Different strokes for different banks: a heterogeneity analysis of Fed QE on bank lending

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[1]Usual disclaimer applies

Introduction

- Central banks implemented unconventional policy measures (QE) in reaction to the Global Financial Crisis, considerably expanding their balance sheets.
- Between November 2008 and October 2014 the Fed launched three QE rounds
- By the end of three rounds of QE, the Fed balance sheet reached $4.5 trillion, close to 30 percent of GDP
- **Yet**, fifteen years from the Fed's first QE program, it has been hard to assess the impact of unconventional monetary policies

Related Literature on QE

- Different channels through which QE is transmitted to the economy (Bernanke et al., 2020)
  - Signalling channel: Krishnamurthy & Vissing-Jorgensen (2011), Berger & Bouwman (2013)
  - Portfolio channel: Gagnon et al. (2011), D'Amico et al. (2012), Koijen et al. (2021)
  - Lending channel:
    - Rodnyansky & Darmouni (2017): QE-exposed banks increased lending during QE3
    - Chakraborty et al. (2020): Crowding-out effect
    - Other studies include Luck & Zimmermann (2018), Maggio et al. (2016)
- One common thread is **mixed findings**

Contribution and Research Question

- Does bank heterogeneity play a role in shaping the response of bank lending to QE purchases?
- *Twofold* contribution to the limited and more recent empirical literature on QE and bank lending:
  - Exploits the heterogeneity of the Fed QE programme, both in terms of volumes and types of assets purchased
  - Analyze whether banks with similar exposure to MBS and/or Treasuries purchases reacted differently depending on their liquidity and capitalization

Preview of Findings

- Banks receive cheap liquidity as a direct effect of Fed purchases
- Such liquidity injection can encourage bank lending and have a potential positive effect on the real economy
- Bank exposure to QE purchases affects lending depending upon the type of asset purchases
  - MBS-exposed banks reduced lending, while TSY-exposed banks increased lending
- Transmission of unconventional monetary policy depends on the degree of heterogeneity in the banking sector
  - Bank lending reacts differently to liquidity and capital for MBS- and TSY-exposed banks

Implications

- Implications for how we have been thinking about the QE transmission channels
- Trasmission mechanisms we think are likely the most significant to relate to our empirical results are
  - Bank lending channel: an expansionary monetary policy leads to leads to a cheap source of funding and , in turn, an increase in banks' loan supply
  - Risk-taking channel: expansionary monetary policy reinforces the incentives of financial intermediaries to finance riskier projects
  - Portfolio re-balancing channel: through QE, central banks change the relative supply of the assets being purchased and thus induce changes in their relative yields.
- Policy makers - QE may be less effective than previously thought

Data and Identification strategy

- Consolidated financial statements for Bank Holding Companies (BHCs) in the United States from 2006:Q1 to 2014:Q4
- Actual amounts of MBS and Treasuries purchases collected from New York Fed
- Bank's reliance on QE is measured by ratio of MBS-to-total assets and/or ratio of TSY-to-total assets in 2007Q4
- Identification strategy relies on the interaction of cross-sectional variation among banks in their MBS/TSY holdings and amount of security purchases by the Fed

Empirical set-up

$$
\begin{aligned}
Y_{i,t} = \alpha_i + \beta_{j,t} + \gamma_1 AssetPurch_{t-4} + \gamma_2 Treat_i + \gamma_3 Heterogen_i^j + \\
\gamma_4 Treat_i \times AssetPurch_{t-4} + \gamma_5 Heterogen_i^j \times AssetPurch_{t-4} + \\
\gamma_6 Treat_i \times Heterogen_i^j + \gamma_7 Treat_i \times AssetPurch_{t-4} \times Heterogen_i^j + \\
\delta' X_{i,t} + \epsilon_{i,t}.
\end{aligned} \tag{1}
$$

- $Y_{i,t}$ = log of tot loans or real estate or commercial and industrial loans
- $Treat_i$ = indicator variable; 1 if bank belongs to treatment group and 0 for control group. Treatment and Control group banks based on top and bottom quartiles of MBS-to-assets holdings in 2007:Q4
- $AssetPurch_t$ = amounts of MBS and TSY purchases in each quarter
- $Heterogen_i^j$ = indicator variable for liquidity or level of capital in 2007:Q4

Table: Summary Statistics

	Obs	Mean	Std.D.	p10	Median	p90
Treatment Group						
$\left(\frac{MBS}{TotalAssets}\right)_i$	7,343	0.2	0.1	0.1	0.2	0.3
$\left(\frac{Treasury}{TotalAssets}\right)_i$	7,343	0.2	0.1	0.0	0.1	0.2
log(Total Loans)	7,343	14.0	1.4	12.6	13.7	15.9
log(RE Loans)	7,332	13.7	1.4	12.3	13.4	15.4
log(C&I Loans)	7,332	11.9	1.9	10.0	11.6	14.4
Asset Size	7,343	13.6	1.5	12.2	13.2	15.5
Liquidity	7,343	0.1	0.1	0.0	0.0	0.1
Tier 1 Risk-based Capital Ratio	7,312	13.7	19.3	9.1	12.8	19.1
Net Income/Total Assets	7,343	0.0	0.0	-0.0	0.0	0.0
Cash/ Total Assets	7,343	0.0	0.0	0.0	0.0	0.1
Loans to Deposit ratio	6,942	0.8	0.6	0.5	0.8	1.0
Control Group						
$\left(\frac{MBS}{TotalAssets}\right)_i$	7,312	0.0	0.0	0.0	0.0	0.1
$\left(\frac{Treasury}{TotalAssets}\right)_i$	7,312	0.1	0.1	0.0	0.1	0.2
log(Total Loans)	7,303	13.5	0.9	12.6	13.4	14.5
log(RE Loans)	7,268	13.2	0.9	12.3	13.1	14.3
log(C&I Loans)	7,291	11.3	1.2	10.1	11.3	12.7
Asset Size	7,312	12.5	1.1	11.4	12.4	13.7
Liquidity	7,312	0.1	0.1	0.0	0.1	0.2
Tier 1 Risk-based Capital Ratio	7,308	12.9	24.2	8.1	11.9	17.5
Net Income/Total Assets	7,312	0.4	19.5	-0.0	0.0	0.0
Cash/ Total Assets	7,312	0.1	0.1	0.0	0.0	0.1
Loans to Deposit ratio	6,918	36.4	1,302.0	0.7	0.9	1.1

Distinct number of banks for each category

Table: Number of treated banks based on bank heterogeneity

Category	**Number of banks**
(Liquid= 1); (Capital != 1); (Treatment !=1)	238
(Liquid= !1); (Capital = 1); (Treatment !=1)	232
(Liquid= 1); (Capital != 1); (Treatment =1)	43
(Liquid= !1); (Capital = 1); (Treatment =1)	74
(Liquid= 1); (Capital = 1); (Treatment =1)	20

Results: Heterogeneity analysis (Liquidity)

Table: The impact of MBS and TSY purchases on lending: effect of bank liquidity

	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurchases_{t-4} \times Treat_i^{MBS^Q}$	0.0425***	0.0482**	-0.0378**			
	(0.0152)	(0.0182)	(0.0151)			
$MBSpurchases_{t-4} \times Treat_i^{MBS^Q} \times Liquidity_i^Q$	-0.0073***	-0.0065**	-0.0088**			
	(0.0021)	(0.0024)	(0.0038)			
$TSYpurchases_{t-4} \times Treat_i^{TSY^Q}$				-0.0101	-0.0019	0.0249
				(0.0089)	(0.0055)	(0.0244)
$TSYpurchases_{t-4} \times Treat_i^{TSY^Q} \times Liquidity_i^Q$				0.0058**	0.0043**	0.0052**
				(0.0025)	(0.0020)	(0.0020)
Observations	5,524	5,490	5,806	10,761	10,726	10,723
R-squared	0.2110	0.2020	0.0567	0.0387	0.0434	0.0616
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
$Treat_i^Q \times$Asset Purchases$_{t-4} \times BankControls$	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State X Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

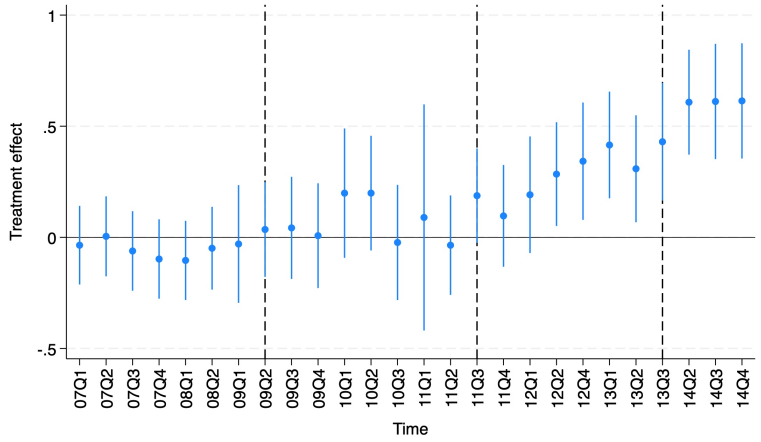
Results: Heterogeneity analysis (Capital)

Table: The impact of MBS and TSY purchases on lending: effect of bank capital

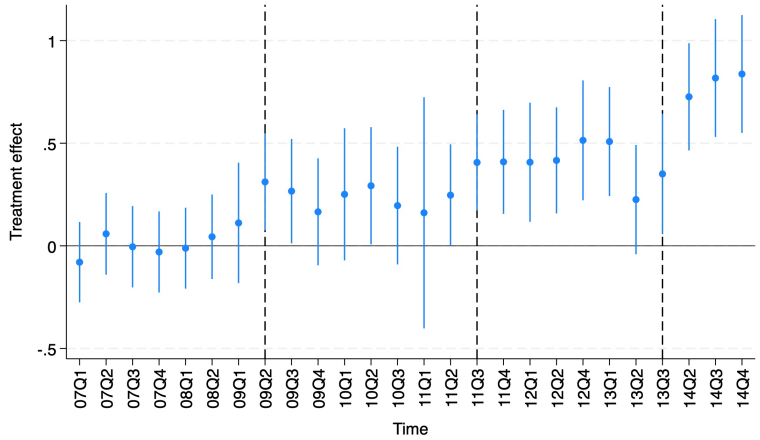
	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurchases_{t-4} \times Treat_i^{MBS^Q}$	0.0202	0.0219***	0.0122**			
	(0.0162)	(0.0054)	(0.0050)			
$MBSpurchases_{t-4} \times Treat_i^{MBS^Q} \times Capital_i^Q$	-0.0029*	-0.0040**	-0.0076			
	(0.0016)	(0.0017)	(0.0059)			
$TSYpurchases_{t-4} \times Treat_i^{TSY^Q}$				-0.0171*	-0.0080***	-0.0520*
				(0.0085)	(0.0027)	(0.0255)
$TSYpurchases_{t-4} \times Treat_i^{TSY^Q} \times Capital_i^Q$				0.0038**	0.0030*	0.0013
				(0.0018)	(0.0017)	(0.0025)
Observations	5,540	5,510	5,535	11,420	10,839	11,384
R-squared	0.2312	0.2210	0.0177	0.1731	0.0688	0.0355
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
$Treat_i^Q \times$Asset purchases$_{t-4} \times BankControls$	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State X Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Timing of the effects (Liquidity)

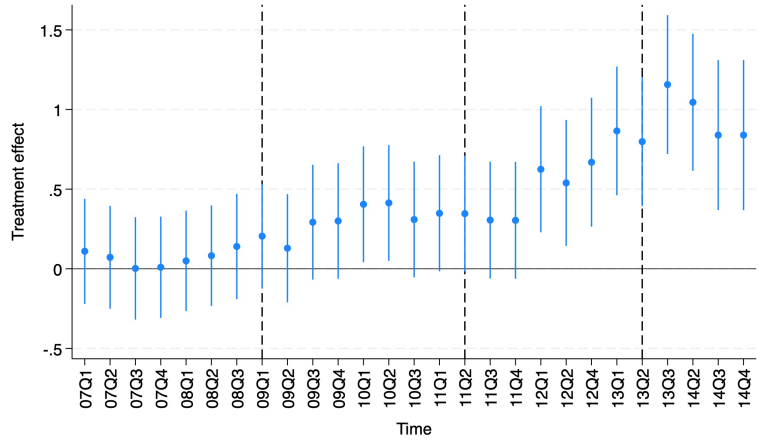
Total lending



RE lending

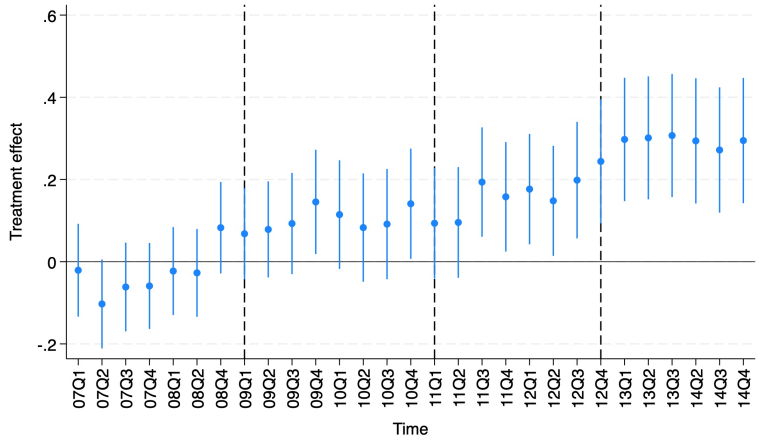


C&I lending

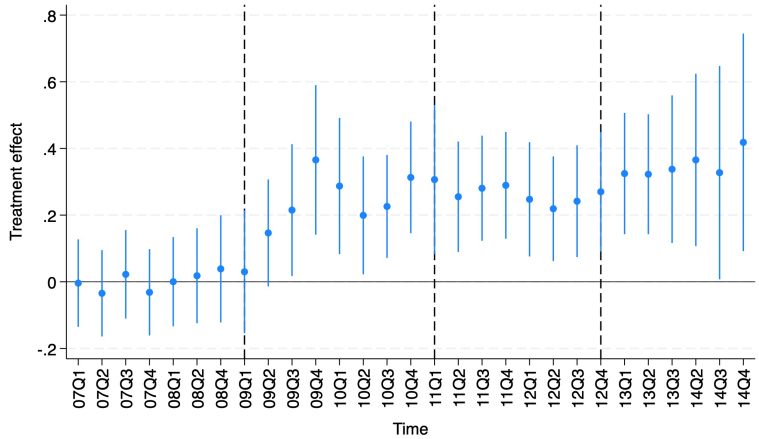


Timing of the effects (Capital)

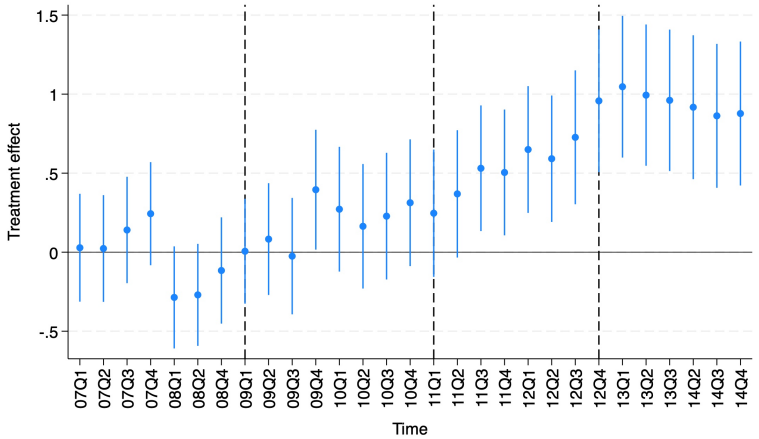
Total lending



RE lending



C&I lending



Robustness Checks: Varying definition of the treatment variable: taking decile values: Liquidity

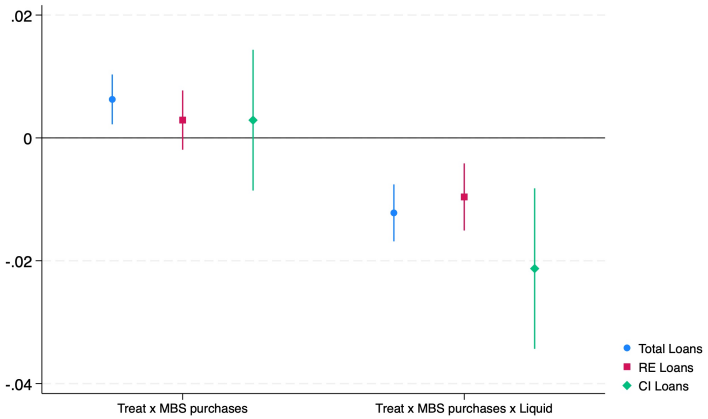


Figure: MBS purchases

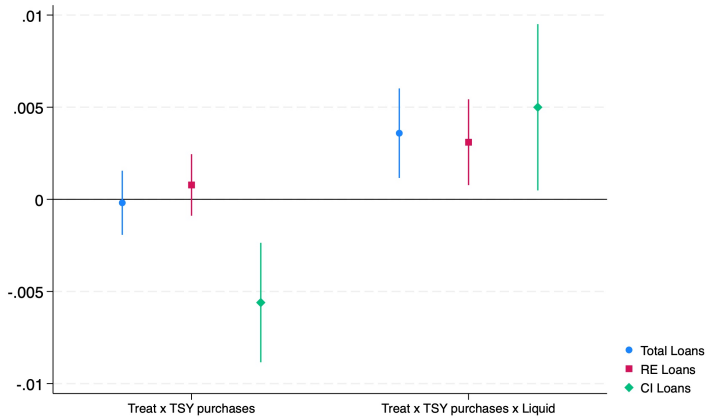


Figure: TSY purchases

Robustness Checks: Varying definition of the treatment variable: taking decile values: Capital

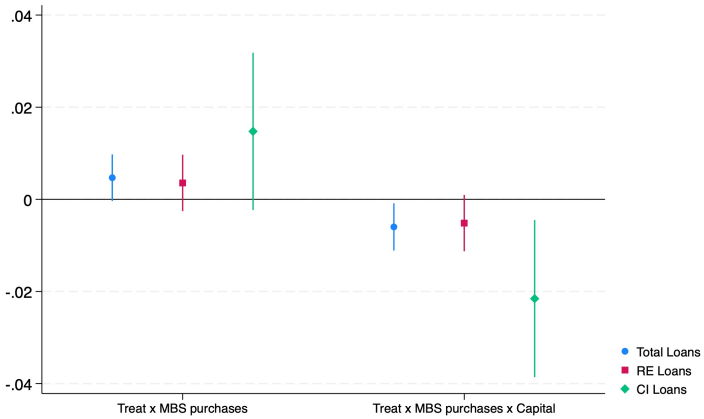


Figure: MBS purchases

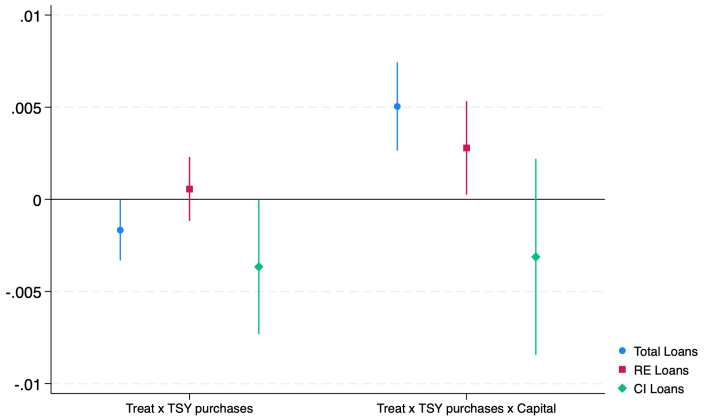


Figure: TSY purchases

Robustness Checks: Varying definition of the treatment variable: taking continuous measure: Liquidity

Table: The impact of MBS and TSY purchases on lending: effect of bank liquidity

	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurchases_{t-4} \times \frac{MBS}{Assets_i}$	-0.0135	-0.0286	0.1594*			
	(0.0563)	(0.0794)	(0.0807)			
$MBSpurchases_{t-4} \times \frac{MBS}{Assets_i} \times Liquidity_i^Q$	-0.0392***	-0.0289**	-0.0883***			
	(0.0111)	(0.0114)	(0.0242)			
$TSYpurchases_{t-4} \times \frac{TSY}{Assets_i}$				0.0933**	0.0933	-0.1247
				(0.0374)	(0.0603)	(0.0928)
$TSYpurchases_{t-4} \times \frac{TSY}{Assets_i} \times Liquidity_i^Q$				0.0144*	0.0185**	0.0350***
				(0.0082)	(0.0086)	(0.0114)
Observations	10,761	10,726	10,723	11,320	11,285	11,282
R-squared	0.1291	0.1355	0.0679	0.0945	0.0838	0.0336
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
$Treat_i^Q \times$Asset purchases$_{t-4} \times BankControls$	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State $\times TimeFixedEffects$	Yes	Yes	Yes	Yes	Yes	Yes

Robustness Checks: Varying definition of the treatment variable: taking continuous measure: Capital

Table: The impact of MBS and TSY purchases on lending: effect of bank capital

	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurchases_{t-4} \times \frac{MBS}{Assets_i}$	0.0086***	0.0082***	0.0096***			
	(0.0008)	(0.0017)	(0.0019)			
$MBSpurchases_{t-4} \times \frac{MBS}{Assets_i} \times Capital_i^Q$	-0.0300***	-0.0196**	-0.0351*			
	(0.0083)	(0.0077)	(0.0191)			
$TSYpurchases_{t-4} \times \frac{TSY}{Assets_i}$				0.0435	-0.1263***	-0.9338***
				(0.0845)	(0.0288)	(0.0954)
$TSYpurchases_{t-4} \times \frac{TSY}{Assets_i} \times Capital_i^Q$				0.0239***	0.0426***	0.0692***
				(0.0079)	(0.0097)	(0.0246)
Observations	10,771	10,743	10,735	10,771	10,743	11,192
R-squared	0.2398	0.2107	0.0595	0.2343	0.0970	0.2046
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
$Treat_i^Q \times$Asset purchases$_{t-4} \times BankControls$	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State $\times TimeFixedEffects$	Yes	Yes	Yes	Yes	Yes	Yes

Conclusions

- Bank heterogeneity plays a crucial role in the lending behaviour of banks during periods of unconventional monetary policy
- This paper exploits bank heterogeneity as a result of the FED QE program, both in terms of volumes and asset type
- Particularly, the paper investigates whether banks that had a similar exposure to MBS and/or Treasuries purchases reacted differently to size, liquidity and capital.
- We find that banks "in the tails" of the risk distribution increase lending while the "safest" banks reduce lending.
- Implications for policymakers when assessing the impact of QE and possibly, by extension, QT

Conclusions

- The strength of the transmission mechanism may be weaker under QE than previously thought, based on experience with conventional monetary policy.
- Potential implications for financial stability - " gambling for resurrection" behaviour.
- Bank heterogeneity plays an overall critical role for QE effectiveness

Thank You !!

Results: Heterogeneity analysis (Bank size)

Table: The impact of MBS and TSY purchases on lending: effect of bank size

	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurch_{t-4}$	0.0179***	0.0203***	0.0164**			
	(0.0049)	(0.0054)	(0.0074)			
$MBSpurch_{t-4} \times Treat_i^{MBS^Q} \times BankSize_i^Q$	0.0109***	0.0106**	0.0106***			
	(0.0038)	(0.0041)	(0.0037)			
$TSYpurch_{t-4}$				0.0769***	0.0841***	0.0076
				(0.0127)	(0.0141)	(0.0245)
$TSYpurch_{t-4} \times Treat_i^{TSY^Q} \times BankSize_i^Q$				0.0004	0.0031*	0.0054*
				(0.0017)	(0.0018)	(0.0032)
Observations	5,731	5,725	5,724	9,014	9,027	9,001
R-squared	0.1468	0.1304	0.0808	0.2205	0.1891	0.1104
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes

Robustness Checks: Varying definition of the treatment variable: taking continuous measure: Size

Table: The impact of MBS and TSY purchases on lending: effect of bank size

	Total Loans (1)	**RE Loans** (2)	**C & I Loans** (3)	**Total Loans** (4)	**RE Loans** (5)	**C & I Loans** (6)
$MBSpurchases_{t-4}$	0.0151***	0.0189***	0.0056			
	(0.0027)	(0.0027)	(0.0046)			
$MBSpurch._{t-4} \times \frac{MBS}{Assets_i} \times BankSize_i^Q$	0.0528***	0.0476***	0.0605***			
	(0.0087)	(0.0086)	(0.0152)			
$TSYpurchases_{t-4}$				-0.0434***	-0.0245***	-0.1255***
				(0.0084)	(0.0093)	(0.0225)
$TSYpurch._{t-4} \times \frac{TSY}{Assets_i} \times BankSize_i^Q$				0.0313***	0.0366***	0.1458***
				(0.0056)	(0.0068)	(0.0164)
Observations	11,031	11,024	11,505	11,031	9,071	9,026
R-squared	0.0927	0.0951	0.0554	0.7243	0.6500	0.2808
Bank-level Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes