

The Effect of US Unconventional Monetary Policies on Bank Lending in Emerging Markets: Evidence from Turkey[±]

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We analyze the cross-border spillovers of US unconventional monetary policies on bank credit supply in Turkey and assess the underlying channels. We use an extensive firm-bank matched dataset of loans to non-financial firms during 2007-2014 from the credit register of the Central Bank of the Republic of Turkey. Our identification strategy isolates loan supply shifts by controlling for unobserved firm heterogeneity in loan demand through firm-month fixed effects. We find that asset purchases by the Federal Reserve had a significant positive impact on the supply of bank loans to Turkish firms. Consistent with external finance premium theory, this effect was larger for lower-capital banks, suggesting that riskier banks faced a more rapid decline in the cost of external funds and hence were able to expand loan supply more, accentuating the credit cycle in Turkey.

JEL codes: E44, E52, E58, G01,G21, G28.

Keywords: credit channel of monetary policy, financial globalization, cross-border loans, foreign funding, quantitative easing (QE), credit supply

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1. Introduction

In the years following the US subprime crisis, which morphed into a full-blown global financial crisis in 2008-2009, central banks in several advanced economies pursued highly accommodative monetary policies (or “unconventional monetary policies,” UMP). In several rounds of “quantitative easing” (QE) the US Federal Reserve, the Bank of England, the European Central Bank, and the Bank of Japan expanded domestic and global liquidity through direct purchases of public and private debt securities and term loans to the banking system. These programs were successful in decreasing risk premia and boosting asset prices both at home and abroad, supporting economic recovery. It is also believed that ample global liquidity boosted capital inflows and hence improved borrowing conditions for emerging markets as well, raising the question of international spillovers and the effects of UMP on the domestic credit cycle in these countries.

In this paper we explore the cross-border impact of the unconventional monetary policies in the US on an emerging market, focusing on the case of Turkey. For the analysis we use information on bank-firm relationships drawn from the universe of business loans (“credit register”) in Turkey over the 2007-2014 period. We document a positive effect of US QE on the supply of local currency credit to non-financial firms in Turkey. We also show that this effect operates through banks’ ability to raise funds in international markets which allows them to increase their loan portfolios without being constrained by their deposit base. Furthermore, bank heterogeneity plays an important role in the transmission of US monetary policy to Turkey, with lower-capitalized banks exhibiting faster wholesale funding and credit supply growth.

Studies of the effectiveness of QE have generally focused on the impact on financial market conditions and the real sector in advanced economies. The literature identifies a positive impact on the term structure (Wu, 2014; D’Amico and King, 2013) and real economy activity in the US (Chen et al., 2011), as well as positive cross-border effects (Glick and Leduc, 2012; Neely, 2011). Eser and Schwaab (forthcoming) document improved liquidity conditions in financial markets in the Euro area —e.g., reduced default-risk premia, bond yield volatility, and tail risk—after the European Central Bank’s UMP actions. Fratzscher, Lo Duca, and Straub (2013, 2012) find that European Central Bank security purchase programs boosted asset prices and reduced market fragmentation in the Euro area.**

The cross-border effects of QE on credit and economic conditions in emerging markets have been studied less. Chen et al. (2015) estimate the impact of the fall in US corporate spreads

** Related studies examine the impact of QE on financial institutions’ characteristics such as risk appetite. Chodorow-Reich (2014) documents a modest link between US QE and risk-taking by money market funds, but no such evidence for banks and life insurance companies. Lambert and Ueda (2014) argue that QE delayed balance sheet repair in the US banking system.

induced by QE and find heterogeneous effects depending on countries' financial structure, policy frameworks, and exchange rate arrangements. US QE appears to have supported economic activity in Brazil and China during 2009-2013. Fratzscher, Lo Duca, and Straub (2014) show that ECB QE had a positive effect on equity markets in emerging market countries. What is missing from this literature is systematic micro-level evidence on the spillover effects of QE on credit aggregates and the real sector in emerging markets. In fact, Bowman, Londono, and Sapriza (2014) cast doubt on the existence of such an effect, arguing that spillovers from US QE to financial conditions in emerging markets were not outsized relative to a model that accounts for each country's sensitivity to US monetary policy shocks.

Our work is closely related to two recent studies of the international credit channel of monetary policy and its effects on emerging markets. Morais, Peydro and Ruiz (2015) show that expansionary monetary policy in the US and Eurozone increases credit supply to Mexican firms. This effect occurs due to the large presence of foreign bank affiliates in Mexico that benefit from parent support, mainly US and European banking groups. Ongena, Schindele and Vonnak (2015) show that that a loose monetary policy stance in the US and Eurozone increases the supply of foreign currency credit in Hungary, with more pronounced effects for lower-capital banks.^{††}

Our analysis focuses on Turkey, a large emerging market economy with a banking system mainly comprised of domestic banks that have ample access to foreign funds. Like the two studies above, we use detailed *micro* data to explore the response of bank credit supply in Turkey to foreign monetary policy, in particular, several rounds of US quantitative easing. In particular, our sample comprises 31 banks and more than 27,000 individual firms, for a total of more than 2.5 million bank-firm relationships during the period of analysis.

Our results can be summarized as follows. First, we estimate a baseline effect of our QE measure on the supply of bank loans, while controlling for credit demand. We find this effect to be positive. We then investigate a channel behind this effect, namely banks' foreign funding. We argue that the way in which ample global liquidity spills over to credit aggregates in Turkey is through banks' ability to borrow in international markets. We find evidence that for a given level of QE, banks with a higher reliance on market funds expand their loan supply more than other banks. Finally, we ask whether this effect varies with bank balance sheet characteristics such as capital. According to the external finance premium theory, during monetary expansions banks with lower capital are able to expand loan supply faster due to a rapid decrease in the cost of external funds. Our estimates support this hypothesis.

^{††} However, these effects also tend to be more pronounced for riskier borrowers, suggesting an international risk-taking channel (see also Ioannidou, Ongena, and Peydro (2013) for a study of Bolivia).

The remainder of the paper is organized as follows. Section 2 presents the stylized facts about US QE and the Turkish economy, followed by our testable hypotheses. Section 3 describes our data. The empirical strategy is discussed in Section 4 and the results are presented in Section 5. In Section 6 we outline the next steps of the paper.

2. US Quantitative Easing and the Turkish Economy

a. Stylized Facts

Following the 2007-2008 US subprime mortgage crisis and the associated recession, the Federal Reserve (“Fed”) reduced its standard monetary policy tool, the target Fed funds rate, to near-zero in December 2008. The depth of the financial crisis and the economic slowdown led the Fed to use UMP actions and tools to stimulate the economy. The two types of unconventional tools utilized were large-scale asset purchases and forward guidance. Large-scale asset purchases, often called “quantitative easing”, refers to the Fed’s buying of financial assets and expanding its balance sheet. Forward guidance refers to the Fed’s communication of information about its future monetary policy stance.

The Fed announced its first large-scale asset purchase program in November 2008 (QE1) and started the purchases in January 2009. From January 2009 through March 2010, the Fed purchased \$1.75 trillion in long-term Treasuries as well as agency mortgage-backed securities (MBS) and agency debt^{††}. The Fed balance sheet continued to expand with QE2 announced in November 2010 and QE3 announced in September 2012, reaching about \$4.5 trillion by the end 2014. Figure 1 shows that the largest portion of the Fed’s assets consists of securities held outright, the growth of which we employ as our main measure of QE in the empirical analysis. The securities include US Treasuries, agency debt securities, and agency mortgage-backed securities.

The period of Fed balance sheet expansion coincided with large volumes of capital flows to emerging markets, as well as exchange rate appreciation and rapid credit growth in these economies (Eichengreen and Gupta, 2014; Chen, Mancini-Griffoli, and Sahay, 2014). Turkey was also strongly affected by these trends. Figure 2 shows the growth rate of total business loans in Turkey vs. that of Fed’s securities held outright. Before the global crisis, the growth rate of business lending was hovering at around 35 percent and declined rapidly at the onset of the crisis. As the effects of the crisis started to dissipate, credit growth picked up again and reached pre-crisis levels. Securities held by the Fed, on the other hand, started to increase in 2009 with QE1 and almost tripled by the end of 2009. Afterwards securities continued to increase throughout most of the sample period, albeit at a slower rate. During the first stage

^{††} Agency mortgage-backed securities refers to mortgage-backed securities issued by government sponsored enterprises (GSEs) Fannie Mae and Freddie Mac, and by the government agency Ginnie Mae. Agency debt refers to debt securities issued by GSEs, Fannie Mae, Freddie Mac, and twelve Federal Home Loan Banks.

of QE, credit growth in Turkey was low, reflecting the effects of the crisis. However, as the economy recovered from the crisis, the credit cycle in Turkey started to follow the cyclical pattern of QE very closely.

Figure 3 depicts the expansion of the Fed's balance sheet alongside the net foreign debt to GDP ratio of Turkey. As the Fed continued to inject liquidity in USD markets, the net foreign debt of Turkey also increased, and the two series track each other very closely. The observed pattern suggests that the increased liquidity in international markets may have increased the funds channeled to the Turkish economy. To understand if the banking sector benefitted from this funding availability, in Figure 4 we plot the total debt of the Turkish banking sector owed to foreign financial institutions (in percent of GDP) together with the Fed's balance sheet size. As in the previous chart, the two series co-move closely, suggesting that Turkish banks increased their foreign liabilities by tapping into the liquidity generated by QE.

b. Testable Hypotheses

Based on the stylized facts described above, we formally test the following three hypotheses:

Hypothesis #1. US QE had a positive impact on the supply of private credit to Turkish businesses.

Hypothesis #2. For a given level of QE, banks that borrowed more heavily in international bank funding markets increased the supply of loans more than other banks. In other words, a channel through which QE led to higher provision of bank credit is banks' foreign borrowing. US QE led to higher availability of bank funds in international markets and hence to higher foreign borrowing by Turkish banks, allowing for an expansion of their loan books.

In addition, we test for a bank balance sheet channel which allows for the identified effects above to differ according to bank balance sheet characteristics. According to the *external finance premium* theory for banks (Bernanke, 2007), the cost of external funds is lower for banks with stronger balance sheet positions. This theory predicts that during a liquidity squeeze, generated for instance by monetary policy tightening, banks with stronger financial positions dampen the economic cycle by reacting to changes in monetary conditions less than other banks. This is because their cost of funding does not rise as much as it does for weaker banks. Conversely, during an expansion, weaker banks amplify the economic cycle, borrowing more and expanding their balance sheets faster than stronger banks as they face a more rapid decline in the cost of external funds. Focusing on net worth as a key indicator of balance sheet strength, we also test the bank balance sheet channel, which predicts that:

Hypothesis #3. For the same level of QE and reliance on foreign borrowing, lower-capital banks increase the supply of loans more than other banks.

3. Data

We use loan-level data from the credit register of the Central Bank of the Republic of Turkey (CBRT) covering the period November 2006 to September 2014. The credit register contains supervisory data on individual loans granted to non-financial firms by all banks in Turkey on a monthly basis. The loans are double-matched to firm and bank balance sheet characteristics using unique identifiers that link credit register data to confidential information on banks' and firms' financials.

Banks in Turkey are required to provide detailed information on business loans above a lower threshold to the CBRT. With this threshold, loan coverage in our dataset is 81.1 percent of all business loans extended by the domestic banking system to non-financial borrowers. In addition to capturing more than four-fifths of the universe of loans in the economy, our data indicate a very strong correlation between credit growth computed from the loan-level information and that from aggregate series. Figure 5 displays the two series and indicates a high co-movement during the period of analysis with a correlation coefficient of 92 percent.

The credit register reports the outstanding loan balance of each firm vis-à-vis each bank branch on a monthly basis. In total there are more than 40 million individual monthly observations in our sample. We infer the loan originations by taking the monthly differences in stocks at the “firm-bank branch” level and treating positive values as new loans extended in that period by each bank branch to each firm. The remaining observations, indicating declines in account balances, are interpreted as net repayments and are dropped from the analysis.

Balance sheets and income statements of firms and banks are also available from the CBRT. The firms are identified by a unique identifier (tax ID) across datasets. Our double-matched dataset comprises 48 banks and 28,854 firms. We use loan data from 31 banks in our sample, which includes private, state-owned, foreign-owned and participation banks^{§§} and excludes development banks, which have a different business model aligned to social goals, and investment banks. In the current analysis, we only use local currency loans.

At the macro level, we use data on domestic interest rates, industrial production index (as an indicator of economic activity), consumer price index (CPI), all on a monthly frequency from the CBRT. The definitions of the variables, data sources, and summary statistics are given in Appendix Tables A1 and A2.

^{§§} The term “participation banks” is used in Turkey to refer to banks that engage in Islamic banking.

4. Empirical Strategy

The initial specification that we use to estimate the impact of US QE on bank lending is given in Equation (1). Later, we will build on this specification to investigate the potential channels through which QE affects banks lending, and to investigate the interaction between QE and the strength of banks' balance sheets (i.e., the bank balance sheet channel).

$$\log(\text{loan amount}_{fbjt}) = \alpha_b + \alpha_f \times \alpha_t + \beta_Q QE_t + \beta_I \Delta IR_t + \beta_G \Delta Output_t + \beta_C \Delta CPI_t + \beta_B \text{Bank Controls}_{bt} + \varepsilon_{fbjt} \quad (1)$$

The dependent variable $\log(\text{loan amount}_{fbjt})$ is the logarithm of the amount of new loans extended by bank branch j of bank b to firm f in month t . The main variable we use to measure QE is the monthly change in securities held outright from the Fed's balance sheet expressed as a ratio of US GDP. (Monthly GDP data is interpolated from the quarterly series.)

To control for domestic economic conditions, we include in the regressions a measure of the change in domestic monetary policy, the monthly growth rate of the industrial production index (as GDP data are unavailable at a monthly frequency), and the inflation rate. For domestic monetary policy, we use the difference between the overnight repo rate and the average cost of funds provided by the CBRT. The average cost of funds is the average rate at which CBRT lends to banks. While the CBRT sets a policy funding rate, it also uses quantity restrictions on the amounts it lends to banks. Therefore, the funding rate by itself is not sufficient to capture the monetary stance of the CBRT. The difference between the overnight repo rate and the CBRT funding rate reflects the liquidity conditions in the interbank market resulting from changes in both the policy rate and the funding quantities. Therefore, we use the monthly change in this variable as our measure of changes in domestic monetary conditions, where a higher value reflects a tighter monetary stance.

To separate loan demand from loan supply, we need to control for changes in loan demand. In most specifications we control for bank and firm effects, which capture unobserved time-invariant characteristics for each lender and firm. In our richer specifications, we use firm*month fixed effects to capture time-varying firm-specific heterogeneity in loan demand. Firm*month fixed effects control for the possibility that each firm may experience a different demand shock each month.

After estimating the impact of QE on bank lending, we move on to investigating a potential channel through which QE might affect bank lending: foreign borrowing. Motivated by Figures 3 and 4, we hypothesize that banks that borrowed more heavily in international bank funding markets increased the supply of loans more than other banks. To investigate this hypothesis we estimate the specification below:

$$\begin{aligned}
\log(\text{loan amount}_{fbjt}) & \\
&= \alpha_b + \alpha_f \times \alpha_t + \beta_Q QE_t + \beta_I \Delta IR_t + \beta_G \Delta Output_t + \beta_C \Delta CPI_t + \beta_F F_{bt} \\
&+ \beta_{F,QE} F_{bt} \times QE_t + \beta_B \text{Bank Controls}_{bt} + \varepsilon_{fbjt} \quad (2)
\end{aligned}$$

where F_{bt} represents the ratio of foreign non-deposit funding to total funding of bank b in month t .

Finally, we also investigate the interaction between QE and banks' net worth. The bank capital ratio is defined as the ratio of paid-in capital to total assets. The mean capital ratio for the banks in our sample is 7.4 percent, with a minimum of 0.8 percent and a maximum of 38.7 percent. Bank capital enters the specification as a triple interaction term with the QE variable and bank's total funding. In the literature, these variables have been used in interaction with the change in the monetary policy rate to identify the bank balance sheet channel of monetary policy (Jimenez et al., 2012, 2014). Such a specification allows testing the hypothesis that lower-capital banks were more affected by changes in the global liquidity conditions for a given level of reliance on wholesale funding.

To test the bank balance sheet channel, we estimate the specification:

$$\begin{aligned}
\log(\text{loan amount}_{fbjt}) &= \alpha_b + \alpha_f \times \alpha_t + \beta_Q QE_t + \beta_I \Delta IR_t + \beta_G \Delta Output_t + \beta_C \Delta CPI_t + \\
&\beta_F F_{bt} + \beta_{F,QE} F_{bt} \times QE_t + \beta_{Cap,QE} Cap_{bt} \times QE_t + \beta_{Cap,F} Cap_{bt} \times F_t + \beta_{Cap,F,QE} Cap_{bt} \times \\
&F_{bt} \times QE_t + \beta_B \text{Bank Controls}_{bt} + \varepsilon_{fbjt} \quad (3)
\end{aligned}$$

In the above specifications, we also control for other bank characteristics that may affect bank lending, which are bank size, return on assets, the ratio of nonperforming loans, the risk profile of the bank, capital ratio, and liquidity ratio.

5. Results

Table 1 reports the baseline regression results. The dependent variable is the logarithm of new loan amount at the firm-bank branch-month level. We start with the simplest specification in which we regress loan amounts only on QE (column 1), where we control for time-invariant heterogeneity at the bank and firm level with bank and firm fixed effects. Then we add bank controls (column 2) and control variables for domestic macroeconomic conditions (column 3). Looking at column 3, the coefficient estimates on QE show that a 10-basis point increase in our QE measure (the standard deviation of this variable is 35 basis points) leads to an increase in credit supply in Turkey by 0.85 percent. The positive effect is in line with our first testable hypothesis.

In column 4, we report the results from the regression that estimates the interaction of QE with foreign borrowing of Turkish banks. The positive and significant coefficient estimated for "Foreign Funding*QE" supports our second hypothesis: for a given level of QE, banks that borrowed more heavily in international bank funding markets increased the supply of

loans more than other banks. At the sample mean level of QE (0.23 percent), one percentage point increase in the foreign funding ratio (the standard deviation of this variable is 17.2 percent) leads to an increase in the marginal effect of QE on bank loan supply by approximately 1 percentage point.

Finally, in column 5, we report the results from the regression that tests the bank balance sheet channel. The negative and statistically significant coefficient estimated for the triple interaction term “Foreign Funding*Capital*QE” supports our third hypothesis: for the same level of QE and reliance on foreign borrowing, lower-capital banks increase the supply of loans more than other banks.

Taken together, these results provide evidence of spillovers from US QE to an emerging market through increased funding availability for the banking system and heterogeneous credit supply effects depending on bank capital.

6. Future Work

Our aim in this paper is to explore the international spillovers of US unconventional monetary policies undertaken in the aftermath of the financial crisis on the credit cycle in emerging markets, focusing on the case of Turkey. So far we have documented the impact of the Fed’s balance sheet expansion, and associated global liquidity, on bank loan supply to non-financial firms during 2007-2014. In the next steps we wish to explore several related questions.

First, we will assess the impact of US quantitative easing on foreign currency loans in Turkey, which represent about one third of total bank-intermediated credit to firms. This will allow us to explore differential effects of foreign monetary policy on the credit supply of banks in local vs. foreign currencies.

Second, we will examine the real economy impact of US quantitative easing by quantifying the link between firm-level credit supply shocks (estimated from our bank-firm lending specifications) and firm asset growth, sales growth, and investment. To this end, we will use the income statement and balance sheet data that have been matched with loan data for all firms in our original sample.

Third, we will test for the effect of forward guidance about reduced Federal Reserve security purchases—the so-called “taper tantrum” episode of May-June 2013—on borrowing costs for Turkish banks’ and their lending behavior. The episode triggered concerns about the international spillovers of an impending exit from unconventional monetary policies on emerging markets, leading to capital outflows and volatility in global financial markets (Aizenman, Binici and Hutchison, 2014), with potential consequences for the real economy.

FIGURES AND TABLES

Figure 1. Federal Reserve Assets, 2007-2014

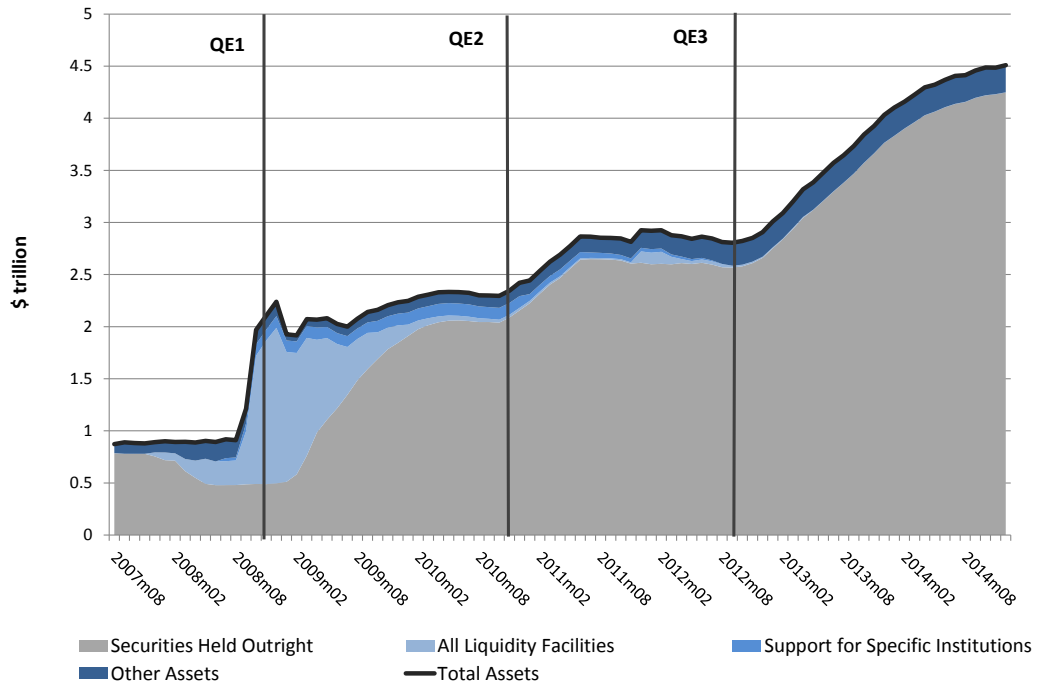


Figure 2. Business Loans in Turkey and QE, 2007-2014

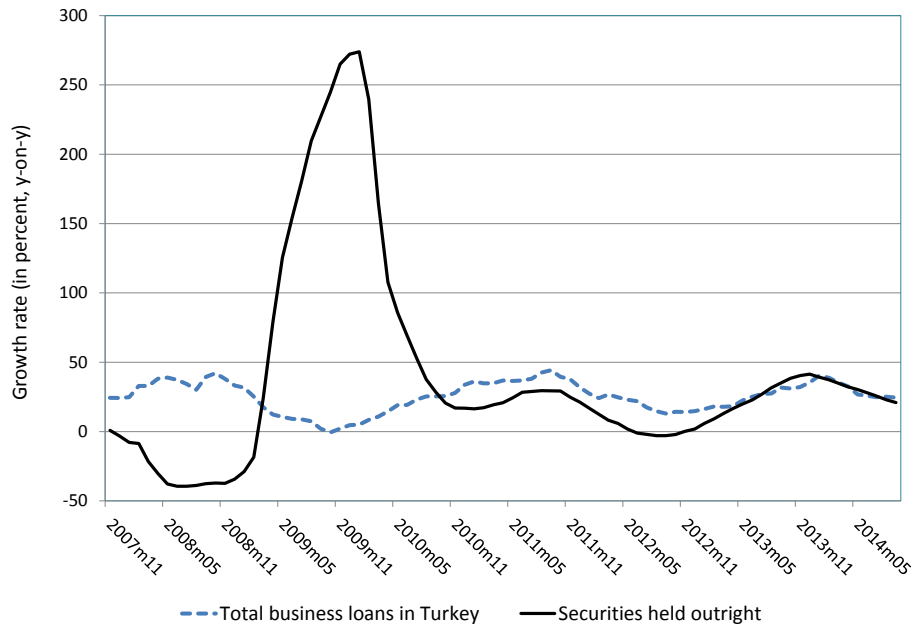


Figure 3. Foreign Debt in Turkey and QE, 2006-2014

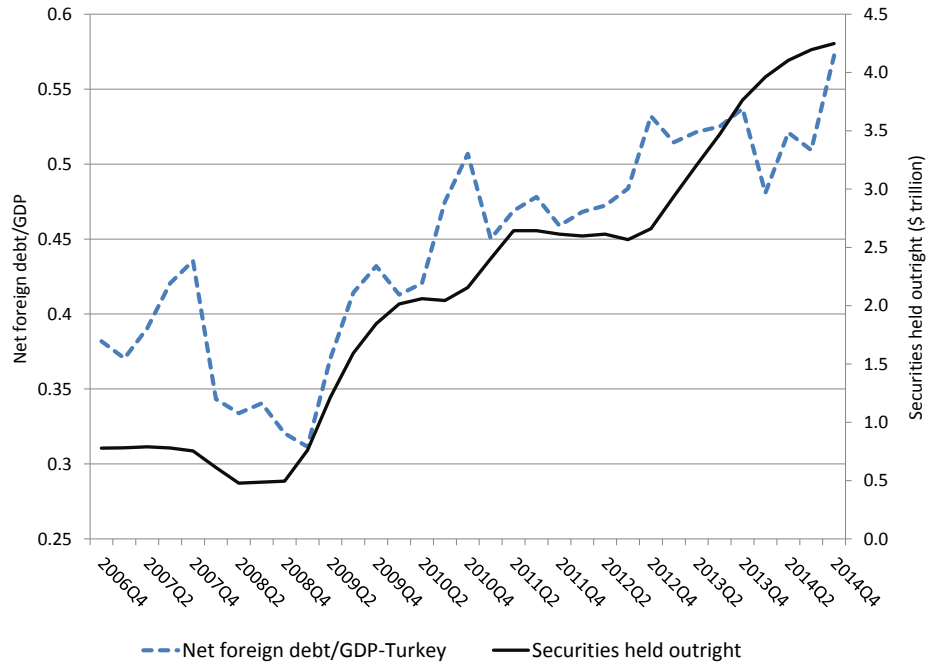


Figure 4. Foreign Debt of the Turkish Banking Sector and QE, 2006-2014

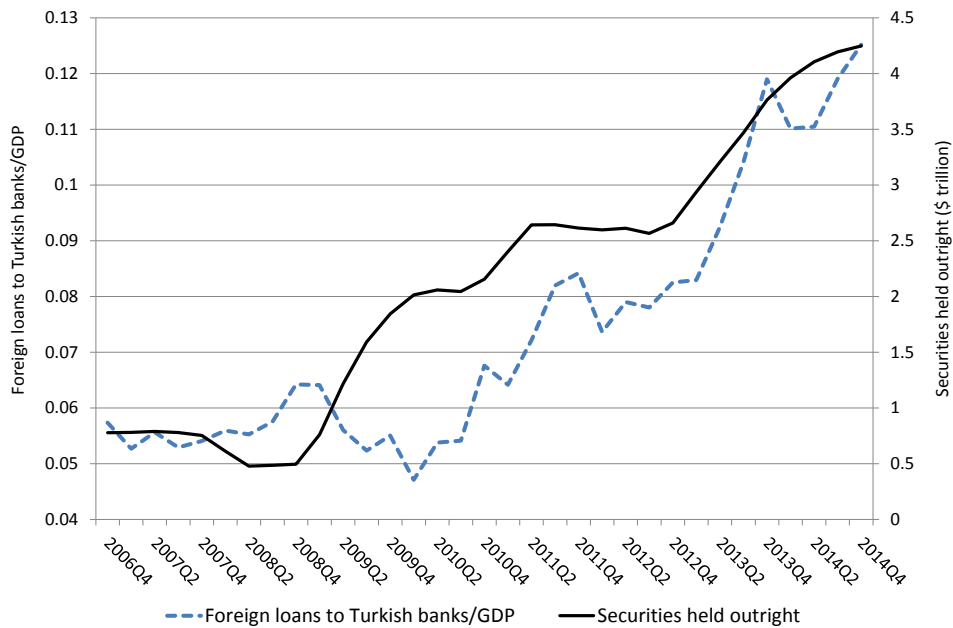


Figure 5. Credit register data representativeness, 2007-2014

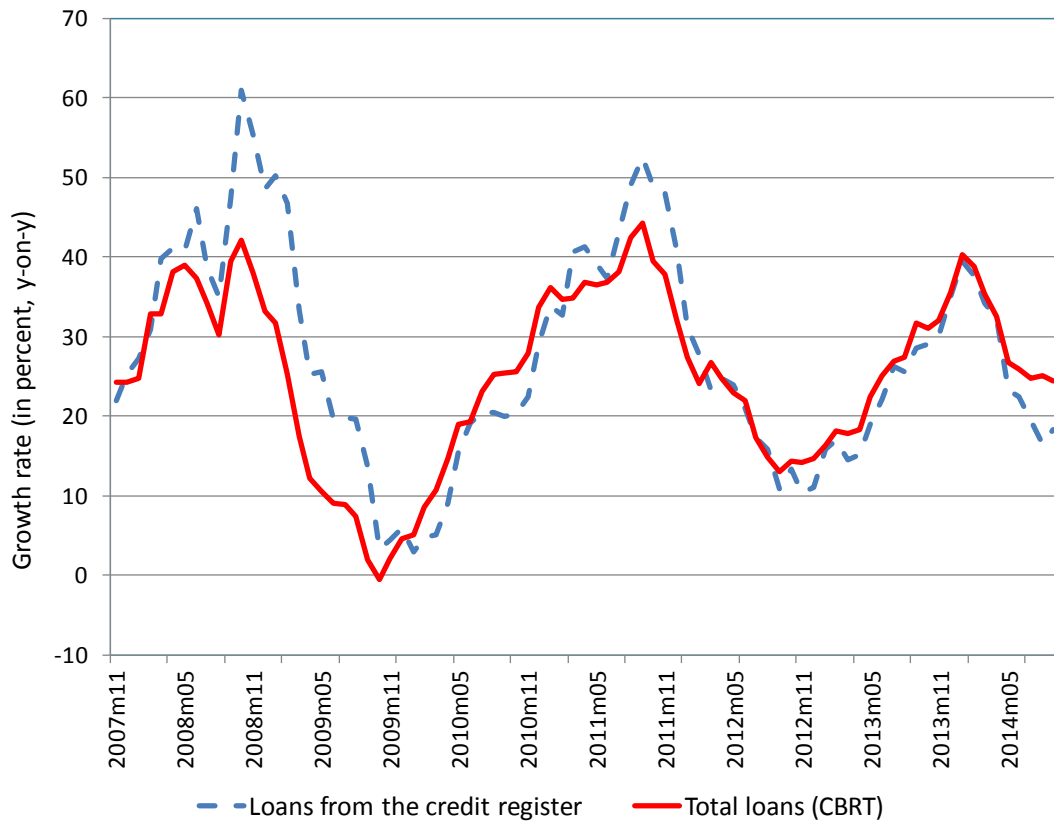


Table 1. Regression results

	(1)	(2)	(3)	(4)	(5)
QE	4.263*** (0.421)	2.341*** (0.461)	2.145*** (0.466)		
Domestic monetary policy			-0.033*** (0.003)		
Inflation			-0.006*** (0.002)		
Industrial Production Growth			0.002*** (0.000)		
Bank Capital		-0.745*** (0.127)	-0.719*** (0.127)	-0.573*** (0.206)	2.968*** (0.308)
Bank Liquidity		0.530*** (0.051)	0.540*** (0.052)	1.205*** (0.095)	1.141*** (0.095)
NPL ratio		-6.115*** (0.245)	-6.183*** (0.245)	-5.165*** (0.467)	-5.625*** (0.468)
ROA		0.062 (0.227)	0.080 (0.232)	-1.703** (0.830)	-0.748 (0.832)
Risk profile (RWA/Assets)		1.170*** (0.022)	1.161*** (0.022)	1.185*** (0.045)	1.140*** (0.045)
Size (Log-assets)		0.246*** (0.005)	0.247*** (0.005)	-0.295*** (0.020)	-0.243*** (0.021)
Foreign Funding				0.484*** (0.057)	1.943*** (0.102)
Foreign Funding*QE				21.708** (10.107)	99.983*** (17.721)
Foreign Funding*Capital					-23.450*** (1.393)
Bank Capital*QE					287.473*** (51.841)
Foreign Funding*Capital*QE					-1,431.215*** (272.560)
Bank FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Firm-year-month FE				YES	YES
Observations	2,691,430	2,691,430	2,691,430	2,637,922	2,637,922
R-squared	0.321	0.324	0.324	0.661	0.661

Notes: The dependent variable is log(loan volume). "QE" stands for growth rate in the size of the Fed's balance sheet, our proxy for US quantitative easing. See text (Section 4) for definitions of the remaining variables. A constant term is estimated but the coefficient is not shown. The standard errors are clustered at the bank-firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

DATA APPENDIX

Table A1. Variable definitions and sources

Variable	Definition	Source
Δ Securities/GDP	Monthly change in securities held outright divided by monthly US GDP (monthly GDP is interpolated using quarterly GDP)	Securities held outright: US Federal Reserve US GDP: IMF International Financial Statistics (IFS)
Δ IR	Proxy for domestic monetary conditions: Monthly change in the difference between the interbank overnight repo rate and the average cost of funding provided by the CBRT	CBRT
Industrial production growth	Monthly growth rate of the industrial production index	CBRT
Inflation	Monthly CPI inflation	CBRT
Capital Ratio	Paid-in capital divided by total assets	CBRT
Liquidity Ratio	Liquid assets (cash holdings plus receivables from the Central Bank, money markets and other banks) divided by total assets	CBRT
Size	Log (total assets)	CBRT
Total Assets	Total assets of the bank	CBRT
Return on assets (ROA)	Net income divided by total assets	CBRT
Non-performing loan ratio (NPL)	Nonperforming loans divided by total loans	CBRT
Risk profile	Risk-weighted assets divided by total assets	CBRT

Table A2. Variable Units and Descriptive Statistics

Variable	Unit	Mean	St. Deviation	Min	Median	Max
ΔSecurities/GDP	%	0.23	0.35	-0.68	0.1	1.55
ΔIR	%	0.01	0.45	-1.59	-0.02	1.87
Industrial production growth	%	0.6	8.07	-17	-0.57	21.46
Inflation	%	0.64	0.84	-1.43	0.52	3.27
Capital	%	7.42	5.51	0.79	6.19	38.75
Liquidity	%	13.19	11.74	1.94	9.11	72.97
Size	-	16.7	1.7	12.32	16.13	19.26
Total Assets	1,000,000 TRY	10,482	11,001	225	10,107	231,385
Return on assets (ROA)	%	0.90	0.83	-1.68	0.72	5.53
Non-performing loan ratio (NPL)	%	2.30	1.42	0	2.08	7.54
Risk profile	%	78.67	16.20	22.51	81.03	132.79

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