

# Effects of ECBs Unconventional Monetary Policy on Credit Supply in the Euro Area

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August 2016

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## Abstract

In this thesis I analyze the effects of ECBs unconventional monetary policy on credit supply to firms in the euro area. Since March 2010, the ECB launched a broad range of new policy tools and modified them steadily. More than six years after the initiation, the right measures to boost bank lending again could not be found. By evaluating the impact of these measures I present important findings which can be considered in upcoming policy decisions. Using an unique data set containing information about syndicated loans and issued bonds in ten euro area countries, I find that the recent Asset Purchase Program positively affected credit supply in GIIPS countries. Further, the LTRO and TLTRO were unable to motivate banks to increase their lending. By expanding the Asset Purchase Program and launching the TLTRO II with a stronger incentive system, the ECB seems to be on the right track.

*Key words: unconventional monetary policy, credit supply, bank lending, euro area, SMP, OMT, LTRO, TLTRO, APP*

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# 1 Introduction

After the great recession, when many central banks reached their zero lower bound, one main question arose: What should we do next? A popular answer was the inclusion of unconventional monetary policy tools. In December 2008, the Fed launched its Large Scale Asset Purchases (LSAP) later known as three Quantitative Easing (QE) programs. After six years and expanding its balance sheet to almost USD 4.5tn (November 2014), the asset purchases stopped in late 2014. While the Bank of England started its QE program later in March 2009, the Bank of Japan has a long history of asset purchase since 2001.

In this context the ECB can be classified as a latecomer. However, in terms of size the unconventional monetary policy of the ECB is unprecedented. Starting with the Securities Markets Program (SMP) as an attempt to fix the impaired transmission channel in some European countries, the ECB continued with three-year Longer-term Refinancing Operations (LTRO) to boost bank lending in December 2011 and January 2012. Crosignani et al. (2016) called this the "largest liquidity injection ever". Following other central banks example, in 2014, large scale asset purchases began, currently with a volume of EUR 80bn per month. In this master thesis I want to investigate the effects of ECBs unconventional monetary policy tools on credit supply to firms in the euro area.

Because the ECB uses unconventional monetary policy instruments for the first time, the effectiveness of these measures is currently still uncertain. Moreover, effectiveness is of crucial importance. Through its current policy the ECB takes a high risk and behaves on the edge of its mandate. It is therefore necessary to examine unconventional measures on their true effects. Further, if it turns out that a certain instrument exerts a particularly positive effect, it could be a sign for the ECB to focus on this instrument.

Of course researchers, especially in central banks, already tried to find results in this topic. However, these results are often country specific without showing the impact on the whole region. Moreover, the ECB still launches new instruments and modifies old unconventional measures. My thesis fills this gap and gives an up to date view on ECBs current monetary policy.

To answer my research question, I use two different approaches: the loan-to-loan method and the loan-to bond method. The analysis of credit supply is always somehow problematic because the researcher has to find an appropriate way to distinguish between supply and demand effects. The observable credit growth is an equilibrium outcome of those two factors. ECBs unconventional monetary policy takes place in a time of low economic growth and high uncertainty in Europe. Not including demand effects would most probably lead to a downward bias of my results.

The idea behind the loan-to-loan method is to track the credit relationship between one

firm and two banks. If credit exposures to this firm decrease in the loan books of both banks, this can be interpreted as a lower credit demand.

The loan-to-bond method does not incorporate the firms credit choice between two banks but between bank financing and market financing. A firm that issued a bond clearly has credit demand. Assuming that bonds and loans are perfect substitutes, one can interpret the issuance as a sign for low credit supply by banks.

I build an unique data set containing information about 9,262 syndicated loans borrowed by 2,953 companies from ten countries of the euro area between Q1 2010 and Q2 2016. I link this loan data with accounting data of 102 banks from the euro area, which allows me to follow the specific bank-firm relationship. Moreover, I complete my data set by including data on all bonds issued in these countries in that period.

My first finding is that although both the SMP and Outright Monetary Transactions (OMT) are classified as attempts to fix the impaired transmission channel of monetary policy in Europe, only the SMP increased credit supply significantly. On the contrary, the announcement of OMT even had a negative effect on credit supply. As a possible explanation I find that Government bonds from peripheral countries offered attractive risk-adjusted returns in comparison with granting loans to companies.

Furthermore, I show that banks with higher three-year LTRO Uptake decreased their credit supply to the real economy. Previous research identifies the incentive to use the new funds to buy Government bonds, later known as the "Sarko-Trade", as the main reason for this. However, this negative reaction disappears in my analysis after including unobserved time fixed effects.

Unfortunately, the modified Targeted LTRO (TLTRO) fails to correct its predecessor in two ways. First, banks interest in the new liquidity injection was quite low compared to the LTRO. Second, TLTRO Uptake had no effect on credit supply.

Nevertheless, for the latest instrument, the Asset Purchase Program (APP), I find a positive impact on credit supply, strongly pronounced in GIIPS countries. In my view, the ECB successfully reduced returns of Governments bonds in these countries and by that created an incentive for banks to increase their lending to the real economy.

My thesis extends the existing literature in four ways:

- (i.) Instead of showing a single country analysis I give a comprehensive overview of cross-country effects of ECBs unconventional monetary policy on European banking lending behavior.
- (ii.) By extending my data sample with recent figures, I also include the TLTRO and the relatively new APP. Because of the fact that the ECB links the potential refinancing through TLTRO with banks outstanding amount of loans to non-financial corporations and households (without mortgages) it could affect lending behavior

more than the normal LTRO. As far as I know, this is the first paper empirically evaluating the TLTRO and the APP.

- (iii.) In addition to the often discussed methodology from Khwarja and Mian (2008), I use a new methodology to measure changes in credit supply introduced by Becker and Ivashina (2014a) using both data on syndicated loans and data on corporate bond issuance.

All in all, my results suggest that the ECB is on the right track. The APP, the instrument which shows the highest impact on credit supply, was recently expanded to EUR 80bn per month and now also include the purchase of corporate bonds. Second, in line with my analysis, the ECB reworked the framework of the LTRO and TLTRO again. With the new TLTRO II, started in June 2016, the ECB created higher incentives for banks to use the liquidity injection and increase credit supply to the real economy.

The rest of the thesis is structured as follows. In Section 2, I present the related literature. In Section 3, I discuss the main features of the unconventional monetary policy tools of the ECB. Section 4 provides details on my methodological framework. The data I use is described in Section 5. In Section 6, I present the results of my empirical analysis, before Section 7 concludes.

## 2 Related Literature

This thesis contributes to recent literature on banking and monetary policy in two main ways. First, my paper relates to the literature analyzing the effects of shocks on banking behavior and credit supply. Early publications focused on the mechanism of monetary policy on the lending channel. To be mentioned among others are Bernanke and Blinder (1988) as well as Kashyap and Stein (1994) for theoretical frameworks and Bernanke and Blinder (1992) for an empirical framework.

In contrast to classical research in that field, Disyatat (2011) argues that the modern transmission of monetary policy on banking lending works through bank balance sheet strength and risk perception and not through bank deposit flows. An empirical assessment can be found in Kishan and Opiela (2012). They provide evidence for a monetary policy channel which works through market discipline. Positive policy shocks reduce uncertainty about bank health, which lowers external funding costs. This is in line with Acharya et al. (2015b), who argue that higher bank risk in times of crisis leads to an impaired transmission channel of monetary policy.

As a consequence from the ongoing discussion about effectiveness of monetary policy at the zero lower bound Benmelech and Bergman (2012) built a theoretical framework which



explains how monetary policy can fall into a “credit trap”. In that scenario any liquidity injection from the central bank will have no positive influence on credit supply.

Recent papers published after the Great Recession also look on the effects of financial crisis on credit supply. Ivashina and Scharfstein (2010) analyze the drop in corporate lending in the USA after the financial crisis. Brei et al. (2013) examine how rescue packages during the financial crisis affected credit supply. They reveal that the strength of bank balance sheets is an important driver for policy effectiveness.

Further, bank balance sheet strength is the main topic of many papers about the effects of the European sovereign debt crisis. This literature provides evidence on how the amount of banks government debt portfolios of stressed countries (mainly Greece, Ireland, Italy, Portugal and Spain (GIIPS)) influenced lending behavior. Popov and van Horen (2015) investigate how holdings of GIIPS sovereign debt impaired banking lending. Jimenez et al. (2012) and Bottero et al. (2015) look at effects of the sovereign debt crisis on credit supply using Credit Register data of Spain and Italy.

Looking at real effects, Acharya et al. (2015a) show that firms with loan relationships to banks headquartered in stressed countries have lower employment growth, lower levels of investment as well as lower sales growth. Becker and Ivashina (2014b) give a potential explanation. They argue that between 2010 and 2013 the European banking sector increased their sovereign bond portfolio which led to a crowding out effect of corporate lending and thus to financial constraints for firms. There, they use a methodology on measuring credit supply introduced by Becker and Ivashina (2014a). The authors interpret the shift from corporate financing through bank loans to bond financing as a negative sign for credit supply by banks.

Second, this thesis fits to the literature assessing effectiveness of unconventional monetary policy. The first block within this literature concentrates on macroeconomic effects and the changes in asset prices. Casiraghi et al. (2013) find evidence for counteracting increases of Italian government bond yields as a result of the ECB SMP and OMT program. A similar result for all GIIPS countries is given by Eser and Schwaab (2016). They estimate that the asset purchase decreased the yield of Spanish five-year maturity bonds by 4 to 6 bps/EUR bn. Szczerbowicz (2015) shows that not only European governments had lower market borrowing cost after various ECB policy announcements, but also European banks. Within a panel VAR framework Gambacorta et al. (2014) assess the macroeconomic effects of unconventional monetary policy in eight advanced economies, similarly to Peersman (2001). Focusing on asset prices and bond market fragmentation, Fratzscher et al. (2014) reveal positive effects of ECBs policy. They also deliver a comprehensive overview of transmission channels.

In addition, the second block in this literature focuses on the real effects of unconventional monetary policy. Gertler and Karadi (2011) develop a DGSE model including

unconventional monetary policy. They show that central bank intermediation brings substantial net benefits during a crisis, although central bank credit is less efficient than private financial intermediation. In their more recent paper (Gertler and Karadi, 2013) the authors extend their model to analyze the different impact of different forms of unconventional monetary policy. They forecast a higher impact on the economy if the central bank buys more assets with private risk. Using an event-study approach Chodorow-Reich (2014) shows the positive impact of the Fed unconventional monetary policy on the health of financial institutions, especially looking at banks and insurers CDS spreads.

For Europe Daetz et al. (2016) look at real effects of the ECB LTRO program. They find that corporations increased their cash following the liquidity shock. However, there is no sign for increased investments which indicates a precautionary cash savings motive from corporates. This underlines the limited impact of central bank policy: even if credit supply increases after monetary policy actions, there is no certainty about real effects.

In particular, my thesis is allocated to the interface of these two fields: the effect of unconventional monetary policy on banking lending. Within a structural VAR framework, Boeckx et al. (2014) look at the effect of the ECB balance sheet operations on banking lending after the financial crisis. In their view, especially less capitalized institutions could register strong benefits. A similar framework is given by Lewis and Roth (2015). In line with these results Darracq-Paries and De Santis (2013) also see positive impacts on the credit supply using ECB Banking Lending Survey (BLS) data.

Analyzing changes in the sovereign debt portfolio of Portuguese banks, Crosignani et al. (2015) show that banks used the LTRO program to buy short-maturity high-yield government bonds which could be pledged as a central bank collateral (see also Acharya and Steffen, 2015). Influenced by these results van der Kwaak (2015) builds a DGSE model which explains the portfolio choice of banks after the LTROs. He argues that banks have an incentive to shift from private loans to government debt which implies a negative impact on credit supply to firms in the short run. On the contrary, there is a positive effect in the long run because the LTRO indirectly helps banks to recapitalize which increases credit supply. However, an immediate recapitalization would have a stronger impact on credit supply.

In contrast, Andrade et al. (2015) find a positive impact of the LTRO program on credit supply in France. Similar research was done for Spanish banks by Garcia-Posada (2015) and for Italian banks by Carpinelli and Crosignani (2015).

All three empirical papers about the effect of the LTROs build their research on the methodology developed by Khawaja and Mian (2008). Their study on banks credit supply after an unanticipated nuclear test in Pakistan delivered a method how to isolate credit supply from demand by using Credit Register data. The idea is that firm fixed demand effects can be identified if the data sample covers corporations that have loans provided

by at least two financial institutions.

A similar work is provided by Acharya et al. (2016). In their paper they measure the impact of the OMT program on banking lending in GIIPS countries. By modifying the framework of Khwarja and Mian (2008), they give a new methodology that uses syndicated loan data to identify changes in credit supply. This innovation allows them to investigate cross-country effects of unconventional monetary policy. Ferrando et al. (2015) focus on the effects of the OMT program as well. Instead of using syndicated loan data which samples mostly bigger firms, the authors analyze the credit access of small and medium enterprises (SMEs) by using ECBs “Survey on the Access to Finance of Enterprises (SAFE)”.

### 3 ECBs Unconventional Monetary Policy Instruments

In this section, I want to describe the main instruments the ECB used to further stimulate the economy in the last years. In my view, it is crucial to first understand the different monetary policy programs before analyzing the effects of them. Unconventional monetary policy is a new field for central banks and therefore the methods the policy makers use differ and develop. For me as a researcher and especially for the central bank itself it is fundamental to not only see how an instrument affected credit supply but also why. Based on this answer one can evaluate the usefulness of a program and decide whether one should modify it. Figure 1 shows the chronological order of the instruments.

#### 3.1 Securities Markets Program

The start of the ECBs first unconventional measure, the Securities Markets Program (SMP), is closely linked to the Greek sovereign debt crisis. On May 2, 2010, after policy makers and market participants realized the true condition of the Greek economy, the European Commission, the ECB and the IMF initiated a EUR 110bn rescue package to prevent sovereign default. As a consequence, markets were more and more worried about other countries in peripheral Europe, which resulted in rising sovereign bond yields. A week later, on May 10, 2010, the ECB announced to introduce a series of instruments to “address the severe tensions in certain market segments, which are hampering the monetary transmission channel”.<sup>1</sup>

One of this instruments was the SMP, in which the ECB stated to buy sovereign and private debt to “ensure depth and liquidity in those market segments which are dysfunctional”. To address critical voice which emphasized that the ECB would act outside its official mandate by directly financing governments and increasing inflationary pressure,

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<sup>1</sup><https://www.ecb.europa.eu/press/pr/date/2010/html/pr100510.en.html>

Figure 1: Timeline of ECBs Unconventional Monetary Policy

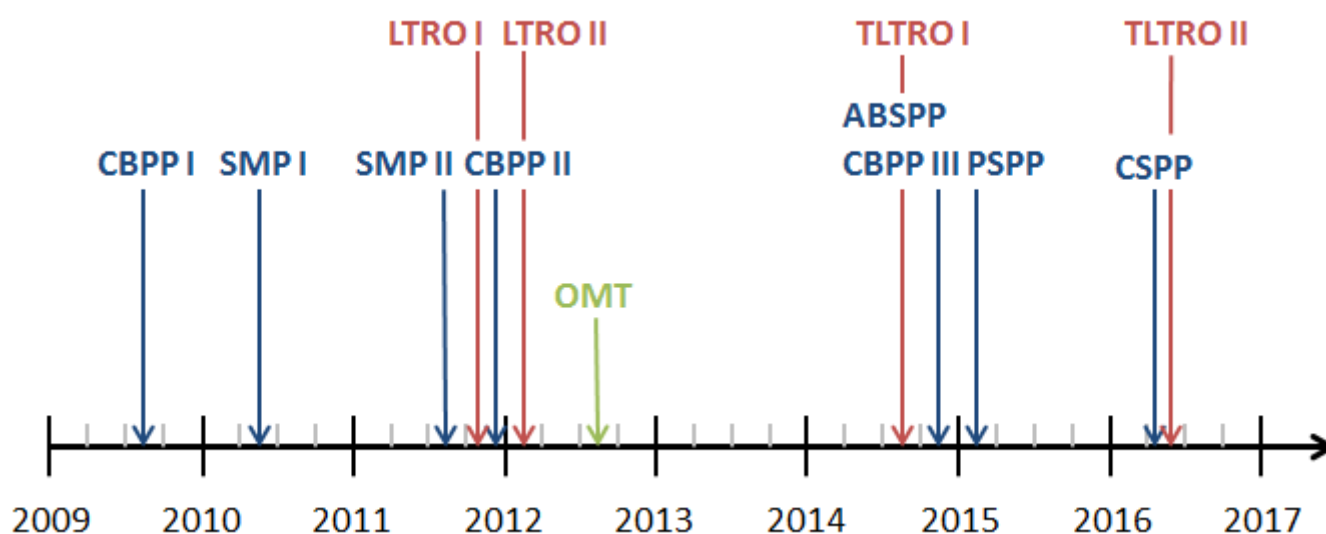


Figure 1 outlines the sequence of ECBs recent unconventional monetary policy instruments. *LTRO* labels the first two three-year Longer-term Refinancing Operations. While *TLTRO I* refers to the beginning of the first series of Targeted Longer-term Refinancing Operations, which includes eight tenders, *TLTRO II* refers to the beginning of the second series of Targeted Longer-term Refinancing Operations, which includes four tenders. *CBPP I* and *CBPP II* signify for the first two Covered Bond Purchase Programs. *SMP I* and *SMP II* identify the quarters, where the ECB bought most of the securities in its Securities Markets Program. This was replaced by the Outright Monetary Transaction (*OMT*) Program. The extended Asset Purchase Program (*APP*) comprises the third Covered Bond Purchases Program (*CBPP III*), the Asset Backed Securities Purchase Program (*ABSPP*), the Public Sector Purchase Program (*PSPP*) and the recently introduced Corporate Sector Purchase Program (*CSPP*).

the central bank decided to sterilize the purchases by absorbing the new liquidity.

Compared to similar purchase programs by other central banks Eser and Schwaab (2016) find four main differences of the SMP. First, the SMP was no substitute of the the classical interest rate setting, but a complement. The Fed and the Bank of England used their quantitative easing after they reached the zero lower bound, whereas the SMP concentrated on specific regions, where the monetary transmission did not work like in the rest of the euro area.

Second, within the SMP the ECB bought mainly assets from countries with very high yields and risk premia. In the initial phase of the SMP, purchases of Government bonds from Greece, Portugal and Ireland were targeted, while in the second phase, starting in August 2011, also bonds from Spain and Italy were bought (see Fratzer et al. 2014). Contrary, both U.S and U.K. bonds have very low default premia and are considered as safe heavens.

Third, the ECB communicated very little information about the program besides their main objective. The Fed and the BoE, however, defined a very clear framework in which the program would work including the amount of purchases and the end date.

Lastly, markets interpreted the programs in a different way. The main message of the Fed

and BoE QE was low future short-term interest rates. This was not intended by the ECB. The ECB wanted to show markets that they mispriced peripheral European Government bonds and that the yields are not in line with actual risk characteristics.

### 3.2 Outright Monetary Transactions

Despite the asset purchases through the SMP, the ECB was unable to regain trust into the stability of the euro area. In 2012, after Italian and Spanish Government bond spreads reached an unsustainable level and by that led to a potential break up of the monetary union, Mario Draghi did his famous "whatever it takes" - speech. On July 26, 2012, Draghi said, "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."<sup>2</sup>

On September 6, 2012, the ECB officially presented the technical details of the Outright Monetary Transactions (OMT) program and by that terminated the previous SMP. Similar to the SMP, the target of the OMT was to restore confidence in European sovereign debt. However, there are two differences. First, the OMT limits itself to purchase of short-term debt, e.g. bonds with maturities up to three years, whereas the SMP had no such limitation. Second, and more importantly, the ECB made it clear that asset purchases through the OMT can only happen after a country received support from the European Stability Mechanism (ESM). This condition ensures that the OMT does not create any incentive for governments to not consolidate their public finances.

What makes the OMT program so special is that it worked without spending a single euro. Until the time of writing, the ECB did not purchase any government bond through the OMT. After some legal issues were solved, the OMT were implemented in March 2015. However, researchers mostly share the opinion that the OMT helped to significantly decrease Government bonds spreads in peripheral Europe.

### 3.3 Longer-term Refinancing Operations

The high sovereign bond yields not only affected public finances and governments, but also the European banking system suffered from the macroeconomic uncertainty. Traditionally, banks have a very pro-cyclical business model. While most of Europe was far away from significant GDP growth and governments were unable to boost the economy, bank balance sheets were full of sovereign debt, which raised concerns about their health. Consequently, tensions started to appear on the interbank market resulting in high interbank lending rates and high funding costs for banks. The stressed funding situation, further, led to tighter credit conditions for customers and therefore deteriorated growth perspectives

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<sup>2</sup><https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html>

even more (see Andrade et al. (2014)).

In this vicious circle of macroeconomic uncertainty and stressed bank balance sheets, on December 8, 2011, the ECB announced an unprecedented liquidity injection through two three-year Longer-term Refinancing Operations (LTRO). It is important to keep in mind that this was not the first LTRO. In the early years of the monetary union, the euro system introduced LTROs with a maturity of three month. In the course of the financial and the sovereign debt crisis, the ECB started to extend the maturity of the LTRO further and further. However, the combination of two rounds, the extra long maturity and full allotment made the three-year LTRO to an unique liquidity shock.

The ECB emphasized their support of the liquidity situation of euro area banks through the measure. Further, they define their goal to enhance "provision of credit to households and non-financial corporations".<sup>3</sup>

In total, the ECB lend EUR 489.2bn to 523 banks in the first round on December 21, 2011, and EUR 529.5bn to 800 banks in the second round on February 29, 2012. After one year, financial institutions had the option of an early repayment. The interest rate was "fixed at the average rate of the main refinancing operations over the life of the respective operation."<sup>4</sup>

### 3.4 Targeted Longer-term Refinancing Operations

On June 5, 2014, the ECB announced a series of eight targeted Longer-term Refinancing Operations (TLTRO). Compared to the standard LTRO, the new liquidity provision inhabits some new innovations.

Similar to the LTRO, the ECB named the enhancement of a functioning monetary policy transmission channel and the provision of credit to the real economy as their main goal. However, the question if and how the LTRO was able to achieve these goals was discussed lively. Many researcher found theoretical and empirical evidence that the LTRO created an incentive for banks to buy sovereign debt, not to lend money to firms. The TLTRO can be interpreted as an attempt to correct this defect.

In 8 rounds, quarterly from September 2014 until June 2016, banks had the opportunity to borrow money with a maturity date in September 2018. Hence, the first TLTRO were even longer than the LTRO. In turn, banks were only entitled to borrow a limited amount of money. The initial allowance was defined as "7% of the total amount of their loans to the euro area non-financial private sector, excluding loans to households for house purchase, outstanding on April 30, 2014."<sup>5</sup> In the first two rounds banks could only borrow in total

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<sup>3</sup><https://www.ecb.europa.eu/press/pressconf/2011/html/is111208.en.html>

<sup>4</sup>[https://www.ecb.europa.eu/press/pr/date/2011/html/pr111208\\_1.en.html](https://www.ecb.europa.eu/press/pr/date/2011/html/pr111208_1.en.html)

<sup>5</sup>[https://www.ecb.europa.eu/press/pr/date/2014/html/pr140605\\_2.en.html](https://www.ecb.europa.eu/press/pr/date/2014/html/pr140605_2.en.html)

the initial allowance.

In the next six rounds they could borrow additional amounts, linked to the extra net lending each bank provided to the real economy. To compute this extra net lending, the ECB looked at the difference between banks net lending from April 30, 2014 until the reference date of the allotment, and banks net lending in the twelve months before April 30, 2014. This enhanced that not only banks with already high lending could use the TLTRO. Instead the ECB set an incentive to increase credit supply to the real economy. Further, if a bank used the TLTRO and decreased credit supply, which means that the bank had a lower net lending than in the period before April 30, 2014, it is forced to early repay the credit in September 2016.

Like for the LTRO, the interest rate is linked to the average rate of the main refinancing operations, plus 10bp. However, compared to the three-year LTRO program, the Uptake in the targeted version was low. In total, banks used EUR 432bn of the new liquidity injection, not even half of the LTRO Uptake. While the start seemed promising with a allotment of more than EUR 310bn in the first three rounds, banks interest in the TLTRO slowed steadily, resulting in Uptakes below EUR 10bn in the last two rounds.<sup>6</sup>

The lack of success of the TLTRO forced the ECB to introduce a modified version of the measure, called the TLTRO II. On March 10, 2016, the ECB announced the technical detail of the program, including many innovations to make the measure more attractive for banks and to further boost the lending to firms.<sup>7</sup>

There will be four rounds in total, quarterly from June 2016 until March 2017. All operations have a maturity of four years, with a repayment option after two years. There is no forced early repayment because of negative net lending like in the TLTRO I.

Again the total possible allowance is linked to banks loans to the euro area non-financial private sector, excluding loans to households for house purchase. In total, banks can take up to 30% of their loan book, with January 31, 2016, as the reference date. Surprisingly, the ECB offered all banks an early repayment of their TLTRO I loans on June 2016, so they could roll over their borrowing to the new measure.

Also similar to the first version of the TLTRO, the interest rate applied to the new measure is linked the rate of the main refinancing operations. Additionally, the ECB set a strong incentive for banks to increase their credit supply by lowering the interest rate applied to the TLTRO II potentially to the level of the deposit facility, if banks increase the volume of their loans to the real economy. With a deposit facility currently at -0.4%, banks would get money for their TLTRO Uptake.

First figures show a high acceptance within in the banking industry. The ECB could allot almost EUR 400bn to financial institutions in the first round of the TLTRO II, while

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<sup>6</sup><https://www.ecb.europa.eu/mopo/implement/omo/html/index.en.html>

<sup>7</sup>[https://www.ecb.europa.eu/press/pr/date/2016/html/pr160310\\_1.en.html](https://www.ecb.europa.eu/press/pr/date/2016/html/pr160310_1.en.html)

banks took the early repayment offer and gave EUR 368bn of the TLTRO I back.<sup>8</sup>

### 3.5 Asset Purchase Program

The Asset Purchase Program (APP) of the ECB cannot be seen as a single measure. Instead it is a combination of four different programs: the third Cover Bond Purchase Program (CBPP), the Asset-backed Securities Purchase Program (ABSPP), the Public Sector Purchase Program (PSPP) and the relatively new Corporate Sector Purchase Program (CSPP).

The purchase of European covered bonds was launched on July 2, 2009, with a targeted volume of EUR 60bn. In contrast to the US and UK banking sector, the European banking sector has traditionally a high reliance on covered bonds as a funding source.<sup>9</sup> After the Lehman default, uncertainty about the health of European banks started to rise, which led to a dry up in the bank debt market and increased funding costs for banks. The CBPP was then initiated to prevent a credit crunch and enhance liquidity in the interbank market. In June 2015, the ECB reached its target of EUR 60bn and terminated the program.

On October 6, 2011, the ECB announced the second CBPP, this time with a volume of EUR 40bn. The aim was defined as a contribution "to easy funding conditions for credit institutions and enterprises" as well as "to encouraging credit institutions to maintain and expand their lending to customers".<sup>10</sup> However, after the program ended as scheduled a year later, the ECB only purchased bonds with a total amount of EUR 16.4bn due to high market demand for covered bonds and low supply.

The third CBPP started in October 2014 with a duration of at least two years. Interestingly, the ECB did not mention any target volume. After 21 month of the program, the asset holdings reached a volume of more than EUR 186bn.<sup>11</sup>

Together with the CBPP III, the ECB also announced their intention to buy asset-backed securities. On November 21, 2014, the Asset-backed Securities Purchase Program (ABSPP) started. Again, the ECB did not mention a target volume. Due to the small European ABS market holdings currently reached on EUR 20bn. The program increased banks incentive to lend more money to the real economy. Banks could securitize loans and get new funds by selling them. Because of the negative experiences with ABS in the

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<sup>8</sup>[www.bloomberg.com/news/articles/2016-06-24/ecb-hands-banks-399-billion-euros-with-promise-to-pay-for-loans](http://www.bloomberg.com/news/articles/2016-06-24/ecb-hands-banks-399-billion-euros-with-promise-to-pay-for-loans)

<sup>9</sup>Covered bonds are fixed income instruments issued by banks. They can be characterized between unsecured bonds and asset-backed securities. The main feature of a covered bond is its double recourse. If the bank defaults, the investor has an additional senior claim on a previously defined cover pool, mostly consisting of mortgage loans or public debt. Because of this, covered bonds are seen as very safe securities and offer banks long-term funding with low interest rates.

<sup>10</sup>[https://www.ecb.europa.eu/press/pr/date/2012/html/pr121031\\_1.en.html](https://www.ecb.europa.eu/press/pr/date/2012/html/pr121031_1.en.html)

<sup>11</sup>July 2016: <https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html>



financial crisis, concerns about the risk of the ABSPP were raised by critics.

In January 2015, the ECB decided to also include public debt into their purchase of assets. The Public Sector Purchase Program (PSPP), launched on March 9, 2015, is by far the largest measure with holdings amounted to more than EUR 900bn. Alongside with the presentation of the PSPP, the ECB also announced to target monthly purchases amounting to EUR 60bn. At the time of announcement the PSPP should at least last until September 2016.

Most of the securities bought through the PSPP are government bonds and recognized agencies debt (at the initiation 88%, now 90%), the rest is allocated to international organizations and development banks.

The purchases are divided between countries based on ECBs capital key. Hence, Germany is the biggest provider of securities, together with France and Italy. This prevents the ECB to only buy debt from stressed countries. Also the ECB only purchases assets from secondary markets which prevents illegal government financing.

The youngest measure of ECBs tool-box is the Corporate Sector Purchase Program (CSPP). It allows central banks to buy investment grade corporate debt issued by non-bank corporations in the euro area. Together with the announcement of the program, the ECB also stated its intention to expand the volume of the APP to monthly purchases of EUR 80bn and increase the the minimum duration until March 2017.

## 4 Methodology

The analysis of the impact of ECBs monetary policy on credit supply brings two identification problems: (i) the possible endogeneity of the LTRO Uptake and (ii) the separation of credit supply and demand. While I can assume that the SMP, the OMT program and the APP are exogenous shocks to the banking sector, this is very unlikely for the LTROs. Banks can decide if and also how much liquidity they want to get.

Andrade et al. (2015) show, that bidders in the first LTRO were less capitalized than bidders in the second round. They give two potential reasons for that finding. On the one hand, it can be possible that banks were afraid of getting some kind of stigma after taking central bank liquidity. Banks in a stable position, who did not necessarily need the facility, did not want to send bad signals to depositors and financial markets.<sup>12</sup> On the other hand, especially stressed banks with low capital ratios and funding problems had an incentive to borrow as much money as possible. These banks also had to cut credit supply and deleverage their balance sheet. That means that my estimate would have a

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<sup>12</sup>Later, ECB President Mario Draghi emphasized that there will be no such stigma, Governing Council of 9 February 2012.

downward bias. A way to address this bias is to control for time varying bank specific characteristics, as Posada et al. (2015) state it. Further, I also add time-invariant bank fixed effects to capture unobserved factors and measure the overall situation of each bank within my sample period. By including these control variables my regressions tries to ensure zero correlation between the LTRO proxy and the error term.

Another interesting solution for this possible endogeneity problem is shown by Carpinelli and Crosignani (2015). The authors include banks wholesale funding exposure as an interaction term in their analysis. In the period shortly before the first LTRO program the liquidity on the interbank lending market was very low. Therefore, banks with a high wholesale funding exposure were most likely to use the LTRO. However, because of the lack of banks accounting data I am not able to use this approach.

The second identification problem, the separation of credit supply and demand, occurs because I cannot observe them directly. The observable credit growth is an equilibrium outcome of those two factors. Also, not including credit demand in my regression analysis would create an omitted variable bias because certainly there is a correlation between credit demand and the liquidity shocks.

The unconventional monetary policy of the ECB was a direct response to the sovereign debt crisis that also affected investment behavior of corporates. Unfortunately, the direction of the bias cannot be predicted a priori. The classical view would suggest a decreasing credit demand after a crisis because of macroeconomic uncertainty and negative investment opportunities. However, if firms expect an ongoing banking instability together with possible financial constraints in the future, it would be rational to increase credit demand and save the cash. To address this identification problem, I will use two different approaches: the loan-to-loan method and the loan-to-bond method.

#### 4.1 Loan-to-Loan Method

The loan-to-loan method was first implemented by Khwaja and Mian (2008) in their analysis on the effects of liquidity shocks on credit supply in Pakistan. The authors derive that one can add firm fixed effects if the data sample just contains corporates with loans from more than one bank. The method “tests whether the same firm borrowing from two different banks experiences a larger [increase] in lending from the bank facing a relatively greater [rise] in its liquidity supply” (Khwaja and Mian (2008)). These firm fixed effects ensure that all corporate specific characteristics, observed and unobserved, which could influence credit demand, are controlled.

However, I cannot use the original methodology of Khwaja and Mian (2008). The authors and any other researcher who applies their method have access to detailed loan information from national Credit Registers (see Andrade et al. (2015), Garcia-Posada

(2015) and Carpinelli and Crosignani (2015)). Although there are efforts to build such a European micro loan database, I have to fall back on syndicated loan data. This brings two problems. Data on syndicated loans just contains the initial amount of a loan at the time of origination and typically these loans have long maturities. As a consequence there is very low credit variation looking at just one firm.

To solve this problem, I follow the approach from Acharya et al. (2016) by clustering corporates with similar firm fixed effects. Criteria for the different clusters are: (i) country and (ii) industry. My idea is that firms in the same country and in the same industry have similar investment opportunities and financing constraints. I use firms first two digits of their SIC codes to allocate borrowers into industries. Investigating the lending volume of banks to different firm clusters ensures enough variation for the analysis.

This leads to the following regression:

$$\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP + \delta * Z_{bt-1} + \varepsilon_{bmt} \quad (1)$$

Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of lagged bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ . A positive  $\beta$  would imply an increasing credit supply by banks as a result of ECBs unconventional monetary policy.

As stated above, the bank fixed effect  $\gamma_b$  together with  $Z_{bt-1}$  ensures that I control for the possible endogeneity of the LTRO Uptake. In line with the model of Acharya et al. (2016) all control variables are lagged by one quarter. In my view, the assumption that banks base their lending policy on most recently published figures and not on day-to-day data, which is difficult to access, is very robust. Further, I try to capture many aspects of banks situation by including proxies for return, liquidity position, loan book health as well as cost and balance sheet structure.

The firm-cluster fixed effect  $\alpha_m$  controls for every unobserved heterogeneity between industries including credit demand. Instead of simply tracking the loan volume of a firm-cluster and a bank, I rather analyze firms credit choice between banks. This means if bank  $b$  strongly decreases loan exposure to firm-cluster  $m$ , it does not necessarily have to indicate lower credit supply. A possible explanation would be low credit demand in times of recession and uncertainty. This would be captured by  $\alpha_m$ . Because I take various firm-cluster-bank relationships into account, my model is able to identify the overall demand effect of each firm-cluster in the sample period.

A common strategy to control for shocks affecting the whole banking sector is the ad-

dition of time fixed effects (see Acharya et al. (2016)). These effects capture the overall condition of the whole bank sample and include shocks shared by all banks. This can be macroeconomic shocks or specific quarters where all banks showed similar lending behavior, for example, because of regulatory aspects. Including time fixed effects  $\theta_t$  into my model leads to:

$$\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt} \quad (2)$$

A crucial step for my analysis is the right choice of proxy for the different policy instruments. While it is more or less clear to use the log change of assets on ECBs balance sheet that were bought within the APP and the SMP, the other instruments offer more options.

In similar papers the common strategy was to use banks individual LTRO Uptake as a percentage of banks Total Assets (see Andrade et al. (2015), Garcia-Posada (2015) as well as Carpinelli and Crosignani (2015)). Again, the lack of data makes this approach problematic for my analysis. This is because there is no regulatory need for banks to publish their LTRO Uptake. The mentioned authors mostly come from a central bank environment, hence have access to this confidential information. Luckily, some banks published their Uptake, but of course this decreases the richness of my data.

As an alternative, I include the country-wide LTRO Uptake, defined as the Total LTRO Uptake in a country as a percentage of the Total Assets in the banking system of that country. Daetz (2016), who first used this approach, delivers a comprehensive overview on how much liquidity was obtained by each country through the LTRO. The assumption based on this strategy is that banks need of liquidity and therefore the incentive to borrow money through the LTRO is country-specific. This is not unrealistic. The banking sector is highly correlated, banks in the same region face similar investment opportunities and share many customers. Especially for big banks which operate in the whole country, this is the case. Of course, I lose much of my data variation in exchange for more data points. Additionally, I include a dummy variable for the post-LTRO period to capture the overall effect of the liquidity injection.

For the TLTRO Uptake the same thoughts apply. However, because of the lack of country-wide TLTRO Uptake data, this proxy is not applicable, which leaves the individual Uptake and the overall effect.

The dummy approach is also a common way to capture the effect of the OMT program (see Fratzscher et al. (2014)), most likely because of a missing alternative. As stated before, until now no asset was bought within the OMT program. The effect was more of a psychological boost to decrease uncertainty in financial markets followed by significantly lower CDS spreads in peripheral Europe.

Acharya et al. (2016) argue that this helped banks with high sovereign debt exposure on their asset side. Lower spreads lead to increased prices and high portfolio returns. The authors define this return as "OMT windfall-gains" and investigate if banks with higher windfall-gains increased their credit supply. However, this approach requires detailed information on each banks sovereign debt portfolio which is not accessible for me. Table 1 describes the monetary policy variables I include in my analysis.

Table 1: Description of Monetary Policy Variables

Table 1 describes the variables I include in my regression analysis to proxy ECBs monetary policy instruments.

Variable	Definition	Variation
SMP	Log change of holdings within the Securities Markets Program	same for all banks
OMT	Dummy variable equal to one starting in Q3 2012 and zero before	same for all banks
LTRO Dummy	Dummy variable equal to one starting in Q4 2011 and zero before	same for all banks
LTRO Country	Country-wide LTRO Uptake to Total Assets in banking sector by end 2011	by country
LTRO Individual	Banks total LTRO Uptake to Total Assets by end 2011	by bank
TLTRO Dummy	Dummy variable equal to one starting in Q3 2014 and zero before	same for all banks
TLTRO Individual	Banks total TLTRO Uptake to Total Assets by end 2014	by bank
APP	Log change of holdings within the Asset Purchase Program	same for all banks

Based on my linear panel data model, I use ordinary least squares (OLS) estimators to obtain regression results within the loan-to-loan method. Further, I use the dummy variable approach to control for fixed effects, where I add a specific dummy for every firm-cluster and quarter.

In general, the model assumes (i) linearity of parameters; (ii) independence of observations across firm-clusters; (iii)  $\varepsilon_{bmt}$  is uncorrelated with all explanatory variables; (iv) homoscedasticity and no serial correlation. Additionally, for the fixed effects it is necessary that explanatory variables are not perfectly collinear and that they have non-zero within-variance.

First, I conduct a Hausman test to investigate if including fixed effects is appropriate. I find very low Chi-square statistics, which indicates a rejection of  $H_0$  and by that justifies the usage of fixed effect models.

Further, similar paper compute standard errors by clustering them on a bank or firm level to counteract heteroscedasticity problems. However, since I do not find evidence

for this problem and moreover clustering standard errors hardly affects my results, I use unclustered standard errors in my analysis.

## 4.2 Loan-to-Bond Method

The loan-to-bond approach was developed by Becker and Ivashina (2014a) to investigate the cyclicity of credit supply. Later, the authors used their method to analyze the effect of sovereign bond holdings on banking lending in Europe. Under the assumption that bank credit and debt through issuance of corporate bonds are perfect substitutes, one can interpret the shift from loans to bonds as a credit supply contraction and vice versa. If a firm cannot get a loan because of deleveraging or uncertainty in the banking sector and if financial markets have no frictions so there are enough potential buyers for corporate credit, then issuing bonds is a logical step. Therefore, the credit decision for every existing bank-firm-relationship can be expressed as:

$$L_{it} = \begin{cases} 1, & \text{if firm } i \text{ receives a loan from a bank and does not issue a bond in quarter } t \\ 0, & \text{if firm } i \text{ issues a bond and does not receive a loan from a bank in quarter } t \end{cases}$$

Within a logit regression model this leads to:

$$Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})} \quad (3)$$

Further, incorporating time fixed effects  $\theta_t$  leads to:

$$Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})} \quad (4)$$

Compared to the loan-to-loan method, an important difference is that I no longer look at single firm-bank or cluster-bank relationships. Instead, I analyze how the broader conditions in the financial system affect the credit supply to firms. As a consequence, the bank fixed effect  $\gamma_b$  drops out and I replace it with country fixed effects  $\lambda_c$ . Also  $Z_{bt-1}$  is no longer bank-specific, but country-specific for each country  $c$ . This means the control variables capture the main risk characteristics of the complete banking system in the home country of firm  $i$ . Of course also the individual LTRO and TLTRO Uptake are not applicable anymore.

In contrast to the model by Becker and Ivashina (2014b), my approach differs in two main ways. First, instead of analyzing the effects of banks sovereign bank holding on credit supply, I focus on central banks policy instruments. Second, the authors take firm

specific characteristics into account, which could affect the firms credit choice, whereas I include bank specific control variables.

Another difference is the choice for the estimation method. Becker and Ivashina (2014b) present their results using OLS. Although they state that implementation of probit and logit regressions do not change outcomes, the usage of of a linear regression is highly discussable because of the binary dependent variable. Further, also probit regressions should be conducted with caution on my model. Greene (2002) shows how results of probit regressions are biased by including fixed effects. Unfortunately, firm fixed effects are crucial for my analysis to control for unobserved firm heterogeneity. Therefore, I implement logit regressions as my estimation method for the loan-to-bond-approach.

Positively, logistic regressions make fewer assumptions than OLS, including (i) independent variables and (ii) linearity of independent variables and log odds. One major issue, however, is the requirement of relatively large data samples. This must be kept in mind for the empirical analysis.

Again, I do not find evidence for heteroscedasticity and compute standard errors, hence, without clustering them.

The alternative methodology makes it necessary to restrict the data only on firms, which issue bonds and loans over the period of my sample. Including corporates, who do not switch their debt choice, would bias the coefficient of interest to zero because the firm fixed effect would capture all variation.

Of course one other shortcoming of this method is that many firms do not have access to bond financing. Especially in Europe, where SMEs play a big role for the economy and financing through bank loans is more common, this is an important concern. However, the recent decision of the ECB to include corporate bonds into the expanded APP shows the relevance of market financing in Europe.

As far as I know, there is currently no analysis on effects of ECB unconventional monetary policy on corporate bond issuance. Therefore, my alternative measure could predict potential outcomes of the new Corporate Sector Purchase Program (CSPP). For example a finding that the LTRO increases credit supply by banks and incentives firms to switch from bond financing to loan financing would question the purpose of the CSPP. Both programs would imply a similar effect and could end in a liquidity shortage in the corporate bond market.

## 5 Data

In this section, first, I outline the different databases I include within my analysis and briefly describe them. Then, I show which restrictions I use to obtain my data sample.

Finally, I report descriptive statistics and stylized facts for the data.

## 5.1 Data Sources

For the loan-to-loan method my final data set contains hand matched data from five different sources.

Loan information is obtained by Thomson Reuters Dealscan database. DealScan contains data about 240,000 syndicated loan transactions from all over the world, starting from 1981 till now. It delivers data about the type of the loan facility, the intended usage of the loan and roles of the different banks they had in that transaction.

Accounting data for banks comes from Bankscope on a single bank level and from the ECBs Statistical Warehouse on a country level. Bankscope is one of the most comprehensive databases of banks firm level data. It has information on 32,000 private and public banks including 8,000 European banks. Data range goes from 1985 till now. It contains balance sheet data as well as rating and ESG data. Both, Bankscope and ECBs Statistical Warehouse only provide annual data on balance sheet information. To match the data with my quarterly loan and bond data, I used linear interpolation.

I collect data on ECBs monetary policy from three sources. The ECB itself provides historical data on the APP on a weekly basis.<sup>13</sup> Data on the SMP for 2014 till now can also be found on that website. Previous data on the SMP was hand collected through the weekly financial statements of the ECB.

Like stated before, there is no regulatory need for banks to publish data on the individual LTRO Uptake. Since I have no access to central banks insights, I have to rely on voluntary public commentaries of banks. The bank level LTRO and TLTRO Uptake is based on hand collected data from Bloomberg. On a country level I use data published by Daetz (2016).

For the loan-to-bond method I also include bond deal information from Thomson Reuters SDC Platinum database. The database contains information about more than 800,000 bond issuances since 1970.

## 5.2 Sample Selection

In my analysis I want to investigate the effect of ECBs unconventional monetary policy on credit supply to companies in the euro zone. While other papers focus on single countries or regions, I want to show results for a broader perspective. Therefore, I restrict my sample to loans to (non-financial) companies from ten countries. This ten countries include Austria, Belgium, Germany, France and the Netherlands, which build the "Core"

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<sup>13</sup><https://www.ecb.europa.eu/stats/monetary/res/html/index.en.html>



European sample, as well as Greece, Ireland, Italy, Spain and Portugal, which build my GIIPS sample. My sample period spans from Q1 2010, shortly before the start of the SMP, to Q2 2016, the most recent data point I could get.

For the loan-to-loan method my baseline sample consists of 10,991 loans from 1,800 banks granted to 3,325 companies from ten countries. Here, I include every type of credit facility, regardless if it is a term loan, a revolver line or another type. In line with similar papers (see Acharya et al. (2016) and Sufi (2007)), loans are aggregated to their parent bank, which reduces the bank sample to 861 banking groups. Because I do not want to incorporate effects of monetary policies from central banks other than the ECB, I restrict my sample to loans granted by banking groups headquartered in one of the ten countries I am analyzing. Including banks from the US or the UK could bias my results. This leaves 10,027 loans from 520 banks received by 3,177 companies.

Consistent with Acharya et al. (2016), I only assign a syndicated loan to a bank, if the role of the bank in that transaction can be classified as a lead arranger. This is necessary, because in most cases DealScan only provides information about the total volume of a credit facility without showing which bank gave which share. The restriction ensures that if I include a bank-loan relationship in my sample, the bank really increased its loan exposure to a firm. According to the definitions of Standard & Poor's, a bank can be classified as a lead arranger if its role is "mandated lead arranger", "mandated arranger" or "bookrunner". 268 banks meet this definition, which granted 9,342 loans to 2,984 companies.

As the last restriction to be included in my sample, banks have to be covered by the Bankscope database, so I can obtain their balance sheet information. Although Bankscope covers a large portion of European banks, it contains data only on 102 banks of my restricted sample. This leads to a final sample of 9,262 loans received by 2,953 companies. It is interesting to see that although 7/8 of the original banks drop out because of the restrictions, more than 84 % of the loans still can be included in my sample. This shows a main characteristic of the European syndicated loan market. Most of the loans can be, at least partly, attached to a small number of banks.

According to Thomson Reuters SDC Platinum database 8,815 bonds were issued by 1,053 companies within my country sample between Q1 2010 and Q2 2016. In the same time, 10,991 syndicated loans were granted to 3,325 borrowers in these countries. These build my baseline sample for the loan-to-bond method.

However, it would not be appropriate to include every type of loan. The loan-to-bond method analyzes the substitution between loans and bonds. Because of the different characteristics, bonds and revolver lines cannot be compared in that way. Becker and Ivashina (2014a) find that revolver lines and commercial papers can be seen as substitutes, while bonds and term loans form another pair. In fact, they find similar results for both

pairs in the US, where commercial paper programs are more popular. Restricting my loan sample to term loans and promissory notes, I find 6,241 credit facilities from 2,612 companies.

As stated in Chapter 4, it is crucial for this method that I only include firms who switched their credit choice. Therefore, to be included in my sample, a firm had to take both types of credit. From these two groups of companies, 237 of them borrowed money through both, bonds and loans, resulting in 933 received loans and 1,142 issued bonds. Finally, 38 companies drop out because, although they took both types of credit, they still cannot be classified as a switcher. This can happen, for example, when a company issues one bond in the sample period, but in that quarter where the bond was issued the company also received a loan. This means a company needs to have one quarter, where it only issued bonds, and one quarter, where it only financed themselves through a loan. This leads to the final sample of 199 companies, 783 loans and 827 bonds.

### 5.3 Descriptive Statistics

In this section I will provide the main statistics of my data sample. Table 2 summarizes the core characteristics of the loan data. My bank sample consists of 102 financial institutions in total, 54 headquartered in Core Europe, 48 headquartered in a GIIPS country. French and German banks represent the main part for the core sample, while Spanish and Italian banks account for the bulk of the GIIPS sample. Approximately 2/3 of the borrowing companies come from Core Europe. The distribution of loans shows a similar picture. This is consistent with the general macroeconomic view of the past couple of years, with slow credit growth in peripheral Europe. Figure 2 and Figure 3 indicate a similar result. Figure 2 presents the evolution of the aggregated loan exposure since 2010. Figure 3 shows that the share of Core European companies on the aggregated loan exposure is relatively constant on a 70% level.

The median loan in my sample is equivalent to USD 55mn, while the mean is equivalent to USD 258mn. Although most of the country specific data is in line with the general view, Belgium seems to be an exception with a very high mean of USD 628mn and a standard deviation USD 2,325mn.

Table 3 exhibits the country specific LTRO Uptake data in total numbers as well as in percentage of the respective financial sector size. Banks from GIIPS countries used the new credit facility extensively, while banks from Core Europe borrowed not even 1% of their total assets. Especially Spanish and Italian banks used the LTRO to refinance. While there is data for both LTRO Uptake rounds for most of the countries, Greece only reported the full amount. There I cannot distinguish between LTRO I and LTRO II.

Table 4 presents the bank specific LTRO and TLTRO Uptake of banks in my sam-

Table 2: Summary Statistics: Loan Data

Table 2 presents the summary statistics for the loan data sample. Loans are further divided by the location of the borrowing firm. The label Core refers to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Data comes from Thomson Reuters DealScan database.

	<u>No. Banks</u> units	<u>No. Firms</u> units	<u>No. Loans</u> units	<u>Mean</u> USD mn	<u>Median</u> USD mn	<u>Min</u> USD mn	<u>Max</u> USD mn	<u>S.d.</u> USD mn
All	102	2,953	9,262	258.16	55.00	0.12	30,000.00	868.70
Core	54	1,835	6,230	282.90	60.00	0.12	25,000.00	915.40
GIIPS	48	1,118	3,032	207.33	47.08	0.15	30,000.00	761.38
Austria	5	53	228	182.45	56.00	3.00	2,000.00	330.31
Belgium	3	98	291	628.67	100.00	1.60	25,000.00	2,325.25
France	17	663	2,081	298.00	50.00	0.12	13,000.00	882.29
Germany	21	780	2,842	222.55	52.00	0.73	20,000.00	715.18
Netherlands	8	241	788	361.89	125.00	2.50	10,070.00	791.56
Greece	4	31	62	251.90	151.05	5.60	1,250.00	265.79
Ireland	2	59	119	323.39	135.00	1.50	2,500.00	481.21
Italy	18	372	949	222.80	45.00	0.50	10,000.00	747.20
Portugal	4	24	60	304.31	145.15	1.00	3,150.00	525.24
Spain	20	632	1,842	187.23	40.66	0.15	30,000.00	799.03

Figure 2: Aggregated Loan Exposure of European Banks

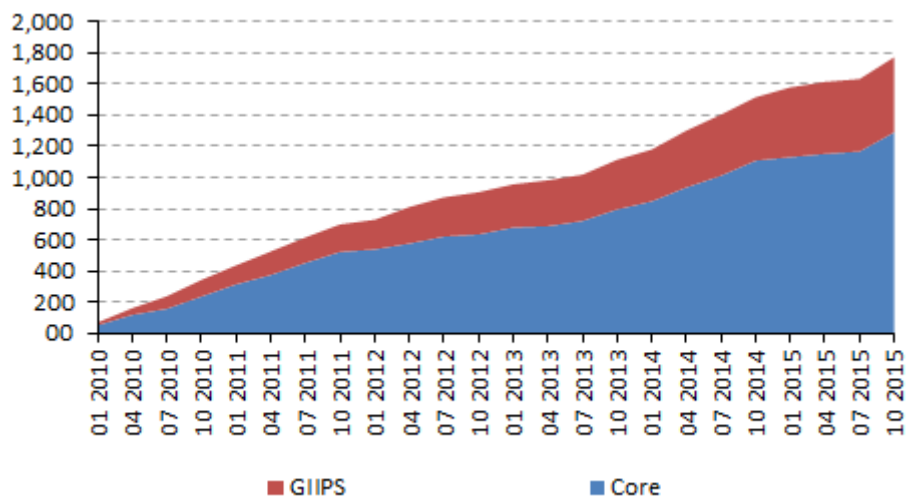


Figure 2 presents the aggregated loan exposure (in USD bn) of the banks included in my sample. Further, the figure divides between loan exposure to firms located in a GIIPS country (red) or in a Core country (blue), referring to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Loan data is restricted to syndicated loans obtained from Thomson Reuters DealScan database. Loans have to be issued by a bank headquartered in one country stated above and have to be granted to firms located in one country stated above.

Figure 3: Aggregated Loan Exposure to GIIPS Firms vs. Core Firms

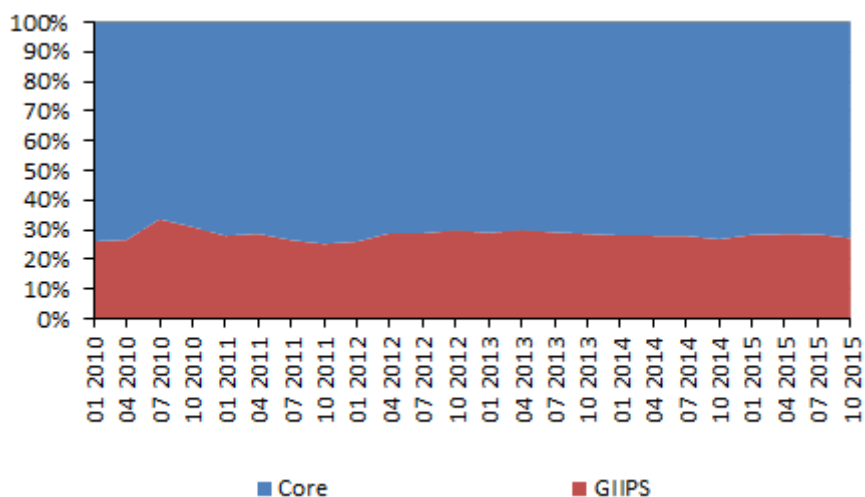


Figure 3 presents the percentage share of the aggregated loan exposure of the banks included in my sample, to firms located in a GIIPS country (red) and to firms located in a Core country (blue), referring to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Loan data is restricted to syndicated loans obtained from Thomson Reuters DealScan Database. Loans have to be issued by a bank headquartered in one country stated above and have to be granted to firms located in one country stated above.

Table 3: Summary Statistics: Country Specific LTRO Uptake

Table 3 presents the summary statistics for the country-wide LTRO Uptake of banks located in my country sample. LTRO I refers to the first round of the unconventional three-year liquidity injection, which took place in December 21, 2011, while LTRO II refers to the second round initiated by the ECB in February 29, 2012. The Uptake volume is shown in EUR bn and scaled by the Total Assets within the banking systems by end 2011. The label Core, refers to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. LTRO data is provided by Daetz (2016), data about the size of the different banking systems in terms of Total Assets is obtained from ECBs Statistical Datawarehouse. Note: In case of Greece, there is only data for the total LTRO amount. I can not distinguish between both rounds nor between LTROs with different maturities. Hence, the number also includes the standard 1-month and 3-month LTROs.

	<u>LTRO I</u>	<u>LTRO II</u>	<u>Total Uptake</u>	<u>LTRO I</u>	<u>LTRO II</u>	<u>Total Uptake</u>
	bn EUR	bn EUR	bn EUR	in %	in %	in %
All	508.34	409.13	917.47	2.01	1.62	3.63
Core	75.66	73.13	148.79	0.42	0.41	0.83
GIIPS	432.68	336.00	768.68	5.95	4.62	10.57
Austria	3.66	7.83	11.49	0.42	0.90	1.32
Belgium	45.30	43.69	88.99	8.15	7.86	16.01
France	5.59	6.53	12.12	0.09	0.10	0.19
Germany	12.25	13.13	25.38	0.16	0.17	0.33
Netherlands	8.86	1.95	10.81	0.35	0.08	0.43
Greece <sup>a</sup>	60.94	n.a.	60.94	17.77	n.a.	17.77
Ireland	21.91	17.61	39.52	5.75	4.62	10.37
Italy	172.08	128.11	300.19	6.76	5.03	11.78
Portugal	24.54	24.76	49.30	6.15	6.21	12.36
Spain	153.21	165.52	318.73	4.25	4.59	8.84

ple. From 102 banks in total, 37 banks reported their amount of longer-term refinancing. Consistently with the previous table, mostly Spanish and Italian banks told how extensively they used the liquidity. The mean Uptake for the whole sample equivalents 7.61%, while the average GIIPS bank borrowed 8.27% of its total assets. Neither banks from the Netherlands nor banks from Greece reported their Uptake. This shows a disadvantage of my data sample. Most likely Dutch banks did not report their Uptake, because they either did not had any or it has been very low, while Greek banks surely used the LTRO. However, my data sample cannot incorporate this fact.

Table 4: Summary Statistics: Bank Specific LTRO Uptake

Table 4 presents the summary statistics for the LTRO and TLTRO Uptake of banks located in my data sample. LTRO refers to the unconventional three-year liquidity injection, which took place in December 21, 2011 and in February 29, 2012. TLTRO refers to the first series of Targeted Longer-term refinancing operations started in Q3 2014. The Uptake volume is scaled by banks Total Assets by end 2011 for LTRO and by end 2014 for TLTRO. The label Core, refers to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Uptake data is based on hand-collected data from Bloomberg, while banks accounting data is obtained from Bankscope.

		<u>No. Banks</u>	<u>Mean</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>S.d.</u>
		units	in %	in %	in %	in %	in %
<i>Panel A: LTRO</i>	All	37	7.61	6.15	0.34	18.69	5.18
	Core	8	5.23	4.27	0.34	17.60	5.20
	GIIPS	29	8.27	7.88	2.56	18.69	4.97
	Austria	3	7.60	4.87	0.34	17.60	7.31
	Belgium	2	5.65	5.65	3.69	7.60	1.95
	France	1	4.85	4.85	4.85	4.85	0.00
	Germany	2	1.43	1.43	0.42	2.45	1.02
	Netherlands	0	0.00	0.00	0.00	0.00	0.00
	Greece	0	0.00	0.00	0.00	0.00	0.00
	Ireland	1	9.16	9.16	9.16	9.16	0.00
	Italy	13	10.15	10.07	2.82	18.69	4.53
	Portugal	2	11.07	11.07	9.31	12.84	1.76
	Spain	13	5.90	2.99	2.56	16.33	4.87
<i>Panel B: TLTRO</i>	All	22	4.51	3.11	0.65	9.71	2.89
	Core	3	3.42	1.33	1.02	7.91	3.18
	GIIPS	19	4.68	3.11	0.65	9.71	2.80
	Austria	1	7.91	7.91	7.91	7.91	0.00
	Belgium	2	1.17	1.17	1.02	1.33	0.15
	France	0	0.00	0.00	0.00	0.00	0.00
	Germany	0	0.00	0.00	0.00	0.00	0.00
	Netherlands	0	0.00	0.00	0.00	0.00	0.00
	Greece	0	0.00	0.00	0.00	0.00	0.00
	Ireland	0	0.00	0.00	0.00	0.00	0.00
	Italy	7	6.51	6.65	2.13	9.71	2.85
	Portugal	0	0.00	0.00	0.00	0.00	0.00
	Spain	12	3.61	3.11	0.65	8.76	2.14

From the 37 banks, which reported their LTRO Uptake, 22 also reported their TLTRO Uptake. Again Spanish and Italian banks play the main role. Only three banks from non-GIIPS countries reported their data. The small sample size, especially of Core banks, could be problematic in the empirical analysis and should be kept in mind. The mean equivalent is 4.51%, significantly lower than the mean of the LTRO. There are several potential explanations for this. One can argue that financing conditions for banks improved so the banks did not have the need to use the central bank money. Also, the restrictions of the TLTRO could have decreased the incentives for banks.

Figure 4 and 5 show the evolution of the SMP and the different ECB Asset Purchase Programs. One can see the big effect of the PSPP on ECBs asset portfolio starting in Q1 2015. In a short time period the APP could take a share of almost 90% of the assets on ECBs balance sheet. Including the new CSPP, this trend will go on in the upcoming months and years.

Summary statistics for the bank control variables on the individual bank level are stated in Table 5. Comparing banks from both regions, the statistics indicate average ROAE near zero for GIIPS banks, while Core banks could earn higher revenues within the sample period. The reason for the poor condition of peripheral banks probably is the high rate of impaired loans. Also the relative high ratio of liquid assets for Core banks is remarkable.

The main statistics for the loan-to-bond method are stated in Table 6. Similar to the loan data from the loan-to-loan method, again approximately 2/3 of my sample consists of companies, bonds and loans from Core Europe. With 47 companies, Germany got the biggest share, followed by France, Italy and Spain. The average bond issue has a volume of USD 1,322mn. With USD 866mn the average bond issue from GIIPS companies is significantly lower. On the loan side, there is a contrary picture. For the whole sample the mean equivalent is USD 683mn, for the GIIPS sample the mean is USD 1,344mn.

Figure 6 presents the distribution of the volume of newly issued bond between GIIPS and Core companies within my sample period. Although bonds from Core companies account for the bulk of the bond market, the share fluctuates over time. Especially, in Q1 2010 and Q4 2013 GIIPS companies represented a relatively big part of the market. The timing of loan borrowing and bond issuance from my sample companies can be seen in Figure 7. What is striking is that companies issued many bonds in 2010, 2013 and 2014 relatively to their loan borrowing. In 2011 one can see the contrary with more loans, while in the rest of the years the numbers do not deviate much from each other.

Similar to Table 5, Table 7 shows summary statistics for the bank control variables on a country wide level. Again the low, here even negative, ROAE and the high impaired loans ratio for GIIPS banks is remarkable. Compared to bank level data in Table 5 it is

Figure 4: Outstanding Volume of ECBs Purchase Programs

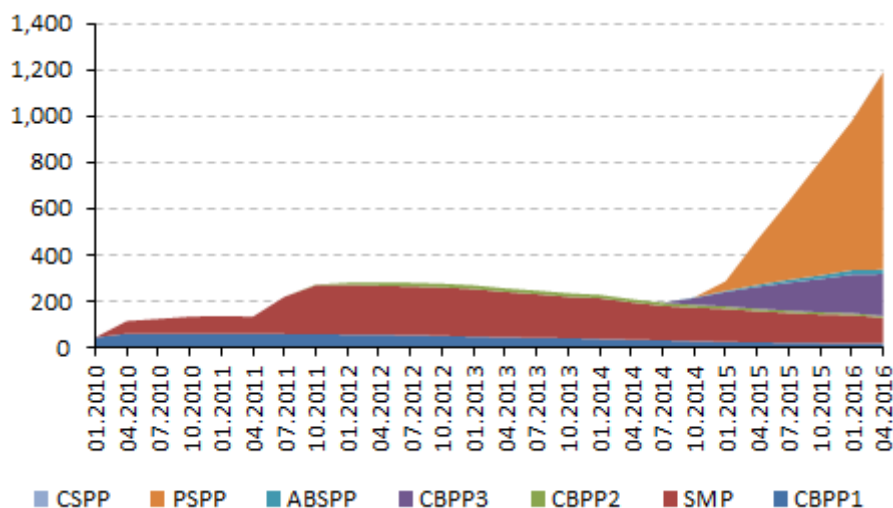


Figure 4 shows the Volume of ECBs different Purchase Programs (in EUR bn). *CBPP1* and *CBPP2* signify for the first two Covered Bond Purchase Programs. *SMP* identifies the Securities Markets Program. The extended Asset Purchase Program (*APP*) comprises the third Covered Bond Purchases Program (*CBPP3*), the Asset Backed Securities Purchase Program (*ABSPP*), the Public Sector Purchase Program (*PSPP*) and the recently introduced Corporate Sector Purchase Program (*CSPP*).

Figure 5: Share of ECBs Purchase Programs on the Total Asset Portfolio

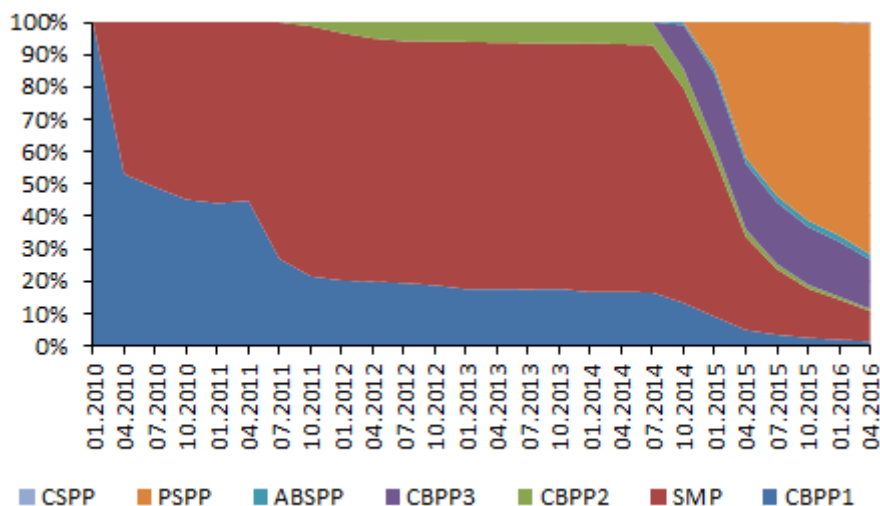


Figure 5 shows the share of ECBs different Purchase Programs on the total asset portfolio. *CBPP1* and *CBPP2* signify for the first two Covered Bond Purchase Programs. *SMP* identifies the Securities Markets Program. The extended Asset Purchase Program (*APP*) comprises the third Covered Bond Purchases Program (*CBPP3*), the Asset Backed Securities Purchase Program (*ABSPP*), the Public Sector Purchase Program (*PSPP*) and the recently introduced Corporate Sector Purchase Program (*CSPP*).



Table 5: Summary Statistics: Bank Characteristics on Individual Bank Level

Table 5 presents the summary statistics for the control variables on a individual bank level. Impaired Loans refers to the volume of impaired loans as a percentage of the gross loans. Liquid Assets refers to the volume of liquid assets, defined as cash, trading securities and interbank lending of maturities less than three months, as a percentage of total assets. Further, I distinguish between banks headquartered in a GIIPS country and banks headquartered in a Core country, referring to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Data is obtained by Bankscope.

		<u>Mean</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>S.d.</u>
		in %	in %	in %	in %	in %
<i>Panel A: All</i>	ROAE	1.62	4.45	-223.69	90.73	18.36
	Impaired Loans	8.78	6.10	0.04	53.54	8.22
	Liquid Assets	17.23	13.19	0.08	91.78	14.54
	Cost/Income	64.36	61.88	11.59	430.17	30.11
	Total Capital	15.77	14.10	-8.40	77.80	8.39
	Equity/Liabilities	8.48	6.69	-4.65	261.72	13.17
<i>Panel B: Core</i>	ROAE	2.13	5.37	-223.69	42.90	20.87
	Impaired Loans	4.07	3.30	0.04	13.17	2.89
	Liquid Assets	23.12	20.50	0.08	72.45	13.79
	Cost/Income	64.56	63.55	11.59	426.98	27.39
	Total Capital	16.43	15.50	6.90	49.25	5.47
	Equity/Liabilities	7.67	5.27	-0.08	261.72	15.00
<i>Panel C: GIIPS</i>	ROAE	0.29	3.59	-79.72	90.73	16.58
	Impaired Loans	12.44	10.38	0.08	53.54	9.11
	Liquid Assets	10.59	7.29	1.30	91.78	12.33
	Cost/Income	64.14	58.96	13.19	430.17	32.72
	Total Capital	15.23	13.50	-8.40	77.80	10.12
	Equity/Liabilities	9.40	7.91	-4.65	126.73	10.65

Table 6: Summary Statistics: Bonds and Loans

Table 6 presents the summary statistics for the bond data sample and the linked loan data. To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not received a loan, and at least one quarter, where it received a loan and did not issue a bond. Bonds and loans are further divided by the location of the borrowing firm. The label Core, refers to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Bond data comes from Thomson Reuters SDC Platinum database, while loan data is obtained by Thomson Reuters DealScan database.

	<u>No. Firms</u> units	<u>No. Issues</u> units	<u>Mean</u> USD mn	<u>Median</u> USD mn	<u>Min</u> USD mn	<u>Max</u> USD mn	<u>S.d.</u> USD mn
<i>Panel A: Bonds</i>							
All	199	827	1,322.56	640.35	5.14	14,864.26	2,072.22
Core	132	572	1,511.67	666.76	5.14	14,864.26	2,302.96
GIIPS	67	255	866.28	514.34	9.97	11,258.09	1,250.54
Austria	11	13	334.20	290.02	120.39	684.09	173.86
Belgium	14	110	2,921.95	1,018.75	13.63	14,864.26	3,747.34
France	40	226	1,706.22	785.05	5.14	10,884.02	2,140.52
Germany	47	160	650.47	562.73	30.28	2,286.69	464.74
Netherlands	20	63	787.06	750.00	40.00	2,421.14	590.03
Greece	7	34	1,847.83	177.50	25.00	11,258.09	3,157.46
Ireland	5	17	487.83	532.62	283.32	681.85	152.65
Italy	30	73	796.56	414.71	32.14	4,061.74	964.50
Portugal	4	8	480.98	551.44	64.29	779.42	241.85
Spain	21	123	829.08	558.97	9.97	3,500.00	894.69
<i>Panel B: Loans</i>							
All	199	783	683.33	131.35	3.00	80,000.00	3,811.67
Core	132	573	440.43	110.00	3.00	25,500.00	1,681.13
GIIPS	67	210	1,344.92	182.25	3.00	80,000.00	6,768.02
Austria	11	27	96.57	66.00	3.00	400.00	92.66
Belgium	14	78	835.80	75.00	3.00	25,000.00	3,171.01
France	40	152	274.47	77.63	3.00	5,000.00	528.28
Germany	47	213	304.43	103.36	10.00	2,875.00	502.75
Netherlands	20	103	755.99	300.00	13.00	25,500.00	2,611.20
Greece	7	26	7,857.18	157.40	10.33	80,000.00	17,828.07
Ireland	5	14	561.14	472.80	51.75	1,000.00	295.58
Italy	30	79	336.90	135.00	3.00	5,500.00	768.02
Portugal	4	11	274.09	320.00	10.00	600.00	213.37
Spain	21	80	508.26	297.50	7.00	5,000.00	766.35

Figure 6: Volume of Newly Issued Bonds by GIIPS Firms vs. Core Firms

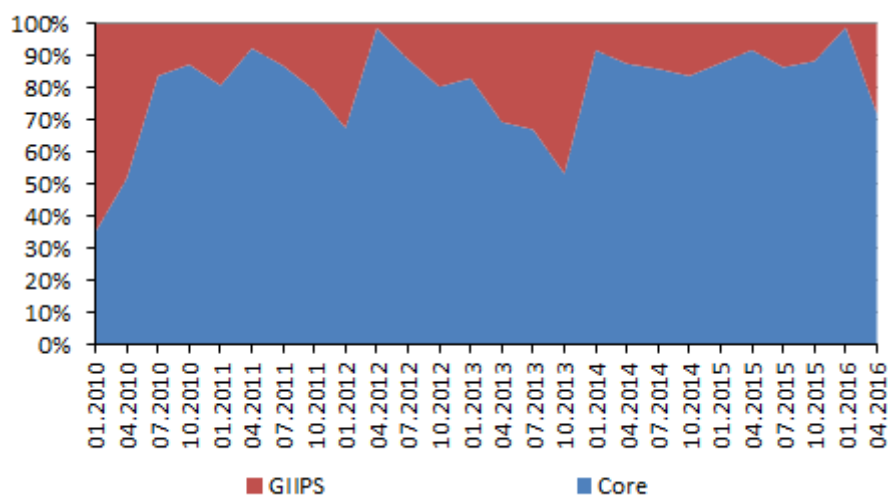


Figure 6 shows the share of newly issued bond volume from firms located in a GIIPS country and by firms located in a Core country, referring to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Bond data is obtained from Thomson Reuters SDC Platinum database.

Figure 7: Number of Loans and Bonds from European Firms

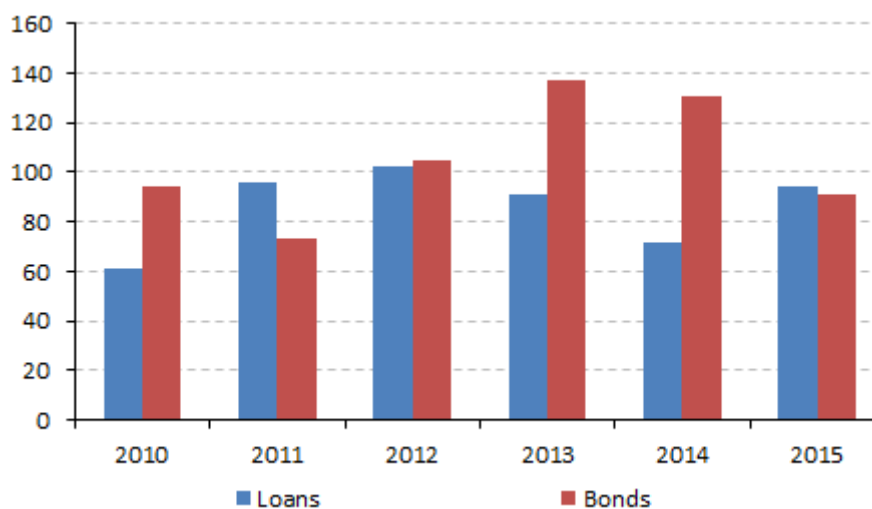


Figure 7 presents the number of syndicated loans granted to firms included in my sample and the number of bonds issued by a firm included in my sample. Companies had to use both loans and bonds for their financing operations in the period from 2010 until 2016. Loan data comes from Thomson Reuters DealScan database, while bond data comes from Thomson Reuters SDC Platinum database.

interesting to see that on a country level GIIPS banks have a higher Total Capital Ratio than Core banks. This is likely to be caused by the different measurement. The Total Capital Ratio on a bank level is computed relatively to the risk adjusted assets, while on a country level, through lack of data, total assets are the basis.

Table 7: Summary Statistics: Bank Characteristics on Country Level

Table 7 presents the summary statistics for the control variables on a country wide level. Impaired Loans refers to the volume of impaired loans as a percentage of the gross loans. Total Capital Ratio is defined as banks Total Capital as percentage of Total Assets. Further, I distinguish between banks headquartered in a GIIPS country and banks headquartered in a Core country, referring to a country sample consisting of Austria, Belgium, France, Germany and the Netherlands. Data is obtained by ECBs Statistical Warehouse.

		<u>Mean</u>	<u>Median</u>	<u>Min</u>	<u>Max</u>	<u>S.d.</u>
		in %	in %	in %	in %	in %
<i>Panel A: All</i>	ROAE	-4.23	2.33	-165.01	10.81	24.79
	Impaired Loans	7.26	4.69	1.63	34.05	6.53
	Cost/Income	63.81	62.73	33.19	135.58	13.48
	Total Capital	1.87	1.29	0.19	9.80	1.73
	Equity/Liabilities	6.27	6.22	-0.83	10.06	1.86
<i>Panel B: Core</i>	ROAE	3.28	3.47	-7.99	10.81	3.92
	Impaired Loans	3.60	3.76	1.63	6.52	1.24
	Cost/Income	67.60	67.34	57.96	93.19	6.78
	Total Capital	0.92	0.64	0.19	2.97	0.87
	Equity/Liabilities	5.36	5.14	3.67	8.10	1.24
<i>Panel C: GIIPS</i>	ROAE	-12.65	-2.18	-165.01	9.23	34.53
	Impaired Loans	10.46	8.40	2.81	24.58	6.21
	Cost/Income	59.84	59.57	33.19	135.58	17.39
	Total Capital	2.79	2.70	0.31	9.80	1.87
	Equity/Liabilities	7.08	7.31	-0.83	9.52	1.88

## 6 Empirical Results

In this section, I will report the main results of my empirical investigation. The question is whether and how the unconventional monetary policy of the ECB affected credit supply from euro zone banks to euro zone companies. One important extension to the existing literature is that I not only analyze the effect of one specific monetary instrument, but also give a comprehensive overview of all measures including the combined effects of the new TLTRO and APP. To answer this question, I use two different approaches. First, I will show the regression estimates of Equation (1) and (2), relating to the loan-to-loan method. Then, I will give the results of the loan-to-bond approach based on Equation (3) and (4). Finally, I will discuss my results and describe how economic theory can explain the outcomes.

## 6.1 Results: Loan-to-Loan Method

The main results of the loan-to-loan method are reported in Tables 8-17. After using my full sample to provide results on the overall impact of the ECB policy, I divide my sample into four different sub-samples based on the location of the lending bank and the location of the borrowing company.

This gives me the chance to distinguish between effects on the credit supply of banks from a specific region and effects on credit supply to firms from a specific region. For example, one interesting result would be, if I find that the quantitative easing had a significant positive effect on lending behavior of banks from region A, while there was no such effect for companies in region A. This would imply that the monetary policy helped banks to lend more. However, banks used the new liquidity to finance companies outside of their home region.

Compared to similar literature, my data sample is uniquely able to identify this problem because of two facts. First, by including banks and companies from both core and peripheral Europe I have access to see cross regional effects. Second, my credit data incorporates mostly large banks and firms, which are not necessarily constrained to lend and borrow in their home region.

### Full Sample

Table 8 reports the estimates for my baseline regression without time fixed effects using the full sample. While the SMP significantly increased credit supply in Europe, it decreased after the OMT announcement, both at a 0.1% significance level. A 1% larger holding of assets by the ECB through SMP resulted in a 0.132% higher credit growth.

Regardless of the type of proxy I use for the LTRO and TLTRO program, I find negative coefficients for them. In Column (3) I use dummy variables for both instruments, whereas in Column (4) I use a dummy variable for TLTRO and the country wide LTRO Uptake. The result indicates that a bank, headquartered in a country with a 1% higher country specific LTRO Uptake, had a 1.4% lower credit growth. Column (5) shows the results using the individual Uptake data and therefore should be most accurate. Again, both coefficients are negative. However, the coefficient for the LTRO is lower and the coefficient for the TLTRO is not significant, compared to previous regressions.

The APP had a significant positive effect on credit supply. Increasing the asset portfolio by 1% raised credit growth by 0.07%.

Column (7) reports the combined effect of the LTRO, TLTRO and APP. This is appropriate and moreover necessary because the ECB launched both latter measures as parts of a coherent package. I also include the three-year LTRO since both liquidity injections are closely related. One can see a slightly negative coefficient for the LTRO and the TLTRO,

Table 8: Regression Results Loan-to-Loan Method: Full Sample, without Time Fixed Effects

Table 8 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$ . Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before; (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual  $LTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before; and (i) the individual  $TLTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2011 (see lower index next to column number).  $APP$  refers to the log change in the asset volume within the Asset Purchase Program.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\begin{smallmatrix} d \\ d \end{smallmatrix}$ (3)	$\begin{smallmatrix} c \\ d \end{smallmatrix}$ (4)	$\begin{smallmatrix} i \\ i \end{smallmatrix}$ (5)	(6)	$\begin{smallmatrix} i \\ i \end{smallmatrix}$ (7)
SMP	0.132*** (5.94)						
OMT		-.133*** (-14.27)					
LTRO			-0.196*** (-17.42)	-0.014*** (-8.58)	-0.011*** (-4.89)		-0.005 (-0.00)
TLTRO			-0.023** (-2.73)	-0.045*** (-5.51)	-0.0014 (-0.45)		-0.0018 (-0.08)
APP						0.070* (2.28)	0.052 (1.42)
ROAE	0.000 (0.95)	0.000 (0.30)	-0.000 (-0.62)	0.000 (1.05)	0.000 (0.35)	-0.000 (-0.12)	0.000 (0.01)
Impaired Loans	-0.002 (-1.33)	0.004* (2.18)	0.004** (2.59)	0.005** (2.59)	-0.005* (-2.04)	0.011 (0.83)	0.020 (0.87)
Liquid Assets	0.001 (0.98)	0.003* (2.33)	0.002 (1.24)	-0.000 (-0.01)	0.004 (1.17)	-0.008 (-0.65)	0.006 (0.22)
Cost/Income	-0.001 (-1.43)	-0.001* (-2.47)	-0.000 (-0.75)	-0.000 (-1.28)	-0.001 (-1.76)	-0.001 (-0.39)	0.003 (0.30)
Total Capital	-0.006** (-3.08)	-0.001 (-0.32)	0.000 (0.24)	-0.004 (-1.88)	-0.001 (-0.28)	-0.013 (-0.92)	-0.008 (-0.24)
Equity/Liabilities	-0.005 (-1.05)	-0.007 (-1.45)	-0.008 (-1.69)	-0.008 (-1.68)	-0.009 (-1.13)	-0.002 (-0.07)	-0.014 (-0.22)
N	18189	18388	18388	18388	6368	5146	1674
$R^2$	0.009	0.019	0.027	0.015	0.020	0.011	0.007

while the coefficient for the APP is positive. However, none of them are significant at a 5% level.

Table 9 presents the same regressions including time fixed effect this time. Compared to Table 8, it is a striking that the effects of the bank specific LTRO and TLTRO Uptake are positive (see Column (5)), significantly for the LTRO.

Also, the results in Column (7) come more in favour of the ECB instruments. While the coefficient of the TLTRO is slightly negative, the coefficients for the APP and the LTRO are positive. Interestingly, in Column (6), where I only include the APP, the effect of the asset purchases is positive, but not significant. Only after also taking the LTRO and TLTRO into account the effect becomes significant.

What is also remarkable on the first sight are the relatively low  $R^2$  values for all regressions, with a maximum of 0.06 in Table 9 Column (5). However, compared to similar papers (see Acharya et al. (2016)) these low figures are not special and therefore should not be interpreted against the model.

## Core Banks

The regression results only including loans granted by banks from Core Europe can be found in Table 10 and 11. Table 10 presents the estimates without time fixed effects. Results are mostly consistent with previous outcomes for the full sample. The coefficients for all measurements of the LTRO are negative, but significantly only for the dummy variable. According to Column (5) and (6) the TLTRO and the APP had no significant effect on credit supply.

For this subsample the analysis of the combined effects of the unconventional monetary policy instruments seems not applicable. As seen in Chapter 5, only 3 Core banks reported their individual TLTRO Uptake, reducing my sample to only 153 data points (see Column (7)). This leads to a high collinearity and forces many variables to drop out. Including time fixed effects does not change the results in a remarkable way (see Table 11).

## Core Companies

Table 12 shows the estimates for the subsample including loans received by companies located in Core Europe. Results for SMP and OMT are in line with previous outcomes, whereas the negative effect of the LTRO here is stronger pronounced than in the subsample of Core Banks. Column (3)-(5) indicate a highly significant negative effect of the LTRO on the credit supply to firms in Core Europe regardless of the proxy. Mixed results are obtained for the TLTRO. While the dummy variable shows a highly significant negative

Table 9: Regression Results Loan-to-Loan Method: Full Sample, with Time Fixed Effects

Table 9 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $\theta_t$  is a time varying fixed effect,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program.  $t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> / <sub>d</sub> (3)	<sup>c</sup> / <sub>d</sub> (4)	<sup>i</sup> / <sub>i</sub> (5)	(6)	<sup>i</sup> / <sub>i</sub> (7)
SMP	2.091*** (12.13)						
OMT		-0.698*** (-19.02)					
LTRO			-0.582*** (-15.93)	0.005* (2.30)	0.006* (1.97)		0.171 (0.09)
TLTRO			-0.116*** (-5.53)	-0.717*** (-19.05)	0.005 (1.10)		-0.006 (-0.25)
APP						0.074 (1.90)	0.097* (2.14)
ROAE	-0.000 (-0.88)	-0.000 (-1.09)	-0.000 (-1.09)	-0.000 (-1.11)	-0.000 (-0.32)	-0.000 (-0.10)	0.002 (0.44)
Impaired Loans	0.004* (2.45)	0.005** (3.17)	0.005** (3.17)	0.004* (2.02)	0.002 (0.87)	0.011 (0.79)	0.019 (0.84)
Liquid Assets	0.002 (1.51)	0.002 (1.73)	0.002 (1.73)	0.002* (2.00)	-0.001 (-0.24)	-0.007 (-0.61)	0.001 (0.05)
Cost/Income	-0.000 (-0.36)	-0.000 (-0.25)	-0.000 (-0.25)	-0.000 (-0.41)	0.001 (1.32)	-0.001 (-0.32)	0.008 (0.75)
Total Capital	0.002 (0.88)	0.003 (1.67)	0.003 (1.67)	0.003 (1.60)	0.005 (0.89)	-0.012 (-0.82)	0.004 (0.13)
Equity/Liabilities	-0.004 (-0.85)	-0.006 (-1.22)	-0.006 (-1.22)	-0.004 (-0.80)	-0.005 (-0.64)	-0.001 (-0.02)	-0.014 (-0.21)
N	18189	18388	18388	18388	6368	5146	1674
R <sup>2</sup>	0.027	0.042	0.042	0.042	0.060	0.011	0.011



Table 10: Regression Results Loan-to-Loan Method: Core Banks, without Time Fixed Effects

Table 10 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before; (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual  $LTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the first  $TLTRO$  program, and zero before; and (i) the individual  $TLTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number).  $APP$  refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans from banks headquartered in Austria, Belgium, France, Germany and the Netherlands.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\overset{d}{d}$ (3)	$\overset{c}{d}$ (4)	$\overset{i}{i}$ (5)	(6)	$\overset{i}{i}$ (7)
SMP	0.121*** (3.68)						
OMT		-0.140*** (-9.57)					
LTRO			-0.218*** (-13.41)	-0.008 (-1.87)	-0.034 (-0.95)		x
TLTRO			-0.009 (-0.74)	-0.038** (-3.12)	0.055 (0.72)		x
APP						0.112 (1.37)	-1.695 (-1.60)
ROAE	0.001 (1.13)	-0.000 (-0.34)	-0.001 (-1.23)	0.001 (0.88)	-0.008 (-1.29)	0.001 (0.18)	x
Impaired Loans	0.002 (0.31)	0.0134 (1.69)	0.014 (1.85)	-0.002 (-0.29)	0.050 (0.73)	0.057 (0.89)	x
Liquid Assets	0.001 (0.43)	0.004* (2.17)	0.003 (1.44)	-0.001 (-0.54)	0.009 (0.35)	-0.001 (-0.09)	-12.19 (-0.79)
Cost/Income	-0.001 (-0.97)	-0.001 (-1.10)	0.000 (0.14)	-0.001 (-1.19)	0.011 (1.18)	-0.000 (-0.02)	x
Total Capital	-0.004 (-1.33)	0.001 (0.24)	0.001 (0.26)	-0.004 (-1.34)	0.040 (0.93)	-0.004 (-0.13)	-10.72 (-1.11)
Equity/Liabilities	-0.043*** (-4.32)	-0.016 (-1.47)	-0.020 (-1.79)	-0.043*** (-3.92)	-0.115 (-0.45)	0.091 (0.91)	-79.59 (-1.53)
N	10846	10958	10958	10958	558	3085	153
$R^2$	0.009	0.018	0.027	0.110	0.036	0.009	0.034

Table 11: Regression Results Loan-to-Loan Method: Core Banks, with Time Fixed Effects

Table 11 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $\theta_t$  is a time varying fixed effect,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans from banks headquartered in Austria, Belgium, France, Germany and the Netherlands.  $t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> / <sub>d</sub> (3)	<sup>c</sup> / <sub>d</sub> (4)	<sup>i</sup> / <sub>i</sub> (5)	(6)	<sup>i</sup> / <sub>i</sub> (7)
SMP	1.948*** (7.44)						
OMT		-0.677*** (-12.47)					
LTRO			-0.587*** (-10.97)	0.006 (1.20)	10.57 (0.00)		x
TLTRO			-0.090** (-2.96)	-0.680*** (-12.51)	0.055 (0.00)		x
APP						0.059 (0.48)	-1.695 (-1.60)
ROAE	-0.001 (-1.13)	-0.001 (-1.59)	-0.001 (-1.59)	-0.001 (-1.61)	-0.943 (-0.00)	0.001 (0.13)	x
Impaired Loans	0.013 (1.64)	0.014 (1.75)	0.014 (1.75)	0.012 (1.40)	-7.837 (-0.00)	0.065 (0.99)	x
Liquid Assets	0.003 (1.49)	0.004* (1.99)	0.004* (1.99)	0.004* (2.18)	-4.303 (-0.00)	-0.004 (-0.23)	-12.19 (-0.79)
Cost/Income	0.000 (0.23)	0.000 (0.19)	0.000 (0.19)	0.000 (0.26)	0.167 (0.00)	-0.004 (-0.30)	x
Total Capital	0.004 (1.09)	0.005 (1.36)	0.005 (1.36)	0.005 (1.46)	-4.023 (-0.00)	-0.018 (-0.42)	-10.72 (-1.11)
Equity/Liabilities	-0.008 (-0.63)	-0.008 (-0.62)	-0.008 (-0.62)	-0.009 (-0.73)	-1.638 (-0.03)	0.062 (0.54)	-79.59 (-1.53)
N	10846	10958	10958	10958	558	3085	153
R <sup>2</sup>	0.027	0.039	0.039	0.040	0.075	0.009	0.034

effect, the individual Uptake indicates no significant effect. Also the APP in Column (6) has no significant effect. Looking at the combined effects, there is no clear evidence for the effectiveness of ECBs new measures.

Controlling for unobserved time varying effects leads to positive, however, not significant results for the country wide LTRO Uptake as well as for the bank specific LTRO and TLTRO Uptake (see Table 13 Column (4) and (5)). The rest of outcomes are in line with Table 12.

### **GIIPS Banks**

Now, I turn the analysis to the peripheral European samples. In Table 14 results are reported for credit supply provided by GIIPS banks without including time fixed effects. I find a highly significant negative effect for all LTRO proxies in the single instrument analysis (Column (3)-(5)). Also the coefficients for the TLTRO Uptake are all negative, significantly for the dummy variable (Column (3) and (4)), not significant for the bank specific Uptake (Column (5)).

The analysis of the combined effects show no significant results.

Including time fixed effects improves results, especially for the APP (see Table 15). Both coefficients for the APP are positive and significant at a 5% level. Also the effect of the individual LTRO Uptake is significantly positive.

### **GIIPS Companies**

Finally, I want to complete the loan-to-loan method with the analysis of the effects of ECBs unconventional monetary policy on credit supply to firms located in GIIPS countries. Remark that reducing financial constraints for this group of firms was one of the main targets of the central bank.

Results for the analysis without time fixed effects can be seen in Table 16. Again, similar to the other groups, I find significant positive effects of the SMP and negative effects of the OMT in the single instrument analysis, while all LTRO proxies indicate a negative outcome with a low significance level. Column (5) implies that a 1% higher LTRO Uptake decreased credit supply to GIIPS firms by 0.8%. Contrary, the bank specific TLTRO Uptake had a not significant, but positive effect.

For the first time in my single instrument analysis I find a highly significant effect of the APP (see Column (6)). Increasing the asset holdings in this program by 1% led to 0.12% higher credit supply. This positive effect of the APP continues in the multi instrument analysis and the effect even increases. Also the coefficient of the TLTRO Uptake remains positive, while the LTRO Uptake stays negative, both statistically not significant. Including time fixed effects increases the effect of the APP even more. Further, the effect

Table 12: Regression Results Loan-to-Loan Method: Core Companies, without Time Fixed Effects

Table 12 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans borrowed by firms headquartered in Austria, Belgium, France, Germany and the Netherlands.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> <sub>d</sub> (3)	<sup>c</sup> <sub>d</sub> (4)	<sup>i</sup> <sub>i</sub> (5)	(6)	<sup>i</sup> <sub>i</sub> (7)
SMP	0.166*** (5.32)						
OMT		-0.148*** (-11.27)					
LTRO			-0.214*** (-13.80)	-0.015*** (-5.81)	-0.018*** (-4.02)		-0.028 (-0.58)
TLTRO			-0.034** (-2.97)	-0.057*** (-4.96)	-0.005 (-0.94)		0.040 (0.59)
APP						0.050 (0.88)	-0.077 (-1.00)
ROAE	0.000 (0.74)	-0.000 (-0.43)	-0.000 (-1.16)	0.000 (0.34)	0.000 (0.25)	0.000 (0.02)	-0.006 (-0.81)
Impaired Loans	0.002 (0.46)	0.010** (2.67)	0.011** (2.92)	0.012** (2.95)	0.000 (0.03)	0.019 (0.52)	0.048 (1.09)
Liquid Assets	-0.001 (-0.73)	0.0008 (0.46)	-0.001 (-0.73)	-0.003 (-1.84)	-0.001 (-0.13)	-0.004 (-0.26)	0.028 (0.43)
Cost/Income	-0.001 (-0.81)	-0.001 (-1.12)	0.000 (0.50)	-0.000 (-0.29)	0.000 (0.50)	0.001 (0.13)	-0.015 (-0.54)
Total Capital	-0.004 (-1.35)	0.002 (0.75)	0.003 (1.07)	-0.004 (-1.24)	-0.001 (-0.09)	0.005 (0.17)	-0.027 (-0.47)
Equity/Liabilities	-0.026** (-3.07)	-0.016 (-1.95)	-0.017 (-1.91)	-0.023* (-2.56)	0.006 (0.45)	0.018 (0.23)	-0.016 (-0.13)
N	10238	10341	10341	10341	2897	2864	786
R <sup>2</sup>	0.012	0.022	0.031	0.017	0.020	0.011	0.009

Table 13: Regression Results Loan-to-Loan Method: Core Companies, with Time Fixed Effects

Table 13 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $\theta_t$  is a time varying fixed effect,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans borrowed by firms headquartered in Austria, Belgium, France, Germany and the Netherlands.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\frac{d}{d}$ (3)	$\frac{c}{d}$ (4)	$\frac{i}{i}$ (5)	(6)	$\frac{i}{i}$ (7)
SMP	1.749*** (6.97)						
OMT		-0.625*** (-11.92)					
LTRO			-0.492*** (-9.47)	0.005 (1.64)	0.009 (1.30)		0.003 (0.06)
TLTRO			-0.133*** (-4.59)	-0.640*** (-12.03)	0.003 (0.44)		-0.021 (-0.28)
APP						0.010 (0.14)	-0.004 (-0.04)
ROAE	-0.000 (-0.72)	-0.001 (-1.25)	-0.001 (-1.25)	-0.001 (-1.21)	-0.000 (-0.05)	-0.000 (-0.01)	-0.001 (-0.06)
Impaired Loans	0.010* (2.57)	0.012** (3.01)	0.012** (3.01)	0.009* (2.13)	0.010 (1.86)	0.024 (0.63)	0.032 (0.72)
Liquid Assets	-0.001 (-0.74)	-0.001 (-0.35)	-0.001 (-0.35)	-0.000 (-0.03)	-0.008 (-1.48)	-0.006 (-0.35)	-0.003 (-0.05)
Cost/Income	0.001 (0.69)	0.001 (0.70)	0.001 (0.70)	0.000 (0.54)	0.003 (1.36)	-0.000 (-0.06)	0.006 (0.21)
Total Capital	0.007* (2.01)	0.008* (2.31)	0.008* (2.31)	0.008* (2.40)	0.003 (0.38)	-0.003 (-0.10)	-0.002 (-0.04)
Equity/Liabilities	-0.011 (-1.25)	-0.013 (-1.40)	-0.013 (-1.40)	-0.011 (-1.21)	0.007 (0.54)	0.006 (0.07)	0.036 (0.30)
N	10238	10341	10341	10341	2897	2864	786
$R^2$	0.033	0.044	0.044	0.044	0.058	0.012	0.017

Table 14: Regression Results Loan-to-Loan Method: GIIPS Banks, without Time Fixed Effects

Table 14 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before; (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual  $LTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before; and (i) the individual  $TLTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number).  $APP$  refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans from banks headquartered in Greece, Ireland, Italy, Portugal and Spain.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\begin{smallmatrix} d \\ d \end{smallmatrix}$ (3)	$\begin{smallmatrix} c \\ d \end{smallmatrix}$ (4)	$\begin{smallmatrix} i \\ i \end{smallmatrix}$ (5)	(6)	$\begin{smallmatrix} i \\ i \end{smallmatrix}$ (7)
SMP	0.084** (2.91)						
OMT		-0.111*** (-8.21)					
LTRO			-0.158*** (-9.95)	-0.015*** (-9.41)	-0.010*** (-4.64)		-0.769 (-0.33)
TLTRO			-0.028* (-2.34)	-0.028* (-2.29)	-0.001 (-0.45)		-0.003 (-0.11)
APP						0.046 (1.76)	0.053 (1.41)
ROAE	0.000 (0.26)	0.000 (0.77)	0.000 (0.33)	0.000 (0.52)	0.000 (0.39)	-0.000 (-0.12)	-0.000 (-0.10)
Impaired Loans	-0.005*** (-3.36)	0.001 (0.75)	0.002 (1.22)	0.003 (1.65)	-0.005 (-1.87)	0.012 (1.28)	0.022 (0.93)
Liquid Assets	0.001 (0.57)	0.001 (0.82)	0.0001 (0.60)	0.001 (0.63)	0.002 (0.50)	-0.011 (-0.60)	0.017 (0.50)
Cost/Income	-0.001 (-1.46)	-0.001 (-1.88)	-0.000 (-0.90)	-0.000 (-1.15)	-0.002 (-1.79)	-0.001 (-0.32)	0.003 (0.25)
Total Capital	-0.007** (-3.09)	-0.003 (-1.40)	-0.001 (-0.59)	-0.001 (-0.45)	-0.001 (-0.18)	-0.014 (-0.89)	-0.026 (-0.60)
Equity/Liabilities	0.011* (2.33)	0.002 (0.31)	0.000 (0.02)	-0.002 (-0.35)	-0.009 (-1.00)	-0.021 (-0.78)	-0.002 (-0.03)
N	7343	7430	7430	7430	5810	2061	1521
$R^2$	0.016	0.025	0.031	0.030	0.020	0.024	0.008

Table 15: Regression Results Loan-to-Loan Method: GIIPS Banks, with Time Fixed Effects

Table 15 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $\theta_t$  is a time varying fixed effect,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans from banks headquartered in Greece, Ireland, Italy, Portugal and Spain.  $t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> / <sub>d</sub> (3)	<sup>c</sup> / <sub>d</sub> (4)	<sup>i</sup> / <sub>i</sub> (5)	(6)	<sup>i</sup> / <sub>i</sub> (7)
SMP	2.192*** (9.87)						
OMT		-0.716*** (-14.81)					
LTRO			-0.570*** (-11.74)	-0.000 (-0.02)	0.006* (1.98)		-0.579 (-0.25)
TLTRO			-0.147*** (-5.19)	-0.715*** (-7.81)	0.005 (1.19)		-0.005 (-0.20)
APP						0.084* (2.57)	0.102* (2.18)
ROAE	-0.000 (-0.04)	0.000 (0.17)	0.000 (0.17)	0.000 (0.17)	-0.000 (-0.47)	-0.000 (-0.10)	0.001 (0.29)
Impaired Loans	0.002 (0.86)	0.004* (2.04)	0.004* (2.04)	0.004* (2.00)	0.002 (0.81)	0.011 (1.20)	0.021 (0.90)
Liquid Assets	0.001 (0.83)	0.001 (0.58)	0.001 (0.58)	0.001 (0.58)	0.001 (0.21)	-0.007 (-0.36)	0.012 (0.36)
Cost/Income	-0.000 (-0.54)	-0.000 (-0.10)	-0.000 (-0.10)	-0.000 (-0.10)	0.001 (1.18)	-0.000 (-0.11)	0.007 (0.65)
Total Capital	-0.002 (-0.94)	0.000 (0.09)	0.000 (0.09)	0.000 (0.09)	0.005 (0.95)	-0.009 (-0.61)	-0.015 (-0.34)
Equity/Liabilities	0.004 (0.88)	0.001 (0.12)	0.001 (0.12)	0.001 (0.11)	-0.006 (-0.71)	-0.017 (-0.62)	-0.001 (-0.02)
N	7343	7430	7430	7430	5810	2061	1521
R <sup>2</sup>	0.035	0.055	0.055	0.055	0.061	0.027	0.011

Table 16: Regression Results Loan-to-Loan Method: GIIPS Companies, without Time Fixed Effects

Table 16 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry. SMP refers to the log change in the asset volume within the Securities Markets Program. OMT is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before. LTRO proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year LTRO program, and zero before; (c) the country-wide LTRO Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual LTRO Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number). TLTRO proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the TLTRO program, and zero before; and (i) the individual TLTRO Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number). APP refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans borrowed by firms headquartered in Greece, Ireland, Italy, Portugal and Spain.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\overset{d}{d}$ (3)	$\overset{c}{d}$ (4)	$\overset{i}{i}$ (5)	(6)	$\overset{i}{i}$ (7)
SMP	0.069* (2.19)						
OMT		-0.111*** (-7.99)					
LTRO			-0.174*** (-10.48)	-0.014*** (-6.69)	-0.008** (-3.17)		-0.704 (-0.33)
TLTRO			-0.007 (-0.58)	-0.024 (-1.95)	0.002 (0.45)		0.013 (0.59)
APP						0.121*** (3.46)	0.144*** (3.62)
ROAE	0.000 (0.53)	0.000 (0.76)	0.000 (0.11)	0.000 (0.91)	0.001 (0.79)	-0.000 (-0.21)	0.003 (0.81)
Impaired Loans	-0.004* (-2.52)	0.001 (0.52)	0.001 (0.76)	0.002 (1.02)	-0.007* (-2.49)	0.010 (0.86)	0.004 (0.15)
Liquid Assets	0.003 (1.94)	0.005** (2.65)	0.004* (2.12)	0.002 (1.40)	0.010 (1.82)	-0.013 (-0.85)	0.013 (0.43)
Cost/Income	-0.001 (-1.55)	-0.001* (-2.24)	-0.001 (-1.17)	-0.001 (-1.40)	-0.002 (-1.72)	-0.001 (-0.19)	0.004 (0.49)
Total Capital	-0.007** (-3.04)	-0.004 (-1.49)	-0.002 (-0.92)	-0.004 (-1.50)	-0.004 (-0.57)	-0.027 (-1.77)	-0.032 (-0.85)
Equity/Liabilities	0.007 (1.36)	0.001 (0.23)	-0.001 (-0.19)	-0.001 (-0.21)	-0.022* (-2.00)	0.002 (0.05)	-0.034 (-0.46)
N	7951	8047	8047	8047	3471	2282	888
$R^2$	0.011	0.019	0.026	0.018	0.027	0.028	0.038



of the country-wide and bank specific LTRO Uptake becomes insignificantly positive in the single instrument analysis but remains negative in combination with the APP (see Table 17).

## 6.2 Results: Loan-to-Bond Method

In this part I want to report the outcomes of the alternative approach of measuring credit supply, the loan-to-bond method. As a recall, this approach uses an index variable tracking the corporate debt choice between bonds and loans. A positive coefficient implies that the variable increased the incentive of a firm to borrow money thorough a loan instead of issuing a bond. This can be interpreted as a higher credit supply provided by banks. As a consequence, by breaking up my previous bank-firm relationship and focusing on the credit choise of companies I am not able to analyze the effects on credit supply provided by banks of a specific region anymore. Therefore, I will start by investigating the overall effects of the ECBs unconventional monetary policy and then analyze the different impact in core and peripheral Europe.

Next, I include time fixed effects to control for any unobserved time-varying characteristic shared by all firms.

One problem of my analysis was the lack of data points, resulting in errors, if I included the APP as a explanatory variable. Hence, I decided to not include this variable in my further analysis.

### Full Sample

Table 18 presents the results of my baseline regression using the full data sample without including time fixed effects. Column (1) exhibits a significantly positive effect of the SMP, whereas Column (2) indicates a lower credit supply after the OMT program announcement. In Column (3) I used dummy variables for the LTRO and the TLTRO, while Column (4) shows the effect if the country wide LTRO Uptake. Both regressions imply a positive, but not significant impact. Results for the regressions including unobserved time varying effects are shown in Table 19. From the sample of independent variables only the TLTRO dummy has a significant positive effect in one regression. However, since the coefficient of this variable is insignificant in another regression, it should not be interpreted as a robust result. Contrary to the previous table, after including time fixed effects the coefficient of the SMP is significantly negative.

Table 17: Regression Results Loan-to-Loan Method: GIIPS Companies, with Time Fixed Effects

Table 17 presents results of the following OLS regression:  $\Delta Loan_{bmt} = \alpha_m + \gamma_b + \theta_t + \beta * MP_t + \delta * Z_{bt-1} + \varepsilon_{bmt}$  Where  $\Delta Loan_{bmt}$  is the quarter-to-quarter change in loan exposure from bank  $b$  to firm-cluster  $m$ ,  $\alpha_m$  is a time-invariant fixed effect of firm-cluster  $m$ ,  $\gamma_b$  is a bank fixed effect of bank  $b$ ,  $\theta_t$  is a time varying fixed effect,  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{bt}$ ,  $TLTRO_{bt}$  and  $APP_t$ .  $Z_{bt-1}$  is a comprehensive set of bank-specific control variables. The coefficient of interest for my research question is the  $\beta$ .

The unit of observation is a firm-cluster-bank quarter, where firms are clustered based on their country and industry.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before; (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011; and (i) the individual  $LTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before; and (i) the individual  $TLTRO$  Uptake of bank  $b$  as percentage of its total assets by end 2014 (see lower index next to column number).  $APP$  refers to the log change in the asset volume within the Asset Purchase Program. Sample is restricted to loans borrowed by firms headquartered in Greece, Ireland, Italy, Portugal and Spain.

$t$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	$\frac{d}{d}$ (3)	$\frac{c}{d}$ (4)	$\frac{i}{i}$ (5)	(6)	$\frac{i}{i}$ (7)
SMP	2.463* (10.47)						
OMT		-0.771*** (-15.07)					
LTRO			-0.678*** (-13.25)	0.002 (0.60)	0.006 (1.54)		-0.304 (-0.14)
TLTRO			-0.093** (-3.10)	-0.781*** (-14.48)	0.008 (1.34)		0.026 (1.10)
APP						0.165*** (3.78)	0.199*** (4.08)
ROAE	-0.000 (-0.43)	-0.000 (-0.31)	-0.000 (-0.31)	-0.000 (-0.33)	-0.000 (-0.12)	-0.000 (-0.16)	0.004 (1.06)
Impaired Loans	0.001 (0.41)	0.003 (1.25)	0.003 (1.25)	0.002 (0.93)	0.001 (0.35)	0.008 (0.67)	0.001 (0.06)
Liquid Assets	0.004* (2.53)	0.004* (2.39)	0.004* (2.39)	0.004* (2.44)	0.006 (1.10)	-0.011 (-0.69)	0.007 (0.21)
Cost/Income	-0.000 (-0.81)	-0.000 (-0.55)	-0.000 (-0.55)	-0.000 (-0.57)	0.001 (1.07)	-0.000 (-0.00)	0.007 (0.73)
Total Capital	-0.003 (-1.08)	-0.001 (-0.20)	-0.001 (-0.20)	-0.001 (-0.25)	0.005 (0.80)	-0.022 (-1.41)	-0.025 (-0.66)
Equity/Liabilities	0.004 (0.66)	0.001 (0.19)	0.001 (0.19)	0.002 (0.30)	-0.010 (-0.91)	0.009 (0.26)	-0.033 (-0.44)
N	7951	8047	8047	8047	3471	2282	888
$R^2$	0.034	0.055	0.055	0.055	0.090	0.028	0.044

Table 18: Regression Results Loan-to-Bond Method: Full Sample, without Time Fixed Effects

Table 18 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$  and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	1.419* (1.99)			
OMT		-0.157 (-0.59)		
LTRO			0.181 (0.73)	0.040 (0.79)
TLTRO			0.566 (1.68)	0.585 (1.73)
ROAE	-0.006 (-0.23)	-0.003 (-0.11)	0.006 (0.24)	0.007 (0.26)
Impaired Loans	0.014 (0.24)	-0.020 (-0.40)	-0.043 (-0.83)	-0.072 (-1.08)
Cost/Income	0.046 (1.69)	0.040 (1.72)	0.042 (1.85)	0.050* (2.06)
Total Capital	-1.574** (-2.70)	-1.346* (-2.40)	-1.766** (-3.21)	-1.889** (-3.06)
Equity/Liabilities	-0.148 (-0.66)	-0.271 (-1.01)	-0.645* (-2.44)	-0.598* (-2.37)
N	566	659	659	659

Table 19: Regression Results Loan-to-Bond Method: Full Sample, with Time Fixed Effects

Table 19 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}{1 + exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$ ,  $\theta_t$  is a time varying fixed effect and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction Program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	-8.089*			
	(-2.00)			
OMT		1.305		
		(1.67)		
LTRO			-0.308	0.061
			(-0.42)	(1.01)
TLTRO			1.613**	1.247
			(2.68)	(1.58)
ROAE	-0.012	-0.011	-0.011	-0.007
	(-0.44)	(-0.39)	(-0.39)	(-0.26)
Impaired Loans	-0.028	-0.042	-0.042	-0.088
	(-0.48)	(-0.85)	(-0.85)	(-1.29)
Cost/Income	0.033	0.033	0.033	0.039
	(1.18)	(1.33)	(1.33)	(1.54)
Total Capital	-1.757**	-1.628**	-1.628**	-1.960**
	(-2.58)	(-2.60)	(-2.60)	(-2.72)
Equity/Liabilities	-0.054	-0.204	-0.204	-0.204
	(-0.15)	(-0.56)	(-0.56)	(-0.55)
N	566	659	659	659

### **Core Companies**

The outcomes for the analysis of the credit choice of Core European firms is stated in Table 20. I find significant positive effects for the country wide LTRO Uptake (see Column 4), implying that a firm located in a country with relatively high LTRO Uptake was more likely to borrow money through a loan.

The significant positive impact of the LTRO Uptake remains after including time fixed effects. The rest of the outcomes stays not significant.

### **GIIPS Companies**

The not observable impact of the unconventional monetary policy on firms credit choice continues after focusing on the GIIPS sample. In Table 22 none of the outcomes of the policy variables are statistically significant. Correcting for time fixed effects does not help much. Only the TLTRO dummy increased credit supply significantly in one regression (see Column 3), while in the other regression the result is insignificantly positive (see Column 4).

### **Summary Results**

In general, while the loan-to-bond approach seems to barely work with my data sample, the outcomes of my empirical analysis using the loan-to-loan method can be summarized as follows:

- (i.) In all samples, analyzing the single effect of the policy instruments, results show positive effects of the SMP and negative effects for the OMT as well as for the LTRO and TLTRO dummy variables, very often highly significant.
- (ii.) In all samples, looking at the single instruments analysis without time fixed effects, the country specific LTRO Uptake and the bank specific Uptake had a negative effect on credit supply, changing to a positive effect, in some cases significantly, after correcting for time fixed effects. This also shows that the country specific LTRO Uptake is an appropriate alternative.
- (iii.) Investigating for the combined effects of the instruments, only the APP seems to have had a significant positive impact on credit supply from GIIPS Banks and especially to GIIPS companies. Contrary, there is no evidence for any effect of the individual TLTRO.

Table 20: Regression Results Loan-to-Bond Method: Core Companies, without Time Fixed Effects

Table 20 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$  and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before. Sample is restricted to loans borrowed by firms headquartered in Austria, Belgium, France, Germany and the Netherlands.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	1.461 (1.65)			
OMT		0.007 (0.02)		
LTRO			0.293 (0.95)	0.246* (2.17)
TLTRO			0.258 (0.58)	0.134 (0.30)
ROAE	0.117 (0.82)	0.024 (0.24)	0.030 (0.26)	-0.023 (-0.19)
Impaired Loans	0.650 (1.23)	0.134 (0.32)	0.191 (0.44)	-0.448 (-0.85)
Cost/Income	0.118 (1.32)	0.029 (0.47)	0.025 (0.35)	0.002 (0.03)
Total Capital	-4.249 (-1.72)	-5.890* (-2.32)	-5.838* (-2.23)	-11.17** (-2.89)
Equity/Liabilities	-0.114 (-0.28)	-0.100 (-0.22)	-0.367 (-0.73)	0.065 (0.12)
N	392	469	469	469

Table 21: Regression Results Loan-to-Bond Method: Core Companies, with Time Fixed Effects

Table 21 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$ ,  $\theta_t$  is a time varying fixed effect and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011.  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before. Sample is restricted to loans borrowed by firms headquartered in Austria, Belgium, France, Germany and the Netherlands.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	-4.391 (-0.55)			
OMT		-0.411 (-0.31)		
LTRO			-0.847 (-0.75)	0.280* (2.21)
TLTRO			0.436 (0.55)	-0.544 (-0.42)
ROAE	-0.000 (-0.00)	-0.025 (-0.12)	-0.025 (-0.12)	-0.086 (-0.38)
Impaired Loans	0.806 (1.28)	0.316 (0.65)	0.316 (0.65)	-0.434 (-0.72)
Cost/Income	0.096 (0.77)	0.007 (0.07)	0.007 (0.07)	-0.026 (-0.25)
Total Capital	-3.757 (-1.41)	-5.571* (-2.11)	-5.571* (-2.11)	-12.18** (-2.88)
Equity/Liabilities	-0.024 (-0.02)	0.261 (0.20)	0.261 (0.20)	0.543 (0.41)
N	392	469	469	469

Table 22: Regression Results Loan-to-Bond Method: GIIPS Companies, without Time Fixed Effects

Table 22 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$  and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before. Sample is restricted to loans received by firms headquartered in Greece, Ireland, Italy, Portugal and Spain.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	1.433 (0.95)			
OMT		-1.081 (-1.47)		
LTRO			0.352 (0.52)	0.020 (0.27)
TLTRO			1.215 (1.50)	1.233 (1.52)
ROAE	0.006 (0.20)	-0.000 (-0.00)	0.002 (0.05)	-0.001 (-0.05)
Impaired Loans	0.002 (0.04)	0.013 (0.20)	-0.111 (-1.51)	-0.112 (-1.23)
Cost/Income	0.051 (1.39)	0.043 (1.09)	0.067 (1.87)	0.067 (1.83)
Total Capital	-1.264* (-1.99)	-0.283 (-0.36)	-1.805* (-2.42)	-1.715* (-2.33)
Equity/Liabilities	-0.296 (-0.76)	-0.306 (-0.82)	-0.583 (-1.40)	-0.578 (-1.35)
N	174	190	190	190



Table 23: Regression Results Loan-to-Bond Method: GIIPS Companies, with Time Fixed Effects

Table 23 presents results of the following logit regression:  $Prob(L_{it} = 1) = \frac{\exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}{1 + \exp(\alpha_i + \lambda_c + \theta_t + \beta * MP + \delta * Z_{ct-1})}$ . Where  $\alpha_i$  is a time-invariant fixed effect of firm  $i$ ,  $\lambda_c$  is a country fixed effect of banks in country  $c$ ,  $\theta_t$  is a time varying fixed effect and  $MP$  is a set of monetary policy instruments, including  $OMT_t$ ,  $SMP_t$ ,  $LTRO_{ct}$  and  $TLTRO_{ct}$ .  $Z_{ct-1}$  is a comprehensive set of bank control variables measuring the conditions of the financial sector in the home country of firm  $i$ . The coefficient of interest for my research question is the  $\beta$ .

The dependent variable  $L_{it}$  equals 1 if firm  $i$  receives a loan in quarter  $t$  and 0 if firm  $i$  issues a bond in quarter  $t$ . To be included in my sample, a firm had to have at least one quarter between 2010 and 2016, where it issued a bond and did not receive a loan, and at least one quarter, where it received a loan and did not issue a bond.

The unit of observation is a firm quarter.  $SMP$  refers to the log change in the asset volume within the Securities Markets Program.  $OMT$  is a dummy variable equal to one after the announcement of the Outright Monetary Transaction program and zero before.  $LTRO$  proxies the effect of the three-year Longer-term Refinancing Operations using (d) a dummy variable, which equals one after the start of the three-year  $LTRO$  program, and zero before and (c) the country-wide  $LTRO$  Uptake, defined as the total amount that was borrowed from banks headquartered in the home country of bank  $b$  as percentage of the total assets in that country by end 2011 (see upper index next to column number).  $TLTRO$  proxies the effect of the first Targeted Longer-term Refinancing Operations using a dummy variable, which equals one after the start of the  $TLTRO$  program, and zero before. Sample is restricted to loans received by firms headquartered in Greece, Ireland, Italy, Portugal and Spain.

$z$ -statistics are reported in parentheses. Significance level: \* ( $p < 0.05$ ), \*\* ( $p < 0.01$ ), \*\*\* ( $p < 0.001$ ).

	(1)	(2)	<sup>d</sup> (3)	<sup>c</sup> (4)
SMP	-21.30 (-1.12)			
OMT		3.471 (1.20)		
LTRO			-0.298 (-0.12)	-0.155 (-0.32)
TLTRO			3.769* (2.22)	5.150 (0.85)
ROAE	0.033 (0.72)	0.038 (0.82)	0.038 (0.82)	0.046 (0.88)
Impaired Loans	-0.071 (-0.49)	-0.021 (-0.15)	-0.021 (-0.15)	0.032 (0.15)
Cost/Income	0.037 (0.76)	0.017 (0.38)	0.017 (0.38)	0.020 (0.44)
Total Capital	-2.220 (-1.00)	-1.228 (-0.68)	-1.228 (-0.68)	-1.471 (-0.75)
Equity/Liabilities	0.184 (0.40)	0.121 (0.25)	0.121 (0.25)	-0.057 (-0.08)
N	174	190	190	190

### 6.3 Transmission Channels of ECBs Unconventional Monetary Policy

In this section I want to discuss the results of my regression analysis and show how economical theory can explain the outcomes. To do so, first, I will present the two main transmission channels of monetary policy: the direct pass-through channel and the portfolio balancing channel. I will explain how ECBs unconventional monetary policy instruments could affect bank lending through these channels and what evidence can be found in my results. Finally, I will link my results to findings of other researchers.

#### Direct Pass-through Channel

The mechanism behind the direct pass-through channel can be explained as follows: lower banks funding costs, so they can lend money to the private sector with lower interest rates. Of course, this channel is mainly prominent for the LTRO and TLTRO, which directly targeted banks refinancing situation. Banks could borrow huge amounts of money from the ECB for a long period and with an extremely low interest rate. However, my results indicate a very small effect on actual credit supply. Without time fixed effects, outcomes are close to zero and for the LTRO significantly negative. With time fixed effects, outcomes become indeed positive, but are barely significantly positive.

One possible explanation could be that banks, which extensively used the LTRO, were in a period of deleveraging in recent years. Although, my model tries to incorporate this fact using bank control variables, there is no guarantee for functionality. On the other hand, recent research often mentions that the LTRO creates an incentive for banks to buy government bonds. Van der Kwaak (2015) sees the possibility to use government bonds as a pledge for refinancing operations as the main reason why it could be attractive for banks to switch from private loans to sovereign debt. Crosignani et al. (2015) find exactly this result in the Portuguese banking sector.

The efforts of the ECB to modify the LTRO and decide that, within the TLTRO funding is directly linked to banks lending to the real economy, also can be interpreted as a sign for the disappointing effect of the LTRO. Unfortunately, the TLTRO program likewise did not boost credit supply as hoped. The cumulative Uptake of EUR 432bn could not even make half of the LTRO. In my bank sample, from 37 banks which reported their LTRO Uptake only 22 published their usage of the TLTRO. Further, my results do not show that banks with higher TLTRO Uptakes increased their lending volume significantly. The ECB tried to motivate banks to increase lending by deciding that banks with lower net lending than before had to early repay their borrowings. However, in times of extremely high liquidity on the interbank market, this incentive could not work. From the total EUR 432bn TLTRO borrowings banks early repaid EUR 368bn in June 2016.

With the new TLTRO II the ECB tries another route by paying banks a bonus for increasing credit supply.

The CBPP III and the ABSPP within the APP have a similar effect. By buying banks covered bonds, the ECB lowers funding costs for banks. Further, banks can securitize their loans and sell them to the ECB as a ABS, which opens new funds for the bank.

Although the SMP, OMT and the PSPP within the APP did not affected banks funding directly, they improved refinancing costs by lowering risk premia for Government bonds. This works through two mechanisms. First, the evaluation of risks in banking sectors and therefore the pricing of bank bonds is closely related to sovereign risks. Second, lower risk in sovereign bonds result into higher prices of these bonds. European banks are typical buyers of sovereign debt, so the ECB helped them by strengthen their balance sheet (see Acharya et al. (2016)). Earnings in their asset portfolio created new funds and lowered risk, which led to cheaper market funding. Disyatat (2011) argues that bank balance sheet strength and risk perception are the most important factor in modern transmission channels. Also there is much evidence for positive effects of ECBs purchase programs on government spreads (see Casiraghi et al. (2013) as well as Eser and Schwaab (2016)). My results confirm parts of these findings. I find a highly significant positive effect of the SMP and a often significant effect of the APP. Although the SMP focused only on peripheral countries, my results indicate positive effects in the whole euro area. This shows the integration and the cross-country relationships within the European banking sector. Further, the effect of the APP is especially high for the subsample of GIIPS companies. For the OMT, I only find significantly negative results, although banks funding costs were lowered in the period after the announcement (see ECB (2015)).

### **Portfolio Balancing Channel**

The transmission channel, which is often linked to quantitative easing policies, is the portfolio balance channel. It is based on the idea of imperfect substitution between assets and liquidity. If the ECB buys assets from investors, these investors are likely to buy other, more risky assets. On the banking side, this could mean that by buying Government bonds and decreasing spreads, the ECB creates an incentive for banks to lend more to the real economy. On the demand side, higher asset prices results in positive wealth effects and more optimistic predictions of the future. Both leads to higher consumption and investments. However, since I particularly investigate effects on the credit supply side, the latter mechanism is not part of my analysis.

A main target of the APP is to lower attractiveness of Government bonds investments and by that encouraging banks to rebalance their portfolio choice in favor of loans. The

ECB does this in three ways. First, within the PSPP the ECB buys Government bonds, which lowers investment returns in that asset class. In recent years, Government bonds especially from peripheral Europe offered banks a higher risk-adjusted return compared to lending loans. The ECB (2015) finds that banks earned 0.5%-1% higher ex-post risk-adjusted returns if they invested in Spanish and Italian bonds.

Also, the APP tries to boost the economical growth, which improves the macroeconomic outlook and lowers credit risk of loans. Traditionally, credit risk and loan default rates are low in growth periods. This makes risk-adjusted returns of loans more attractive, which should be followed by an increasing credit supply to the real economy.

Lastly, the purchase of ABS encourages banks to securitize loans into structured products. This makes it necessary grant to more loans.

My results are in line with the theoretical predictions. I find not only positive effects of the APP, but also high and significant effects analyzing the two GIIPS samples. Like stated above, to lower returns of Government bonds in peripheral Europe is explicitly mentioned as a target of the ECB. Therefore, it is logical that the effect of the APP is strong in these countries. Yields for German Government debt were low even before the launch of the APP. Not return aspects, but the characteristics of a safe heaven are more important in these countries.

Similar to the negative effect described for the LTRO, the negative regression outcomes for the OMT can be explained through the portfolio rebalancing channel. Although funding costs of banks were low, the credit institutions offered low credit supply. The reason can be higher attractiveness of Government bonds in that period. Through the commitment of the ECB and Draghis "whatever it takes"-speech, markets could have regained trust in GIIPS bonds and priced credit risk low, while macroeconomic outlooks were still uncertain and therefore loans to private borrowers were risky.

## 7 Conclusion

For more than six years now the ECB tries to fight against low inflation rates, low growth rates and an impaired transmission channel of monetary policy. In that time the central bank introduced various new measures, namely the Securities Markets Program, Outright Monetary Transactions, very long Long-term Refinancing Operations and the expanded Asset Purchase Program. This paper examines the effect of these unconventional monetary policy instruments on credit supply in the euro area using two different approaches: the loan-to-loan method and the loan-to-bond method. I base my analysis on a very rich data set of syndicated loan data and bond data from ten European countries. By including credit information from both peripheral Europe and Core Europe, I am able to

provide unique insights to the recent monetary policy of the ECB.

While the loan-to-bond approach fails to model the true credit supply of European banks, most probably caused by the small role of bond financing for firms in Europe, the loan-to-loan method shows many interesting outcomes. Although, both the SMP and OMT are classified as attempts to fix the impaired transmission channel of monetary policy in Europe, only the SMP increased credit supply significantly. On the contrary, the OMT even had a negative effect on credit supply. As a possible explanation, I find that Government bonds from peripheral countries offered attractive risk-adjusted returns in comparison with granting loans to companies.

Furthermore, I show that banks with higher LTRO Uptake decreased their credit supply to the real economy. Previous research identifies the incentive to use the new funds to buy Government bonds, later known as the "Sarko-Trade", as the main reason for this. However, this negative reaction disappears in my analysis after including unobserved time fixed effects.

Unfortunately, the modified TLTRO fails to correct its predecessor in two ways. First, banks interest in the new liquidity injection was quite low compared to the LTRO. Second, TLTRO Uptake had no effect on credit supply.

Nevertheless, for the latest instrument, the APP, I find a positive impact on credit supply, strongly pronounced in GIIPS countries. In my view, the ECB successfully reduced returns of Governments bonds in these countries and by that created an incentive for banks to increase their lending to the real economy.

However, there is still a long way to go. The period of unconventional monetary policy in Europe is not over yet. While my sample data could not even include the whole TLTRO I phase, the ECB already launched another, modified version of long-term liquidity provision. Further, asset purchases were increased and now also include corporate bonds. After interpreting my results, I see the new measures as the right path.

One important characteristic of my investigation is the inclusion of a broad country sample to analyze the overall impact of unconventional monetary policy on credit supply in the euro area. Unfortunately, this required to use syndicated loan data instead of micro loan data from credit registers. Consequently, my data sample is not as detailed as I want it to be and it is concentrated on large borrowers. Therefore, I welcome ECBs initiative to create a new database called AnaCredit, which will contain loan-by-loan data on an European level. This will open new possibilities for research in the field of banking.

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