Unconventional Monetary Policy, Bank Lending, and Security Holdings: The Yield-Induced Portfolio Rebalancing Channel*

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Abstract

Exploiting a granular dataset of banks' security holdings I estimate the effect of unconventional monetary policy on bank lending and security holdings. Using a difference-in-differences regression setup and holding the security composition of each bank constant at its level in January 2014, well in advance of an anticipation of the ECB's asset purchase program (APP), this paper provides evidence for the presence of a yield-induced portfolio rebalancing channel: Banks experiencing a higher average yield decline of their securities portfolio induced by unconventional expansionary monetary policy increase their real sector lending more strongly in response. The effect is stronger for banks facing many reinvestment decisions. Moreover, I find that banks with a higher average yield decline reduce their overall investments in securities more intensely, especially in those securities that had larger valuation gains. My results suggest that banks target a specific yield level and shift their investments from the securities to the (higher-yielding) credit portfolio. Making use of data on bank-specific TLTRO uptakes, my results do not seem to be driven by alternative, liquidity-driven transmission channels.

Keywords: Unconventional Monetary Policy, Quantitative Easing, Portfolio Rebalancing.

JEL classification: E44, E51, E52, E58, G21.

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1 Introduction

After reaching the zero lower bound on interest rates many central banks like the Fed, the BoE, the BoJ, and the ECB embarked on so-called unconventional monetary policy measures to stimulate their economies. The new central bank toolkit includes new communication strategies, negative interest rates, liquidity injections, and large-scale asset purchases (LSAP). Theses measures are sizable. Since their introduction in the Eurozone, the balance sheet of the European Central Bank (ECB) has increased from approximately 1.1 trillion EUR in January 2007 to 4.5 trillion EUR in January 2018 and, as opposed to the Federal Reserve's balance sheet, is still growing. The question that has been at the center of the debate among policymakers, investors, and academics is whether these measures are effective in stimulating economic activity and through which channels the transmission mechanism works. For instance, in the words of Ben Bernanke, Chairman of the Federal Reserve, in January 2014: *"The problem with Quantitative Easing (QE) is it works in practice, but it doesn't work in theory."*

I contribute to this debate by documenting a novel channel of QE on economic activity working through banks, which I label "yield-induced portfolio rebalancing." According to this channel, banks might react to a yield compression of longer term securities by reducing their bond holdings and investing in alternative assets with a higher expected return like loans to the real sector. To empirically test for the presence of this channel, I consider Germany, a country in the Eurozone. The Eurozone has a bank-dominated financial system and banks are key for the transmission of monetary policy. ECB Chief Economist Peter Praet (2016) argues that: *"This crucial role of the banking system explains why many of our monetary policy interventions during the crisis were aimed at repairing the bank lending channel."*

Economic theory yields different predictions of how QE can work. In their seminal work Eggertsson and Woodford (2003) develop the famous irrelevance result of QE. Accordingly, in a standard New Keynesian model open market operations are ineffective at the zero lower bound. Thus, unconventional monetary policy like asset purchases or the change in the composition of the central bank balance sheet are not expected to have direct real effects. Only a commitment about the future path of interest rates is a powerful way to stimulate the economy. Bhattarai, Eggertsson, and Gafarov (2015) show that LSAP can act as a commitment device by generating a credible signal about the future path of interest rates.

In finance theory signaling is one channel through which QE can influence asset prices. LSAP can cause a change of the expectations of the future path of short term interest

rates, thus, affecting the risk neutral component of bond yields (see e.g. Bauer and Rudebusch, 2014). Alternatively, according to the "portfolio-balance channel" the central bank can reduce the supply of bonds, which can affect the term premium of long-term securities if investors have maturity-specific bond demands (see e.g. Vayanos and Vila, 2009; Krishnamurthy and Vissing-Jorgensen, 2011). There exists a vast empirical literature that analyzes the impact of QE on prices and finds that, by and large, asset purchases positively affect asset prices and decrease bond yields.[1]

In my study, I take the result that QE affects bond yields negatively as given and ask whether there are second-round effects that result in a portfolio reallocation of banks. Banks might be faced with different incentives to rebalance their portfolio composition. First, these incentives might stem from the additional liquidity emerging at banks. In the spirit of Bagehot (1873) in crisis times the central bank can act as a lender of last resort and provide liquidity directly to banks to prevent a credit contraction (see e.g. Carpinelli and Crosignani, 2017). Alternatively, liquidity might be generated by the sale of securities to the central bank either by the banks directly (see e.g. Rodnyansky and Darmouni, 2017) or by the deponents of the bank (see e.g. Christensen and Krogstrup, 2017). Second, the impact that the numerous unconventional monetary policy measures exert on *yields* (or prices) of securities held by banks might cause a rebalancing due to a "stealth recapitalization" (Brunnermeier and Sannikov, 2014). The increase in the mark-to-market value of these securities can raise banks net worth and result in increased credit supply.

There is a growing body of empirical literature that examines the liquidity-driven rebalancing motive by banks (see e.g. Kandrac and Schlusche, 2016; Butt, Churm, McMahon, Morotz, and Schanz, 2014; Carpinelli and Crosignani, 2017; Andrade, Cahn, Fraisse, and Mésonnier, 2015). However, little work has been done on a rebalancing that is price- or yield-induced.[2] My goal is to contribute to this strand of literature.

My study is motivated by the following descriptive findings (see Figure 1). Throughout 2014 and 2015 there was a huge yield decline of all types of fixed-income securities in the Eurozone that coincided with the expectation, announcement, and implementation of various unconventional monetary policy measures (Panel a). This yield decline led to a compression of bond yields that was stronger than the decrease of interest rates on newly issued loans. Consequently, the spread between the average interest rate that

[1] See e.g. Altavilla, Carboni, and Motto (2015) for the ECB's Asset Purchase Program, Krishnamurthy, Nagel, and Vissing-Jorgensen (2018) on the ECB's Outright Monetary Transactions and the Security Markets Program, Krishnamurthy and Vissing-Jorgensen (2013) for the Fed's Quantitative Easing, and Joyce and Tong (2012) for the Bank of England's asset purchase program.

[2] Exceptions are Albertazzi, Becker, and Boucinha (2018) and Rodnyansky and Darmouni (2017).

German banks charged on loans to the non-financial sector and the average yield of banks' securities portfolio increased (Panel b). At the same time, the volume of credit supplied by German banks increased in relation to the nominal value of securities held (Panel c). These stylized facts give rise to the question whether the increased loan provision was driven by the change in the relative price between book credit and bonds. In other words, did the expectation and announcement of unconventional monetary policy measures that increased the relative return of book credit in terms of bond yields led to a rebalancing from security holdings into credit?

Motivated by these stylized facts, I develop the following hypotheses to test for the presence of a yield-induced portfolio rebalancing channel: **(Hypothesis i)** Banks facing a larger compression of yields in their securities portfolio increase their book credit provision more strongly because they target a specific yield level. **(Hypothesis ii)** Banks with a higher average yield decline of their securities portfolio reduce their overall securities holdings more intensely, especially selling those securities with the highest drop in yield and realizing valuation gains. Thus, I analyze whether, against the background of a change in relative price between book credit and bonds, there is a rebalancing between the securities portfolio and the credit portfolio of banks that are more affected by the monetary policy induced yield decline.[3]

In order to empirically test for these hypotheses, the German security register proves particularly useful. First, the granular information about the security-level holdings by German banks allows to exploit the impact that the expectation and announcement of various unconventional monetary policy measures, most importantly the Expanded Asset Purchase Program (APP) of the European Central Bank (ECB), had on the yield of each security. More specifically, I use the cross-sectional heterogeneity in the composition of each banks' securities portfolio by calculating a bank specific "yield-drop" variable. For each security that a bank holds in January 2014, one year before the APP was announced by the ECB in January 2015 and well before investors started to expect and price in this measure, I calculate by how much the specific yield changed between January 2014 and June 2015. In other words, to rule out endogeneity stemming from reverse causality I hold the composition of securities fix at its level in January 2014 and take the impact of monetary policy on prices as given. Aggregating this information on the bank level, this yield-drop variable is characterized by substantial cross-sectional variation.

[3]It is important to stress that, as opposed to Brunnermeier and Sannikov (2014), for this mechanism to work it is not necessary that the securities held by banks are market-to-market. In fact, only about 20% of the banks in my sample have a trading book with mark-to-market assets. Instead, I show that banks are selling securities with the highest drop in yield and increase their credit supply because of the relative price change between book credit and securties.

Second, the securities register includes information about the maturity date of the securities held by banks. This provides another source of heterogeneity that I exploit for identification of Hypothesis (i): From the point of view of January 2014 the amount of securities that matures between January 2014 and June 2015 is predetermined.[4] This allows me to test whether the rebalancing arising from a high yield decline is stronger for banks with many reinvestment decisions. In face of their compressed yields and the freed up liquidity resulting from the maturing securities, those banks might increase their credit provision more strongly to restore their targeted yield of their portfolio.

Third, when analyzing banks' securities holdings (i.e. Hypothesis (ii)) I exploit the exhaustive detail of the security register for identification. I analyze the data at the security-bank-month level. The inclusion of security*time fixed effects into my baseline regressions allows me to compare the level of holdings in the same security and the same month across banks more and less affected by unconventional monetary policy. Thus, I can account for any observable or unobservable time-varying heterogeneity across securities, like liquidity, credit risk, and the level of issuance (credit demand by the securities' issuers).

Armed with the two sources of heterogeneity, i.e. yield drop and maturing assets, I use a difference-in-differences estimation technique and find significant and sizable effects on credit supply for banks with a higher drop in yields as compared to their counterparts. On average, banks with a decline in yield of one standard deviation increase their provision of newly issued loans to the real sector by 4.8% between 2013 and 2015, i.e. over a two year period surrounding the monetary policy induced yield decline and reduce their overall holdings of securities by 5.1%. I find that the effect of credit supply is particularly pronounced for banks with many maturing assets, i.e. banks facing many reinvestment decisions. Moreover, I find that banks with a higher yield decline reduce their holdings of securities characterized by the largest valuation gains (i.e. with the largest drop in yield) more strongly, thus, realizing the gains from these security holdings. The results suggest that banks target a specific yield level and, facing an average yield decline of their securities portfolio, actively rebalance towards higher-yielding book credit.

Instead of increasing their book loan provision, banks more affected by monetary policy could seek to increase their investments in higher-yielding securities. Following Albertazzi et al. (2018), I investigate this alternative potential rebalancing opportunity but do not find evidence in favor of it. I follow a similar argumentation as Albertazzi et al. (2018) and argue that yields were already so compressed in Germany that, against

[4]Among others, the maturity structure has been exploited by Almeida, Campello, Laranjeira, and Weisbenner (2012) to study the real effects of the 2007 crisis or by Tischer (2017), who exploits banks' maturity structure to identify the effect of QE on lending using a similar dataset.

the background of a home-bias, a rebalancing into securities with a relatively high yield would make it necessary to heavily change the portfolio composition. This highlights the economic plausibility of my findings: given the relative price change between securities and book credit banks favor a rebalancing towards lending.

I do not find robust evidence that the above effects are more pronounced for weakly capitalized banks. One potential explanation might be that, outside crisis times, equity does not constitute a constraint for comparatively well-capitalized German banks. This confirms the findings of Timmer (2018), who shows that, outside crisis times, the securities trading behavior of banks does not depend on their equity ratio.

There are three potential concerns for identification that I address in the following way: First, an important prerequisite for my estimates to be attributable to the monetary policy induced yield decline is that the treatment intensity (i.e. by how much the average yield of a bank's securities portfolio declined) is unrelated to other bank characteristics that might influence the lending behavior. To address this issue, I carefully adjust the data by means of a matching approach in addition to controlling for a number of covariates. I effectively select a control group that has similar characteristics as the treated banks. This weighting approach takes care of the parallel trend assumption.

The second concern is that of distinguishing between supply and demand effects, which are mostly unobserved. The portfolio rebalancing channel analyzed in this paper is a notion involving a supply-driven credit increase. As my credit data is on a bank level, I follow the bank lending channel literature (see e.g. Kashyap and Stein, 1995; Kishan and Opiela, 2000; Worms, 2001) when analyzing Hypothesis (i). Accordingly, I focus on groups of banks for which economically the supply driven effect should be stronger. I robustly find that the yield-induced rebalancing motive towards more credit provision is particularly pronounced for banks facing many reinvestment decisions. This result reinforces the notion of a supply-driven credit expansion.

Thirdly, the treatment intensity given by the monetary policy induced yield decline could potentially be correlated with other events that simultaneously affect a bank's loan issuance through other channels. Between September 2014 and March 2017 the Targeted Longer Term Refinancing Operations (TLTROs) were implemented in the Eurozone with the aim of fostering credit provision. They offer central bank refinancing at favorable conditions, which are tied to a bank's net credit supply. Using detailed proprietary data on the bank-specific TLTRO uptakes, I show that there is no differential drawing on this specific credit facility between banks more and less affected by the treatment. Thus, the bank-specific yield decline is not simply proxying for the TLTRO uptakes and is not

capturing a liquidity-driven rather than a yield-induced rebalancing motive.[5]

Various robustness checks support the presence of my findings. Most importantly, a falsification test finds no significant differences in lending behavior between 2011 and 2013 among banks with diverse valuation gains, i.e. in a period prior to the onset of the treatment. Thus, the observed change in lending outcomes is most likely attributable to the monetary policy induced yield drop, as opposed to an alternative bank-specific unobservable force.

Related Literature My paper contributes to the growing literature that assesses the effectiveness of unconventional monetary policy on the bank level. Many papers in this group study liquidity-driven channels. Papers like Andrade et al. (2015) or Carpinelli and Crosignani (2017) analyze the effect of the 3-year Longer Term Refinancing Operations (3y-LTROs) that were implemented in the Eurozone in 2011 and 2012 in the wake of the Eurozone sovereign debt crisis to prevent a funding squeeze of the banking sector. Butt et al. (2014) focus on banks' deposits as the key pass-through variable of assets sales by the banks' deponents (e.g. institutional investors etc.). They show that the Bank of England's asset purchases had no impact on bank lending through this channel. Kandrac and Schlusche (2016) test for the existence of a reserve-induced portfolio rebalancing channel, where the sale of securities increases banks reserves, thus, disturbing the banks' optimal balance sheet composition. The authors exploit a regulatory change in the US that influenced the reserve distribution and find that banks increase their lending and risk-taking activity to reinstall the optimal asset and liability structure. Another paper studying the effect of QE on lending is Chakraborty, Goldstein, and MacKinlay (2016). They analyze MBS and tresury purchases by the Fed and find a crowding out of commercial lending in favor of mortgage origination following MBS sales. In addition, they find that firms borrowing from MBS selling banks reduce their investments. Koetter, Podlich, and Wedow (2017) analyze the effect that the Eurosystem's Securities Markets Program (SMP) had on competition in the banking market. The authors exploit the heterogeneity in bank-level holdings of securities that were purchased under the SMP and find positive effects on loan and deposit market shares. Another paper close to my analysis is Rodnyansky and Darmouni (2017). The authors study the effect that the three rounds of QE in the US had on lending. They mainly focus on mortgage lending and exploit the heterogeneity in the MBS holdings of banks. In contrast to their approach, I do not consider banks' holdings of a particular asset class to define the treatment status but rather exploit the

[5]Note that I am allowing the TLTROs to affect a banks credit provision through their overall effect on yields but I want to rule out that my treatment intensity is picking up the TLTROs' effect on banks' credit provision through liquidity channels.

heterogeneity in the impact that unconventional monetary policy had on yields of all fixed-income securities that banks hold in their own accounts. Furthermore, they do not study banks security holdings behavior.[6]

Overall, my contribution consists of taking the result that asset purchases affect bond yields negatively as given and drawing a link to the literature that studies the effectiveness of unconventional monetary policy on the bank level by asking whether banks that face stronger yield reductions have larger incentives to reduce their securities holdings and increase bank lending. A closely related paper to my analysis is Albertazzi et al. (2018), who also study the yield-induced rebalancing motive using the heterogeneity in the APP induced yield decline. However, they mainly focus on different sectors (e.g. households, firms, pension funds, money market funds, banks etc.) and analyze whether those sectors have a rebalancing motive into newly issued riskier securities.[7] They find evidence in favor of this portfolio rebalancing motive in countries more affected by the sovereign debt crisis. In contrast, my study explicitly focuses on banks and tests for the hypotheses developed above, which are motivated by the stylized fact that the relative price between credit and securities has changed in Germany. Additionally, I intend to shed more light on the underlying bank-specific mechanisms as well as heterogeneities of the yield-induced portfolio rebalancing channel. Furthermore, by making use of data from monetary policy operations, in particular bank-specific TLTRO-uptakes, I can control for alternative, liquidity-driven transmission channels.

Another related paper to my study is Peydró, Polo, and Sette (2017). They also analyze banks investment behavior due to monetary policy using credit and securities register data from Italy. They find that in crisis times less capitalized banks prefer buying securities rather than increasing credit supply in reaction to a softer monetary policy. One key difference to my paper is the monetary policy indicator that they examine. They mainly focus on the central bank balance sheet, which incorporates the actually implemented monetary policy measures. In contrast, I use the impact that the anticipation and announcement of unconventional monetary policy had on yields. Additionally, Peydró et al. (2017) study crisis and non-crisis times, whereas I focus on a time period that spans the implementation of the APP and the TLTROs.

Another group of papers studies the effects of asset purchases on macroeconomic

[6]Further papers studying the effects of unconventional monetary policy include: Grosse-Rueschkamp, Steffen, and Streitz (2017), Arce, Gimeno, and Mayordomo (2017), and Abidi, Miquel Flores, and Eterovic (2017) all analyze the effects of the ECB's Corporate Bond Purchase Program. Acharya, Eisert, Eufinger, and Hirsch (2017), and Ferrando, Popov, and Udell (2016) study the announcement effects of the ECB's Outright Monetary Transaction Program.

[7]They also give suggestive evidence in favor of a yield-induced rebalancing motive of banks from countries less affected by the sovereign debt crisis by studying the largest 25 European institutions.

variables using VAR models. Their main focus are the effects of QE on output and prices. Weale and Wieladek (2016) rely on Bayesian inference and use a combination of zero and sign restrictions to identify an asset purchase announcement shock. They find a positive effect on output and prices for the US and UK. A similar approach is taken by Gambacorta, Hofmann, and Peersman (2014), who estimate a Panel VAR for eight advanced economies and focus on the aggregated central bank balance sheet as the main policy variable. Lewis and Roth (2017) also estimate a Bayesian VAR and identify an asset purchase shock by using different aggregated items from the ECB's balance sheet. The authors find a positive effect of asset purchases on output for both the Eurozone and Germany. They also analyze the response of bank lending to firms following the asset purchase shock and find no reaction of this variable in the German economy. All those papers have the advantage that the exploitation of the time series variation enables them to study the transitional dynamics of asset purchases. However, it is hard to draw conclusions about the heterogeneous reaction of various agents to the asset purchase shock. Furthermore, most of these papers use aggregate central bank balance sheet items that include the actually purchased amounts of securities or they construct an asset purchase announcement series. Therefore, they do not fully incorporate the effects stemming from the anticipation of asset purchase programs by investors. Especially in the case of the Eurozone there is evidence that the APP has been anticipated by market participants, thus, affecting prices positively well in advance of the actual implementation. I explicitly incorporate this anticipated reaction in bond prices in my analysis.

My paper also relates to the literature analyzing the bank lending (Bernanke and Blinder, 1988; Bernanke and Blinder, 1992) and risk taking channels (Borio and Zhu, 2008; Adrian and Shin, 2011) of monetary policy during conventional times. In their seminal paper, Kashyap and Stein (1995) exploit bank-level data and identify the bank lending channel by showing that small banks, i.e. banks facing larger frictions and having difficulties in saturating their funding needs, contract their lending activity stronger after a monetary policy tightening. In a similar vein, Kishan and Opiela (2000) and Gambacorta and Mistrulli (2004) focus on weakly capitalized banks instead of the banks' size. More recent contributions analyze the bank lending and risk taking channel using loan level data (Jiménez, Ongena, Peydró, and Saurina, 2012; Jiménez, Ongena, Peydró, and Saurina, 2014).

This paper also contributes to the literature studying security holdings of banks and institutional investors at the security-level. Abbassi, Iyer, Peydró, and Tous (2016) also use the German securities register in conjunction with lending data. However, they do not study monetary policy, but are interested in securities trading by banks with trading expertise in the crisis. Timmer (2018) studies security trading of institutional investors.

Contrary to my results, Timmer (2018) finds that banks respond pro-cyclically to price changes, i.e. they sell securities when prices are falling. In contrast to Timmer (2018), I focus on banks with large credit and securities portfolios and focus on a time period characterized by a huge decline of the general yield level induced by monetary policy.[8]

The rest of the paper proceeds as follows. Section 2 presents the data used for the analysis and the estimation approach. Section 3 reports the empirical results and Section 4 concludes.

2 Data and Empirical Setting

I focus on Germany to analyze the yield-induced portfolio rebalancing channel. Germany's financial system is bank-dominated and the largest in the EMU making it an ideal candidate to study the effects of unconventional monetary policy on bank lending and security holdings. Further, the availability and combination of the securities register with balance-sheet information and data from monetary policy implementation provides a comprehensive view on banks' balance sheets. In this Section, I first describe the stylized facts about the credit and securities market in Germany during the time period of investigation, i.e. from January 2013 until December 2015, which provide descriptive evidence for the potential presence of a yield-induced rebalancing channel. Then, I describe the data used for the empirical analysis and, finally, the identification strategy and the empirical setup.

2.1 Descriptive Evidence

One prerequisite for the presence of the yield-induced portfolio rebalancing channel is that of a yield decline that can be attributed to unconventional monetary policy. Panel a of Figure 1 shows the evolution of 10-year government bond yields for selected Eurozone countries. Between January 2014 and June 2015 yields of government securities declined substantially. The yield decline is not specific to government securities but can also be observed among other fixed-income securities, like corporate or covered bonds. Along with the government bond yields the graph shows various unconventional monetary policy measures that are indicated by vertical lines. In June 2014 the deposit facility rate was lowered by 10 basis points into negative territory, i.e. to -0.10%. In September 2014 the first tender of the first TLTRO-series was implemented, in January 2015 the APP was announced, and in March 2015 the APP was implemented. It is challenging to quantify

[8] Timmer (2018) analyzes the time period 2005 Q4 - 2014 Q4 and focuses on all German banks.

how much of the yield decline between January 2014 and June 2015 was due to the specific unconventional measures, especially because throughout 2014 there was a huge discussion among investors whether the ECB will announce an asset purchase program. Appendix A.1 contains a compilation of newsletter articles that highlight the investors' speculation throughout the year 2014. As I want to capture this anticipation effects, in this paper, I take the impact of monetary policy on asset prices as given by calculating the drop in yields between January 2014 and June 2015.

A further indication for the presence of a yield-induced rebalancing motive towards more credit supply is that loan provision becomes more attractive relative to security investments. Panel b of Figure 1 illustrates the spread between the average interest rate that German banks charge on loans to the non-financial sector and the average yield of banks' securities portfolios. This figure is increasing over time, primarily driven by a stronger decline of the securities' yields as compared to the fall in interest rates on loans. This spread gives rise to the presence of a potential rebalancing motive towards more lending. In other words, panel c shows the change in the relative return of bank loans in terms of bond yields, which is a prerequisite for the existence of a rebalancing motive, whereby the compression of yields on securities held by banks induces them to invest in assets with a higher expected return, i.e. loans.

The next piece of evidence is provided by panel c of Figure 1, which depicts the evolution of the ratio of the average credit volume extended to the non-financial private sector in the numerator and the average nominal value of securities held by all German banks in the denominator. Similarly, also this ratio is increasing over time.

Figure 1 provides first descriptive evidence in favor of a yield-induced portfolio rebalancing channel. This needs to be formally tested at the bank level to gauge the causal effect of unconventional monetary policy on bank lending and securities holding behavior. Before introducing the empirical setup, the data used in the empirical analysis is described.

2.2 Data

To construct the dataset used for the empirical analysis I use the German securities register, the balance sheet statistics, the interest rate statistics, and the income statement statistics of German banks compiled by the Deutsche Bundesbank. This dataset is augmented with data on the refinancing operations of German monetary policy counterparties. The baseline time period under consideration is January 2013 until December 2015.

The securities register includes the nominal amounts of the security holdings of each German bank on a *security level* for the end of each month. I merge this dataset with the centralized securities data base to obtain additional security specific information as the yield, price, maturity date, security type, and issuer sector. I complement this data with monthly *bank-level* balance sheet information like total assets, equity capital, central bank reserves, saving deposits, and yearly income statement items such as net profits and net interest received. The data on monetary policy refinancing operations includes the bank-specific TLTRO-uptakes.

My bank-level loan data comes from the interest rate statistics, composed of a sample of above 200 deposit taking and loan granting credit institutions. The sample is selected with a stratified sampling procedure according to the categories of banks, regional criteria, and size. In terms of coverage around 70% of the total German loan business is captured by this dataset.[9] Thus, the sample includes German banks with a strong focus on credit provision. The unique feature of the MFI interest rate statistics is that, along with the interest rates on loans, it includes the monthly volumes of *new business* at the end of each month for loans to households and non-financial corporations.

As I focus on newly issued loans, my final sample after merging the loan data with the above datasets consists of 204 banks. This sample is interesting due to the following reasons: First, those are the banks most active in credit provision and, therefore, they are particularly important for the transmission of those unconventional monetary policy measures, which target an expansion of credit provision. Second, as described in the following Section, a difference-in-differences regression setup is used and the treatment intensity in the average yield drop of a bank is exploited for identification. This requires to make sure that the banks from the control group are similar in terms of observable and unobservable characteristics to the treated banks. As described in the following Section, I deal with the observable characteristics by means of a matching procedure. However, it is more challenging to handle unobservable characteristics. Choosing banks with a similar business model, i.e. a strong focus on credit provision, can help in this respect.

2.3 Empirical Strategy

The identification strategy exploits differences in banks' exposure of their securities portfolio to unconventional monetary policy measures. To this end, I construct a bank-level variable indicating by how much the average yield of the securities portfolio dropped be-

[9]Details on data used are available at: http://www.bundesbank.de/Redaktion/DE/Standardartikel/Statistiken/einlagen_und_kreditzinssaetze.html.

tween 2014:M1 and 2015:M6 in the following way. I consider fixed-income securities as they account for more than 95% of all securities holdings of German banks. Furthermore, debt securities are most comparable in their structure to bank loan contracts, thus, a rebalancing motive into more loan supply should be most pronounced for this asset class. For each security I calculate by how much its yield dropped between 2014:M1 and 2015:M6. I exclude all securities that mature in this time window to rule out that my final variable picks up any mechanical change in yield stemming from a possible pull-to-par effect. Finally, I weight each security by its nominal amount. I label the resulting variable "MP", which denotes monetary policy.

Holding the composition of securities fixed at its level in January 2014, well before investors started to anticipate the asset purchase program,[10] I can rule out any endogeneity stemming from reverse causality. Additionally, by calculating the drop in yield between 2014:M1 and 2015:M6 irrespectively of whether the security is actually still held in 2015:M6 helps me to prevent endogeneity arising from the decision of banks to sell a security due to unconventional monetary policy. The choice of June 2015 as the end date of the window for the yield decline calculation is driven by the following trade off decision. First, enlarging the window, e.g. choosing 2015:M12 as the end date, would result in a smaller fraction of securities that are actually still held at the end date. Second, picking a smaller window, e.g. 2014:M12 as the end date, would result in capturing a smaller amount of unconventional monetary policy measures.[11] Nevertheless, in Section 3.3 I show that results are robust to choosing 2014:M12 as the end date of the window for the yield decline calculation.

Although yields might have declined due to another reason than unconventional monetary policy, I follow Albertazzi et al. (2018) and argue that both anecdotal evidence (see Appendix A.1) and the empirical literature (e.g. Altavilla et al., 2015) demonstrate that the announcement and anticipation of the APP by financial market participants was the most important driver of asset prices in the Eurozone in the period examined in this paper. [12]

[10]To my knowledge, the first newsletter article that mentions speculations about an asset purchase program was published in March 2014 (see Appendix A.1).

[11]The APP was implemented in March 2015. I choose June 2015 to also capture some of the effects of the actual implementation of the APP on yields.

[12]The anticipation effect on yields of securities makes it challenging to quantify how much of the overall yield decline was due to monetary policy. Considering only securities that were eligible under the APP would introduce an endogeneity concern as the eligible assets were determined on the announcement date of the APP, which was in January 2015, i.e. one year after January 2014.

Summary Statistics Table 1 shows the summary statistics of all variables used in the empirical analysis. Most importantly, the MP variable is characterized by substantial cross-sectional variation. While the securities portfolio of the lower quartile bank faced a decline of 0.47 percentage points, the average yield drop of the upper quartile bank was 0.79 percentage points. The ratio of maturing securities to total assets does also display considerable cross-sectional variation: the lower quartile bank has securities that mature between 2014:M1 and 2015:M6 accounting for 1.5% of the total balance sheet, while this figure amounts to 4.7% for the upper quartile bank. Interestingly, the median bank holds approximately 17% of their total assets in fixed income securities and for the lower quartile bank this figure is at approximately 10%. This illustrates that the banks in my sample are characterized by a fairly large fraction of fixed-income securities on the asset side of their balance sheet.

Table 2 displays additional descriptive statistics. Given the total securities holdings in 2014:M1 the table shows that 62% of these securities are still held in 2015:M6, whereas 22.5% are maturing and 15.5% are sold in between. Not surprisingly, the fraction of securities still held in 2015:M6 is smaller when focusing on trading book assets. It is crucial to emphasize that banks would not have a rebalancing motive if they held all assets until maturity as their eventual yield would be determined at the moment of the security's purchase in this case. However, as Table 2 shows, banks are selling a substantial fraction of their overall securities. Additionally, they face reinvestment decisions whenever a security matures. Thus, it is an empirical question whether they continually target a specific yield level and whether the change in relative price between book credit and securities drives their credit provision and their security holdings decision.

Credit Analysis To assess the yield-induced impact of unconventional monetary policy on bank lending, i.e. Hypothesis (i), I employ a difference-in-differences (DID) approach and run the following bank-level regression (**Baseline Model 1**):

$$\Delta Log(loans)_i = \beta_0 + \beta_1 * MP_i + X_i^{'}\beta_2 + Banktype\, FE + u_i, \tag{1}$$

where i denotes a bank. The dependent variable $\Delta Log(loans)_i$ is the change in the logarithm of newly issued loans around the yield decline. To avoid problems of serial correlation, I follow Bertrand, Duflo, and Mullainathan (2004) and collapse the monthly observations in pre (2013:M1-2013M12) and post (2015:M1-2015:M12) event averages. Thus, I have one observation for each bank. The alternative to collapsing the data is twoway-clustering of the standard errors (see below). The key variable of interest is MP_i. Control variables are denoted by X_i. Following the bank lending literature (Kashyap

and Stein, 2000) X_i includes the logarithm of total assets, the equity to assets ratio, and the return on assets. I include the central bank reserves to assets ratio to control for any potential sales of securities by the bank to the central bank in the context of the APP and to control for a possible reserve-induced transmission channel (Kandrac and Schlusche, 2016). The deposit to assets ratio controls for another liquidity-driven transmission channel operating through deposits (Butt et al., 2014). I further include an interbank lending to assets ratio to control for the funding situation of the bank and the net interest margin to control for the profitability and the importance of loan provision. Additionally, banktype fixed effects (i.e. savings banks, cooperative banks, Landesbanks, big commercial banks, regional banks) are included in the regressions. In this collapsed regression Model 1 all control variables are measured before the yield decline in December 2013. Finally, u_i is an error term. The coefficient β_1 measures the treatment effect of the monetary policy induced yield decline.

As an alternative specification to Model 1, I estimate the following panel equation (**Model 2**):

$$Log(loans)_{i,t} = \alpha_i + \alpha_t + \alpha_1 \left(MP_i * POST_t\right) + X'_{i,t}\alpha_2 + u_{i,t}, \tag{2}$$

where α_i and α_t are bank and time fixed effects respectively and control for bank-specific time invariant unobserved characteristics as well as economy wide shocks. Note that a country-wide change of loan demand is absorbed by the time fixed effects. The dependent variable $Log(loans)_{i,t}$ is the logarithm of newly issued loans and $POST_t$ is a dummy variable that takes the value of one after 2015:M1. The model is estimated with monthly data for the period 2013:M1 until 2015:M12. Time-varying control variables are denoted by $X_{i,t}$ and include the same variables as above. I follow Bertrand et al. (2004) and avoid problems of serial correlation of the error term by twoway clustering the standard errors at the bank and time level (Petersen, 2009) instead of collapsing the data as in Model 1. The key variable of interest is the interaction term $MP_i * POST_t$, as I am interested in the differential effect of banks with a high decline in yields versus banks with a low yield decline comparing the pre-MP period (2013:M1-2013:M12) relative to the period after the MP induced yield decline (2015:M1-2015:M12). In other words, the coefficient α_1 measures the treatment effect of the monetary policy induced yield decline.

Securities Analysis To analyze whether banks reduce their security holdings and realize the valuation gains stemming from unconventional monetary policy, i.e. Hypothesis

(ii), I estimate the following econometric model at the *security-bank-month* level:

$$\begin{aligned} Log(security\ holdings)_{j,i,t} = \gamma_1\ & (MP_i * POST_t * High\text{-}yield\text{-}decline_j) \\ & + \gamma_2\ (MP_i * POST_t) \\ & + \gamma_3\ (POST_t * High\text{-}yield\text{-}decline_j) \\ & + \gamma_4\ (MP_i * High\text{-}yield\text{-}decline_j) \\ & + X'_{i,t}\gamma_5 + \gamma_{j,t} + \gamma_{i,t} + u_{j,i,t}, \end{aligned} \tag{3}$$

where the dependent variable is the logarithm of nominal holdings of security j by bank i at month t. $X_{i,t}$ includes the bank-specifiy, time-varying control variables from above. $POST_t$ is a dummy variable that takes the value of 1 after 2015:M1. $High\text{-}yield\text{-}decline_j$ is a dummy variable that takes the value of one if a security has a high drop in yield between 2014:M1 and 2015:M6, i.e. when the security is above the 90th percentile of all securities. The model is estimated for the period 2013:M1 until 2015:M12.

For identification, in the strongest specification, I include security*time fixed effects to control for any security-specific time varying observable or unobservable characteristics (e.g. liquidity, risk, issuance amount) and bank*time fixed effects to control for any bank-specific time varying observable or unobservable characteristics. In some regressions I am interested in the interaction between MP_i and $POST_t$. I include security, bank, and time fixed effects, or security*time fixed effects along with bank fixed effects and time-varying, bank-specific control variables into the regression in this case as otherwise the interaction term would be absorbed by the bank*time fixed effects. I cluster standard errors at the bank, security, and time level.[13] The estimated coefficient γ_2 then measures the overall securities holdings of banks more versus banks less affected before versus after the monetary policy induced yield decline. The estimated coefficient γ_1 measures the differential securities holdings of securities with a high decline in yield by banks more versus banks less affected by monetary policy before and after the unconventional monetary policy driven yield decline.

Parallel trend assumption The key identifying assumption is that the treatment intensity is unrelated to other bank characteristics that might influence a bank's lending behavior. In other words, the trends related to loan provision need to be the same among more and less treated banks before the treatment happens. Figure 2 provides a first test of this assumption. The sample is divided into high- and low-yield-drop banks according to the median of the MP variable. Before January 2014 the evolution of new loan provision

[13]Results also hold when clustering at the security and bank level.

looks comparable. In line with the hypothesis of the paper, starting in the middle of 2014 banks more affected by the monetary policy induced yield decline increase their new loan provision much stronger than less affected banks. This development continues throughout 2015.

In a next step, I assess whether the MP variable can be predicted by various (pre-shock) bank-level characteristics. Column 1 of Table 3 shows the results of a probit regression of the MP dummy on these characteristics. No variable has explanatory power for the treatment status and also the p-value of the χ^2 test of overall model fit shows that one cannot reject the null hypothesis that all coefficient estimates are zero. Nevertheless, as the p-value is close to the 10% significance level and given the pre-shock evolution of newly issued credit provision shown in Figure 2, in a careful attempt to ensure that my results are not biased by the potentially endogenous determination of securities holdings (with a high yield-drop), I perform a nearest-neighbor propensity score weighting approach. In a first step, I divide my sample according to the median of the MP variable and regress the resulting treatment status on the pre-shock bank-level characteristics. The propensity scores (predicted values) of this probit regression are used in a nearest neighbor propensity score matching approach with replacement. For each bank out of the group with a high yield drop a control unit is selected out of the "low-yield-drop" group that gives the best match according to the propensity score. In a second step, I use the resulting weights that are calculated based on the frequency of a match in my regressions. This way I discard the observations that are very dissimilar to the "treated" banks by giving them a low weight. Column 2 of Table 3 displays the results of the probit regression with the matched sample. Compared to column 1, the p-value of the χ^2 test of overall model fit increases to 0.726, which indicates the satisfactory performance of the weighting exercise. I report results based on this matched sample in columns 2 and 4 of Table 4.

3 Results

3.1 Credit Analysis

Table 4 reports the main estimation results for the credit regressions to test Hypothesis (i). Columns 1 and 2 show the results of the collapsed baseline model 1, where the dependent variable is the change of the logarithm of newly issued loans of bank i between the pre event average (2013:M1-2013:M12) and the post event average (2015:M1-2015:M12). Bank-type fixed effects are included. The coefficient estimate of the MP variable is statistically significant at the 1% significance level. The positive sign is in line with the presence of

a yield-induced rebalancing motive: Banks experiencing a higher average yield decline of their securities portfolio induced by expansionary unconventional monetary policy increase their real sector lending more strongly in response. To illustrate the economic impact of the effect lets consider the coefficient of the MP variable in column 1, which shows the results in a sample without propensity score weighting. A bank with a one standard deviation decrease of the average yield (0.41) of its securities portfolio increases the average newly issued loan provision by 8.8% between 2013 and 2015 as compared to a bank without such decrease in yield.

In column 2, I report the results with the weighted sample based on the propensity score matching procedure described above. The coefficient in colum 2 is only slightly smaller as compared to the unmatched sample. This indicates that it is unlikely that my results in the unmatched sample in column 1 are biased by the potentially endogenous determination of security holdings (with a high yield-drop).

Next, in columns 3 and 4, I present results for model 2, where instead of taking pre and post event averages, the regression is performed using monthly observations with standard errors clustered at the bank and time level. As the dependent variable is the natural logarithm of newly issued loans, the coefficient estimate in column 3 suggests that banks with a decrease of the average yield in their securities portfolio by one standard deviation (0.41) on average increase their provision of newly issued loans by 4.8% between 2013 and 2015 as compared to banks without such decrease in yields. Compared to model 1, the lower magnitude of the effect might be driven by the control variables. Whereas in model 1 the bank-specific control variables are measured before the monetary policy induced yield decline (2013:M12), model 2 includes the time varying values. As before, the coefficient estimate is only slightly changed when using the weighted sample (see column 4). Therefore, for the ease of exposition, in all subsequent regressions I report the results with the unweighted sample.

Heterogeneities: Maturing Assets The main hypothesis analyzed in this paper is that banks that face a stronger yield compression rebalance their portfolio towards alternative assets with a higher expected return. This effect should be particularly strong for banks that hold many maturing securities. Once a security matures and additional liquidity is released, the bank has to make a reinvestment decision. Hence, the yield-induced portfolio rebalancing effect towards loans to non-financial companies and households should be particularly strong for banks with many maturing assets that simultaneously have a strong decline of yields in their securities portfolio. These banks might increase their credit provision more strongly to restore their targeted yield of their secu-

rities portfolio.

In Table 5, I test for this incentive by exploiting the heterogeneity given by the amount of securities that mature between 2014:M1 and 2015:M6 for identification.[14] In column 2 I include the maturing-assets-ratio along with an interaction term between MP variable and the maturing-assets-ratio into the regression model 1. I precede equivalently in column 4 for model 2. As expected, in both cases the interaction term is positive and statistically significant. This means that the treatment effect is larger for banks with a higher maturing assets to total assets ratio. In both models the coefficient estimates of the MP variable remain positive and significant. The marginal effect of the MP variable depending on the maturing-assets-ratio is depicted in Figure 3. Thus, the results seem to confirm the above conjecture that banks that face reinvestment decisions due to many maturing securities increase their (higher yielding) credit provision when they are more heavily affected by the monetary policy induced yield decline. These findings seem to be in line with banks targeting a specific yield level of their total assets.

Heterogeneities: Equity Now, I turn my attention to analyzing whether the effect of unconventional monetary policy is stronger for weakly capitalized banks. In the presence of funding constraints the monetary policy induced valuation gains on securities held by banks can potentially improve the banks' capital position and, consequently, their credit-bearing capacity. Table 6 tests for this mechanism. The regression setup remains unchanged compared to above with the exception that an interaction term between the MP variable and the equity-ratio is included into the regression. Intuitively, worse capitalized banks should profit more by the valuation gains as opposed to well capitalized banks because they face more frictions: they are more likely constrained by their capital position and they have more problems in attracting funds. Hence, if this form of equity mechanism is at work one would expect a stronger effect of the MP variable on bank lending behavior for banks with a lower equity to assets ratio. The coefficient estimates of the interaction term between the MP variable and the equity ratio is not statistically different from zero in neither model. Thus, I do not find evidence for the above conjecture.

Heterogeneities: Sectors So far, I have focused on the total lending to the private non-financial sector. An interesting question is which sectors receive the additionally issued loans. Table 7 contains the results of regressions with the dependent variable split into loans to non-financial corporations (columns 1 and 3) and loans to households (columns 2 and 4). The results do not show any difference in loan provision to any of the

[14] The maturing-assets-ratio is calculated based on the securities portfolio in 2014:M1.

two sectors. Accordingly, both, the non-financial corporations and the household sector face a higher loan provision.

Contaminating Events One potential concern regarding the identification strategy implemented in this paper is that one of the unconventional monetary policy measures that potentially affects banks through other non yield-induced channels might be both correlated with the MP variable and linked to banks' lending behavior. One such measure are the Targeted Longer Term Refinancing Operations (TLTROs), which were implemented between December 2014 and March 2017, i.e. during most of the time period analyzed in this paper. The main aim of the TLTROs was to provide banks with liquidity under favorable conditions to foster credit provision. These refinancing operations have a maturity of up to 4 years. The amount that a bank is allowed to draw in the numerous tender operations and the interest rate it has to pay for the central bank money are linked to the banks' net credit provision.

In an initial attempt to eye-ball whether the potential contamination of the TLTROs might bias my results, in panel a of Figure 4 I use data on bank-specific TLTRO uptakes to shows the average TLTRO uptake as a fraction of total assets of the two groups of banks divided according to the median of the MP variable. The evolution of the TLTRO-ratio is mostly parallel for the two groups, which is a first indication that banks with a higher yield drop do not use the TLTROs more extensively than banks with a lower yield drop. Next, in Table 8 I run regressions, where I explicitly control for the bank specific TLTRO uptakes. [15] All previous results hold. Thus, the results suggest that the monetary policy induced yield decline is not simply proxying for TLTRO uptakes. This indicates that my results do not seem to be driven by alternative liquidity-driven transmission channels but are rather capturing yield-induced rebalancing motives.

Apart from the TLTROs, further potentially contaminating events are the actual purchases of securities by the central banks of the Eurosystem in the context of the APP. When a bank sells eligible securities on behalf of their deponents, the bank's total central bank reserves on its asset side as well as its saving deposits on its liability side might increase. This increase might disturb the bank's optimal balance sheet composition. In order to reinstall the original composition, banks might seek to increase their loan provision. This argument has been made by Friedman and Schwartz (1963) and has recently

[15] I use the empirical specification of model 2 in this case because model 1 includes control variables measured in 2013:M12 and the TLTROs were initiated in late 2014. An alternative to reporting the results with the additional control variable separately would be to directly include it in the main specification. However, in this case the TLTRO-ratio could only enter model 2. To ensure comparability of estimates stemming from the model choice and not from different control variables, I chose to report results separately in Table 8.

been empirically tested by Kandrac and Schlusche (2016). In addition to controlling for the deposit-to-assets ratio and the reserves-to-asset ratio in all regressions, panels b and c of Figure 4 show the evolution of those variables for the two groups of banks. Although the central bank reserves ratio increases sharply starting at the beginning of 2015, banks with a higher yield drop do not face a larger increase compared to banks with a low drop in yield. Similarly, there is no differential pattern for the evolution of the deposit-to-assets ratio. Thus, the MP variable does not proxy for this reserve-induced portfolio rebalancing effect.

3.2 Securities Analysis

This section investigates whether banks more affected by the unconventional monetary policy reduce their overall securities holdings and realize the gains from holding securities with a high drop in yield (Hypothesis ii). Before conducting a detailed analysis Figure 5 shows the evolution of the securities to total assets ratio of banks more and less affected by monetary policy. Banks more affected reduce their nominal overall security holdings throughout 2014 and 2015, whereas banks less affected by the yield decline do not seem to adjust their securities portfolio. A similar pattern emerges when examining the fraction of securities with a high decline in yield to total assets in Figure 6. The Figure shows that banks more affected by the monetary policy induced yield decline decrease their holdings of securities with the highest valuation gains. Banks with a lower average yield decline do not seem to reduce their holdings of these securities.

A more formal analysis, i.e. the results of estimating equation 3, is presented in Table 9. Column 1 shows that banks more affected by unconventional monetary policy reduce their overall nominal securities holdings after the shock. Economically, banks with a one standard deviation drop in the average yield of their securities portfolio reduce their overall holdings of securities by 5.5% (0.41*(-0.133)). In column 2 I add security*time fixed effects and find similar results in terms of significance and magnitude. Banks more affected by monetary policy decrease their security holdings by 5.1%. In column 3 I add the triple interaction term between MP_i, $POST_t$, and $High\text{-}yield\text{-}decline_j$ along with all other double interaction terms between those three variables. I find that after the monetary policy induced yield decline, banks more affected by monetary policy (i.e. with a one standard deviation decline) reduce their holdings of securities with the highest yield decline by 6.1%. The coefficient of MP_i*$POST_t$ remains largely unchanged in column 3. In columns 4 and 5 I successively saturate the econometric model with bank*time and security*time fixed effects. The coefficient estimates of the triple interaction term remain qualitatively similar, yet get stronger in magnitude. All in all, the results suggest that

banks more affected by monetary policy reduce both, their overall securities holdings and the holdings of those securities that had the largest drop in yield, realizing the gains from these securities.

Next, I investigate the type of securities that banks more affected by unconventional monetary policy are reducing. Corporate bonds are most comparable in their characteristics to book credit. An interesting question therefore is, whether banks are especially reducing their holdings of this particular asset class. To this end, I consider corporate bonds, government bonds, and other securities.[16] I repeat the same type of security holdings regressions for the different issuer sectors in Table 10, where I include security*time fixed effects, bank fixed effects, and time-varying bank-level controls into the regression. The results suggest that the rebalancing motive is largest for corporate securities. In fact, the coefficient estimate in column (2) is larger (in absolute values) than the coefficients in column (3) and (4), which suggests that banks more affected by the monetary policy induced yield decline decrease their corporate bonds holdings more heavily in response. However, one has to bear in mind that corporate bonds account only for a small fraction of overall banks' security holdings.[17] In terms of nominal amounts, the largest reduction concerns the holdings of securities issued by financial institutions.

In unreported regressions I have investigated whether there is a differential heterogeneity in the securities holdings with respect to the equity ratio. I do not find evidence in favor of the hypothesis that banks with a low equity ratio reduce their securities holdings more strongly. One potential explanation might be that, outside crisis times, equity does not constitute a constraint for comparatively well-capitalized German banks.

Following Albertazzi et al. (2018), I have analyzed whether banks more affected by monetary policy rebalance towards securities with a higher yield.[18] I do not find evidence for this kind of rebalancing into higher yielding securities. Similar as Albertazzi et al. (2018), I argue that one possible explanation might be that yields were already so compressed in Germany that, against the background of a home-bias, investing in securities with a relatively high yield would make it necessary to heavily change the portfolio composition. This highlights the economic plausibility of my findings: given the relative price change between securities and book credit banks favor a rebalancing towards lending.

[16] Those include mainly issues of financial institutions and, to a much smaller extend, of public sector entities like agencies etc.

[17] The fraction of the total nominal amount of corporate bonds held by the banks in my sample in 2014m1 accounts to 1.8% of the total securities portfolio.

[18] This can be tested by the inclusion of an interaction term between MP_i, $POST_t$, and the time varying yield of the security $yield_{j,t}$ into the security-level regression equation 3.

3.3 Robustness

So far, I found significant effects of the monetary policy induced yield decline on bank lending and securities holding behavior. In this section, I test the robustness of these results. Most importantly, to test whether the MP variable picks up any other observable or unobservable traits that might be linked to banks' lending behavior, I run placebo regressions with a different timing of the dependent variable. I regress the change in the logarithm of newly issued loans between 2011 and 2013, i.e. in a period where the differential yield decline should have no effect on bank lending, on all control variables from above. Table 11 shows the results of this falsification exercise. As expected, the MP variable is not statistically significant and has the wrong sign in all regressions. This points towards the exogeneity of the MP variable. Hence, the change in lending outcomes observable in the period under investigation is most likely attributable to the yield drop as opposed to an alternative observable or unobservable force.

In a next step, I present results for an alternative dependent variable. Instead of newly issued credit, in column 2 of Table 12 I use the outstanding stock of credit as outcome variable. The previous results hold. As expected, the magnitude of the effect is reduced in this case because the credit stock includes maturing assets, which might lead to a smaller increase of this variable as opposed to the amount of truly newly issued loans. Looking at the coefficient of the MP variable in column 2 of Table 12 banks with a one standard deviation decrease of their average yield (0.41) in their portfolio increase their outstanding stock of credit by approximately 3% between 2013 and 2015.

Column 3 of Table 12 shows results with a dummy variable instead of the continuous MP variable. The dummy takes the value of 1 for banks with a yield drop above the median of the MP variable distribution. The baseline result remains qualitatively unchanged.

Next, to further highlight the economic plausibility of my results, in column 4 of Table 12 I weight the MP variable with the securities to assets ratio. The rebalancing motive should be larger for banks that hold a larger fraction of yield-decreasing securities relative to their total balance sheet. As expected, this robustness check indicates that the size of the securities portfolio plays a role in the strength of the rebalancing motive.

To rule out that the results are driven by potential outliers or the level of winsorization applied to the outcome variable in all preceding regressions, I present the results of two additional specifications. In column 5 of Table 12 I winsorize the MP variable at the 1% and at the 99%-level of the distribution with little impact on the coefficient estimates. I report results without winsorizing the dependent variable in column 6. The findings are confirmed.

Next, instead of estimating an interaction term between the maturing asset ratio and the MP variable, I split the sample according to the median of the maturing assets to total assets ratio in columns 7 and 8. As expected the statistical and economic significance is larger for banks with a higher maturing assets to total assets ratio. For banks with below median maturing assets the coefficient estimate is still significant and positive. Additionally, also the difference between the two coefficients of the two groups of banks (with a high or low maturing asset ratio) is significant for both models.[19]

Eventually, I change the timing of the construction of the MP variable. Instead of calculating the decline in yields between January 2014 and June 2015, I choose a smaller time window, i.e. January 2014 until December 2014. Results are robust to this alternative timing and are displayed in column 9 of Table 12. The coefficient estimate of the MP variable is somewhat smaller in this case. This makes sense economically, as yields further declined after December 2014.

4 Conclusion

I have documented new stylized facts regarding the credit and security holdings of German banks. The change in the spread between the average interest rates that German banks charge on loans to the non-financial sector and the yield on securities that they hold has increased during a time period of implementation of various unconventional monetary policy measures. At the same time also the volume of credit supplied has increased in relation to the nominal securities holdings.

Building on these stylized facts, in this paper I analyze the following questions: Given the change in relative prices between securities and credit, do banks that face a larger decrease in yields of their securities portfolio induced by unconventional monetary policy measures supply more credit to the real sector? Do those banks also reduce their securities investments, thus, changing their portfolio allocation? And if so, are those banks selling the securities with the highest yield decline, thus realizing valuation gains? Are the effects stronger for less capitalized banks?

The availability and combination of the securities register, bank balance sheet information, and, most importantly, data from monetary policy implementation, provides a comprehensive view on banks' balance sheets and facilitates to answer the above questions.

[19]The p-value of the two-sided t-test of the difference between the two coefficients (with 87 degrees of freedom, i.e. 102 observations-15 controls and fixed effects) is 0.04. In both cases the t-statistic reads: $(\hat{\beta}_1 - \hat{\beta}_2)/(\sqrt{se(\hat{\beta}_1)^2 + se(\hat{\beta}_2)^2})$.

I find that banks experiencing higher drops in yields of their securities portfolio seek to restore their targeted yield level by increasing their higher-yielding credit provision. This effect is particularly pronounced for banks with many maturing assets that have to make reinvestment decisions. At the same time, these banks reduce their security holdings and realize the gains from securities with a high drop in yield. My results suggest that banks actively rebalance their investments from the securities portfolio to the credit book, given the change in the relative price between credit and securities. Thus, the paper sheds additional light on how the transmission of unconventional monetary policy works at the bank level.

My results are informative for the current debate on the effectiveness of unconventional monetary policy. My paper highlights the importance of keeping hold of the impact of these measures on financial markets as changes in relative prices between bonds and book credit have implications for bank lending to the real sector.

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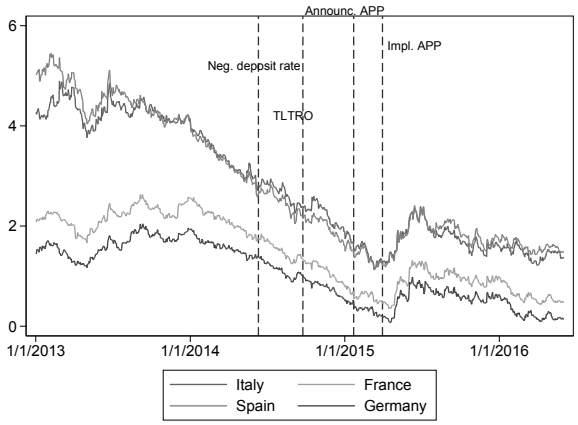
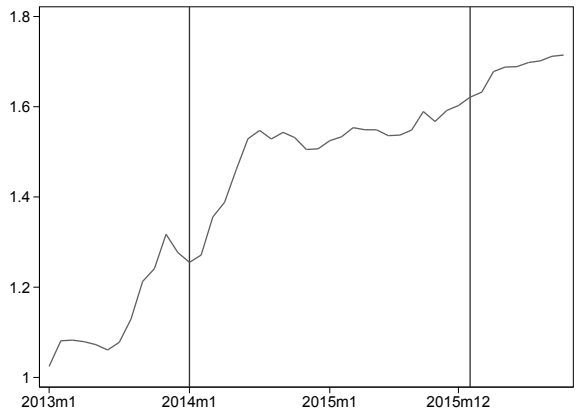
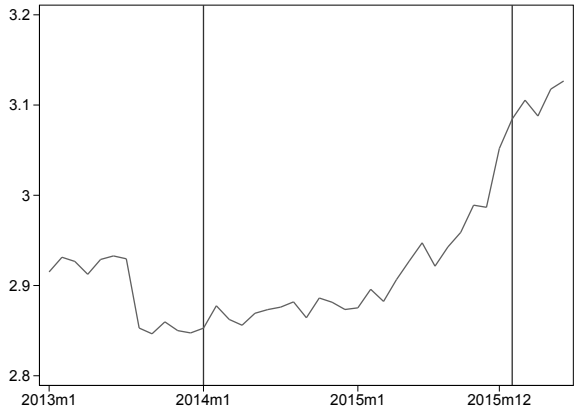
Figures and Tables



(a) Government Bond Yields



(b) Ratio: Interest Rates



(c) Ratio: Volumes

Figure 1: Descriptive Evidence. Subfigure 1a shows the evolution of the 10 year government bond yields of Italy, France, Spain, and Germany (in %). Subfigure 1b shows the evolution of the spread between the volume-weighted interest rates charged by German banks on loans supplied to the non-financial private sector and the volume-weighted yields from their securities portfolio (moving averages). Subfigure 1c depicts the time series of the ratio of the volume of credit supplied by German banks to the non-financial private sector over the nominal value of the securities held by German banks. The two bold vertical lines denote the period under investigation.

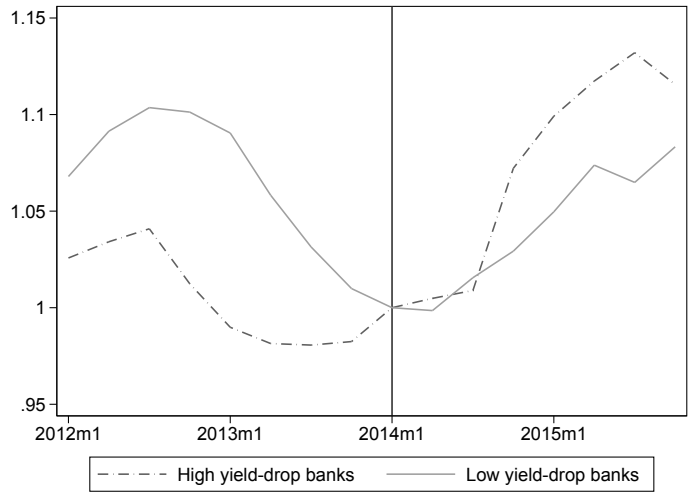


Figure 2: Evolution of loan provision. The Figure shows the evolution of newly issued loans over the period 2012:M1 until 2015:M12 (normalized to 2014:M1). The solid line refers to banks in the lower 50%-percentile of the MP variable, whereas the dashed line refers to banks in the upper 50%-percentile of this variable. The bold vertical line denotes 2014:M1, the month when the securities portfolio of the banks is selected for the construction of the MP variable. The graph depicts 4 month moving averages.

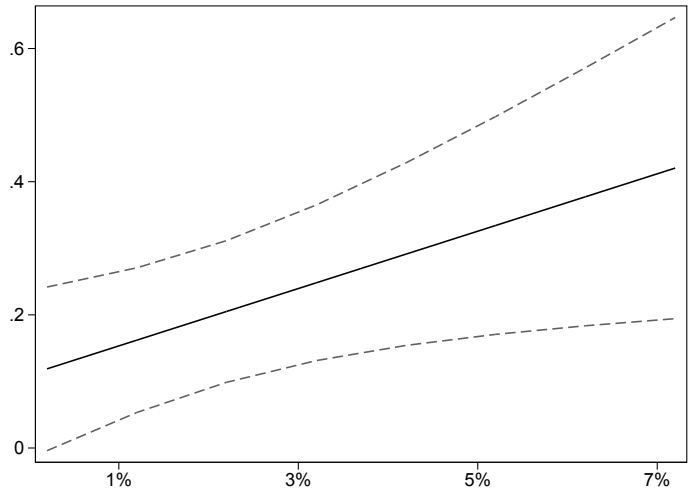
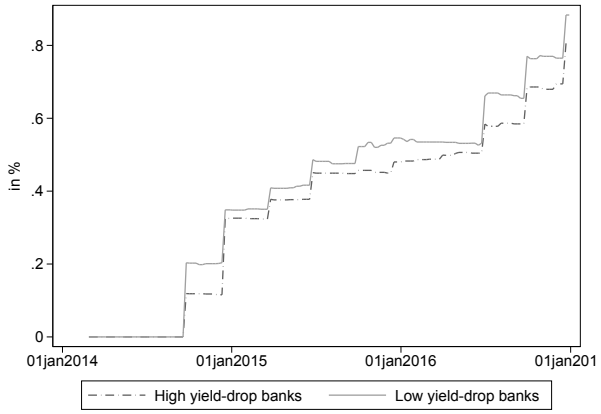
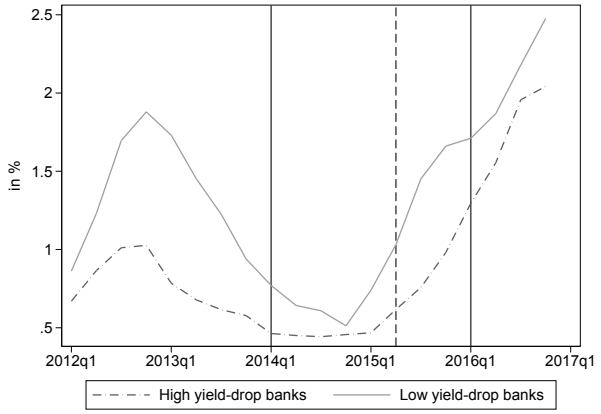


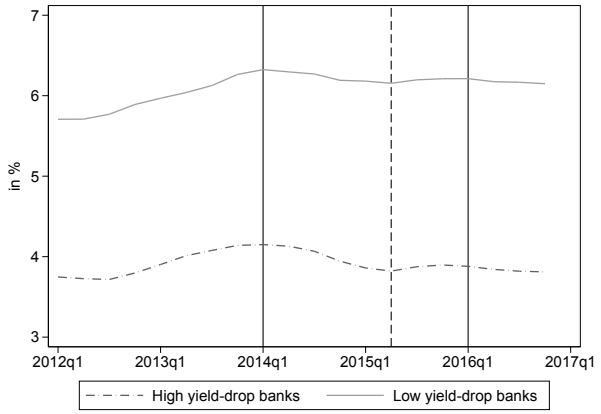
Figure 3: Marginal Effect of the MP variable. The Figure shows the marginal effect of MP variable depending on the maturing assets to total assets ratio based on the coefficient estimates of Table 5.



(a) TLTRO Uptake



(b) Central Bank Reserves



(c) Saving Deposits

Figure 4: Contaminating Events. Subfigure 4a shows the evolution of the ratio of the TLTRO uptake to total assets. Subfigure 4b depicts the ratio of reserves held at central banks to total assets, whereas Subfigure 4c shows the saving deposits to assets ratio. The solid line refers to banks in the lower 50%-percentile of the MP variable, whereas the dashed line refers to banks in the upper 50%-percentile of this variable. The two bold vertical lines denote the period under investigation.

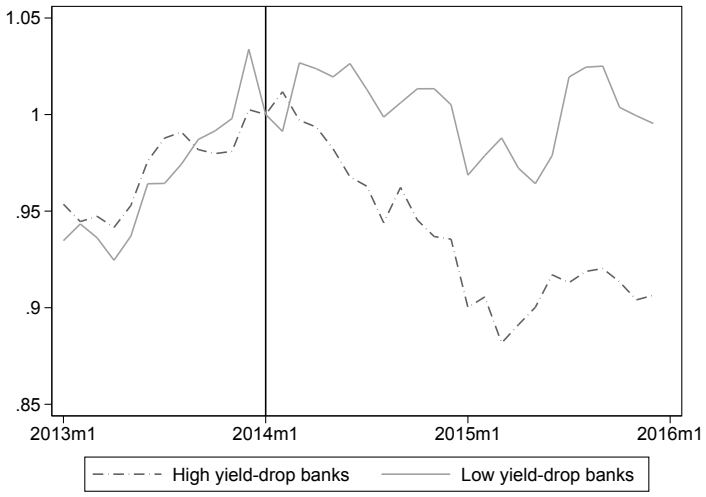


Figure 5: Evolution of Security Holdings. The Figure shows the evolution of the ratio of nominal security holdings to total assets over the period 2012:M1 until 2015:M12 (normalized to 2014:M1). The solid line refers to banks in the lower 50%-percentile of the MP variable, whereas the dashed line refers to banks in the upper 50%-percentile of this variable. The bold vertical line denotes 2014:M1, the month when the securities portfolio of the banks is selected for the construction of the MP variable.

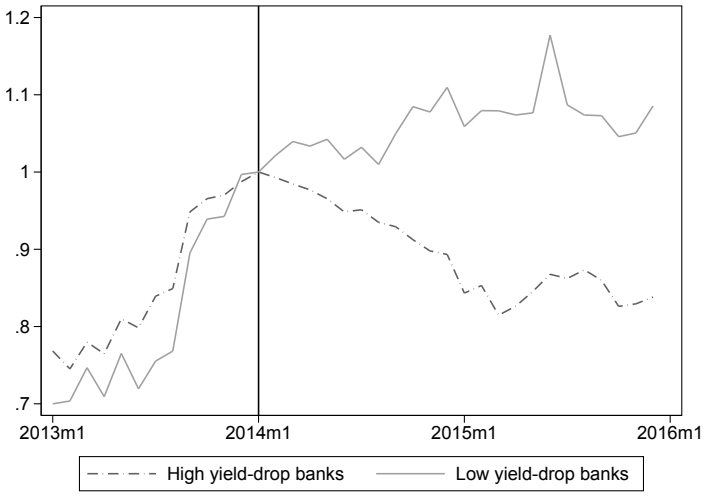


Figure 6: Evolution of Security Holdings with High Yield Decline. The Figure shows the evolution of the ratio of nominal security holdings of securites with a high decline in yield to total assets over the period 2012:M1 until 2015:M12 (normalized to 2014:M1). The solid line refers to banks in the lower 50%-percentile of the MP variable, whereas the dashed line refers to banks in the upper 50%-percentile of this variable. The bold vertical line denotes 2014:M1, the month when the securities portfolio of the banks is selected for the construction of the MP variable.

Variable	Mean	SD	p25	p50	p75	Obs.
MP	0.627	0.410	0.468	0.615	0.791	204
Total securities / Assets	0.186	0.113	0.098	0.171	0.238	204
Maturing securities / Assets	0.038	0.036	0.015	0.029	0.047	204
Credit: model 1						
log(Assets) [in € th.]	16.003	1.279	15.117	15.621	16.604	204
Equity / Assets	0.066	0.026	0.047	0.065	0.079	204
Reserves / Assets	0.012	0.018	0.004	0.008	0.011	204
Interbank / Assets	-0.038	0.160	-0.114	-0.039	0.035	204
Deposits / Assets	0.651	0.215	0.589	0.728	0.794	204
Return on Assets	0.004	0.007	0.001	0.004	0.006	204
Net Interest Margin	0.018	0.009	0.013	0.019	0.022	204
Δ Log(loans) - new business*	0.109	0.345	-0.015	0.122	0.252	204
Δ Log(loans) - credit stock*	0.043	0.232	-0.038	0.028	0.105	204
Credit: model 2						
log(Assets) [in € th.]	16.007	1.294	15.117	15.625	16.597	7,173
Equity / Assets	0.068	0.025	0.051	0.068	0.082	7,173
Reserves / Assets	0.010	0.015	0.002	0.007	0.010	7,173
Interbank / Assets	-0.042	0.149	-0.111	-0.039	0.032	7,173
Deposits / Assets	0.656	0.213	0.611	0.731	0.794	7,173
Return on Assets	0.005	0.005	0.002	0.004	0.006	7,173
Net Interest Margin	0.018	0.009	0.013	0.019	0.022	7,173
TLTRO-Ratio (in %)	0.151	0.669	0.000	0.000	0.000	7,173
Log(loans) - new business* - [in € th.]	11.552	1.328	10.678	11.388	12.278	7,173
Securities:						
Log(security holdings)[in €]	14.783	2.694	13.177	15.425	16.806	1,463,750
High-yield-decline	0.099	0.299	0.000	0.000	0.000	1,463,750
Post	0.347	0.476	0.000	0.000	1.000	1,463,750

Table 1: Summary Statistics. This table shows the summary statistics of the variables used in the empirical analysis. In the sample of model 1 of the credit analysis all level variables are measured in December 2013, i.e. prior to the monetary policy induced yield decline. Changes indicate the difference between the average for the pre-event period (2013:M1 to 2013:M12) and the average for the post-event period (2015:M1 to 2015:M12). The sample of model 2 of the credit analysis includes monthly observations for the time period analysed in the regressions, i.e. 2013m1-2015m12. The sample of the security analysis includes monthly observations for the period 2013m1-2015m12. Variables denoted with * are winsorized at the 1%- and 99%-level.

	Still held in 2015m6	Maturing before 2015m6	Sold
All securities	62.0%	22.5%	15.5%
Trading book securities	37.0%	36.2%	26.8%
	Still held in 2014m12	**Maturing before 2014m12**	**Sold**
Trading book securities	50.0%	24.2%	25.8%

Table 2: Securities held in 2014:M1. Given the securities held in 2014:M1, this table shows the fraction of securities that are still held in 2015:M6 (2014:M12) and the fraction of securities that are sold between 2014:M1 and 2015:M6 (2014:M12)

	Probit: MP dummy (50th-percentile)	
	(1)	(2)
	Pre-matching	Post-matching
log(Assets)	0.101	0.122
	(0.105)	(0.112)
Equity-Ratio	-3.490	6.373
	(4.073)	(4.871)
Reserve-Ratio	-4.157	-1.015
	(5.918)	(5.796)
Deposit-Ratio	0.030	0.952
	(0.699)	(0.839)
Interbank-Ratio	-0.969	-0.655
	(0.671)	(0.809)
ROA	15.936	24.198
	(14.594)	(18.420)
Net Interest Margin	-12.985	-19.483
	(13.605)	(25.226)
Observations	204	204
p-value	0.129	0.726

Table 3: Propensity Score Weighting. Column (1) of the table displays the results of a probit regression of the MP dummy (50th percentile) on various bank-level characteristics. Column (2) reports the same regression results for the weighted sample. Weighting is done according to the nearest-neighbour propensity score matching approach with replacement. The p-value refers to the χ^2 test of the joint significance of all variables. Robust standard errors are reported in parenthesis. ***, **, and * denote significance at the 1-, 5-, and 10%-levels.

	Model 1: Δ *Log* (*loans*)		Model 2: *Log* (*loans*)	
	(1)	(2)	(3)	(4)
MP	0.216***	0.177***		
	(0.057)	(0.043)		
MP * Post			0.116***	0.130***
			(0.042)	(0.040)
log(Assets)	-0.004	-0.035	0.787***	0.818***
	(0.040)	(0.039)	(0.273)	(0.263)
Equity-Ratio	-0.905	1.287	3.775**	1.488
	(1.581)	(1.910)	(1.661)	(2.057)
Reserve-Ratio	-2.967**	-4.953***	-1.109*	-1.873**
	(1.292)	(1.517)	(0.575)	(0.794)
Deposit-Ratio	0.085	-0.197	0.248	0.629
	(0.243)	(0.285)	(0.530)	(0.592)
Interbank-Ratio	0.013	0.290	-0.393	-0.753
	(0.185)	(0.199)	(0.358)	(0.476)
ROA	10.435**	3.247	-0.511	0.026
	(4.149)	(3.457)	(1.956)	(2.425)
Net Interest Margin	1.185	-2.090	6.772	0.340
	(2.481)	(6.487)	(6.884)	(8.472)
Matching	pre-	post-	pre-	post-
Bank-type FE	YES	YES	-	-
Bank FE	-	-	YES	YES
Month FE	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,173	7,173
R-squared	0.180	0.184	0.930	0.930

Table 4: Baseline Regressions. Column 1 and 2 show the coefficient estimates of the baseline regression (1) pre matching (colum 1) and post matching (column 2). The dependent variable denotes the change in the logarithm of the pre (2013:M1-2013:M12) event average and the post (2015:M1-2015:M12) event average of newly issued loans. All control variables are measured in December 2013 and include: the logarithm of total assets, the equity to assets ratio, the reserves to asset ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin, and banktype fixed effects (e.g. Landesbanks, cooperative banks, saving banks, regional banks, big commercial banks, mortgage banks). Robust standard errors are reported in parentheses. Columns 3 and 4 show the coefficient estimates of the regression model 2. The dependent variable denotes the logarithm of newly issued loans for the time period 2013:M1 until 2015:M12. Post is a dummy variable taking the value of 1 after 2015:M1. All control variables are measured monthly. Bank and month fixed effects are included. Standard errors are two-way clustered at the bank and time level and reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Model 1: Δ *Log* (*loans*)		Model 2: *Log* (*loans*)	
	(1)	(2)	(3)	(4)
MP	0.216***	0.110*		
	(0.057)	(0.064)		
MP * Maturing		4.308**		
		(1.902)		
MP * Post			0.116***	0.084**
			(0.042)	(0.038)
MP * Post * Maturing				1.404*
				(0.737)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FEs	-	-	YES	YES
Month FEs	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,173	7,173
R-squared	0.180	0.202	0.930	0.930

Table 5: Reinvestment Decisions. Columns 1 and 2 show the coefficient estimates of model 1. The dependent variable denotes the change in the logarithm of the pre (2013:M1-2013:M12) event average and the post (2015:M1-2015:M12) event average of newly issued loans. All control variables are measured in December 2013 and include: the maturing assets to total assets ratio (when interaction estimated), the logarithm of total assets, the equity to assets ratio, the reserves to asset ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin, and banktype fixed effects (e.g. Landesbanks, cooperative banks, saving banks, regional banks, big commercial banks, mortgage banks). Robust standard errors are reported in parentheses. Columns 3 and 4 show the coefficient estimates of model 2. The dependent variable denotes the logarithm of newly issued loans for the time period 2013:M1 until 2015:M12. Post is a dummy variable taking the value of 1 after 2015:M1. All control variables are time varying. Bank and month fixed effects are included. Standard errors are two-way clustered at the bank and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Model 1: Δ *Log* (*loans*)		Model 2: *Log* (*loans*)	
	(1)	(2)	(3)	(4)
MP	0.216***	0.323**		
	(0.057)	(0.142)		
MP * Equity		-1.938		
		(2.358)		
MP * Post			0.116***	0.120
			(0.042)	(0.117)
MP * Post * Equity				-0.069
				(1.830)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FEs	-	-	YES	YES
Month FEs	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,173	7,173
R-squared	0.180	0.183	0.930	0.930

Table 6: Heterogeneities: Equity. Columns 1 and 2 show the coefficient estimates of model 1. The dependent variable denotes the change in the logarithm of the pre (2013:M1-2013:M12) event average and the post (2015:M1-2015:M12) event average of newly issued loans. All control variables are measured in December 2013 and include: the logarithm of total assets, the equity to assets ratio, the reserves to asset ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin, and banktype fixed effects (e.g. Landesbanks, co-operative banks, saving banks, regional banks, big commercial banks, mortgage banks). Robust standard errors are reported in parentheses. Columns 3 and 4 show the coefficient estimates of model 2. The dependent variable denotes the logarithm of newly issued loans for the time period 2013:M1 until 2015:M12. Post is a dummy variable taking the value of 1 after 2015:M1. All control variables are time varying. Bank and month fixed effects are included. Standard errors are two-way clustered at the bank and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Model 1: Δ *Log* (*loans*)		Model 2: *Log* (*loans*)	
	(1)	(2)	(3)	(4)
	Corporations	Households	Corporations	Households
MP	0.252*	0.197*		
	(0.149)	(0.100)		
MP * Post			0.107*	0.125***
			(0.055)	(0.039)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FEs	-	-	YES	YES
Month FEs	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	6,511	6,969
R-squared	0.275	0.136	0.897	0.902

Table 7: Sectors. Columns 1 and 2 show the coefficient estimates of model 1. The dependent variable denotes the change in the logarithm of the pre (2013:M1-2013:M12) event average and the post (2015:M1-2015:M12) event average of newly issued loans to non-financial corporations (column 1) and households (column 2). All control variables are measured in December 2013 and include: the logarithm of total assets, the equity to assets ratio, the reserves to asset ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin, and banktype fixed effects (i.e. Landesbanks, cooperative banks, saving banks, regional banks, big commercial banks, mortgage banks). Robust standard errors are reported in parentheses. Columns 3 and 4 show the coefficient estimates of model 2. The dependent variable denotes the logarithm of newly issued loans to non-financial corporations (column 1) and households (column2) for the time period 2013:M1 until 2015:M12. Post is a dummy variable taking the value of 1 after 2015:M1. All control variables are time varying. Bank and month fixed effects are included. Standard errors are two-way clustered at the bank and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Model 2: *Log* (*loans*)	
	(1)	(2)
MP * Post	0.115***	0.081*
	(0.043)	(0.040)
MP * Post * Maturing		1.424*
		(0.738)
TLTRO-Ratio	0.005	0.008
	(0.017)	(0.017)
Controls	YES	YES
Bank FEs	YES	YES
Month FEs	YES	YES
Two-way clustered S.E.	YES	YES
Observations	7,173	7,173
R-squared	0.930	0.930

Table 8: Alternative Events: Controlling for TLTROs. The Table shows the coefficient estimates of the regression of equation (2), where the dependent variable denotes the logarithm of newly issued loans for the time period 2013:M1 until 2015:M12. Post is a dummy variable taking the value of 1 after 2015:M1. All control variables are measured monthly and include: the maturing asset ratio (when interaction estimated) the TLTRO-uptake over total aseets, the logarithm of total assets, the equity to assets ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin. Standard errors are two-way clustered at the bank and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Dependent variable: Log(security holdings)				
	(1)	(2)	(3)	(4)	(5)
MP*Post	-0.133**	-0.124**	-0.123**		
	(0.049)	(0.048)	(0.048)		
MP*High-yield-decline			0.439***	0.447***	0.460***
			(0.152)	(0.149)	(0.155)
Post*High-yield-decline			0.141**	0.162***	
			(0.057)	(0.035)	
MP*Post*High-yield-decline			-0.148***	-0.162***	-0.169**
			(0.047)	(0.022)	(0.070)
Controls	YES	YES	YES	-	-
Security FE	YES	-	YES	YES	-
Bank FE	YES	YES	YES	-	-
Time FE	YES	-	YES	-	-
Security*Time FE	NO	YES	NO	NO	YES
Bank*Time FE	NO	NO	NO	YES	YES
Observations	1,463,750	1,003,450	1,463,750	1,463,714	1,003,410
R-squared	0.754	0.519	0.754	0.756	0.524

Table 9: Securities. The dependent variable is the logarithm of securities nominal holdings by each bank i of security j during month t in the period January 2013 until December 2015. 'Post' is a dummy variable taking the value of 1 after 2015:M1 and zero otherwise. 'High-yield-decline' is a dummy variable that takes the value of 1 if a security has a high drop in yield between 2014:M1 and 2015:M6 (i.e. above the 90th percentile of all securites) and zero otherwise. Fixed effects are either included (YES) not included (NO) or spanned by other fixed effects (-). A constant is included but its coefficient is left unreported. Standard errors are clustered at the bank, security, and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Dependent variable: Log(security holdings)			
	(1)	(2)	(3)	(4)
	All	Corporates	Government	Other
MP*Post	-0.124**	-0.315**	-0.143*	-0.061*
	(0.048)	(0.116)	(0.084)	(0.035)
Controls	YES	YES	YES	YES
Security FE	-	-	-	-
Bank FE	YES	YES	YES	YES
Time FE	-	-	-	-
Security*Time FE	YES	YES	YES	YES
Bank*Time FE	NO	NO	NO	NO
Observations	1,003,450	87,009	286,918	629,520
R-squared	0.519	0.564	0.471	0.533

Table 10: Securities - Issuer Sector. The dependent variable is the logarithm of securities nominal holdings by each bank i of security j during month t in the period January 2013 until December 2015. 'Post' is a dummy variable taking the value of 1 after 2015:M1 and zero otherwise. 'High-yield-decline' is a dummy variable that takes the value of 1 if a security has a high drop in yield between 2014:M1 and 2015:M6 (i.e. above the 90th percentile of all securites) and zero otherwise. Fixed effects are either included (YES) not included (NO) or spanned by other fixed effects (-). A constant is included but its coefficient is left unreported. Standard errors are clustered at the bank, security, and time level and are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	Model 1: Δ *Log* (*loans*)		Model 2: *Log* (*loans*)	
	(1)	(2)	(3)	(4)
MP	-0.034	0.023		
	(0.129)	(0.131)		
MP * Maturing		-2.626		
		(2.889)		
MP * Post			-0.054	0.013
			(0.068)	(0.086)
MP * Post * Maturing				-3.013
				(3.546)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	-	-
Bank FEs	-	-	YES	YES
Month FEs	-	-	YES	YES
Two-way clustered S.E.	-	-	YES	YES
Observations	204	204	7,336	7,336
R-squared	0.232	0.239	0.877	0.877

Table 11: Robustness: Placebo Regressions of Loan Growth 2013. The Table shows the coefficient estimates of the regression of equation (1), where the dependent variable denotes the change in the logarithm of newly issued loans between the averages of 2011 (2011:M1-2011:M12) and 2013 (2013:M1-2013:M12) in columns 1 and 2. The Table also shows the coefficient estimates of the regression of equation (2), where the dependent variable denotes the logarithm of newly issued loans for the time period 2011:M1 until 2013:M12 in columns 3 and 4. Control variables include: the maturing assets to total assets ratio (when interaction estimated), the logarithm of total assets, the equity to assets ratio, the reserves to assets ratio, the deposit to assets ratio, the interbank to assets ratio, the return on assets, the net interest margin, and banktype fixed effects (e.g. Landesbanks, cooperative banks, saving banks, regional banks, big commercial banks, mortgage banks). Robust (model 1) and two-way clustered (model 2) standard errors are reported in parentheses. ***, **, and * denote significance at the 1%-, 5%-, and 10%-levels.

	(1)	(2)	(3)	(4)	(5)
	Baseline Result	Alternative Dependent Variable: Credit Stock	MP Dummy 50th Percentile	Weighted MP	Winsorized MP
MP	0.216***	0.075**	0.112**	1.015***	0.257***
	(0.057)	(0.036)	(0.051)	(0.315)	(0.079)
Controls	YES	YES	YES	YES	YES
Bank-type FE	YES	YES	YES	YES	YES
Observations	204	204	204	204	204
R-squared	0.180	0.196	0.140	0.176	0.353

	(6)	(7)	(8)	(9)
	No winsorization of credit	Low Maturing-Asset-Ratio	High Maturing-Asset-Ratio	Different MP variable Timing: 2014M1-2014:M12
MP	0.247***	0.116**	0.365***	0.187***
	(0.076)	(0.057)	(0.104)	(0.069)
Controls	YES	YES	YES	YES
Bank-type FE	YES	YES	YES	YES
Observations	204	102	102	204
R-squared	0.360	0.140	0.341	0.156
p-value (group difference)		0.039		

Table 12: Additional Robustness Checks: The table shows coefficient estimates of various robustness checks: Column 1 shows the baseline results. In column 2 the dependent variable is credit stock. Column 3 shows results with a dummy (above 50th percentile of MP) variable instead of the continuous MP variable. In column 4 the MP variable is weighted with the securities to asset ratio. Column 5 shows results after winsorizing the MP variable at the 1% and 99% level. In column 6 the dependent variable is not winsorized. Columns 7 and 8 show results with a sample split according to the median of the maturing assets to total assets ratio along with the p-value of group difference. Column 9 shows the results with a different timing of the MP variable.

A Appendix

A.1 Newsletter Articles

- Reuters 31.03.2014:
  *"...Speculation has also grown that it [ECB] may employ other easing measures such as...**U.S.-style bond-buying**. ECB President Mario Draghi suggested after the ECB's March meeting that the bank will either do nothing or take bold action should the outlook deteriorate."*

- Bloomberg 11.04.2014:
  *"Speculation is a big factor in the latest decline in bond yields in Spain, Italy, Portugal, and Greece. Bond prices rose another notch and yields fell after ECB President [Draghi] said the bank's Governing Council was "unanimous" on exploring tools including **purchases of debt**, a European echo of the Federal Reserve's quantitative easing (QE) program."*

- The Telegraph 29.07.2014:
  *"...investors are starting to price in quantitative easing by the ECB, which would entail **sovereign bond purchases** and potentially push yields lower."*

- Financial Times 27.11.2014:
  *"Government borrowing rates across Europe fell to historic lows on Thursday as speculation grows that the central bank is on the brink of **buying large quantities of sovereign."***