Monetary Stimulus and Bank Lending

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Abstract

In recent business cycle downturns, monetary policymakers worldwide have sought to stimulate their economies by conducting asset purchases. The Federal Reserve purchased both agency mortgage-backed securities (MBS) and Treasury securities, which are generally thought to be comparable in credit quality and stimulative effects. We investigate the effect of such purchases on mortgage lending, commercial lending, and firm investment. Banks which are active in the MBS market increase their mortgage origination market share in response to increased MBS purchases, compared to other banks. At the same time, these active-MBS banks reduce commercial lending. Firms which borrow from these banks decrease investment as a result. We do not find the same responses to Treasury purchases. Our results suggest different effects depending on the type of asset being purchased, and that MBS purchases cause distortionary effects across banks and firms.

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The past decade has seen unprecedented monetary policy interventions in the United States, Europe, and Japan. After setting short-term interest rates to near zero, the Federal Reserve embarked on several rounds of asset purchases, known as Quantitative Easing, to further influence markets.[1] Policymakers, investors, and academics alike have wondered about the actual impact of such innovative policies.

In this paper, we investigate the impact of an important tool of monetary policy, asset purchases, on bank lending and ultimately firm investment at a micro-level, especially during the financial crisis. We study a specific channel through which these policies affect firm investment: through banks' balance sheets. The Federal Reserve purchased Treasury securities (TSY) and mortgage-backed securities (MBS) to support banks' balance sheets and the housing market, and to reduce long-term borrowing rates to increase consumer demand and firm investment. We investigate the impact of TSY and MBS purchases separately on firms through the bank lending channel. The expectation is that banks with higher exposure to Treasury and mortgage markets would experience an improvement in balance sheets due to asset purchases, leading to positive spillover effects, including commercial and industrial (C&I) loans to firms.

Our analysis provides two important results. First, banks that are active in the secondary mortgage (MBS) market increase their mortgage origination market share in response to increased MBS purchases by the Federal Reserve, compared to other banks. At the same time, these active-MBS banks have lower commercial lending growth. Firms which borrow from these banks decrease investment as a result. Second, we do not find the same responses to Treasury purchases. In fact, the impact of Treasury purchases on firm investment through the bank lending channel appears negligible. These results suggest that we cannot assume that TSY and MBS purchases have similar

[1] In September 2014, the European Central Bank (ECB) announced two new purchase programs, namely the ABS purchase programme (ABSPP) and the third covered bond purchase programme (CBPP3). The programs "will enhance transmission of monetary policy, support provision of credit to the euro area economy and, as a result, provide further monetary policy accommodation". In March 2015, the Eurosystem started the purchase of bonds issued by euro area central governments and certain agencies, international, and supranational institutions located in the euro area. See the ECB website regarding open market operations at: `https://www.ecb.europa.eu/mopo/implement/omo/html/index.en.html`.

effects on the real economy, and monetary policy transmission is crucially dependent on the type of asset being purchased.

These results contradict the prior that quantitative easing had a uniformly positive impact on the real economy, and have important implications for monetary policy transmission theories. Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) among others emphasize the positive effect of an increase in asset prices on real investments. We show that positive shocks to different asset classes may not have a homogeneous effect on bank lending and the real side of the economy. Our results do not say directly whether the net effect of asset purchases in general equilibrium is positive or negative. We just document the heterogeneous relation between various classes of asset purchases, bank lending, and firm investment through the bank lending channel. We suggest that policymakers should be cognizant of these disparate effects of monetary policy tools on bank lending.

The channels we explore in this paper are an extension of the literature on the credit channel, whereby shocks to intermediaries (banks or public bond markets) affect their ability to lend and end up impacting the firms that borrow from them (Bernanke, 1983). The impact of monetary policy on firms assumes that banks and firms are financially constrained to some extent (literature includes Kashyap and Stein, 1995; Peek and Rosengren, 1995; Holmstrom and Tirole, 1997; Stein, 1998; Bolton and Freixas, 2006, among others). During the financial crisis, asset purchases helped banks' balance sheets. This paper distinguishes the impact of the two types of assets purchases. Further, we explore if the response of banks is different based on the level of securitization, loan sales, and trading activity of the banks.

The mortgage markets and Treasury market are obviously different. The primary mortgage market is where banks compete with each other for origination of loans to homeowners, while secondary markets include loan sales and securitized products. Researchers have discussed that the "primary-secondary spread" in the mortgage market—the spread between mortgage rates and MBS yields—were at historically high values during quantitative easing (Dudley, 2012; Fuster,

Goodman, Lucca, Madar, Molloy, and Willen, 2013). Scharfstein and Sunderam (2014) show that high concentration in mortgage lending reduces the sensitivity of mortgage rates and refinancing activity to mortgage-backed security (MBS) yields, increasing the primary-secondary spread. This is different from the Treasury market where no such spread exists.

We find that banks which are most active in the MBS market, as measured by the level of their MBS assets, the reporting of securitization income, or sales of mortgages to the government-sponsored agencies (GSEs), respond most strongly to MBS purchases. Specifically, these banks increase their nationwide mortgage origination market share in response to MBS purchases, as compared to their peers. Within the bank's own geographic markets, these banks increase their market share most in those markets with the highest housing prices. These findings are consistent with the banks having an incentive to originate, bundle, and securitize more mortgage loans—particularly high-value mortgage loans—in response to the demand increase created by the Federal Reserve.[2] Not all banks benefit equally from the increased MBS asset purchases.

At the same time, these banks reduce commercial lending. Compared to other banks, they reduce their commercial and industrial (C&I) loan growth by almost 1 percentage point when the Federal Reserve increases MBS purchases. Given the average C&I loan growth in our sample is only 0.64%, this reduction is significant. This reduction is strongest for banks located in areas with higher housing prices. These banks do not make similar reductions when the Federal Reserve increases TSY purchases. Even for banks which actively securitize MBS loans and presumably face fewer capital constraints, there is a pronounced shift away from C&I lending when the Federal Reserve is purchasing MBS securities.

Firms which borrow from these banks receive less capital and reduce investment as a result. Specifically, firms reduce their quarterly investment by as much as 10 basis points following increased MBS purchases when their lending bank has higher MBS exposure. The finding is even more pronounced for firms which have access to fewer alternative sources of external capital. Although

[2]This phenomenon is similar in spirit to research on firms with deeper pockets gaining market share during business cycle downturns (Chevalier and Scharfstein, 1996).

these effects are not economically large, they are consistently negative. For reasons unrelated to the borrowing firm, the lending bank restricts capital in favor of stronger opportunities in the mortgage market. In comparison, firms do not experience negative investment effects following Treasury purchases. We find firms that borrowed from banks with higher Treasury and other non-MBS securities holdings are not sensitive to Treasury purchases by the Federal Reserve.

The phenomenon of crowding out of capital from one sector to the economy by another sector during booms has been theoretically argued (Farhi and Tirole, 2012) and empirically shown (Chakraborty, Goldstein, and MacKinlay, 2015). Chakraborty, Goldstein, and MacKinlay (2015) find that during the U.S. housing boom, banks in stronger housing markets reduce commercial lending in favor of more mortgage activity, and firms that borrowed from these banks have to reduce investment as a result. Our paper shows that after the boom ended, a different mechanism crowds-out capital away from firms: Asset market purchases combined with the attempts by better positioned banks to gain market share in real estate lending led to less C&I lending.

The remaining sections are organized as follows. Section I discusses the testable hypotheses. Section II describes the data used for the analysis. Section III reports the empirical results. Section IV provides additional discussion and robustness tests. Section V concludes.

I Hypothesis Development

During the recent financial crisis, monetary policymakers made a large effort to support the housing market and capital markets in general (Mishkin and White, 2014). In addition to keeping short-term rates close to zero, policymakers attempted to reduce long-term interest rates by purchasing Treasuries and MBS assets. The motivations included supply-side arguments such as reducing financing costs for banks due to lower depository rates and higher value of assets on the balance sheet, and demand-side arguments such as higher consumer demand through a wealth effect.

Unfortunately, both the supply-side and demand-side channels face significant frictions due to the state of the economy during and since the financial crisis. Scharfstein and Sunderam (2014) show

that banks that enjoy higher market power may not pass-through the benefits of lower rates in the secondary markets to consumers. On the demand side, Mian, Rao, and Sufi (2013) and Eggertsson and Krugman (2012) argue that the large debt overhang on the balance sheets of households reduce any wealth effect benefits.

Our paper analyzes the individual impact of the two asset classes used in Quantitative Easing on commercial and industrial lending. From the perspective of fixed income capital markets, Treasuries and agency mortgage-backed securities are quite similar. While Treasuries are backed by the full faith and credit of the U.S. government, there has been a long-standing expectation that securities guaranteed by Government Sponsored Enterprises (Fannie Mae, Freddie Mac and Ginnie Mae) and the debt of these agencies themselves will also be protected against default by the U.S. government. This expectation was realized during the financial crisis. After the crisis, Treasury and agency MBS markets are getting treated by the industry participants effectively as one market. In February 2015, the Treasury Market Practices Group was created to support the integrity and efficiency of Treasury, agency debt, and agency MBS markets.[3]

The magnitude of the effect of asset purchases on a bank should depend on the size of the bank's holdings of that asset. The first hypothesis that we are interested in is whether TSY and MBS markets are in fact the same in terms of bank lending: **(H1)** The impact of asset purchases on (a) bank lending and (b) firm investment is different based upon whether the security purchases are Treasuries or agency mortgage-backed securities and based upon the exposure of the lending bank to these two assets.

While investors may not see a large difference in credit quality of Treasuries versus agency MBS, the Treasury market and the mortgage markets have an important difference in terms of credit supply. Banks compete with each other to provide real estate loans to consumers at the primary lending rate, and then some of these loans are sold or securitized at the secondary interest rate (the yield to maturity of the MBS). The higher the primary rate compared to the secondary

[3]The Charter of the Treasury Market Practices Group, a private-sector organization sponsored by the Federal Reserve Bank of New York is available here: `http://www.newyorkfed.org/TMPG/tmpg_charter_02262015.pdf`.

rate, the higher the incentive for banks to originate new loans. Thus, if MBS purchases reduce the secondary rate, then banks are incentivized to originate more loans or refinance loans to draw business away from other lenders.

The Treasury market does not have such a split between the primary/auctions market compared to the seasoned Treasury market. The mechanism through which TSY purchases increase lending is through the general reduction of all interest rates in the fixed-income securities market. This is because long-term Treasury rates provide the reference points for corporate bond yields and mortgage yields. Thus, compared to the Treasury market which benefits all fixed income markets, a stimulus to the mortgage markets helps MBS market participants relatively more.

Given this beneficial situation for banks with MBS market access compared to competing banks without access, business cycle downturns provide an ideal opportunity for the former set of banks to increase market share. Gaining market share is especially beneficial in geographical areas with higher profitability. Further, capital market imperfections such as limited capital mean that the interest rates offered by the constrained banks may be higher as they need to boost short-term profits, thus exacerbating the advantage of banks with access to MBS markets. The literature has suggested this mechanism in theory (Greenwald, Stiglitz, and Weiss, 1984; Klemperer, 1987) and shown it empirically in the case of supermarkets (Chevalier and Scharfstein, 1996).

This provides us our second testable hypothesis: **(H2)** Banks that are able to sell or securitize their loans seek to gain market share with the freed capital by lending more in the residential real estate sector, especially in geographical areas with higher profitability.

Banks with access to the MBS market could still be using a fraction of the advantage gained to lend in C&I markets. Further, banks that are unable to compete in the residential lending market may be making a complementary switch to lending in the C&I loan market. To empirically test these possibilities, we form the following hypothesis: **(H3)** The benefits of monetary stimulus do not translate to higher commercial and industrial lending.

II Data

Given our focus on asset purchases made by the Federal Reserve, we consider the period from 2005q3 through 2013q3.[4] For our analysis, we do the following: 1) determine which firms are borrowing from which banks and when; 2) measure how mortgage origination activity varies across the lending banks; 3) document how the asset purchases of MBS and TSY securities affect the investment levels of the firm and the balance sheets of the bank holding companies (BHCs) themselves.

II.A Relationships Between Firms and Banks

We use the DealScan database, which provides information on syndicated and sole-lender loan packages, to determine our firm-bank relationships. DealScan provides loan origination information, which gives us information on the borrower, the lender (or lenders in the case of a loan syndicate), and the terms of the loan package, including the size, interest rate, maturity, and type of loan or loans being originated. We consider the presence of any loan between the bank and borrowing firm to be evidence of a relationship. In the case of syndicated loans with multiple lenders, we consider the relationship bank to be the one which serves as lead agent on the loan.[5] The length of the relationship is defined as follows: it begins in the first year-quarter that we observe a loan being originated between the firm and bank and ends when the last loan observed between the firm and bank matures, according to the original loan terms. Firms and banks are considered in an active relationship both in year-quarters that new loans are originated and year-quarters in which

[4]The third quarter of 2005 is the first quarter with any asset purchase data, and the third quarter of 2013 is the most recent quarter for which all our required data sources are updated through.

[5]In determining the lead agent on a loan, we follow the same procedure as Chakraborty, Goldstein, and MacKinlay (2015), which is very similar to Bharath, Dahiya, Saunders, and Srinivasan (2011). Specifically, we use the following ranking hierarchy: 1) lender is denoted as "Admin Agent", 2) lender is denoted as "Lead bank", 3) lender is denoted as "Lead arranger", 4) lender is denoted as "Mandated lead arranger", 5) lender is denoted as "Mandated arranger", 6) lender is denoted as either "Arranger" or "Agent" and has a "yes" for the lead arranger credit, 7) lender is denoted as either "Arranger" or "Agent" and has a "no" for the lead arranger credit, 8) lender has a "yes" for the lead arranger credit but has a role other than those previously listed ("Participant" and "Secondary investor" are also excluded), 9) lender has a "no" for the lead arranger credit but has a role other than those previously listed ("Participant" and "Secondary investor" are also excluded), and 10) lender is denoted as a "Participant" or "Secondary investor". For a given loan package, the lender with the highest title (following our ten-part hierarchy) is considered the lead agent.

no new loan originations occur with that bank. Panel A of Table I provides statistics on length and number of relationships. The median relationship last five years and contains one distinct loan package. Although loan packages can have many individual loan facilities, the majority of our packages contain one or two separate facilities only. For those observations without sufficient maturity data to determine the relationship length, we assume the median sample relationship length of five years.

Following Chava and Roberts (2008), we link the DealScan borrowers to Compustat for firm-specific information using their link table. For the lending banks, we create our own link table which matches DealScan lenders to their bank holding companies in the Call Report data. As the DealScan lending data is for individual bank or financial companies, there can be multiple DealScan lenders to each bank holding company. We choose to match to the bank holding company as it provides the most complete picture of the bank's finances—this choice assumes that the bank holding company influences its subsidiary banks' policies for lending, which we believe to be reasonable. We are able to match 265 DealScan lenders to 59 bank holding companies in the Call Report data.[6] These matches are determined by hand using the FDIC's Summary of Deposits data and other available data of historical bank holding company structures. We present the statistics on the number of relationships between borrowers, DealScan lenders, and bank holding companies in Panel A of Table I.

There is a significant amount of consolidation in the US banking sector during our sample period. As such, we update the current holding company for lenders over time. The Summary of Deposits data is helpful for this task, as are historical press releases about different mergers between banks. We assume that the relationship between borrower and lender continues under the new bank holding company for the length of the loan, and any subsequent loans under that same DealScan lender. The main difference is that the bank characteristics that we use as controls change with mergers to reflect the new bank holding company.

[6]Of these 265 lenders, 243 lenders (and 54 bank holding companies) have borrowers that can be matched to Compustat and are included in our main sample.

Across our analysis we use three different panels of data. Our first panel, which we use to investigate the effect of the lending channel on firm investment, is constructed at the firm-bank-year-quarter level. In this panel, firm-bank observations are included for each year-quarter of the lending relationship. This panel contains 71,700 observations for 2,842 firms and 54 bank holding companies.[7]

Our second and third panels are used to investigate the effect of asset purchases on the bank holding company's mortgage origination and commercial loan activity, respectively. As we do not require any DealScan or Compustat data for this panel, we can look at a larger sample of BHCs. One major difference between the two panels is the frequency of observations: the mortgage origination data is only available on an annual basis as opposed to quarterly availability for the commercial lending panel.

II.B Bank and Firm Data

The summary statistics for the loan interest rate, measured by the all-in drawn rate over LIBOR, relative loan size as scaled by the borrowing firm's lagged net property, plant, and equipment (PP&E), and months to loan maturity are included in Panel A of Table I. If a loan package has more than one facility, the interest rate and loan maturity are determined by averaging the individual facilities by their respective dollar amounts. Variable definitions and details on variable construction for these and other variables are included in Table A1.

For our analysis of bank balance sheets, we use Call Report data from each quarter, aggregated to the bank holding company (BHC) level.[8] Our bank analysis focuses on two key variables: securities holdings and MBS holdings. Securities holdings is defined as total balance sheet securities minus mortgage-backed securities, divided by total assets. MBS holdings is defined as mortgage-backed securities divided by total assets. The mortgage-backed securities (MBS) include two major

[7] These numbers account for all our variables having non-missing data, after year-quarter and firm-bank fixed effects are applied.

[8] Although the Call Report data is available at a finer level, we believe this aggregation is best because the entire bank holding company's balance sheet may influence loan activity.

types: (1) traditional pass-through securities and (2) other security types, including collateralized mortgage obligations (CMOs), real estate mortgage investment conduits (REMICs), and stripped MBS. The banks also denote whether these securities are composed of agency-backed mortgages guaranteed by the GSEs (GNMA, FNMA, FHLMC) or non-agency mortgages. The average BHC MBS holdings in our sample is 7.02% and the average non-MBS securities holdings (which includes Treasuries) is 14.4%.

We also include a measure of C&I loan growth. To control for other differences in bank characteristics, we include measures of the bank's size, equity ratio, net income, and cost of deposits. In our various specifications, we include year-quarter or firm-state by year-quarter fixed effects to capture national or regional macroeconomic changes that may affect our results. To control for additional regional differences in economic conditions, we also include the annual change in the state unemployment rate where the bank is located.[9] We use this variable to control for regional macroeconomic changes that would affect the supply and demand of commercial and industrial loans.

From Compustat, we use several firm-specific variables in our analysis. These variables include investment, market-to-book ratio, cash flow, firm size, and Altman's Z-score. All firm and bank variables that are ratios are winsorized at the 1 and 99 percentiles, with the exception of the cash flow variable.[10] As we are focusing on how financial intermediaries affect borrowing firms' investment decisions, we exclude any borrowing firms that are financial companies. Panel B of Table I includes the summary statistics for these variables.

II.C Mortgage Origination and Housing Exposure of Banks

To capture changes in mortgage activity among banks, we incorporate data collected under the Home Mortgage Disclosure Act (HMDA). Available on an annual basis, we use the origination

[9]For the bank-specific unemployment rate, the amount of deposits from the prior year's summary of deposits data is used to created an average change in unemployment rate where the bank operates.

[10]The cash flow variable is winsorized at the 2.5 and 97.5 percentiles because of more extreme outliers. The main results are robust to winsorizing the cash flow variable at the 1 and 99 percentiles.

data from 2005-2014. Aggregated to the bank holding company level, we calculate the share of new mortgage originations for each bank holding company. In addition to a nationwide mortgage origination market share variable, we also calculate the each bank holding company's market share for each individual MSA market in which it reports any activity. This data complements the Call Report Data in that it captures both the mortgages that remain on the bank's balance sheet and those that are sold to other financial institutions or GSEs.

Banks have two avenues to sell mortgages to GSEs: 1) sell loans individually for cash, which the GSE may include in a MBS pool, or 2) organize their mortgages into a MBS pool and having the GSE certify it as an agency MBS pool. The second method, referred to as a swap transaction, requires the bank to have an additional pool purchase contract with the agency. These swapped MBS securities remain on the bank's own balance sheet as MBS assets until they are sold or mature.

An important point of differentiation among banks is their level of involvement in the secondary mortgage market. We try to capture this in two ways: the first is a measure of how much of the bank's total assets are MBS securities. Because MBS securities holdings in part arise from these swap transactions, those banks which hold more MBS securities are more likely to be active in the secondary market. The second variable we use to capture secondary market involvement is an indicator for whether the bank reports non-zero net securitization income. Those banks that not only engage in swap transactions with GSEs, but securitize other non-agency loans, are more likely to be involved in the secondary mortgage market. Whereas more than 80% of our bank observations report some MBS holdings on their balance sheets, only 3% of banks in our sample report non-zero securitization income at some point.

A third measure, *GSE Seller*, is an indicator for banks which sell at least $1 million of originated mortgages to the GSEs in a given year.[11] This variable captures more banks than the *Securitizer* indicator, as about 19% of banks sell mortgages to GSEs in our sample. As this variable generates similar results to other two categorization variables, we use it mainly in our robustness analysis in

[11] We use $1 million as the cut-off since that is the typical minimum MBS pool size for fixed-rate mortgage loans. Increasing or decreasing the cut-off yields similar results.

Section IV.

We also include a measure of housing prices per bank holding company. As in Chakraborty, Goldstein, and MacKinlay (2015), we use the Federal Housing Finance Agency (FHFA) House Price Index (HPI) data as the basis for this variable.[12] To determine the exposure of each bank holding company to different state-level housing prices, we use the summary of deposits data from June of each year, aggregated to the bank holding company level for the next four quarters. Using the percent of deposits in each state as weights, we create a measure of housing prices which is specific to each bank and each year-quarter. For our analysis at the MSA-market level, we use the housing price index for that specific MSA from the FHFA.

One issue that arises is comparability across state price indices. Because all the state-level FHFA indices are set to 100 in 1980, the index value of 100 corresponds to different dollar amounts in each state.[13] If unadjusted, the price level of banks located in high-price states will be understated compared to banks located in lower-price states. As the geography of deposit bases for each bank holding company are varying annually, this mismeasurement will not be fixed by a BHC-level fixed effect. To address this issue, we adjust each state's HPI so that its index level corresponds to the same dollar amount. Specifically, we use the estimated median house price in the fourth quarter of 2000 divided by the state HPI from the fourth quarter of 2000 to find the state's index value in dollars.[14] We then scale each state's index so that an index value of 100 corresponds to $50,000 in every state.[15]

Incorporating housing prices in our analysis introduces concerns that housing prices are picking up other unobserved economic shocks. We therefore use a measure of land area that is unavailable

[12]The HPI is a weighted, repeat-sales index, which measures average price changes in repeat sales or refinancings. The homes included in the HPI are individual single-family residential properties on which at least two mortgages were originated and subsequently purchased by Fannie Mae or Freddie Mac. The state-level housing price indices are normalized to 100 in the first quarter of 1980.

[13]This problem is even more apparent in the MSA data, where the indices are set to 100 in 1995. If unadjusted, all banks, regardless of geographical deposit variation, would have a value of 100 in that year.

[14]Estimated median house price data is available for select years on the FHFA website (`http:\www.fhfa.gov`).

[15]We perform the same correction for the MSA-level housing price indices such that 100 again corresponds to $50,000.

for residential or commercial real estate development as an instrument. Similar approaches are used by Mian and Sufi (2011), Chaney, Sraer, and Thesmar (2012), Adelino, Schoar, and Severino (2014), and Chakraborty, Goldstein, and MacKinlay (2015). This measure of supply elasticity, developed by Saiz (2010), is the area that is unavailable for residential or commercial real estate development in metropolitan statistical areas (MSAs).[16] We use this measure either calculated at the bank level (analogous to the bank-level HPI measure) or at the individual MSA level depending on the specification. In addition, we use the 30-year national mortgage rate interacted with this land availability measure as a second instrument. The reasoning being that the aggregate changes in housing demand, coming from changes in the national mortgage rate, will impact housing prices differently depending on the local housing elasticity.

II.D Asset Purchases Data

Also critical to our analysis are the amounts of MBS and Treasury securities purchased by the NY Federal Reserve under their permanent Open Market Operations programs. The Treasury Permanent Open Market Operations program in general has the power to purchase or sell Treasury securities to "offset other changes in the Federal Reserve's balance sheet in conjuction with efforts to maintain conditions in the market for reserves consistent with the federal funds target rate set by the Federal Open Market Committee (FOMC)." Historical data for these Treasury purchases begin in August 2005.

In November 2008, the Federal Reserve announced a plan to purchase up to $100 billion in direct GSE obligations and up to $500 billion in MBS purchases, which started in early 2009. In March 2009, the program expanded with an additional $750 billion in agency MBS purchases, $300 billion in Treasury purchases, and continued until June 2010. Total purchases over this period totaled over 1.8 trillion in agency MBS, 300 billion in Treasuries, and became known as as "QE1".

[16] Saiz (2010) calculates slope maps for the continental United States using US Geological Survey (USGS) data. The measure is the share of land within 50 km of each MSA that has a slope of more than 15% or is covered by lakes, ocean, wetlands, or other internal water bodies.

In November 2010, the Fed announced a second round of purchases ("QE2"), totaling up to $600 billion in Treasury purchases and concluding in June 2011. The third round of quantitative easing ("QE3"), ran from September 2012 through October 2014, initially at purchase rates of $40 billion per month for agency MBS and $45 billion per month for Treasury securities.

Since completing the last major round of quantitative easing in October 2014, the FOMC has directed the Open Market Operations at the NY Fed to reinvest principal payments of agency MBS in new agency MBS securities to maintain current levels. Similarly, maturing Treasury holdings are being rolled over at auction to maintain current levels.

Figure 1 presents the total purchases by the Open Market Operations desk on a quarterly basis. Over this window, there are periods where there are predominantly MBS purchases (e.g., 2008q4 through 2009q3), TSY purchases (e.g., 2010q3 through 2011q3), and a mix of both security types (e.g., 2012q1 through 2012q4). In our analysis, we will consider how banks responded to purchases of these two different security types.

To complete the above purchases, the NY Federal Reserve uses a primary dealer system. These designated institutions serve as the counterparty to the NY Fed in all the MBS and TSY purchases. Table II lists the primary dealers over our sample period in descending order by amount of the securities purchased or sold.[17] In Section IV, we use the primary dealer information to investigate whether bank holding companies that include a primary dealer respond differently to asset purchases.

III Empirical Results

Section III.A analyzes if the ultimate impact of Treasury purchases and MBS purchases on firms through the bank lending channel is similar. Sections III.B and III.C investigates the impact of asset purchases on bank lending across various markets. Section III.D reports which banks are

[17]Due to data limitations, these amounts are available for MBS securities from 2009q1 through 2013q3 and for TSY securities from 2010q3 through 2013q3.

responding to MBS purchases in terms of C&I lending. Finally, Section III.E investigates the impact of asset purchases based on whether firms are capital constrained.

III.A Firm Investment

The first question we address is if the impact of Treasury purchases and MBS purchase is different (H1). Since asset purchases were dependent on prevailing economic conditions, we cannot identify the impact of asset purchases by noting the average bank lending or firm investment in a certain quarter. In fact, we must eliminate any aggregate time-varying impact of economic conditions on banks and firms. Hence, we utilize the cross-sectional heterogeneity of banks in terms of MBS and Treasury holdings to identify the impact of asset purchases on investment of borrower firms.

Table III reports results for investment regressions for firms that have an active lending relationship with at least one bank in a given year-quarter. The unit of observation in this panel is therefore a firm-bank-year-quarter observation.

The regression specification estimates the impact of the composition of the bank's balance sheet on firm investment at time t for firm i which borrows from bank j:

$$\begin{aligned}\text{Investment}_{ijt} = \alpha_{ij} + \gamma_t + \beta_1 &\text{Firm Variables}_{it-1} + \beta_2 \text{Macro Variables}_{t-1} \\ &+ \beta_3 \text{Asset Purchase Variables}_{t-1} + \beta_4 \text{Bank Variables}_{jt-1} \\ &+ \beta_5 \text{Asset Purchase Variables}_{t-1} \times \text{Bank Balance Composition}_{jt-1} + \varepsilon_{it}. \end{aligned} \quad (1)$$

Column 1 presents the investment results for firms over the entire panel, 2005q3 to 2013q3. The variables of interest are the coefficients on MBS purchases and Treasury purchases. Throughout our analysis, we use the log transform of the dollar amounts of the purchases.[18] We note that one standard deviation increase in Treasury purchases does not significantly effect firm investment. Periods following higher MBS purchases are associated with lower firm investment. It is likely that this is indicative of the periods where quantitative easing was implemented more than anything

[18] We find similar results if we use a binary variable for year-quarters with or without asset purchases.

else.

Column 2 exploits the heterogeneity of bank holdings to differentiate the effect of asset purchases on firms through their lending banks. We include interaction terms between asset purchases and corresponding asset holdings (Treasuries/MBS) to capture the heterogeneous impact of monetary policy on banks, and ultimately firms. The coefficients show that firms that borrow from banks that have higher non-MBS securities holdings (including Treasuries) invest more in the following TSY purchases. However, firms that borrow from banks that have more MBS holdings do not invest more following increases in MBS purchases.

An important concern is that the firm level effects are driven by the business cycle (at the national level). Column 3 includes year-quarter fixed effects to better focus on the effect coming through the bank channel. In this specification, we focus on how asset purchases affected firms specifically through its lending bank. We find that firms which borrowed from banks with higher MBS holdings *decreased* investment following higher MBS purchases from the Federal Reserve. This marginal effect corresponds to 10 basis points of quarterly investment and is significant at the five percent level. There does not appear to be a significant effect in response to TSY purchases across banks due to differential exposure to Treasuries and other government securities. This evidence is consistent with (H1) that impact of asset purchases through a bank lending channel is different for TSY and MBS purchases.

One may still be concerned that the effects are driven by more regional time-varying economic indicators which are omitted in the specification. Column 4 addresses such concerns by including firm state by year-quarter fixed effects which absorb any time-varying state level parameters. The negative investment result remains in this specification.

Focusing on the bank lending channel, these results suggest that TSY purchases and MBS purchases are unequal instruments for transmitting monetary policy preferences of lower long term interest rates. We do not find much evidence of Treasury purchases affecting firm investment through its lending bank. There does seem to be negative effects of MBS purchases on firm

investment through the bank lending channel. Clearly, increasing firm investment was not the sole goal for monetary policy. However, a reduction in firm investment related to MBS purchases is a noteworthy outcome.

III.B Mortgage Lending and Asset Purchases

This section investigates the response of bank mortgage activity to asset purchases (H2). We focus on how a bank's market share of new mortgage originations changes depending on its exposure to the MBS market and the amount of MBS securities the Federal Reserve purchases. We also look specifically at the interaction of these purchases with housing prices in the bank's region of operation. Just as our measures of MBS market exposure captures recent mortgage activity by the bank, housing prices give an indication of the profitability of any new mortgage activity.

Table IV considers the change in mortgage share at the bank holding company level, as measured in basis points. Because the data is only available at an annual frequency, all lagged variables in these specifications are as of the prior year. In Column 1, our main variable of interest is the bank's MBS holdings as a share of its total assets interacted with the amount of MBS purchases. We find for a one standard deviation increase in both these variables, mortgage origination market share increases by about 10% of the mean market share. This estimate is statistically significant at the 5% level.

Column 2 introduces the housing price index at the bank level. Here we focus on the interactions between the bank's MBS holdings, the bank's housing price index, and the Fed's asset purchases. We find that banks in markets with higher housing prices as a group (as measured by the coefficient for *Housing Price Index, Bank's State(s)*) do not have higher nationwide market shares. In periods without asset purchases, banks with higher housing prices and higher MBS holdings (captured by the coefficient for *MBS Holdings* $\times$ *HPI*) do not increase market share. However, in response to MBS purchases, these banks do increase market share. This effect is captured by the triple interaction term, *MBS Holdings* $\times$ *HPI* $\times$ *MBS Purchases*, and is consistent with banks in the

best position to profit increasing market share in response to the MBS purchases. Because this coefficient is presented as a marginal effect, a one standard deviation increase in all three of these variables is associated with the bank increasing its market share by about 4.4%, compared to the sample mean. There is no such effect for Treasury purchases.

It is possible that housing prices may be picking up differences in economic activity. In that case, banks may be gaining market share for reasons other than the increased mortgage profitability from higher housing prices. Column 3 instruments the housing price variable (and its interaction terms) with the land unavailability and mortgage rate instruments. The results are similar to Column 2.

Column 4 uses a different measure to capture banks that are more sensitive to MBS purchases. Here we use an indicator for banks which report securitization income. The reason being that banks which securitize loans are more likely to be involved in the MBS market. We find the securitizing banks increase market share by 9 basis points in response to an increase in MBS purchases, compared to non-securitizing banks.

Column 5 interacts the securitizer indicator with the bank's housing price index and asset purchase variables. Similar to Column 2, the securitizing banks in higher housing price markets increase their market share in response to the Federal Reserve's MBS purchases. Column 6 repeats the specification with instrumental variables. The estimates are similar to Column 5, but not statistically significant. Across both measures of exposure to the secondary MBS markets, those banks increase their mortgage origination share in response to increased MBS purchases.

Table IV considers mortgage origination market share at the national level. Figure 2 looks at how market share at the state-level changes following MBS purchases by the Federal Reserve. Considering the sample of securitizer banks, which are assumed to be more active in secondary mortgage markets, we see significant increases in their average state-level market share following government MBS purchases. This effect is consistent across the majority of states. Figure 3 repeats the analysis for the non-securitizer banks. In this case, there is no significant difference in average

state-level market share in response to MBS purchases.

To better understand the mechanism at work, in Table V, we more formally consider the changes in mortgage origination at the metropolitan statistical area (MSA) level. Specifically, we look at how a bank's market share changes across the MSAs in which it is active, as a function of the MSA-level housing prices and the Federal Reserve's TSY and MBS purchases. In this table, we control for any differences across banks and time periods by including bank by year-quarter fixed effects. Our identifying variation for the effects are across markets for each particular bank in each particular year-quarter.

Column 1 documents the role of MSA housing prices on the bank's market share. There is no significant effect of housing prices on its own. Column 2 introduces an indicator for whether the bank is an active securitizer and for MBS purchases by the Federal Reserve. We find that while non-securitizing banks have lower market share in its MSAs with higher housing prices, the opposite is true for banks which do securitize. For a one standard deviation increase in housing prices, these banks increase their market share by 0.162 basis points. It appears that securitizers are more aggressive in markets with higher housing prices.

Securitizing banks become even more aggressive with increased MBS purchases. For a one standard deviation increase in MBS purchases by the Federal Reserve, these banks increase their market share by an additional 0.164 basis points. Column 3 includes the amount of TSY purchases interacted with the securitizer indicator and housing prices as an additional control. While the strong positive effect of higher housing prices and MBS purchases for the securitizing banks remains, no such effect is found for TSY purchases. Column 4 includes MSA level fixed effects in addition to the bank by year quarter fixed effects. Because the coefficient estimates do not change significantly, the results are not driven by persistent differences in MSAs.

Columns 5 though 8 re-perform the analysis of Columns 1 through 4 but use an instrumental variables approach to address the potential endogeneity of housing prices. Although it is not obvious how potential endogeneity concerns, such as housing prices capturing broader economic activity,

will affect our MSA-specific market share results, we nonetheless attempt to isolate variation in housing prices that is unrelated to other economic activity. We find results broadly consistent with our OLS results from Columns 1 through 4. It does not appear that the findings are a result of some endogeneity problem inherent in housing prices.

Overall, we find that banks which can originate and securitize mortgages are responding to higher MBS purchases by increasing mortgage market share. Within the banks' different geographic markets, they increase market share in those areas with higher housing prices. It appears that these banks are responding on the increased profit opportunities in the MBS market, and all the more so in those markets where the value of residential loans is higher relative to the costs of originating them.

III.C Commercial Lending and Asset Purchases

Asset purchases provide a positive shock to the balance sheet of banks. In response, the expectation of policymakers is that this will lead to more lending. Table VI investigates the loan growth in commercial and industrial lending as a response to MBS and TSY purchases.

Columns 1 through 5 are panel fixed effect regressions, with fixed effects at the bank holding company and year-quarter levels. *C&I Loan Growth* is the difference in the log amount of C&I loans between the current and prior quarter, scaled to a percent. Since C&I loan growth is available on a quarterly frequency, all lagged variables are as of the prior quarter. Columns 4 and 5 use the unavailable land measure and its interaction with the national 30-year mortgage rate as instruments.[19] All independent variables (except the Securitizer indicator) are scaled by their respective standard deviations. As expected, in all columns, we note that banks with higher equity ratios and net income have stronger C&I loan growth.

The variables of interest are the interaction terms with MBS and TSY purchases. Column 1 shows that after controlling for bank and year-quarter fixed effects, banks that securitize their loans

[19]These two instruments are interacted with MBS Purchases, TSY Purchases, and the Securitizer indicator as needed so that we can instrument all the terms which the housing price variable is a component.

have slower loan growth in response to MBS purchases by Federal Reserve. Given the average loan growth in our sample is only 0.64%, the overall effect is reductions in C&I lending for many banks. TSY purchases do not have a significant effect. This is consistent with hypothesis (H3), showing that banks that benefit most from MBS purchases are not providing more C&I loans to firms.

Column 2 considers the real estate exposure of banks. Again, the negative coefficient of interaction term between housing price index and MBS purchase shows that in response to MBS purchases as stimulus, banks with exposure to stronger housing markets have a slower loan growth rate compared to banks with exposure to less expensive housing markets.

Column 3 includes interaction of MBS purchases with both securitizer and housing price index variables. Even with the inclusion of house price index interaction, we note that banks that securitize have slower loan growth compared to other banks. The results remain similar in presence of instrumenting house prices to address possible concerns that the results are driven by omitted economic conditions that drive both housing prices and loan growth. When instrumented (Columns 4 and 5), the coefficient of housing prices becomes less positive, consistent with this concern. With or without instrumentation, banks with exposure to higher housing prices decrease C&I loan growth in response to more MBS purchases. The effect is especially pronounced for banks that are active securitizers.

III.D Firm Investment and Secondary Market Exposure

The previous section shows that in response to MBS and TSY purchases by policymakers, C&I lending does not increase. Table VII investigates the bank lending channel further, dividing the sample of borrowing firms depending on whether their banks are more active the secondary mortgage market, as measured by our *Securitizer* variable. Banks that are more active in the this market should benefit more from asset purchases—especially MBS purchases.

Table VII presents the results. We find that the negative effect of the bank's MBS holdings and Federal Reserve MBS purchases is concentrated among the securitizer banks. For a one standard

deviation increase in the securitizer bank's MBS holdings and government MBS purchases, the firm's investment in the following quarter decreases by 0.195 percentage points, on average. This effect is statistically significant at the 1% level, and is statistically different from the same coefficient for the non-securitizer banks sample.

This effect shows that even within the group of banks that are active securitizers, differences in mortgage activity (as reflected by higher MBS holdings), result in lower investment levels for borrowing firms. This result complements Table V and Table VI, which show that securitizer banks differentially increase their mortgage market share and decrease C&I loan growth in response to higher housing prices.

III.E Constrained Firms and Asset Purchases

The analysis so far has focused mainly on the heterogeneity among banks. However, for the reduction in firm investment to be driven by banks reducing C&I lending, the firms must face some capital constraints. Otherwise, these firms would simply move to another source of capital, such as another bank or public debt markets.

Table VIII divides firms by likelihood of facing financing constraints in two different manners. In Columns 1 and 2, we split the firms based on firm size. The amount of MBS and TSY purchases are interacted with the lending bank's exposure to the respective asset classes. We find the negative investment effect of a bank having higher MBS holdings during increased MBS purchases is concentrated in the smaller firms in our sample. The effect on larger firms is not significant, and the difference between the two samples is statistically significant at the 1% level.

Columns 3 and 4 split the sample of firms based on their access to the bond markets. The assumption is that if a firm does not have an investment grade bond rating, then it will have significantly less access to bond markets (Faulkender and Petersen, 2006). We find that firms without an investment grade rating are the ones that experience lower investment in the presence of MBS purchases. The difference in investment between constrained and unconstrained firms in

response to MBS purchases is statistically significant. The impact of TSY purchases is negligible in both categories when we cut the sample by firm constraints.

IV Additional Discussion and Robustness

IV.A Alternative Mortgage Exposure Variables

In Section III.B we consider the effect of asset purchases on mortgage origination market share. Our two principal measures are the amount of MBS holdings and whether the bank is an active securitizer. In this section, we consider two alternative variables to capture differences in mortgage market activity across banks, *GSE Seller* and *Primary Dealer*.

Table IX repeats the analysis of Table IV for these new variables. Columns 1 through 3 uses the *GSE Seller* indicator. As discussed in Section II, a bank is marked as a GSE seller if it sells at least $1 million of its originated loans to the Government Sponsored Enterprises (GNMA, FNMA, FHMLC) in a given year. In Column 1, we find that GSE sellers increase market share by 0.791 basis points on average for an one standard deviation increase in MBS purchases. This corresponds to about 58% of the sample mean for market share.

Columns 2 and 3 introduce housing prices in the bank's state(s) as an additional variable. Similar to Table IV, we find that within the GSE seller banks, the banks with higher housing prices increase mortgage origination share more in response to MBS purchases. This result holds for the specification where housing price variables are instrumented as well (Column 3).

Columns 4 through 6 instead use the *Primary Dealer* indicator to distinguish bank involvement in mortgage markets. A bank holding company which has a primary dealer in its structure serves as the counterparty to the Federal Reserve in its open market operations. The list of primary dealers during our sample period are listed in Table II.

We find estimates in these specifications to be similar to the *Securitizer* specifications in Columns 4 through 6 of Table IV. However, these estimates are not statistically different from

zero. Given the relatively small number of primary dealers, and the even smaller subset of these dealers which are part of a bank holding company, power is likely an issue in this case.

IV.B Interest Rates versus Asset Market Purchases

The traditional channel of monetary policy support has been reduction in short term interest rates. In the previous section, this channel was not analyzed, as we eliminated time varying conditions by including time fixed-effects.

Table X reports results for investment regressions for firms facing reduction in interest rates along with quantitative easing. The regression specification estimates the impact of various characteristics on the investment at time t of firm i:

$$\begin{aligned}\text{Investment}_{it} = \alpha_i + \gamma_t + \beta_1 &\text{Firm Variables}_{it-1} + \beta_2 \text{Macro Variables}_{t-1} \\ &+ \beta_3 \text{Asset Purchase Variables}_{t-1} \\ &+ \beta_4 \text{Asset Purchase Variables}_{t-1} \times \text{Firm Financial Health}_{it-1} + \varepsilon_{it}. \end{aligned} \quad (2)$$

The unit of observation is at the firm-year-quarter level and the panel's construction is discussed in more detail in Section II.A.

All independent variables are scaled by their respective sample standard deviation to aid comparisons. Column 1 shows that higher 10 year Treasury rates correlate with more investment from firms. This is intuitive because higher Treasury rates suggest a better investment environment. If the market handicaps relatively lower credit quality firms through higher BAA-AAA spread, then firm investment falls on average as expected. Firms with higher cash flow, market-to-book, and better financial health (as measured by Altman's Z-Score) also increase capital expenditures.

Column 2 includes interaction terms between firms' health and interest rates. For an increase in BBB-AAA spread or the 10-year Treasury rate, firms in relatively better financial health (as measured by Altman Z-Score) on average invest more. Firms in better health are more strongly

affected by changes in the Treasury rate and less affected by changes in the BBB-AAA spread than the average firm in our sample. Column 3, which introduces year-quarter fixed effects, has similar results for the interaction between financial health and the interest rate variables.

Column 4 includes the purchases of MBS and Treasury securities by the Federal Reserve. An increase in mortgage purchases is associated with decreases in firm investment and the result is statistically significant at the 1% level. Increases in Treasury security purchases do not have a significant effect on firm investment on average.

Columns 5 and 6 consider if these purchases affect firms differently based on their financial health. There are not any significant differences in the effect of these purchases on firms, at least as captured by differences in Z-Score. Columns 7 and 8 include the full set of interactions and find similar results.

V Conclusion

Much research focuses on the negative effects of large downturns in the economy and the benefits of monetary policy support. In this paper, we consider the impact of quantitative easing on bank lending and firm investment.

We find that banks that are active in the secondary mortgage market increase their mortgage origination market share in response to increased MBS purchases. At the same time, these active-MBS banks reduce commercial lending. Firms which borrow from these banks decrease investment as a result. TSY purchases do not lead to the same response.

Policymakers have argued for the need to support important asset markets in order to increase consumer wealth, consumer demand, and real economic activity. When considering intervention in certain asset markets, such as the housing and Treasury markets, it is important to consider the potential asymmetric effects on banks and firms. Stimulating policies may have lasting effects on the industrial organization of sectors of the economy, depending on the heterogeneity of financial health of banks in that lending market.

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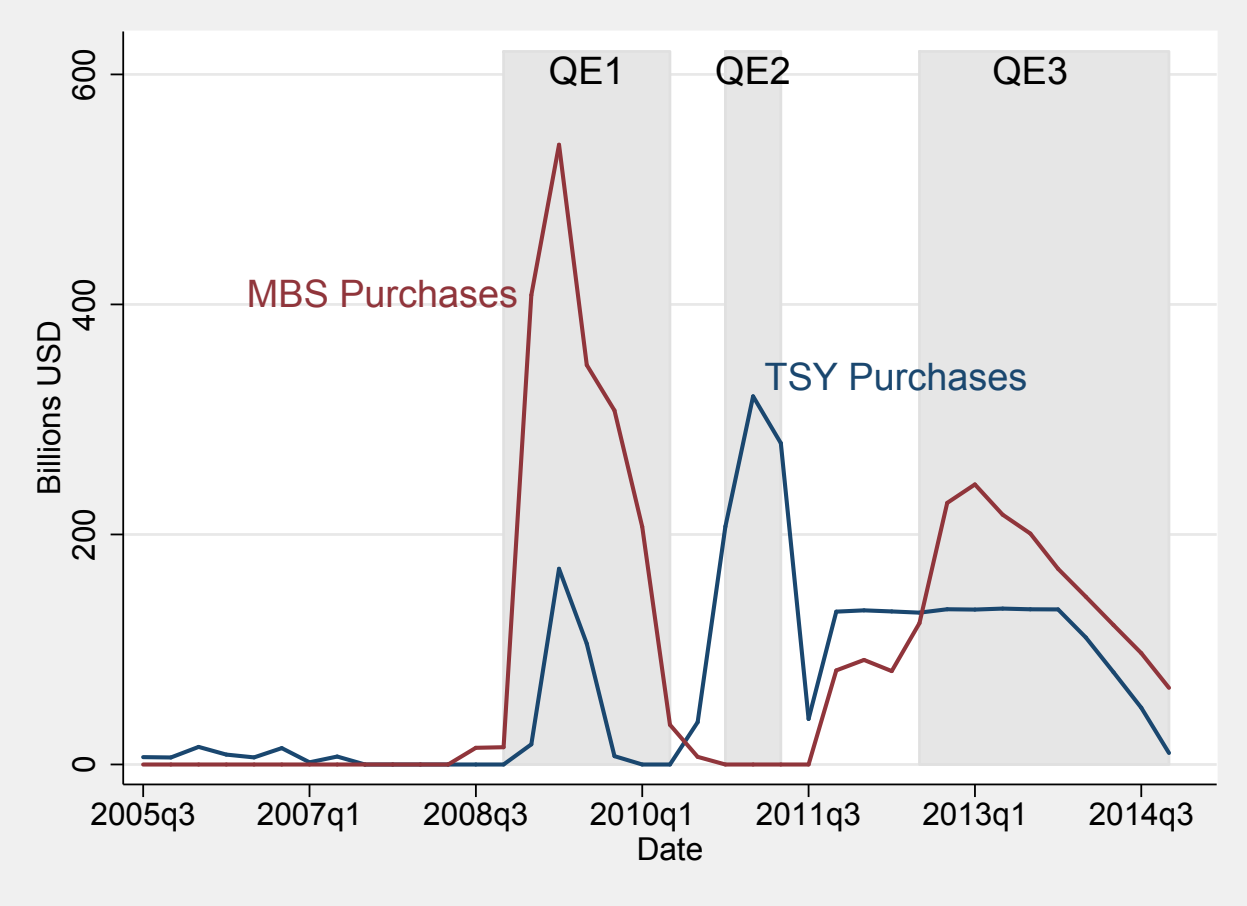

Figure 1: Quarterly totals of treasury security and mortgage-backed security purchases by the Federal Reserve.

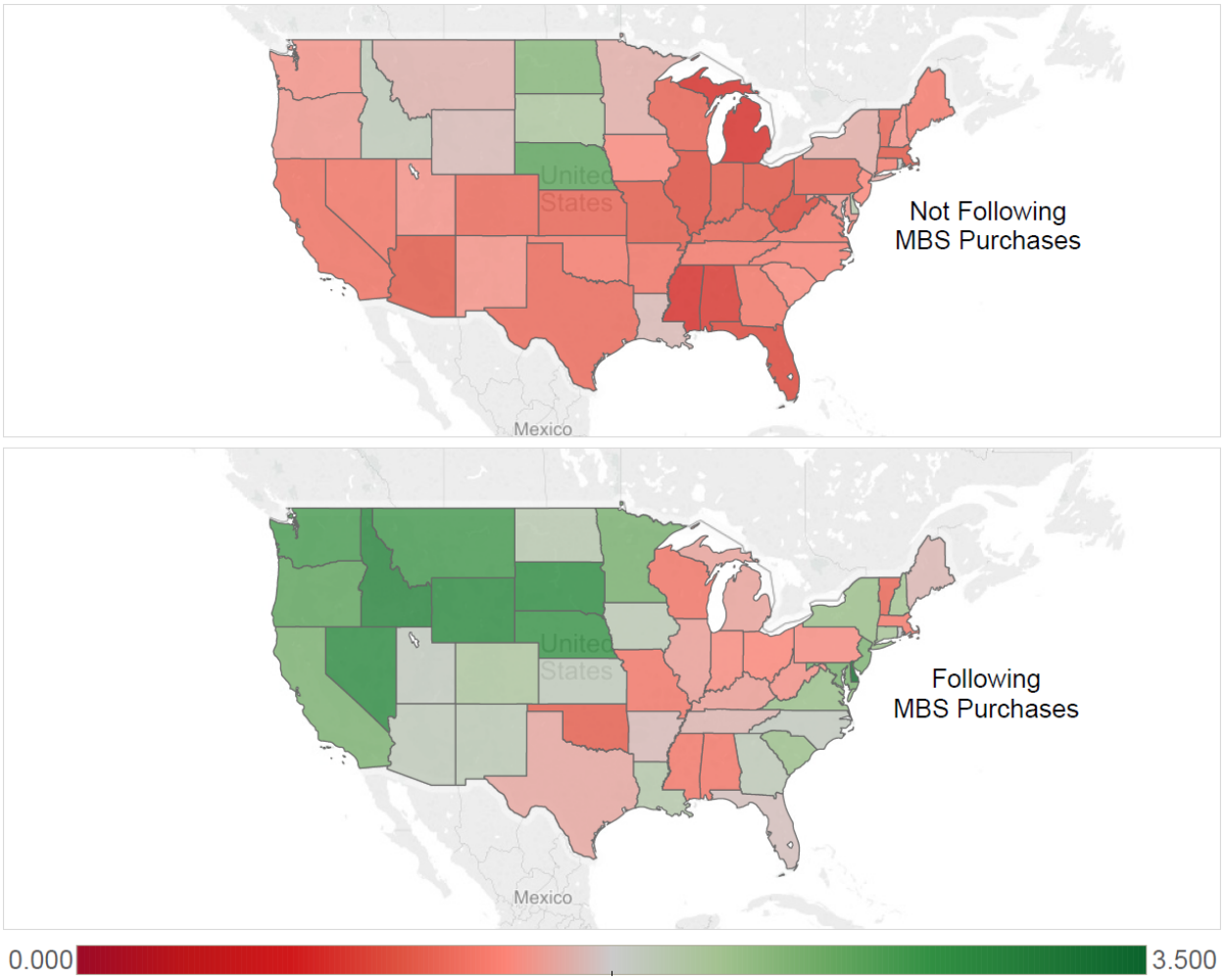

Figure 2: Average state-level mortgage origination market share for securitizer banks, in percentage points. Top panel includes years not following fourth-quarter MBS purchases (2007, 2008, 2009, 2012). Bottom panel includes years following fourth-quarter MBS purchases (2010, 2011, 2013, 2014).

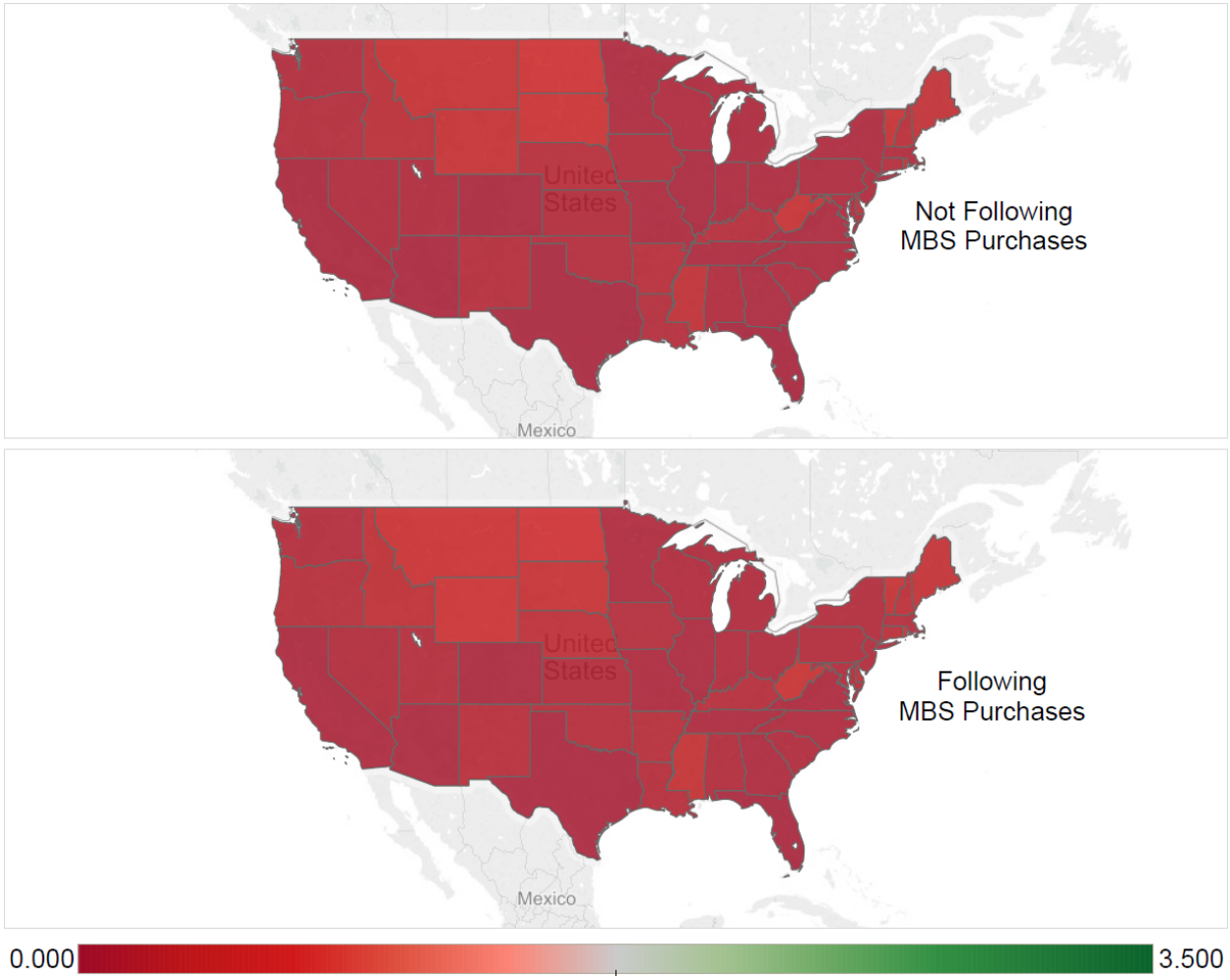

Figure 3: Average state-level mortgage origination market share for non-securitizer banks, in percentage points. Top panel includes years not following fourth-quarter MBS purchases (2007, 2008, 2009, 2012). Bottom panel includes years following fourth-quarter MBS purchases (2010, 2011, 2013, 2014).

Table I: Summary Statistics

This table presents summary statistics of the merged sample of bank holding companies and borrowing firms as obtained from Call Report, Dealscan, and Compustat databases. The sample consists of all firm-year observations from nonfinancial firms. Ratios are scaled by 100.

Panel A: Relationship and Loan Statistics						
	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Number of Relationships						
DealScan Lenders per Borrower	1.89	1.11	1	2	2	3,411
Bank Holding Companies per Borrower	1.43	0.71	1	1	2	3,411
Borrowers per DealScan Lender	24.4	79.7	1	2	8	265
Borrowers per Bank Holding Company	82.6	217.5	2	5	69	59
DealScan Lenders per Bank Holding Company	5.15	8.10	1	2	6	59
Length/Frequency of Relationships						
Length of Relationship	5.33	3.41	3	5	6.75	907
Number of Loan Packages	1.41	0.75	1	1	2	3,915
Loan Facilities per Loan Package	1.33	0.70	1	1	1	5,520
Loan Characteristics						
All In Drawn Spread (bps)	199.7	138.8	100	175	275	7,230
Loan Amount	246.9	603.9	23.6	69.9	193.8	6,931
Maturity (months)	49.9	21.2	36	60	60	7,230
Takeover Loan	0.14	0.35	0	0	0	7,230
Revolving Credit Line	0.83	0.38	1	1	1	7,230

Table I—*Continued*

Panel B: Bank, Firm, and Macroeconomic Variable Statistics						
	Mean	Std Dev	25th Pctile	Median	75th Pctile	# Obs.
Bank Variables						
Bank's MBS Holdings	7.02	8.36	0.19	4.02	10.8	166,392
Bank's Securities Holdings	14.4	11.6	5.63	11.7	20.4	166,392
C&I Loan Growth	0.77	12.6	-4.99	0.33	6.20	164,769
Bank's Size	12.2	1.37	11.3	12.0	12.9	166,392
Bank's Equity Ratio	10.4	2.86	8.60	9.85	11.6	166,392
Bank's Net Income	0.48	0.70	0.20	0.47	0.85	166,392
Bank's Cost of Deposits	1.08	0.83	0.43	0.83	1.55	166,365
Securitizer	0.0067	0.081	0	0	0	166,392
Primary Dealer	0.0021	0.046	0	0	0	166,392
Change in Unemp. Rate, Bank's State(s)	0.053	0.48	-0.20	0	0.20	162,558
Housing Price Index, Bank's State(s)	319.5	122.5	239.9	276.1	342.9	162,558
Land Unavailability, Bank's State(s)	0.19	0.13	0.089	0.17	0.26	162,354
GSE Seller	0.19	0.40	0	0	0	26,492
Mortgage Origination Market Share (bps)	1.36	24.8	0.029	0.082	0.25	26,487
MSA-Level Mortgage Origination Market Share (bps)	64.8	206.6	0.73	3.26	22.5	243,694
MSA Housing Price Index	329.3	204.9	208.6	274.3	386.9	248,494
Firm Variables						
Investment	6.47	7.22	2.33	4.38	7.89	107,328
Cash Flow	6.29	48.9	1.94	6.94	19.0	105,737
Lagged Market-to-Book	1.85	1.42	1.11	1.43	2.04	102,461
Lagged Z-Score	-0.36	4.35	0.0028	0.57	1.14	103,659
Lagged Firm Size	6.60	2.26	5.19	6.66	8.09	112,123
Macroeconomic Variables						
30-Year Mortgage Rate	5.17	1.07	4.37	5.06	6.18	33
TSY Purchases (Bil. USD)	70.3	88.0	1.88	15.3	134.0	33
MBS Purchases (Bil. USD)	95.3	142.8	0	6.65	200.8	33

Table II: Asset Purchase Counterparties

The table reports statistics on counterparties for the Federal Reserve's asset purchases and sales. Amounts are in billions USD.

	Total Amount Purchased or Sold	
Primary Dealer	MBS	TSY
Credit Suisse Securities (USA) LLC	657.358	228.770
Morgan Stanley & Co. LLC	396.813	486.529
Goldman, Sachs & Co.	316.826	342.576
Deutsche Bank Securities Inc.	545.748	107.378
Barclays Capital Inc.	269.858	296.170
Merrill Lynch, Pierce, Fenner & Smith Inc.	435.512	85.342
Citigroup Global Markets Inc.	309.473	128.049
RBS Securities Inc.	211.817	165.868
J.P. Morgan Securities LLC	276.733	94.438
BNP Paribas Securities Corp.	124.075	105.183
UBS Securities LLC	120.266	71.818
Nomura Securities International, Inc.	76.411	81.418
RBC Capital Markets, LLC	20.575	66.732
Mizuho Securities USA Inc.	6.700	72.523
Daiwa Capital Markets America Inc.	13.450	59.470
HSBC Securities (USA) Inc.	0.000	52.425
Jefferies & Company, Inc.	5.350	37.568
BMO Capital Markets Corp.	0.000	34.227
Bank of Nova Scotia, New York Agency	0.000	30.363
SG Americas Securities, LLC	0.000	24.103
Cantor Fitzgerald & Co.	9.175	13.032
MF Global Inc.	0.000	3.097
Banc of America Securities LLC	0.000	1.496
G.X. Clarke & Co.	0.000	0.105
Cabrera Capital Markets, LLC	0.000	0.076
Loop Capital Markets LLC	0.000	0.003
Mischler Financial Group, Inc.	0.000	0.001

Table III: Impact of Monetary Stimulus on Firms

Columns (1) through (4) are Panel Fixed Effect Regressions. All independent variables scaled by their respective standard deviations. Standard errors are clustered by firm, bank, and year-quarter.

	Investment			
	(1)	(2)	(3)	(4)
Bank's MBS Holdings	0.0806	0.127	0.231**	0.215*
	(0.0896)	(0.0821)	(0.109)	(0.114)
Bank's Securities Holdings	-0.268**	-0.537***	-0.144	0.00550
	(0.131)	(0.161)	(0.140)	(0.147)
MBS Purchases	-0.270**	-0.142		
	(0.126)	(0.168)		
TSY Purchases	-0.0535	-0.159***		
	(0.0669)	(0.0584)		
MBS Holdings × MBS Purchases		-0.0649	-0.101**	-0.0896**
		(0.0522)	(0.0398)	(0.0387)
Securities Holdings × TSY Purchases		0.142***	0.0391	0.00855
		(0.0428)	(0.0395)	(0.0235)
Cash Flow	0.207***	0.208***	0.223***	0.220***
	(0.0667)	(0.0671)	(0.0653)	(0.0667)
Lagged Market-to-Book	1.673***	1.668***	1.622***	1.585***
	(0.0669)	(0.0656)	(0.0658)	(0.0602)
Lagged Z-Score	0.784***	0.780***	0.737***	0.680***
	(0.153)	(0.148)	(0.140)	(0.139)
Lagged Firm Size	-0.993	-1.016	-1.345	-1.030
	(0.722)	(0.728)	(0.826)	(0.908)
Bank's Size	-0.375	-0.505	-0.351	-0.113
	(0.581)	(0.538)	(0.494)	(0.385)
Bank's Equity Ratio	-0.126	-0.135	0.0771	0.0297
	(0.139)	(0.134)	(0.0659)	(0.0658)
Bank's Net Income	0.0962	0.0975	-0.0230	-0.00729
	(0.0611)	(0.0629)	(0.0534)	(0.0551)
Bank's Cost of Deposits	-0.195	-0.206	-0.443	-0.433
	(0.161)	(0.160)	(0.298)	(0.269)
Change in Unemp. Rate, Bank's State(s)	-0.115*	-0.129*	-0.0617	-0.0682
	(0.0677)	(0.0671)	(0.0852)	(0.0850)
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	No	No	Yes	No
Firm State by Year-Quarter Fixed Effects	No	No	No	Yes
Observations	68763	68763	68763	66558
Firms	2790	2790	2790	2676
Banks	54	54	54	53
Adjusted R^2	0.458	0.458	0.465	0.472

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table IV: Mortgage Market Share Regression

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the bank holding company and year-quarter level. All continuous independent variables are scaled by their respective standard deviations. Standard errors are clustered by bank holding company.

	Mortgage Origination Market Share					
	(OLS)	(OLS)	(IV)	(OLS)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Housing Price Index, Bank's State(s)		-1.755	-1.640*		-1.159*	-1.178**
		(1.118)	(0.920)		(0.666)	(0.600)
Bank's MBS Holdings	-0.0775	0.221	0.491			
	(0.104)	(0.266)	(0.371)			
MBS Holdings × MBS Purchases	0.140**					
	(0.0610)					
MBS Holdings × TSY Purchases	-0.0302					
	(0.0516)					
MBS Holdings × HPI		-0.101	-0.181			
		(0.102)	(0.150)			
MBS Holdings × HPI × MBS Purchases		0.0602**	0.0387*			
		(0.0269)	(0.0202)			
MBS Holdings × HPI × TSY Purchases		-0.0185	-0.0148			
		(0.0243)	(0.0243)			
Securitizer				-11.51	57.10	30.72
				(8.987)	(40.58)	(20.91)
Securitizer × MBS Purchases				9.009*		
				(5.283)		
Securitizer × TSY Purchases				-4.333		
				(4.103)		
Securitizer × HPI					-22.37	-13.50
					(14.60)	(8.950)
Securitizer × HPI × MBS Purchases					2.706*	2.870
					(1.603)	(2.023)
Securitizer × HPI × TSY Purchases					-1.907	-1.905
					(1.714)	(1.714)
Bank's Size (excl. loans)	1.390*	1.289*	1.295*	1.309*	1.070*	1.129*
	(0.769)	(0.710)	(0.725)	(0.700)	(0.548)	(0.610)
Bank's Equity Ratio	0.217	0.206	0.209	0.170	0.165	0.163
	(0.170)	(0.165)	(0.166)	(0.158)	(0.154)	(0.151)
Bank's Net Income	0.0421	0.137**	0.134*	0.0628	0.155**	0.147**
	(0.0774)	(0.0693)	(0.0729)	(0.0678)	(0.0692)	(0.0667)
Bank's Cost of Deposits	-0.885	-0.907	-0.896	-0.710	-0.603	-0.638
	(0.634)	(0.641)	(0.639)	(0.542)	(0.466)	(0.497)
Change in Unemp. Rate, Bank's State(s)	0.0620*	0.0111	0.0134	0.0450	0.00658	0.00905
	(0.0344)	(0.0218)	(0.0241)	(0.0319)	(0.0246)	(0.0260)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21748	21748	21748	21748	21748	21748
Banks	3392	3392	3392	3392	3392	3392
Adjusted R^2	0.913	0.913	0.913	0.915	0.919	0.919

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table V: MSA-Level Mortgage Market Share

Columns (1) through (8) are Panel Fixed Effect Regressions, with fixed effects at the bank holding company by year-quarter level and MSA level. *Mortage Origination Market Share* is in basis points. All independent variables (except the Securitizer indicator) are scaled by their respective standard deviations. Standard errors are clustered by bank holding company and MSA.

	Mortgage Origination Market Share							
	(OLS)	(OLS)	(OLS)	(OLS)	(IV)	(IV)	(IV)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MSA Housing Price Index	-0.0575	-0.119***	-0.119***	-0.211*	-0.0562	-0.0700**	-0.0815	-0.0529
	(0.0444)	(0.0310)	(0.0310)	(0.119)	(0.0353)	(0.0319)	(0.0528)	(0.0576)
Securitizer × MSA HPI		0.162***	0.184*	0.175*		0.112*	0.180	0.166***
		(0.0598)	(0.0976)	(0.0917)		(0.0617)	(0.144)	(0.0572)
Securitizer × MSA HPI × MBS Purchases		0.164**	0.163**	0.146**		0.150**	0.203*	0.144***
		(0.0733)	(0.0737)	(0.0617)		(0.0585)	(0.120)	(0.0543)
Securitizer × MSA HPI × TSY Purchases			-0.0136	-0.00767			-0.0382	-0.0505*
			(0.0401)	(0.0432)			(0.0484)	(0.0260)
Bank by Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA Fixed Effects	No	No	No	Yes	No	No	No	Yes
Observations	77010	77010	77010	77010	77010	77010	77010	77010
Banks	2082	2082	2082	2082	2082	2082	2082	2082
Adjusted R^2	0.406	0.410	0.410	0.429	0.406	0.409	0.410	0.428

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table VI: C&I Loan Growth

Columns (1) through (5) are Panel Fixed Effect Regressions, with fixed effects at the bank holding company and year-quarter levels. *C&I Loan Growth* is the log difference in C&I loans between the current and prior quarter, scaled to a percent. Columns (4) and (5) use the unavailable land measure and its interaction with the national 30-year mortgage rate as instruments, both interacted with the MBS and TSY purchases. Column (5) further interacts the instrument set with the Securitizer indicator. All independent variables (except the Securitizer indicator) are scaled by their respective standard deviations. Standard errors are clustered by bank holding company and year-quarter.

	C&I Loan Growth				
	(OLS)	(OLS)	(OLS)	(IV)	(IV)
	(1)	(2)	(3)	(4)	(5)
Securitizer	-0.269		-0.284		-1.200
	(0.712)		(2.301)		(3.490)
Securitizer × MBS Purchases	-0.936**				
	(0.474)				
Securitizer × TSY Purchases	-0.00125				
	(0.427)				
Housing Price Index, Bank's State(s)		0.571***	0.568***	0.192	0.181
		(0.202)	(0.201)	(0.355)	(0.352)
Housing Price Index × MBS Purchases		-0.156***	-0.153***	-0.189*	-0.184*
		(0.0461)	(0.0461)	(0.0983)	(0.0984)
Housing Price Index × TSY Purchases		-0.0769*	-0.0776*	-0.0612	-0.0668
		(0.0440)	(0.0441)	(0.0873)	(0.0870)
Securitizer × HPI			0.0281		0.225
			(0.705)		(1.027)
Securitizer × HPI × MBS Purchases			-0.420***		-0.563**
			(0.160)		(0.256)
Securitizer × HPI × TSY Purchases			0.00192		0.147
			(0.139)		(0.182)
Bank's Size (excl. loans)	0.231	0.257	0.262	0.251	0.261
	(0.273)	(0.273)	(0.273)	(0.271)	(0.272)
Bank's Equity Ratio	1.628***	1.622***	1.623***	1.627***	1.629***
	(0.131)	(0.128)	(0.128)	(0.129)	(0.129)
Bank's Net Income	0.506***	0.475***	0.474***	0.486***	0.485***
	(0.0863)	(0.0848)	(0.0847)	(0.0868)	(0.0866)
Bank's Cost of Deposits	-0.245	-0.235	-0.238	-0.226	-0.233
	(0.215)	(0.216)	(0.216)	(0.218)	(0.219)
Change in Unemp. Rate, Bank's State(s)	0.00641	-0.00742	-0.00733	0.00163	0.00181
	(0.0714)	(0.0676)	(0.0675)	(0.0706)	(0.0706)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	156853	156853	156853	156853	156853
Banks	5783	5783	5783	5783	5783
Adjusted R^2	0.0345	0.0348	0.0348	0.0347	0.0348

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table VII: Investment Regression by Banks' Exposure to MBS Market

Columns (1) and (2) are Panel Fixed Effect Regressions. Banks without securitization income are designated as *Non-Securitizer* and banks with securitization income are designated as *Securitizer*. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm, bank, and year-quarter. The *Wald Test* provides the χ^2 statistic on whether the *MBS Holdings* × *MBS Purchases* coefficient is statistically different across the two samples.

	Investment	
	(Non-Securitizer)	(Securitizer)
	(1)	(2)
Bank's MBS Holdings	0.326*	0.163
	(0.167)	(0.125)
Bank's Securities Holdings	-0.334	-0.160
	(0.212)	(0.159)
MBS Holdings × MBS Purchases	-0.0605	-0.195***
	(0.0457)	(0.0376)
Securities Holdings × TSY Purchases	-0.00892	0.0237
	(0.0518)	(0.0550)
Cash Flow	0.228**	0.235***
	(0.110)	(0.0314)
Lagged Market-to-Book	1.847***	1.445***
	(0.154)	(0.0478)
Lagged Z-Score	0.732***	0.820***
	(0.233)	(0.153)
Lagged Firm Size	-1.427	-1.504
	(1.134)	(1.015)
Bank's Size	0.513	-0.966
	(0.669)	(0.666)
Bank's Equity Ratio	-0.0594	0.147
	(0.128)	(0.117)
Bank's Net Income	-0.0713	-0.00534
	(0.0997)	(0.00458)
Bank's Cost of Deposits	-0.651	-0.267*
	(0.467)	(0.139)
Change in Unemp. Rate, Bank's State(s)	0.0243	-0.101
	(0.108)	(0.168)
Wald Test:		
(Non-Securitizer = Securitizer)	5.18**	
Firm-Bank Fixed Effects	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes
Observations	24606	43848
Firms	2047	2319
Banks	46	20
Adjusted R^2	0.486	0.490

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table VIII: Investment Regression for Firm Constraints

Columns (1) through (4) are Panel Fixed Effect Regressions. Firms in the bottom tercile by total assets are marked as *Constrained* and firms in the top tercile by total assets are marked as *Unconstrained*. Firms without a public investment grade bond rating are marked as *Constrained* and firms with a public investment grade bond rating are marked as *Unconstrained*. All independent variables are scaled by their sample standard deviations. Standard errors are clustered by firm, bank, and year-quarter. The *Wald Test* provides the χ^2 statistic on whether the *MBS Holdings* × *MBS Purchases* coefficient is statistically different across the two samples.

	Investment			
	Firm Size		Bond Rating	
	(Constrained)	(Unconstr.)	(Constrained)	(Unconstr.)
	(1)	(2)	(3)	(4)
Bank's MBS Holdings	0.176	0.0372	0.204	0.136
	(0.304)	(0.0969)	(0.127)	(0.110)
Bank's Securities Holdings	-0.587	-0.105	-0.189	0.0833
	(0.399)	(0.109)	(0.165)	(0.0931)
MBS Holdings × MBS Purchases	-0.237***	0.00572	-0.0953**	0.0611***
	(0.0805)	(0.0333)	(0.0402)	(0.0171)
Securities Holdings × TSY Purchases	0.0576	0.0135	0.0705	-0.0454
	(0.107)	(0.0426)	(0.0498)	(0.0334)
Cash Flow	0.122	0.216***	0.213***	0.283***
	(0.121)	(0.0380)	(0.0682)	(0.0640)
Lagged Market-to-Book	1.624***	1.249***	1.692***	1.228***
	(0.219)	(0.155)	(0.0658)	(0.107)
Lagged Z-Score	0.654***	1.073***	0.771***	0.577**
	(0.232)	(0.112)	(0.134)	(0.241)
Lagged Firm Size	-3.946	-0.969***	-1.894*	0.0126
	(2.811)	(0.325)	(0.989)	(0.409)
Bank's Size	0.719	0.484	-0.133	-0.775**
	(1.185)	(0.335)	(0.586)	(0.360)
Bank's Equity Ratio	-0.159	0.140**	0.0332	0.0975*
	(0.310)	(0.0595)	(0.0772)	(0.0587)
Bank's Net Income	-0.219	0.0222	-0.0429	0.00282
	(0.146)	(0.0405)	(0.0656)	(0.0343)
Bank's Cost of Deposits	-0.964*	-0.248	-0.461	-0.374***
	(0.545)	(0.190)	(0.323)	(0.126)
Change in Unemp. Rate, Bank's State(s)	-0.364**	-0.0824	-0.0566	0.00327
	(0.167)	(0.0954)	(0.0893)	(0.0777)
Wald Test:				
(Constrained = Unconstrained)	7.74***		12.83***	
Firm-Bank Fixed Effects	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Observations	9762	28644	50362	18376
Firms	800	1029	2337	627
Banks	48	27	52	27
Adjusted R^2	0.394	0.571	0.442	0.647

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table IX: Mortgage Market Share Regression: Alternate Variables

Columns (1) through (6) are Panel Fixed Effect Regressions, with fixed effects at the bank holding company and year-quarter level. All continuous independent variables are scaled by their respective standard deviations. Standard errors are clustered by bank holding company.

	Mortgage Orig Market Share					
	(OLS)	(OLS)	(IV)	(OLS)	(OLS)	(IV)
	(1)	(2)	(3)	(4)	(5)	(6)
Housing Price Index, Bank's State(s)		-1.574*	-1.342*		-1.739	-1.543
		(0.951)	(0.714)		(1.146)	(0.941)
GSE Seller	0.624	6.439*	8.067**			
	(0.878)	(3.454)	(3.737)			
GSE Seller × MBS Purchases	0.791**					
	(0.366)					
GSE Seller × TSY Purchases	-0.169					
	(0.228)					
GSE Seller × HPI		-2.043	-2.530*			
		(1.321)	(1.441)			
GSE Seller × HPI × MBS Purchases		0.302**	0.223*			
		(0.127)	(0.130)			
GSE Seller × HPI × TSY Purchases		-0.0911	-0.0917			
		(0.103)	(0.104)			
Primary Dealer × MBS Purchases				7.703		
				(7.851)		
Primary Dealer × TSY Purchases				-5.376		
				(14.71)		
Primary Dealer × HPI					-31.20	-39.32
					(21.93)	(36.16)
Primary Dealer × HPI × MBS Purchases					0.626	0.512
					(1.588)	(2.545)
Primary Dealer × HPI × TSY Purchases					-1.325	-1.513
					(3.574)	(3.816)
Bank's Size (excl. loans)	1.832*	1.777*	1.774*	1.815*	1.801*	1.799*
	(1.082)	(1.043)	(1.047)	(1.076)	(1.064)	(1.066)
Bank's Equity Ratio	0.230	0.225	0.231	0.254	0.227	0.227
	(0.179)	(0.176)	(0.177)	(0.198)	(0.188)	(0.193)
Bank's Net Income	-0.00890	0.0855	0.0777	0.0199	0.116*	0.106*
	(0.0881)	(0.0617)	(0.0705)	(0.0817)	(0.0625)	(0.0634)
Bank's Cost of Deposits	-0.905	-0.904	-0.901	-0.894	-0.866	-0.847
	(0.636)	(0.629)	(0.628)	(0.648)	(0.653)	(0.651)
Change in Unemp. Rate, Bank's State(s)	0.0439	-0.00262	0.00911	0.0621*	0.0144	0.0171
	(0.0279)	(0.0222)	(0.0224)	(0.0324)	(0.0201)	(0.0229)
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21748	21748	21748	21748	21748	21748
Banks	3392	3392	3392	3392	3392	3392
Adjusted R^2	0.913	0.914	0.914	0.913	0.914	0.914

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table X: Impact of Monetary Policy on Firms Rates versus Purchases

Columns (1) through (8) are Panel Fixed Effect Regressions. All independent variables scaled by their respective standard deviations. Standard errors are clustered by firm and year-quarter.

	Investment							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged Z-Score	3.167***	2.797***	2.351***	3.125***	3.101***	2.960***	2.873***	2.383***
	(0.183)	(0.366)	(0.339)	(0.172)	(0.179)	(0.177)	(0.370)	(0.349)
BAA Spread	-0.441***	-0.418***		-0.203*	-0.200*		-0.190	
	(0.0800)	(0.0815)		(0.122)	(0.121)		(0.122)	
10-Year Treasury Rate	0.348***	0.356***		0.0405	0.0452		0.0519	
	(0.0989)	(0.102)		(0.141)	(0.141)		(0.145)	
Lagged Z-Score × BAA Spread		0.0852**	0.103***				0.0417	0.0837**
		(0.0394)	(0.0347)				(0.0406)	(0.0339)
Lagged Z-Score × 10-Year Treasury Rate		0.0516	0.0969				0.0369	0.0999
		(0.0652)	(0.0632)				(0.0685)	(0.0662)
MBS Purchases				-0.613***	-0.592***		-0.593***	
				(0.198)	(0.198)		(0.199)	
TSY Purchases				-0.0481	-0.0556		-0.0523	
				(0.130)	(0.131)		(0.131)	
Lagged Z-Score × MBS Purchases					0.0775	0.0494	0.0656	0.0358
					(0.0481)	(0.0446)	(0.0518)	(0.0442)
Lagged Z-Score × TSY Purchases					-0.0277	-0.0457	-0.0182	-0.0198
					(0.0481)	(0.0469)	(0.0505)	(0.0486)
Cash Flow	-0.0281	-0.0270	-0.0207	-0.0262	-0.0208	-0.0169	-0.0218	-0.0193
	(0.0574)	(0.0576)	(0.0584)	(0.0569)	(0.0570)	(0.0583)	(0.0572)	(0.0584)
Lagged Market-to-Book	2.777***	2.774***	2.612***	2.723***	2.718***	2.612***	2.719***	2.613***
	(0.130)	(0.130)	(0.102)	(0.110)	(0.111)	(0.102)	(0.111)	(0.103)
Lagged Firm Size	-2.165***	-2.162***	-1.962***	-2.202***	-2.213***	-1.984***	-2.207***	-1.965***
	(0.367)	(0.369)	(0.353)	(0.351)	(0.350)	(0.351)	(0.352)	(0.353)
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	No	No	Yes	No	No	Yes	No	Yes
Observations	155149	155149	155149	155149	155149	155149	155149	155149
Firms	8553	8553	8553	8553	8553	8553	8553	8553
Adjusted R^2	0.285	0.285	0.291	0.287	0.287	0.291	0.287	0.291

Standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01

Table A1: Variable Definitions

Variable Definitions		
	Definition	Data sources
Loan Characteristics		
All In Drawn Spread (bps)	Basis point spread paid over LIBOR for each dollar of loan drawn. For loan packages with multiple facilities, a dollar-weighted average is used.	DealScan
Loan Amount	Total amount available in a loan package divided by the borrowing firm's lagged net PPE	DealScan and Compustat
Maturity (months)	Loan package maturity (in months) at origination. Dollar-weighted average for packages with multiple facilities.	DealScan
Takeover Loan	Indicator that loan purpose is an acquisition line, LBO, MBO, or takeover.	DealScan
Revolving Credit Line	Indicator that at least one facility is a revolving credit line in loan package.	DealScan
Bank Variables		
MBS Holdings	Balance sheet mortgage-backed securities (RCFD8639) plus trading asset mortgage-backed securities (RCFD G379+G380+G381+K197+K198) divided by total assets (RCFD2170).	Call Report
Securities Holdings	Total balance sheet securities (RCFD8641) minus balance sheet MBS holdings (RCFD8639), divided by total assets (RCFD2170).	Call Report
C&I Loan Growth	Log difference of the sum of balance sheet commercial and industrial loans (RCFD1766) and trading asset commercial and industrial loans (RCFDF614).	Call Report
Bank's Size	Log of total assets (RCFD2170)	Call Report
Bank's Equity Ratio	Total equity capital (RCFD3210) divided by total assets (RCFD2170)	Call Report
Bank's Net Income	Net income (RIAD4340) divided by total assets (RCFD2170)	Call Report
Bank's Cost of Deposits	Interest on deposits (RIAD4170) divided by total deposits (RCFD2200)	Call Report
Securitizer	Indicator that bank reports non-zero net securitization income (RIADB493)	Call Report
Primary Dealer	Indicator that bank is a primary dealer for the New York Fed.	New York Fed
Change in Unemp. Rate, Bank's State(s)	Annual change in unemployment rate where bank has deposits, weighted by prior year's deposit amounts.	Summary of Deposits and FRED
Housing Price Index, Bank's State(s)	State-level housing price index, adjusted by state median housing prices in 2000. Bank-specific weighting determined by prior year's summary of deposits.	Summary of Deposits and FHFA
Land Unavailability, Bank's State(s)	Percent of land unavailable for development in specific MSAs, averaged to state-level using population for weights. Bank-specific weighting determined by prior year's summary of deposits.	Summary of Deposits, Census (2000), and Saiz (2010)
GSE Seller	Indicator that bank sold at least $1 million in originated mortgages to Fannie Mae, Freddie Mac, or Ginnie Mae.	HMDA
Mortgage Origination Market Share (bps)	Bank's share of the mortgage origination market (nationwide). Measured annually.	HMDA
MSA-Level Mortgage Orig Mkt Share (bps)	Bank's share of the mortgage origination market, for a given MSA-level market. Measured annually.	HMDA
MSA Housing Price Index	MSA-level housing price index, adjusted by MSA median housing prices in 2000.	FHFA

Table A1—*Continued*

Variable Definitions		
	Definition	Data sources
Firm Variables		
Investment	Capital expenditures divided by lagged net PPE	Compustat
Cash Flow	Income before extraordinary items plus depreciation and amortization divided by lagged net PPE	Compustat
Lagged Market-to-Book	Book assets plus closing stock price times shares outstanding minus common equity minus deferred taxes, all divided by book assets	Compustat
Lagged Z-Score	Sum of 3.3 times pre-tax income, sales, 1.4 times retained earnings, 1.2 times the difference between current assets and current liabilities, all divided by book assets	Compustat
Lagged Firm Size	Log of book assets	Compustat
Macroeconomic Variables		
30-Year Mortgage Rate	Average 30-year fixed mortgage rate.	FRED
TSY Purchases (Bil. USD)	Amount of treasury securities purchased by the Federal Reserve in a given quarter.	New York Fed
MBS Purchases (Bil. USD)	Amount of MBS securities purchased by the Federal Reserve in a given quarter	New York Fed