" by issuing safe corporate bonds (investment grade) in order to reduce their average cost of debt (Greenwood, Hanson, Stein, 2010)

❑ As a result, QE facilitates access to cheaper credit

❑ In the gap-filling theory investment is decoupled from financing, but one can envision real effects in the presence of market frictions

Effects of QE through Asset Backed Securities: Our Model

❑ A characterizing element of the U.S. QE program (especially, QE-1) is the Fed acquisition of MBS, which reached $1.6 trillion by mid-2014 from $0 prior to 2008

❑ In our model, a QE program implemented through the acquisition of MBS makes the price of these securities go up

❑ In turn, this creates an incentive for banks to purchase receivables and other securitizable assets from firms and issue asset backed securities

❑ Higher prices for asset backed securities make the price of corporate receivables and other securitizable assets go up (i.e., market value of firms assets increase) – Hence, both ABS firms and firms with securitizable assets benefit:

   ❑ 10% of public firms use ABS according to Lemmon et al. (2014)

   ❑ Receivables and Land&Buildings are respectively 14% and 13% of average firm's assets

❑ This allows firms w/ access to the bond market to issue long-term safe bonds (which are selling at a low yield because of the Fed acquisition of long-term Treasuries through QE)

❑ Access to (more and cheaper) "long-term" "safe" debt leads to more investment

Predictions

❑ QE leads to more investment and employment for firms with access to the bond market

❑ These firms can invest more because they can borrow more and at a cheaper rate:

  ❑ Expect leverage to increase

  ❑ Expect cost of debt to decrease

❑ Firms are able to increase leverage by issuing "safe" "long-term" debt, which is the closest substitute for Treasury bonds:

  ❑ Expect senior debt to increase

  ❑ Expect debt maturity to increase

Empirical Literature on Effects of QE

Focusing on banks, Chakraborty, Goldstein, and MacKinlay (2017) find that banks that benefitted more from QE increased mortgage origination, while reducing commercial lending (which in turn led to lower investment by their client firms)

Using similar data, Rodnyanski and Darmouni (2016) find a similar increase in mortgage origination, but insignificant changes for commercial lending

Lo Duca, Nicoletti, and Martinez (2016) focus on U.S. QE and find a strong positive relation between asset purchase activities by the Federal Reserve and corporate bond issuance

Our paper complements this literature by showing that QE boosted corporate investment and employment by increasing the availability of credit (while also lowering the cost of debt) through the bond-lending channel

Empirical Literature on Government and Corporate Policies

Our paper relates also to the growing literature on the effect of government borrowing on corporate policies:

Swanson (2011) and Krishnamurthy and Vissing-Jorgensen (2011, 2012) find that changes in the supply of Treasuries affect yields for corporate bonds rated A or better

Using data for public firms over the last century, Graham, Leary, and Roberts (2014) find a strong negative correlation between government debt and corporate debt and investment

Badoer and James (2016) find a significantly negative relation between the maturity of treasury securities and the maturity of corporate debt

Similarly, Foley-Fisher, Ramcharan, and Yu (2016) find that after the Fed started to purchases longer-term Treasuries (from the proceeds of shorter-term Treasuries) in September 2011 corporations fill the gap by issuing longer-term bonds

Data

Firm level data are from COMPUSTAT

Information on Senior Bonds & Notes Issuance is from Capital IQ

Data on Treasuries and MBSs held by the Fed and bond yields are from the FRED Database

Corporate bond issuance data are from the Securities Industry and Financial Markets Association (SIFMA)

ABS data are from the U.S. Flow of Funds

Empirical Design

Claim: QE affects access to (more and cheaper) "safe" "long-term" credit and facilitates real activities of firms with access to the bond market (treated firms), relative to firms who do not have access to such market (control firms)

In our identification:

- ❑ Only firms with access to the bond market will benefit from the effects of QE on quantity and pricing in the bond market
- ❑ While both treated and control firms are potentially exposed to QE through bank lending (because both groups borrow from banks)

We use a difference-in-difference approach comparing investment, employment, leverage, etc. for firms with and without access to bond market in the eight years (2004 – 2011) around the FED beginning of QE policy in November 2008 – Estimate the following Model:

$$Investment_{i,t} = \beta(Bond\ Market\ Access \times QE\ Period)_{i,t}$$

$$+ \gamma Controls_{i,t} + y_i + z_t + \varepsilon_{i,t}$$

Investment: ratio of CAPX to lagged PP&E

Bond Market Access: indicator for firms with bond market access in 2007

QE Period: indicator equal to 1 for the fiscal years 2008-2011 (and zero for 2004-2007)

y_i and z_t: firm and year fixed effects

The Effect of Quantitative Easing on Investment

Starting with Investment, we find the coefficient on interaction term to be significantly positive across all six estimations

In line w/ prediction, the significantly positive coefficient for interaction term suggests that investment increased for firms with access to bond market (treated) in the QE period: QE stimulates real activities

Dependent variable:	Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.104***	0.086***	0.100***	0.088***	0.105***	0.074***
	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)
Log of Sales	-0.062***	-0.065***	-0.093***	-0.049***	-0.062***	-0.081***
	(0.018)	(0.019)	(0.019)	(0.017)	(0.018)	(0.020)
Tobin's q		0.046***				0.025***
		(0.008)				(0.008)
Profitability			0.408***			0.261***
			(0.068)			(0.071)
EarningsVolatility				1.201***		1.078***
				(0.137)		(0.148)
Tangibility					-0.046	0.042
					(0.090)	(0.092)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	26,772	22,566	26,753	26,735	26,768	22,542
R-2 (within)	0.036	0.045	0.042	0.080	0.036	0.084

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

The Effect of Quantitative Easing on Employment

Dependent variable:	Employment					
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.030*** (0.005)	0.020*** (0.006)	0.029*** (0.005)	0.028*** (0.005)	0.031*** (0.005)	0.019*** (0.006)
Log of Sales	0.024*** (0.006)	0.028*** (0.006)	0.012*** (0.006)	0.026*** (0.006)	0.024*** (0.006)	0.021*** (0.006)
Tobin's q		0.027*** (0.003)				0.021*** (0.003)
Profitability			0.169*** (0.026)			0.111*** (0.028)
EarningsVolatility				0.305*** (0.039)		0.235*** (0.038)
Tangibility					-0.104*** (0.036)	-0.071* (0.038)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	24,446	21,289	24,434	24,396	24,442	21,232
R-2 (within)	0.053	0.066	0.058	0.063	0.054	0.076

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

The Effect of Quantitative Easing on Firm's Value and Performance

Did increased investment and employment lead to higher valuation and stronger performance for the treated firms?

Dependent variable:	Tobin's q	Operating Income Before Depreciation & Amortization/Assets	Operating Income After Depreciation & Amortization/ Assets	Net Income/ Assets
	(1)	(2)	(3)	(4)
Bond Market Access × QE Period	0.252***	0.009***	0.012***	0.018***
	(0.031)	(0.003)	(0.003)	(0.004)
Log of Sales	-0.138***	0.064***	0.061***	0.051***
	(0.035)	(0.004)	(0.004)	(0.005)
EarningsVolatility	1.578***	0.071***	0.083***	0.115***
	(0.291)	(0.020)	(0.021)	(0.024)
Tangibility	-0.547***	-0.065***	-0.139***	-0.310***
	(0.152)	(0.017)	(0.018)	(0.025)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Obs.	22,704	26,920	26,933	26,933
R-2 (within)	0.138	0.119	0.108	0.078

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

The Effect of Quantitative Easing on Cash Holdings

Did QE lead to an increase in cash holdings for treated firms?

Increase in cash for treated firms suggests that by facilitating access to cheaper debt financing, QE might have helped firms build up their cash cushions

Dependent variable:	Cash					
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.019*** (0.003)	0.021*** (0.003)	0.017*** (0.003)	0.019*** (0.003)	0.021*** (0.003)	0.022*** (0.003)
Log of Sales	-0.043*** (0.004)	-0.048*** (0.004)	-0.050*** (0.004)	-0.043*** (0.004)	-0.037*** (0.004)	-0.045*** (0.004)
Tobin's q		0.015*** (0.002)				0.011*** (0.002)
Profitability			0.115*** (0.014)			0.089*** (0.013)
EarningsVolatility				0.082*** (0.016)		0.031** (0.013)
Tangibility					-0.479*** (0.022)	-0.499*** (0.022)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	27,859	22,888	27,826	26,935	27,854	22,690
R-2 (within)	0.064	0.098	0.074	0.067	0.170	0.205

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

The Effect of Quantitative Easing on Access to Credit

In our model, firms invest more by increasing leverage while reducing their average cost of debt

Increased leverage and reduced interest expenses suggest that QE facilitated access to more and cheaper credit for treated firms, which then stimulated real activities

Dependent variables:	Market Leverage		Book Leverage		Interest Expenses/Debt	
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.020***	0.025***	0.016***	0.015***	-0.005**	-0.008***
	(0.004)	(0.004)	(0.005)	(0.005)	(0.003)	(0.003)
Log of Sales	0.018***	0.025***	0.012***	0.024***	-0.002	-0.007**
	(0.003)	(0.004)	(0.004)	(0.004)	(0.002)	(0.003)
Tobin's q		-0.018***		-0.007***		0.008***
		(0.002)		(0.001)		(0.002)
Profitability		-0.199***		-0.208***		0.044***
		(0.014)		(0.018)		(0.014)
EarningsVolatility		0.023**		0.014		-0.020*
		(0.011)		(0.013)		(0.012)
Tangibility		0.131***		0.133***		-0.014
		(0.024)		(0.026)		(0.015)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,796	22,598	27,238	22,341	22,166	17,654
R-2 (within)	0.109	0.178	0.018	0.063	0.003	0.012

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

QE and Debt Composition: Senior Debt

In our model, affected firms are able to increase leverage by issuing longer-term (relatively safer) corporate bonds and notes, which are close substitutes for Treasury bonds

| Dependent variable:	Senior Bonds & Notes/Debt					
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.067***	0.078***	0.069***	0.066***	0.067***	0.078***
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.011)
Log of Sales	0.014**	0.017***	0.022***	0.015**	0.014**	0.026***
	(0.006)	(0.007)	(0.006)	(0.007)	(0.006)	(0.007)
Tobin's q		-0.005				-0.004
		(0.003)				(0.003)
Profitability			-0.117***			-0.103***
			(0.029)			(0.030)
EarningsVolatility				0.012		0.019
				(0.036)		(0.042)
Tangibility					-0.032	-0.048
					(0.047)	(0.052)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	24,071	19,844	24,049	23,348	24,062	19,699
R-2 (within)	0.012	0.013	0.014	0.012	0.012	0.015

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

QE and Debt Composition: Debt Maturity

Dependent variable:	Debt Maturing > 1 Year	Debt Maturing in 2 Years	Debt Maturing in 3 Years	Debt Maturing in 4 Years	Debt Maturing in 5 Years	Debt Maturing > 5 Years
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.037***	-0.010	0.009	0.042***	0.029***	-0.004
	(0.009)	(0.006)	(0.006)	(0.006)	(0.007)	(0.012)
Log of Sales	0.009	-0.013**	-0.015**	0.005	0.015**	0.032***
	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)	(0.010)
Tobin's q	-0.019***	-0.001	-0.003	-0.003	-0.001	-0.010**
	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)	(0.005)
Profitability	0.067*	0.024	0.042	0.044*	-0.008	-0.025
	(0.037)	(0.037)	(0.026)	(0.026)	(0.027)	(0.043)
EarningsVolatility	0.063**	0.001	-0.016	-0.015	0.037	0.085**
	(0.032)	(0.033)	(0.021)	(0.0225)	(0.025)	(0.037)
Tangibility	0.013	0.026	0.034	0.079**	-0.002	-0.117*
	(0.042)	(0.037)	(0.030)	(0.031)	(0.033)	(0.061)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	18,759	16,357	16,342	16,455	16,192	16,246
R-2 (within)	0.007	0.008	0.010	0.007	0.008	0.033

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

The Effects of Quantitative Easing: Graphically
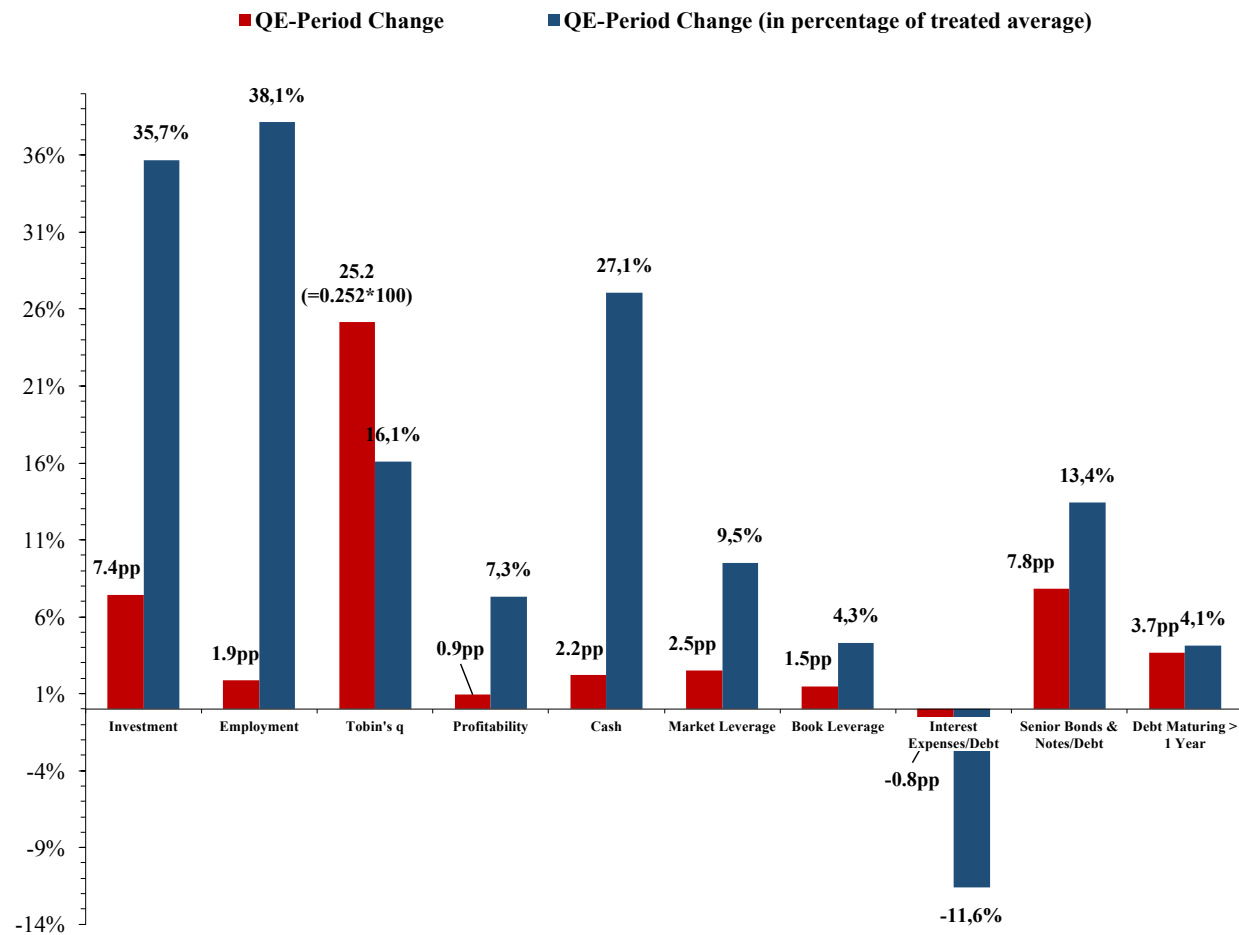
The Effect of Quantitative Easing by Phase: QE-1 and QE-2

This exercise allows us to identify when QE started to be effective

Dependent variables:	Investment (1)	Employment (2)	Tobin's q (3)	Operating Income Before D&A/ Assets (4)	Operating Income After D&A/ Assets (5)	Net Income/ Assets (6)	Cash (7)
Bond Market Access × 2011 (QE-2)	0.065*** (0.015)	0.033*** (0.009)	0.289*** (0.042)	0.013*** (0.004)	0.018*** (0.004)	0.017*** (0.005)	0.024*** (0.004)
Bond Market Access × 2010 (QE-2)	0.088*** (0.014)	0.017** (0.008)	0.147*** (0.037)	0.006* (0.003)	0.010*** (0.004)	0.018*** (0.005)	0.025*** (0.004)
Bond Market Access × 2009 (QE-1)	0.123*** (0.014)	0.018** (0.008)	0.213*** (0.033)	0.008** (0.004)	0.010*** (0.004)	0.019*** (0.005)	0.019*** (0.004)
Bond Market Access × 2008 (QE-1)	0.027 (0.016)	0.010 (0.008)	0.343*** (0.033)	0.010*** (0.004)	0.012*** (0.004)	0.019*** (0.007)	0.021*** (0.003)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,542	21,232	22,704	26,920	26,933	26,933	22,690
R-2 (within)	0.085	0.076	0.139	0.120	0.109	0.078	0.205

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

The Effect of Quantitative Easing by Phase (cont'd)

This exercise allows us to identify when QE started to be effective

Dependent variables:	Market Leverage (8)	Book Leverage (9)	Interest Expenses /Debt (10)	Senior Bonds & Notes/ Debt (11)	Debt Maturing > 1 Year (12)	Debt Maturing in 2 Years (13)	Debt Maturing in 3 Years (14)	Debt Maturing in 4 Years (15)	Debt Maturing in 5 Years (16)	Debt Maturing > 5 Year (17)
Bond Market Access × 2011 (QE-2)	0.014**	0.010	-0.012***	0.119***	0.031**	0.003	0.024**	0.018	-0.003	-0.017
	(0.005)	(0.006)	(0.004)	(0.015)	(0.012)	(0.010)	(0.011)	(0.010)	(0.012)	(0.018)
Bond Market Access × 2010 (QE-2)	0.011**	0.008	-0.008**	0.120***	0.052***	-0.012	0.021*	0.046***	0.011	0.003
	(0.005)	(0.006)	(0.004)	(0.014)	(0.012)	(0.011)	(0.011)	(0.011)	(0.010)	(0.017)
Bond Market Access × 2009 (QE-1)	0.024***	0.015***	-0.008**	0.079***	0.051***	-0.035***	0.011	0.060***	0.058***	0.014
	(0.005)	(0.005)	(0.004)	(0.012)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.016)
Bond Market Access × 2008 (QE-1)	0.046***	0.024***	-0.007	0.018*	0.016	0.003	-0.014	0.041***	0.040***	-0.016
	(0.005)	(0.005)	(0.003)	(0.010)	(0.011)	(0.009)	(0.011)	(0.011)	(0.011)	(0.015)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,598	22,341	17,654	19,699	18,759	16,357	16,342	16,455	16,192	16,246
R-2 (within)	0.181	0.064	0.012	0.020	0.008	0.009	0.011	0.008	0.010	0.033

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

The Effects of QE for Investment Grade and Speculative Grade Firms

Investment grade firms should benefit more from QE because investment grade bonds are better substitutes for Treasury bonds and agency MBS

Dependent variables:	Investment (1)	Employ-ment (2)	Tobin's q (3)	Operating Income Before D&A/ Assets (4)	Operating Income After D&A/ Assets (5)	Net Income/ Assets (6)	Cash (7)
Investment Grade Market × QE Period	0.102*** (0.011)	0.036*** (0.006)	0.236*** (0.033)	0.011*** (0.003)	0.017*** (0.003)	0.030*** (0.004)	0.021*** (0.004)
Speculative Market × QE Period	0.053*** (0.014)	0.005 (0.008)	0.264*** (0.038)	0.008** (0.004)	0.008** (0.004)	0.009* (0.005)	0.023*** (0.004)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,542	21,232	22,704	26,920	26,933	26,933	22,690
R-2 (within)	0.084	0.076	0.138	0.120	0.109	0.078	0.205

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

The Effects of QE for Investment Grade and Speculative Grade Firms (cont'd)

Investment grade firms should benefit more from QE because investment grade bonds are better substitutes for Treasury bonds and agency MBS

Dependent variables:	Market Leverage (8)	Book Leverage (9)	Interest Expenses /Debt (10)	Senior Bonds & Notes/ Debt (11)	Debt Maturing > 1 Year (12)	Debt Maturing in 2 Years (13)	Debt Maturing in 3 Years (14)	Debt Maturing in 4 Years (15)	Debt Maturing in 5 Years (16)	Debt Maturing > 5 Year (17)
Investment Grade Market × QE Period	0.009** (0.004)	0.015*** (0.005)	-0.011*** (0.003)	0.091*** (0.014)	0.066*** (0.010)	-0.024*** (0.007)	-0.007 (0.007)	0.016** (0.006)	0.005 (0.008)	0.082*** (0.014)
Speculative Market × QE Period	0.038*** (0.006)	0.015** (0.007)	-0.006* (0.004)	0.068*** (0.013)	0.013 (0.010)	0.001 (0.007)	0.022*** (0.007)	0.063*** (0.008)	0.048*** (0.010)	-0.074*** (0.015)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,598	22,341	17,654	19,699	18,759	16,357	16,342	16,455	16,192	16,246
R-2 (within)	0.180	0.063	0.012	0.015	0.009	0.009	0.011	0.008	0.009	0.042

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

The Effects of QE: Controlling for Treated-Specific Trends

Dependent variables:	Investment (1)	Employ-ment (2)	Tobin's q (3)	Operating Income Before D&A/ Assets (4)	Operating Income After D&A/ Assets (5)	Net Income/ Assets (6)	Cash (7)
Bond Market Access × QE Period	0.079***	0.022***	0.271***	0.011***	0.015***	0.020***	0.022***
	(0.013)	(0.007)	(0.032)	(0.003)	(0.003)	(0.004)	(0.003)
Bond Market Access × Trend	-0.001	0.001	0.002	-0.001	-0.001	0.001	-0.001
	(0.002)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,542	21,232	22,704	26,920	26,933	26,933	22,690
R-2 (within)	0.084	0.076	0.138	0.122	0.111	0.079	0.205

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

The Effects of QE: Controlling for Treated-Specific Trends (cont'd)

Dependent variables:	Market Leverage (8)	Book Leverage (9)	Interest Expenses /Debt (10)	Senior Bonds & Notes/ Debt (11)	Debt Maturing > 1 Year (12)	Debt Maturing in 2 Years (13)	Debt Maturing in 3 Years (14)	Debt Maturing in 4 Years (15)	Debt Maturing in 5 Years (16)	Debt Maturing > 5 Year (17)
Bond Market Access × QE Period	0.024***	0.013***	-0.009***	0.066***	0.038***	-0.010	0.008	0.041***	0.039***	-0.001
	(0.005)	(0.005)	(0.003)	(0.012)	(0.010)	(0.008)	(0.008)	(0.008)	(0.008)	(0.014)
Bond Market Access × Trend	-0.001	-0.001	0.001	0.005**	-0.001	0.001	0.003	-0.001	-0.003**	-0.001
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	22,598	22,341	17,654	19,699	18,759	16,357	16,342	16,455	16,192	16,246
R-2 (within)	0.180	0.063	0.014	0.030	0.013	0.009	0.012	0.007	0.009	0.053

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

Robustness: Alternative Investment Measures

Dependent variable:	Capital Expenditures/ Property, Plant, & Equipment		Capital Expenditures/ Assets		Capital Expenditures/ Lagged Assets	
	(1)	(2)	(3)	(4)	(5)	(6)
Bond Market Access × QE Period	0.035***	0.026***	0.007***	0.003**	0.014***	0.006**
	(0.004)	(0.004)	(0.001)	(0.002)	(0.002)	(0.003)
Log of Sales	-0.007	-0.005	-0.001	0.001	-0.012***	-0.014***
	(0.005)	(0.005)	(0.002)	(0.002)	(0.003)	(0.003)
Tobin's q		0.015***		0.003***		0.004***
		(0.002)		(0.001)		(0.001)
Profitability		0.056**		0.001		0.055***
		(0.023)		(0.007)		(0.011)
EarningsVolatility		0.091***		0.011*		0.171***
		(0.023)		(0.006)		(0.023)
Tangibility		-0.142***		0.168***		0.125***
		(0.022)		(0.009)		(0.018)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	27,657	22,590	27,820	22,667	26,949	22,651
R-2 (within)	0.063	0.088	0.045	0.116	0.054	0.116

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

Conclusions

Using a difference-in-difference approach, we find that bond-market firms have access to more and cheaper credit in the QE period (relative to control firms)

Notably, these firms are able to increase leverage by issuing "safer" and "longer-maturity" bonds and notes, which are closer substitutes for Treasuries

We also find that firms utilize this increased access to credit to invest, hire, and build up their cash reserves

Overall, our findings suggest that QE stimulated real activities through the bond-lending channel