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ECB corporate QE and the loan supply to bank-dependent firms

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Abstract

Using a representative sample of businesses in the euro area, we show that Eurosystem purchases of corporate bonds under the Corporate Sector Purchase programme (CSPP) increased the net issuance of debt securities, triggering a shift in bank loan supply in favour of firms that do not have access to bond-based financing. Identification comes from matching bank-dependent firms to their lenders and accounting for the effect of CSPP on banks' activity in the syndicated loan market. In a difference-in-differences setting, we show that credit access improved relatively more for firms borrowing from banks relatively more exposed to CSPP-eligible firms. Unlike in previous studies, this result applies regardless of bank balance sheet quality as measured by Tier 1 and NPL ratios.
Keywords: Unconventional monetary policy, corporate sector purchase programme, loan supply, ECB
JEL classification: E52, E58, G01, G21, G28.

Non-technical Executive Summary

Compared to traditional interest rate policy, the impact of unconventional monetary policy is much less understood. This applies in particular to the following addition to the unconventional toolkit: outright purchases of corporate bonds. It was only in March 2016 that the European Central Bank (ECB) announced such a programme. In this paper, we examine the transmission mechanism of what is potentially a valuable tool also for other central banks. The goal of the ECB Corporate Sector Purchase Programme (CSPP) is to ease financing conditions in the real economy and to stimulate the provision of new credit. The rationale is that the presence of a new and large actor in both primary and secondary markets facilitates the issuance of corporate bonds. In broad terms, the CSPP is a quantitative easing (QE) programme, which consists of outright purchases by the Eurosystem of investment-grade euro denominated bonds issued by non-bank corporations (i.e. non-financial corporations (NFCs) and insurance corporations) established in the euro area.

Literature on the CSPP focused so far on its effects on the bond market, showing a tightening of corporate bond spreads and an increase in net bond issuance following the announcement of CSPP. In this paper, we go one step further and ask whether the CSPP also benefited firms that themselves do not issue corporate bonds. The idea is that CSPP creates spare capacity in banks' balance sheets that they can use to lend to bank-dependent firms. Two mechanisms come to mind as to how this may occur. First, large corporations can issue bonds more easily with a new important actor in both the primary and the secondary markets. These firms substitute bank loans with relatively cheaper corporate bonds. Second, ECB activity in secondary markets may prompt banks to sell some of the corporate bonds they hold on their balance sheets, thereby also generating balance sheet capacity.

Our analysis is based on the Survey on the Access to Finance of Enterprises (SAFE). The SAFE provides a representative sample of non-financial firms in the euro area. For our purposes the survey has two advantages. First, it allows us to separate credit supply from demand. Second, the survey is fielded twice a year, usually in April and October. This enables us to carry out the analysis within a time window comprising the year before and the year after the announcement of CSPP, mitigating the impact of confounding factors.

To examine spill-overs from CSPP we employ two distinct, but complementary empirical strategies. The first set of exercises relates the purchase flows associated with the policies of the March 2016 package with credit supply. We then go one step further and provide an accurate representation of the causal chain from activity in the syndicated loan market via banks to bank-dependent firms. In particular, we combine Dealogic data on loan syndications with data on ECB purchases at the ISIN level to understand which banks experienced a negative shock in the syndicated loan market. We manually match this information with a confidential dataset provided by Bureau van Dijk that links SAFE respondents to their banks.

The empirical evidence supports the conclusion that the programme made a positive contribution to the provision of financing to bank-dependent firms, including SMEs. We find that the magnitude of CSPP flows to be significantly associated with our measures of credit supply. In contrast, the flows associated with the other monetary policy instruments appear to have produced effects through different channels. The data are consistent with the notion that the CSPP stimulated net corporate bond issuance, and that reduced loan demand from corporates active in the bond markets creates spare capacity in bank balance sheets. While this spare capacity could also result from banks selling some of their holdings of corporate bonds, the evidence does not support the empirical salience of this channel.

The results hold also when we trace the CSPP impact through firm-bank linkages. It turns out that firms that ex-ante have a relationship with a bank subject to lower demand for syndicated loans are more likely to report improved access to credit post CSPP. We subject the results to several robustness tests. In particular, we show that a placebo treatment coinciding with the implementation of the first TLTRO in September 2014 and the announcement of PSPP in January 2015 cannot account for our results.

1 Introduction

Compared to traditional interest rate policy, the impact of unconventional monetary policy is less understood. This applies in particular to the following addition to the unconventional toolkit by the European Central Bank (ECB): the Corporate Sector Purchase Programme (CSPP) launched in March 2016, which consists of outright purchases by the Eurosystem in both primary and secondary markets of investment-grade euro denominated bonds issued by non-bank corporations (i.e. non-financial corporations (NFCs) and insurance corporations) established in the euro area.[1] The goal of the CSPP is to ease financing conditions in the real economy and stimulate the provision of new credit through the issuance of corporate bonds.

In this paper, we tackle the key question whether the CSPP also benefited firms that themselves do not issue corporate bonds. The idea is that CSPP creates spare capacity in banks' balance sheets that they can use to lend to bank-dependent firms, mainly small and medium-sized enterprises (SMEs). Grosse-Rueschkamp et al. (2019) were the first to find spillover effects to large corporations not eligible for CSPP through the syndicated loan market, showing that banks with low Tier-1 ratios and high non-performing loans (NPL) increased their syndicated lending to firms. This conclusion has important policy implications, because the CSPP-induced spillover effects would work only if banks' balance sheets are constrained.

The entire syndicated market loans accounts only for a small fraction (11.2% in 2015) of bank loans granted to euro area NFCs. Therefore, we assess if this result is more general, applicable also to a broad cross-section of bank-dependent firms, the vast majority of which are small- and medium-sized enterprises. We document the existence of spillovers to bank-dependent firms with no access to the corporate bond market. Moreover, the spillover effects occur regardless of banks' balance sheet quality, implying that the unconventional monetary policy can produce a similar transmission mechanism also when banks' balance sheets are sound. In 2016, banks were already well capitalised and well supported by the 4-year targeted

[1] The CSPP was announced on 10 March 2016 and purchases started on 8 June. As of December 2018, total holdings stood at about EUR 178 billion, corresponding to about 7% of the total Asset Purchase Programme (APP), about one fifth purchased in the primary market. As of January 2019, the Eurosystem no longer conducts net purchases, but continues to reinvest the principal payments from maturing securities held in the CSPP portfolio. At end-December 2018, the Eurosystem holdings under the APP amounted to EUR 28 billion under the ABSPP (Asset-Backed Securities Purchase Programme), EUR 262 billion under the CBPP3 (Covered Bond Purchase Programme), 178 billion under the CSPP, EUR 2102 billion under PSPP (Public Sector Purchase Programme) for a total of EUR 2568 billion.

liquidity operations conducted by the ECB.[2] According to the euro area Bank Lending Survey, banks' liquidity and capital positions tended to ease the credit standards applied to NFC loans during the period under consideration.[3] We argue that a simple rebalancing in banks' loan portfolios has occurred, so that banks would not shrink in size. It may well be that banks with ex-ante weaker balance sheets were simply unable to take on more comparatively riskier SME loans than their counterparts with stronger balance sheets.

To carry out the analysis, we make use of an ECB database providing the bond ISINs actually purchased by the Eurosystem. This allows us to identify precisely the companies that could have substituted bank loans with debt securities due to the CSPP. We then link these firms to their lenders in the syndicated loan market, which in turn have incentives to rebalance their loan portfolio vis-à-vis CSPP-non-eligible firms. Grosse-Rueschkamp et al. (2019), on the other hand, identify the negative loan demand shock on the basis of bank exposure to all CSPP-eligibe NFCs available in their database (also excluding the insurance sector). Given the use of the bonds actually purchased by the Eurosystem, our identification of the potential negative loan demand shock suffered by each bank is more accurate (see also De Santis et al. (2018)). We corroborate the findings that firms whose bonds were purchased by the Eurosystem substituted bank loans with relatively cheaper corporate bonds, whereas CSPP-ineligible firms display a constant ratio of loans to bonds (see Figure 1).

Finally, the CSPP was part of a comprehensive policy package in March 2016 that included the following complementary measures: (i) a further reduction in key ECB interest rates; (ii) a new series of four targeted longer-term refinancing operations (TLTROs); (iii) an increase in the monthly net asset purchases under APP from EUR 60 billion to EUR 80 billion; and (iv) the CSPP, which forms part of the APP.[4] The remainder of the paper refers to these measures as the March 2016 package. We run a set of preliminary exercises to show that the spillover effect is CSPP-driven and not caused by other confounding factors.

Our analysis is based on the Survey on the Access to Finance of Enterprises (SAFE), which provides a representative sample of non-financial firms in the euro area. For our purposes

[2] According to the European Banking Association (EBA), the Common Equity Tier 1 Capital Ratio amounted to 13.15%.

[3] In https://sdw.ecb.europa.eu/ BLS.Q.U2.ALL.LP.E.Z.B3.ST.S.BWFNET shows the liquidity positions and BLS.Q.U2.ALL.CP.E.Z.B3.ST.S.BWFNET yields the capital positions.

[4] In an environment characterized by slightly negative consumer price inflation and weak real GDP growth, with risks to the outlook tilted to the downside, the ECB adopted these policies to stimulate aggregate demand and credit supply.

the survey has three advantages. First, most bank-dependent firms are SMEs, accounting for 70% and 60% of employment and value added in the overall business volume of the euro area.[5] Second, given that lending volumes are equilibrium outcomes reflecting both supply and demand, it allows us to separate credit supply from demand at bank level.[6] As our main dependent variable, we rely on two complementary measures of credit supply: (i) the individual firms' perceptions of banks' credit standards; (ii) the extent to which firms have their loan applications rejected or are discouraged from applying in the first place. Third, the survey is fielded twice a year, usually in April and October. This enables us to carry out the analysis within a time window comprising the year before and the year after the announcement of CSPP, mitigating the impact of confounding factors.

We then combine Dealogic data on loan syndications with data on all ECB purchases at the ISIN level, including NFCs and insurances, only to identify which banks experienced a negative shock in the loan market. We manually match this information with a restricted access dataset provided by Bureau van Dijk that links SAFE respondents to their banks. This yields a difference-in-differences setting where firms that borrow from a bank that experienced a CSPP-induced negative demand shock in the loan market should be more likely to report an improvement in credit supply post CSPP.

The empirical evidence supports the conclusion that the programme made a positive contribution to the provision of financing to bank-dependent firms, including SMEs. We report results for two different explanatory variables, which aim at measuring whether the bank experiences a negative demand shock. The first measure is an indicator equal to one if banks' activity with corporations whose bonds were purchased under CSPP declined following CSPP. The second measure is an indicator equal to one if prior to CSPP the bank has relatively greater exposure to CSPP-eligible than to CSPP-ineligible syndicated loan counterparts. First, we provide visual evidence that our specifications meet the parallel trend assumption that is crucial for the consistency of difference-in-differences. Second, in a differences-in-differences setting, we show that credit access improved relatively more for firms borrowing from banks relatively more exposed to CSPP-eligible firms. We subject the

[5] For a brief overview of the key role played by SMEs in the euro area economy, see https://www.ecb.europa.eu/pub/pdf/other/mb201307_focus06.en.pdf?6562a3cee3bd916eed1651c57dd5d2d2.

[6] Often, the literature addresses demand shocks with time-varying fixed effects (see e.g. Grosse-Rueschkamp et al. (2019)). However, demand shocks can affects banks' loan provisions idiosyncratically, which we can address with our database.

results to several robustness tests. In particular, we show that a placebo treatment coinciding with the implementation of the first TLTRO in September 2014 and the announcement of the PSPP in January 2015 cannot account for our results.

In addition, to attribute the spillover effects to the CSPP, we employ a complementary empirical strategy, by making use of a restricted access database on all unconventional monetary policy activities that were part of the March 2016 package. This set of exercises relates the purchase flows associated with the policies of the March 2016 package with credit supply. In addition to the CSPP flows scaled by GDP measured at the country-survey wave level, we also carry out similar exercises using the outright purchases of government bonds under the PSPP, the TLTRO flows net of all other longer-term refinancing operations, and the additional liquidity provided under the conventional main refinancing operation (MRO). We test two mechanisms as to how this may occur. First, large corporations can issue bonds more easily with a new important actor in both the primary and the secondary markets and, as a result, substitute bank loans with relatively cheaper corporate bonds. Second, ECB activity in secondary markets may prompt banks to sell some of the corporate bonds they hold on their balance sheets, thereby also generating balance sheet capacity.

Next, we use the CSPP flows as an instrument for net issuance of corporate bonds. The use of net purchases as an instrument follows directly from the objectives of the CSPP. Given the newly created aggregate demand for euro-denominated corporate bonds by the ECB, firms can finance their business by substituting bank loans with issuance of relatively cheaper corporate bonds. From an econometric viewpoint, the Eurosystem's corporate bond purchases are predetermined, as the monthly purchase volume is set in advance and allocated across jurisdictions according to market size.

The empirical evidence supports the conclusion that the programme made a positive contribution to the provision of financing to bank-dependent firms, including SMEs. We find that the magnitude of CSPP flows to be significantly associated with our measures of credit supply. This does not apply to other measures of the March 2016 package. The data are consistent with the notion that the CSPP stimulated net corporate bond issuance, and that reduced loan demand from corporates active in the bond markets created spare capacity in bank balance sheets. While this spare capacity could also result from banks selling some of

their holdings of corporate bonds, the evidence does not support the empirical salience of this channel. The other policy measures of the March 2016 package do not convincingly account for the observed increase in net corporate bond issuance. Only the PSPP flows predict bond issuance, presumably through a general price effect; but they are a comparatively weaker instrument for net corporate bond issuance.

Literature on the CSPP has so far focused on its effects on the bond market. Following the announcement of CSPP, several papers document a tightening of corporate bond yield or spreads (ECB (2016); Arce et al. (2017); Cecchetti (2017); Abidi and Miquel Flores (2018); De Santis et al. (2018); Rischen and Theissen (2018); Grosse-Rueschkamp et al. (2019); Zaghini (2019); Li et al. (2019); Todorov (2019); and an increase in net issuance of debt securities (De Santis and Zaghini (2019)).

Literature on CSPP spillovers to bank-dependent firms is still at an early stage. Though Grosse-Rueschkamp et al. (2019) dedicate one section of their paper to the spillover effect, their analysis as mentioned above differs from ours in several regards. By employing the SAFE, Ertan et al. (2018) also show that CSPP purchases improve credit access for small businesses. Whereas they conduct their analysis using ECB purchases in the primary market, which represents only about 20% of the CSPP, our work uses all corporate bonds purchases under the CSPP. Second, they can link firms to their banks only at the industry-region level whereas we obtain cleaner identification by linking banks and firms at the individual level. Finally, Arce et al. (2017) offer cross-sectional evidence of an increase in loan growth to bank-dependent firms in Spain one quarter after the CSPP announcement.

Other studies that use the SAFE investigate the impact on credit constraints of the euro area sovereign debt crisis (Ferrando et al. (2017)) and of the ECB's OMT program (Ferrando et al. (2019)). Studies that use firm-level survey data to identify the role of credit supply during the financial crisis include Popov and Udell (2012), Presbitero et al. (2014), Beck et al. (2014), Pigini et al. (2016). Our paper complements this literature investigating the bank loan supply effect of a specific unconventional monetary policy measure.

More generally, our paper contributes to research on monetary policy and the bank lending channel (Bernanke and Blinder (1988), Kashyap and Stein (1995)) as well as on the impact of unconventional monetary policy (Krishnamurthy and Vissing-Jorgensen (2011),

Giannone et al. (2012), Gilchrist and Zakrajšek (2013), Darracq-Paries and De Santis (2015), Gilchrist et al. (2015), Acharya et al. (2015), Foley-Fisher et al. (2016), Altavilla et al. (2019)).

The remainder of this paper is structured as follows. Section 2 describes the data. Section 3 presents the methodology. Section 4 provides evidence on the CSPP purchase flows and the CSPP-induced loan supply effect. Section 5 shows the CSPP-induced banks' spare capacity and its spillover to bank-dependent firms. Section 6 concludes.

2 Data

2.1 Survey on the access to finance of enterprises

Our main data source is the SAFE, an enterprise survey administered by the ECB and the European Commission. In 12 larger euro area countries, the ECB runs the survey twice per year, usually in April and October. In each of the ECB rounds, the smallest countries in the euro area (currently Estonia, Cyprus, Latvia, Lithuania, Luxembourg, Malta and Slovenia) are excluded from the sample.[7] The more comprehensive survey, run in cooperation with the European Commission, covers all countries of the European Union and some neighbouring economies.

The SAFE documents the availability of and needs for external finance in the six months preceding the interview. In addition, the survey collects information on firm demographics, such as sector, size and age. The interviews are conducted over a four-week period mainly by telephone, but respondents can also complete an online questionnaire. The interviewee in each company usually is a senior executive (general manager, finance director or chief accountant). The sample is stratified by country, enterprise size class and economic activity. The SAFE has a panel component such that a subset of firms participates in multiple survey waves.

The SAFE covers firms of all size categories. The sample is constructed to offer comparable precision for micro (1-9 employees), small (10-49 employees) and medium-sized (50-249 employees) enterprises, taking into account total employment in these size classes. In addition, a sample of large enterprises (250 or more employees) is included in order to

[7] As they represent less than 3% of the total number of employees in the euro area, this has only a marginal impact on the results for the euro area as a whole.

make it possible to compare developments for SMEs with those for large enterprises. The enterprises are split into four major economic activities: industry, construction, trade and other services. The sample excludes firms in agriculture, public administration, and financial services.

To measure credit supply we use both a perceptions-based and a factual measure. We refer to the perceptions-based measure as the change in willingness-to-lend. The change in willingness-to-lend is based on question 11 (Q11) of the SAFE:[8] *"For each of the following factors, would you say that they have improved, remained unchanged, or deteriorated over the past six months?"*

a) General economic outlook
b) Access to public financial support
c) Your enterprise-specific outlook with respect to your sales and profitability or business plan
d) Your enterprise's own capital
e) Your enterprise's credit history
f) Willingness of banks to provide credit to your enterprise

All responses are coded as follows: improvement 1, unchanged 0, and deterioration -1. It is important to stress that the question asks for a qualitative assessment of *changes* in the environment rather than levels. The answers to Q11f serve as our first measure of credit supply.

Question 11 can also be exploited to obtain firm-specific control variables. In particular, we use Q11c to control for the enterprise-specific outlook, Q11d to account for the firm's capital position and Q11e to control for the firm's credit history. The macroeconomic outlook is controlled for by business cycle variables (see next section). Additional controls include (the log of) employment and indicators for firm age.[9]

The factual measure of credit supply is based on questions 7a and 7b of the SAFE (Q7). *"Have you applied for the following types of financing in the past six months?" (Q7a)*

a) Applied

[8] Questionnaire and results of all SAFE waves are available at https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html

[9] We also considered to control for turnover, but found turnover to be highly correlated with employment.

b) Did not apply because of possible rejection

c) Did not apply because of sufficient internal funds

d) Did not apply for other reasons

"If you applied and tried to negotiate for this type of financing over the past six months, what was the outcome?" (Q7b)

a) Received everything

b) Received 75% and above

c) Received below 75%

d) Refused because the cost was too high

e) Was rejected

f) Application is still pending

As in Ferrando et al. (2017), we consider a firm to be credit-constrained if the firm requested the financing (Q7a) and one of the following conditions from Q7b applies: (i) the firm received less than 75% of the desired loan amount (ii) the firm refused the loan offer because the cost was too high; (iii) the firm's application for a bank loan or credit line was denied. Firms that (iv) did not apply because of a possible rejection (Q7a) are also classified as credit-constrained.

The factual measure of credit supply allows for easier comparisons across firms and countries as the same environment may be perceived differently by different individuals. On the other hand, it is easier to interpret willingness-to-lend as reflecting banks' credit standards. The analysis exploiting both factual measures and perceptions allows us to draw safer conclusions on the mechanisms behind CSPP.

2.2 Purchase flows

Our analysis draws on SAFE waves 13-16. Waves 13 and 14 cover the period from April 2015 until March 2016, while rounds 15 and 16 cover April 2016 until March 2017. Limiting the period of analysis to one year before and one year after the announcement of CSPP reduces the likelihood that the results are driven by confounding factors. The starting date thus excludes the period characterized by a sharp improvement in financing conditions

in 2014 resulting from negative policy rates and the expected announcement of the ECB's sovereign QE programme (PSPP) in January 2015. The end date captures the period under which purchases were intended to run with the ECB decision in June 2016 and symmetrically one-year period right up the ECB's announcement of the CSPP in March 2016.[10]

Panel A in Table 1 reports descriptive statistics on the sample that we work with to implement the purchase-flow based methodology. A survey wave covering the 12 larger euro area economies has information on about 11,000 firms. We require firms to participate in at least one survey wave before and one after the announcement of CSPP, which allows use to control for firm fixed effects. Given the research question, we drop those large firms that consider debt securities a relevant financial instrument. This leaves us with a sample of 13,945 firm-wave observations covering 6150 firms.[11]The euro area average of willingness-to-lend improves little in response to the announcement of CSPP. In line with this development, the credit-constrained indicator declines only marginally after CSPP. However, the average mainly reflects developments in Portugal and Spain, where firms reported sharp improvements along these measures already in 2014 following the abatement of the sovereign debt crisis and, therefore, prior to the announcement of CSPP.

In addition to the firm-level data from SAFE, we also assemble country-level data on monetary policy action, bond markets, and the cyclical position of euro area economies. The restricted access dataset on countries' CSPP flows, PSPP flows net of reinvestments, TLTROs net of all other long-term refinancing operations, and the flows of main refinancing operations are all provided by the ECB. Data on bonds outstanding and non-performing loans come from the European Commission and the ECB, respectively. Finally, one year ahead professional forecasts of GDP growth and inflation are provided by Consensus Economics.[12]

[10]In June 2016, the ECB announced that the outright purchases under the APP were intended to run until the end of March 2017, or beyond, if necessary, and in any case until the ECB sees a sustained adjustment in the path of inflation consistent with a return to price stability.

[11]The analysis does not include firms from Greece, as at the time the situation in Greece was in many ways not representative of the European experience.

[12]It is important to stress that Consensus Economics asks the professional forecasters their year-on-year forecast at the end of the current year and at the end of the following year. Following Dovern et al. (2012) by simple interpolation we construct the Consensus Economics forecast one year ahead using the following formula to construct the weight $[(1 + 1/12) - w/12]$, where w is the number of months required to reach the end of the year. For example, if the Consensus forecast is collected in January, then $w = 12$ and the weight is 0.083333. In other words, the estimated Consensus forecast one year ahead is equal to the year-on-year December forecast for the current year multiplied by 0.916667 plus the year-on-year December forecast for the subsequent year multiplied by 0.083333.

The country disaggregation of CSPP flows is compiled on the basis of the country of risk where the main activity is conducted, and not on the basis of the ultimate parent. The ultimate parent might be domiciled in financial centres, while subsidiaries conduct their main economic activity in other countries. Panel B in Table 1 provides the summary statistics of the macro variables used in the econometric analysis.

Ceteris paribus, we might expect a greater share of firms reporting an improvement in credit access in countries where corporate bond issuance has increased strongly following the announcement of CSPP. Firms domiciled in the Netherlands, France, Italy, Ireland and to a smaller extent Spain, Austria and Germany have issued more bonds than those redeemed over the one-year period after the CSPP announcement relative to the previous year. Figure 2 (upper panel) shows a tight positive correlation between the first difference in net bond issuance over GDP and the first difference in the change in banks' willingness-to-lend. The same applies to changes in the prevalence of credit constraints.

Likewise, we might expect willingness-to-lend to improve to a greater extent in countries where banks reduce their holdings of corporate bonds following the announcement of CSPP. It seems that, particularly in the Netherlands, increased issuance of corporate bonds was absorbed by the banking system (see Figure 2, bottom panel). In France, on the other hand, increased issuance was accompanied by net sales of bonds by banks. Figure 2 (bottom panel) shows a comparatively weak association between net purchases of bonds and measures of credit supply that on top goes against the hypothesized direction.

2.3 Construction of the firm-bank linkages

To construct the firm-bank linkages we proceed in three stages. First, we identify the source of the loan demand shock; that is, we identify the corporations eligible for CSPP. Second, we account for banks' activity in the syndicated loan market. Third, we link the SAFE respondents to their lenders.

Information on CSPP-eligible bonds comes from a restricted access ECB database. This yields 922 bond ISINs that were CSPP-eligible at end-March 2017. We obtain the identifiers and names of the underlying firms through Bloomberg and Dealogic DCM, generating 260 CSPP-eligible firms. In particular, 76 firms are matched with Loan Analytics databases

through the Bloomberg-specific or Dealogic DCM-specific firm identifier; 92 firms are matched with Loan Analytics databases manually through the name of the firms; and 43 firms are matched with Loan Analytics databases manually adding company parents of those special purpose financing vehicles, which do not have a match in the Loan Analytics database (e.g. for Bayer Finance SA, we take Bayer AG). Thus, 211 out of 260 CSPP eligible firms, corresponding to 81% of the universe could be identified.

In the second step, we identify the activity of CSPP-eligible firms in the syndicated loan market. In total, we obtain data on 2,948 syndicated loans on Dealogic DCM between April 2015 and March 2017. Among these, the borrowers were CSPP-eligible in 137 cases. This appears small at first glance, but loans of CSPP-eligible borrowers are on average larger than those of CSPP-ineligible firms. The total loan volume of CSPP-eligible firms accounted for USD 195 billion in the year preceding the announcement of CSPP, compared to USD 459 billion for CSPP-ineligible firms. Importantly, total syndicated loan activity of CSPP-eligible firms decline following the introduction of CSPP to USD 128 billion. In contrast, the volume of loans associated with CSPP-ineligible firms increased slightly to USD 483 billion. For each syndicated loan, we know the overall volume and the identity of the banks participating. This information allows constructing measures of bank activity in the syndicated loan market as well as matching this information to the banks of SAFE respondents.

To link SAFE respondents to their lenders we exploit the results of a matching exercise between SAFE and Bureau van Dijk's Amadeus dataset. The matching exercise was performed by Bureau van Dijk. The bank information recorded in Amadeus is time invariant and reflects the information available at the time of the match. Unfortunately, bank data is available only for a subset of the firms in SAFE. This reflects mainly two reasons. First, Bureau van Dijk could not match all SAFE respondents to Amadeus. This applies to about 40% of observations. Second, even if match is found, information on the bank may not be available in Amadeus. As a result, the number of available firm-wave observations drops from 41,089 to 13,461. In particular, we do not have bank information for firms located in Belgium, Finland, Italy, and Slovakia. The exercise is concluded by matching the bank names recorded in Amadeus to the bank names in the syndicated loan dataset.

Based on the dataset we construct two additional variables of interest. The first measures whether the bank experiences a negative demand shock in the syndicated loan market. It is an indicator equal to one if banks' activity with CSPP-eligible syndicated loan counterparts declines following CSPP. For instance, the number of syndicated loans with CSPP-eligible borrowers that Spanish bank Santander engaged in declined from 35 in the year prior to the announcement of CSPP to 24 after. The idea is that the decline in activity can be attributed to CSPP.

The second approach measures a bank's susceptibility to a demand shock. It is an indicator equal to one if prior to CSPP the bank has relatively greater exposure to CSPP-eligible than to CSPP-ineligible syndicated loan counterparts. We only know the overall volume of a syndicated loan and the identity of the banks participating in the syndicate, but not the individual bank's share. Therefore, we proxy a bank's activity by comparing its percentile rank in the distribution of loans to CSPP-eligible borrowers to that of CSPP-ineligible borrowers. Working with the percentile rank accounts for two issues: one associated to the different number of syndicated deals vis-à-vis CSPP-ineligible and non-eligible borrowers, and the other associated to bank size and, correspondingly, the total number of syndicated loans they participate in.

Finally, several variables control for features of the bank or the firm-bank relationship. In particular, we construct indicators equal to one if the bank is classified as a GSIB, a savings bank or a cooperative. We also account for cross-border firm-bank relationships by constructing an indicator equal to one if the firm is located in a country that differs from the headquarter of the bank.

3 Empirical Strategy

This section introduces the methodologies that we use. The first methodology based on purchase flows has broader country coverage and exploits the full sample of the SAFE, but is more vulnerable to confounding factors. The second methodology using firm-bank linkages provides cleaner identification but for a smaller sample of firms.

3.1 Purchase flows

Identifying the effect of CSPP requires tackling two challenges. First, it is necessary to separate loan supply from demand. Second, the methodology needs to isolate the effects of CSPP from potential confounding factors. Fortunately, the SAFE puts us in a good position to deal with the first issue. To measure loan supply we use the change in willingness-to-lend and the credit-constrained indicator.

To organize the discussion on potential confounding factors, it is convenient to first introduce the regression equation, which considers the link between credit supply to bank-dependent firms and CSPP purchases:

$$y_{i,c,t} = \beta_1 QE_{c,t} + \beta_2 X_{c,t} + \beta_3 Z_{i,c,t} + \eta_t + \delta_i + u_{i,c,t}, \tag{1}$$

where $y_{i,c,t}$ is the change in banks' loan supply reported by firm i domiciled in country c at time t; $QE_{c,t}$ is the variable of interest associated with the CSPP programme for each country c; $X_{c,t}$ is a vector of time-varying macro factors at country level; $Z_{i,c,t}$ is a vector of time-varying firm-level control variables; η_t is a time fixed effect which corresponds to each survey wave; δ_i is a firm fixed effect and $u_{i,c,t}$ is an error term, that allows for clustering at the country level.

In order to capture the effects of CSPP we estimate two specifications. In the reduced form regression, $QE_{c,t}$ is given by the CSPP flows scaled by GDP at country level. In the IV regression, $QE_{c,t}$ represents either NFCs' net issuance of corporate bonds (gross issuance minus redeemed bonds) or banks' net corporate bond purchases both scaled by GDP at country level and instrumented by the CSPP flows/GDP ratio. The coefficient of interest is therefore β_1. In the reduced form, it captures how the change in loan supply to bank-dependent businesses varies in response to ECB corporate bond purchases. In the IV regression, it identifies the CSPP-induced mechanism by measuring how the change in lending activity varies in response to an increase either in net corporate bond issuance by NFCs or in net sales of corporate bonds by banks.

Reverse causality from loan supply to ECB's corporate bond purchases is not a question, because of the intrinsic nature of the commitment in the conduct of ECB monetary policy decisions. First, ECB purchases of corporate bonds contribute to the APP's total monthly

purchase volume and this is predetermined on a monthly basis. Second, the time variation recorded in CSPP purchase flows aims uniquely at minimizing any impact that could be detrimental to the functioning of the corporate bond market. Corporate primary market issuance and secondary market liquidity conditions follow a well-known pattern, usually strong at the start of year and deteriorating in the summer and towards the end of the year. These patterns are used as an input when planning the CSPP monthly purchase amounts (De Santis et al. (2018)). All in all, the scheduled monthly purchases under the CSPP do not depend on banks' lending activity to businesses.

While the firm-specific fixed effects absorb time-invariant heterogeneity across firms, the estimates may potentially be contaminated by time-varying omitted variables, both at the country level and at the level of the firm. We address both issues in turn. We cannot rule out that cyclical developments drive firms' perceptions of banks' willingness-to-lend or credit constraints. To alleviate these concerns all specifications include (i) one year ahead forecasts of both GDP growth and inflation to capture the cyclical position of euro area economies, $X_{c,t}$, and (ii) time fixed effects to control for global shocks that are common to all firms, η_t.

At the firm level, perceptions of banks' willingness-to-lend or credit constraints may be confounded by the firm's creditworthiness. Therefore, the vector of firm-specific variables $Z_{i,c,t}$ includes measures of the firm-specific outlook, capital position and credit history whose dynamics can influence access to finance. These three variables allow the effect of improved versus deteriorated outcomes to differ, as loan supply may respond differently to an improvement or a deterioration of the respective variable. To further account for firm heterogeneity, all specifications include time-varying measures of firm size and age as well as firm fixed effects, δ_i.

3.2 Firm-bank linkages

The second approach employs a difference-in-differences setting to test for CSPP spill-overs to bank-dependent firms. The idea is that firms that borrow from a bank that experiences lower demand for syndicated loan should be more likely to report an improvement in credit supply following the introduction of CSPP. In contrast to the first methodology this approach exploits

within-country variation. This in turn enables us to control for cross-country differences in the business cycle with country-survey wave and country-sector fixed effects.

In particular, we estimate a second equation of the following form:

$$y_{i,b,c,t} = \beta_1 I_t + \beta_2 D_b + \beta_3 I_t * D_b + \beta_4 Z_{i,b,c,t} + \beta_4 B_b + \gamma_{c,t} + \delta_{c,s} + u_{i,b,c,t}, \quad (2)$$

where $y_{i,b,c,t}$ is the change in loan supply reported by firm i in country c borrowing from bank b at time t; I_t is an indicator equal to one if CSPP is implemented, i.e. for SAFE waves 15 & 16. D_b measures banks' activity with CSPP-eligible firms in the syndicated loan market.

We use two different measures of activity in the syndicated loan market. In the first specification, it is given by an indicator equal to one if banks' activity with CSPP-eligible syndicated loan counterparts declines following CSPP. We argue that this decline in activity reflects lower demand for loans induced by the implementation of CSPP. The second specification makes a weaker assumption. It identifies banks with the potential of a negative demand shock, and exploits only information available prior to CSPP. To implement it, we use the relative exposure indicator. This indicator equals one if the bank exhibits a higher percentile rank in the distribution of CSPP-eligible borrowers than in the distribution of CSPP-ineligible borrowers.

At the level of the firm, we control for size, age and changes in the firms' capital position, credit history and outlook. In addition, country-survey wave and sector-survey wave fixed effects account for the business cycle.

The coefficient of interest is given by β_3, the coefficient on the interaction term between the CSPP indicator and syndicated loan market activity. If CSPP increases the loan supply to bank-dependent firms, the interaction term should be positive when we look at the change in willingness-to-lend and negative when we examine credit constraints. In addition, the regression includes the familiar firm-level controls $Z_{i,b,c,t}$ from Equation 1 and a set of variables B_b that account for bank characteristics.

It could be argued that the CSPP indicator might pick up the effects of the other unconventional policies of the March 2016 package. Specifically, it may well be that PSPP also stimulates bond issuance by lowering the cost of long-term finance. However, it is unlikely that PSPP weakens the demand for syndicated loans. The flattening of the yield curve through

the PSPP should have stimulated the demand for syndicated loans. The PSPP expansion that was part of the March 2016 package should therefore not yield a significant coefficient on the interaction term β_3. Though using Model 2, we cannot econometrically control for the PSPP expansion, we test this argument in the context of the original announcement of PSPP in January 2015. A similar argument applies to the TLTROs. The attractive conditions attached to TLTRO funding should have stimulated the extension of credit. It is difficult to see how the TLTROs can account for weaker demand for syndicated loans from large corporations. We test this line of reasoning in the context of the TLTRO1 announced in June 2014 and implemented in September.

As discussed above, matching SAFE respondents to their banks leads to a significant loss in the number of observations. As the SAFE is a rotating panel, only a subset of the respondents to a given wave will be interviewed also in the following wave. Imposing fixed effects would therefore lead to additional, significant attrition of the sample. Therefore, we decide to work with country-survey wave fixed effects and country-sector wave fixed effects.

4 Purchase flows and loan supply

Section 4.1 provides evidence on the CSPP purchase flows and the CSPP-induced loan supply effect. Section 4.2 discusses and seeks to understand why the effect is larger in some countries than in others.

4.1 CSPP-induced loan supply effect

Econometric evidence of the shift in loan supply owing to the CSPP using Model (1) is presented in Column (1) of Table 2 and 3. In Table 2 the dependent variable is the change in banks' willingness-to-lend as perceived by bank-dependent businesses, whereas in Table 3 it is given by an indicator equal to one if the firm reports to be credit-constrained. The explanatory variable of interest is the Eurosystem's corporate bond purchases, scaled by GDP. The sample consists of SMEs and large firms that do not consider debt securities a relevant source of finance.

The testable hypothesis is the following: everything else equal, the larger the Eurosystem's corporate bond purchase volumes in a country relative to its size, the stronger the increase (decline) in the change in banks' willingness-to-lend (credit constrained) to firms of that country that do not have access to the corporate bond market. As the credit-constrained indicator (Q7) is equal to one if the firm is credit constrained, a negative coefficient indicates an improvement in loan supply.

The coefficient of interest in Table 2 (Table 3) is positive (negative) and highly significant at conventional levels with a t-statistics equal to 5.41 (-3.51). Therefore, the evidence is consistent with the notion that the Eurosystem's bond purchases have freed up balance sheet capacity that in turn has benefited bank-dependent firms. An increase in CSPP flows by 1% of GDP is associated with an increase in the change of willingness-to-lend of 0.024, which is equal to about 10% of the sample mean, and a decrease in credit-constrained of 0.016, which is equal to about 15% of the sample mean.

The shift in loan supply appears to be induced mainly by CSPP. In a similar exercise, we substitute the CSPP purchase flows with MRO, TLTRO, and PSPP purchase flows. The remaining Columns of Tables 2 and 3 present the results. The estimated coefficients are not statistically significant, though it should be noted that the p-value of the PSPP coefficient is 14% in Table 2. All in all, the complementary unconventional monetary policies and liquidity operations by the ECB cannot account for the observed changes in the cross-country distribution of willingness-to-lend and credit constrained in the time window examined.

The coefficients on the control variables are economically meaningful and stable across specifications. While higher GDP forecasts are accompanied by a stronger increase in the change in willingness-to-lend, the opposite applies to inflation. As one might expect, firms reporting improvements in their outlook, capital position and credit history are more likely to perceive an improvement in banks' change in willingness-to-lend. The Wald statistic for testing the equality of the coefficients in absolute value for each pair of variables indicating deterioration versus improvement cannot be rejected for firms' outlook and capital positions. The null hypothesis is instead rejected for credit history. The coefficient for firms reporting improvement in credit history is twice as large as that for firms reporting deterioration. This suggests that an improvement in credit history leads to a significant non-linear shift in

willingness-to-lend by banks. Firm size is not associated with changes in perceived credit standards. Younger firms with less than five years of age perceive stronger improvements in the change in willingness-to-lend than older firms. The coefficients on the control variables in the credit constrained regression are typically not statistically significant, except for the point estimate on firms reporting deterioration in credit history, which is positive. This suggests that a deterioration in credit history leads to a significant increase in credit constrained by banks.

The Appendix provides a number of robustness checks based on purchase flows. The results are robust if we use the changes in bank loan availability based on SAFE (question Q9) as the dependent variable. The results become stronger if we include the firms that are interviewed only once.

4.2 Mechanisms

In principle, two different mechanisms can account for the increase in credit supply to bank-dependent firms. On the one hand, large corporations can issue bonds more easily with a new important actor in both the primary and the secondary markets. The Eurosystem's aggregate demand for euro-denominated corporate bonds allows corporations to finance their business by substituting bank loans with issuance of relatively cheaper corporate bonds, as depicted in Figures 3. In turn, banks can use the spare capacity to supply loans and finance the activity of firms that do not have access to the corporate bond market. On the other hand, ECB activity in secondary markets may prompt banks to sell some of the corporate bonds they hold on their balance sheets, thereby also generating balance sheet capacity.

The evidence suggests that reduced loan demand from corporates active in the bond markets accounts for the spillovers to bank-dependent firms. Empirically, in Columns (1) and (3) of Table 4, we instrument countries' net issuance of corporate bonds issued by NFCs, defined as corporate bond issuance net of redeemed bond volume at maturity, with the country breakdown of the CSPP flows. In Columns (2) and (4) of Table 4, CSPP flows are used to instrument banks' net purchases of corporate bonds. Table 4 presents second stage IV estimates followed by the coefficient of interest from the first stage. The results are clear: net issuance activity by NFCs is strongly positively associated with changes in willingness-to-

lend and negatively associated with credit constrained. The first stage regression coefficient of the changes in willingness-to-lend equation is equal 0.658 with a t-statistics of 3.42 and of credit constrained is equal to 0.696 with a t-statistics of 3.28. The Kleibergen-Paap rk Wald statistic (Kleibergen and Paap (2006)) is above 10 ranging between the 10% and the 15% maximal Wald test size distortion provided by Stock and Yogo (2005). On the other hand, the evidence does not support the conclusion that CSPP induced banks to sell their corporate bonds to the ECB. Columns (2) and (4) are in fact underidentified. There is no statistical relationship between ECB corporate bond purchases and net purchases of corporate bonds by banks and the coefficient from the second stage has the incorrect sign.

The other policy measures of the March 2016 package do not convincingly account for the observed increase in net corporate bond issuance. Table 5 presents instrumental variables estimates of the change in willingness-to-lend and credit-constrained, where NFC's net corporate bond issuance is instrumented with MRO, TLTRO and PSPP flows. To facilitate comparisons, Column (1) reports the CSPP result from Column (1) in Table 4. When instrumented with MRO and TLTRO flows, NFCs' net corporate bond issuance cannot explain changes in credit supply. Table 5 further indicates that the problem lies in the first stage as neither MRO nor TLTRO flows are partially correlated with NFCs' net corporate bond issuance. The case of PSPP is slightly different. In the IV regression, the PSPP flows become statistically significant, but the Kleibergen-Paap rk Wald statistic is around 7-8. This suggests that PSPP flows are a comparatively weaker instrument for net corporate bond issuance.

We now examine whether the effectiveness of corporate QE depends on market size. For two reasons a bigger bond market may facilitate the effectiveness of corporate QE. First, a bigger market is likely to be composed of a larger number of participants. These firms traditionally issue bonds; therefore, they may respond more promptly to monetary policy stimulus by substituting bank loans with corporate bond issuance. Second, a larger market may reflect a good institutional framework that in turn may prompt more firms to enter the bond market. Figure 3 illustrates market size by the country shares of bonds outstanding, as well as by bonds outstanding in percent of GDP in 2015. Markets differ widely in size with France and Germany accounting for more than 50% of corporate bonds outstanding. Figure 3 also shows the relationship between market size in 2015 with the change in net bond

issuance scaled by GDP following the CSPP announcement. It appears that net corporate bond issuance grows more strongly in the bigger markets, in particular France. On the other hand, there appears to be no relationship between corporate bond issuance and the size of a market relative to GDP.

Next we use our framework to formally investigate the market size hypothesis and Table 6 provides the econometric evidence. We split the sample at the median using the distribution for bonds outstanding relative to GDP (Columns 1) and the country share (Columns 3) by introducing a dummy variable interacted with the CSPP flows. To the extent that market size matters, the interaction term is positive (negative) and statistically significant, that is the change in willingness-to-lend (credit constraints) is larger (smaller) for countries with a larger corporate bond market. To make sure that the estimates are not sensitive to the particular cut-off, Table 6 presents results also when the country grouping is smaller than the cut-off provided by the median (Columns 2 and 4). The estimates coefficients vary widely across specifications, and therefore the results do not provide support for the market size hypothesis.

5 CSPP-induced spare capacity in bank balance sheets

Section 5.1 provides direct evidence on the loan supply to bank-dependent firms resulting from CSPP-induced banks' spare capacity. Section 5.2 presents placebo tests and additional robustness checks.

5.1 Firm-bank linkages and spillover effects

The evidence in Table 4 suggests that reduced loan demand from corporates accounts for the spare capacity in banks balance sheets. In this section, we go one stop further and explicitly test this causal chain in a custom-made dataset. Identification comes from within-country variation in banks' exposure to CSPP-eligible corporates.

Figure 4 provides visual evidence on the parallel trend assumption. The plots show marginal effects from a variant of 2 where the treatment is interacted with indicators for each wave. The estimation window corresponds to the econometric exercises discussed

below where the estimated marginal effects are allowed to differ for each survey wave. The charts on the left-hand-side show results for our first explanatory variable Δ *eligible deals*. Δ eligible deals is an indicator equal to one if banks' activity with CSPP-eligible syndicated loan counterparts declines following CSPP. The plots on the right-hand-side deal with our second explanatory variable: *relative exposure* is an indicator equal to one if prior to CSPP the bank has relatively greater exposure to CSPP-eligible than to CSPP-ineligible syndicated loan counterparts. The charts in the first row correspond to willingness-to-lend, those in the second to the credit-constrained indicator.

The parallel trend assumption appears to be met. The charts in the first column indicate that prior to CSPP, firms that borrowed from banks that eventually decrease their activity in the syndicated loan market report on average marginally worse access to credit. Crucially though, there is no evidence for a shock in credit supply in either wave 13 or wave 14 of the survey. The improvement in access to credit coincides with the announcement of CSPP. The same applies to the relative exposure indicator and willingness-to-lend. The chart on relative exposure and credit constraints indicates a somewhat delayed response. Access to credit only improves with wave 16.

Table 7 presents baseline results for Model 2. Columns (1) and (2) provide results on willingness-to-lend, while Columns (3) and (4) deal with credit constraints. The dependent variables are paired with our two measures of banks' activity with CSPP-eligible borrowers in the syndicated loan market. Intuitively, the higher the exposure of banks to CSPP-eligible firms, the higher the bank spare capacity after the launch of CSPP and the higher the loan supply to bank-dependent firms. Of interest are therefore the interactions with a CSPP indicator that is equal to one during SAFE waves 15 and 16.

SAFE respondents that borrow from banks with greater exposure to CSPP-eligible corporates are more likely to report an improvement in credit supply. In Column (1), the coefficient on the interaction term has the expected sign, but just fails to meet conventional standards of significance (e.g. P-value is 0.105). The interaction between CSPP and relative exposure shown in Column (2), on the other hand, is significant at the five percent level. The results for the credit constraint indicator are stronger. In both cases, the interaction terms are significant

at the five percent level. The results are therefore in line with the findings shown in Tables 2-3, despite the differences in methodology.

Next, we examine whether CSPP matters more for banks experiencing tighter balance sheet constraints. Grosse-Rueschkamp et al. (2019) find that firms in the syndicated loan market are more likely to obtain a loan from weakly capitalized banks and banks with a high share of non-performing loans. We run an analogous regression that includes a triple interaction between the CSPP indicator, bank activity with CSPP-eligible borrowers in the syndicated loan market and bank capital. Bank capital is measured by an indicator equal to one if the bank's Tier 1 ratio exceeds the country-specific median in December 2015. As Table 8 shows, the interaction is not significant in any of the specifications. Adding the additional variables slightly reduces the precision of the other estimates but does not change the overall pattern. Table 9 presents the corresponding results for asset quality. Here the explanatory variable of interest is an indicator equal to one if the bank's NPL ratio exceeds the country median. Again, we obtain insignificant coefficients on the triple interaction.[13]

Banks with balance sheet constraints have less capacity to take on additional risk. As the ECB buys only investment grade corporate bonds, this implies that banks experience less demand from borrowers with low credit risk. In all likelihood, the bank-dependent firms in our sample are more risky borrowers. The most likely interpretation for our finding is that banks with comparatively low capital ratios and relatively high non-performing loan ratios are unlikely to take on more additional risk than well capitalized banks with good asset quality. It is also worthwhile pointing out that our exercise is not directly comparable to that in Grosse-Rueschkamp et al. (2019). In addition to the differences in the sample our work relies on bank-firm relationships that were in place before CSPP, whereas their approach allows new bank-firm linkages to emerge.

All in all, we can safely say that banks experiencing a decline in corporate loan demand from CSPP eligible firms use their spare capacity to increase the loan supply to bank-dependent firms.

[13] In unreported specifications we split the sample at the unconditional median of the tier 1 ratio and the NPL ratio. In both cases, the results remain insignificant.

5.2 Placebo tests and and robustness checks

Table 10 present results for a placebo experiment corresponding to the implementation of the first TLTRO in September 2014 and the announcement of PSPP on 22 January 2015, which was well anticipated by the markets since October 2014. The experiment consists of assessing whether the same negative loan demand shock triggered by CSPP-eligible corporations produces a shift in loan supply vis-à-vis bank-dependent firms in a different period, for example after the launch of the TLTROs and PSPP. If this would be the case, it would be spurious and, as a consequence, it would challenge the main baseline results. Specifically, we run the same experiment using Model 2, but we change the reference period for $y_{i,b,c,t}$ to October 2014 - September 2015 (SAFE waves 12-13) versus October 2013 - September 2014 (SAFE waves 10-11). The placebo treatment variable is equal to one in SAFE waves 12 and 13. Columns (1) and (2) show an improvement in willingness-to-lend following the implementation of the first TLTROs and the announcement of PSPP for all firms. The interaction terms, on the other hand, are insignificant across all four specifications. This is consistent with the view that TLTROs and PSPP are operating through different channels.

In the aftermath of the sovereign debt crisis, some banks experienced financial distress, which was frequently resolved by take-overs. It could be argued that firms borrowing from such banks report an improvement in credit supply that happened to occur in the CSPP period. When matching the bank information available in Amadeus with that in Dealogic, we identify the merged banks. The specifications in Table 11 exclude firms from the sample that borrowed from banks undergoing mergers during the sample period. The results continue to hold.

All in all, we can safely say that the CSPP increased the net issuance of debt securities by NFCs, triggering a shift in bank loan supply in favour of firms that do not have access to bond-based financing, which is larger for banks relatively more exposed to CSPP-eligible firms.

6 Conclusions

Since the announcement of the CSPP in March 2016, financing conditions for euro area firms have improved considerably. Corporate bond spreads tightened and corporate bond issuance increased with large corporations certainly benefiting from the policy. The open question is whether financing conditions outside of corporate bond markets also improved.

We find clear evidence that the CSPP is transmitted also through the bank lending channel, as the unconventional monetary policy freed up balance sheet capacity of banks to lend to companies that do not have access to the corporate bond market, with the key mechanism being the CSPP-induced increase in net corporate bond issuance issued by non-financial corporations. Whereas Grosse-Rueschkamp et al. (2019) document stronger effects for banks with low Tier-1 and high NPL ratios, we do not find a role for bank balance sheet quality. This result has important policy implications, because the spillover effects is independent from the quality of banks' balance sheets.

Literature studied extensively the economic impact of unconventional monetary policies through the purchase of government bonds in many economic areas. The central bank's purchase of corporate bonds is a European feature, launched by the ECB in March 2016 and followed by Bank of England in August 2016. Little work has so far been carried out to investigate its effectiveness. This paper fills the analytical gap, but additional work on the macroeconomic implications is required. We leave this for future research.

References

Abidi, N. and I. Miquel Flores (2018). Who benefits from the corporate QE? A regression discontinuity design approach. Working Papers 2145, European Central Bank.

Acharya, V. V., B. Imbierowicz, S. Steffen, and D. Teichmann (2015, June). Does lack of financial stability impair the transmission of monetary policy? HIT-REFINED Working Paper Series 24, Institute of Economic Research, Hitotsubashi University.

Altavilla, C., F. Canova, and M. Ciccarelli (2019). Mending the broken link: heterogeneous bank lending and monetary policy pass-through. *Journal of Monetary Economics*, forthcoming.

Arce, O., R. Gimeno, and S. Mayordomo (2017). Making room for the needy: the credit-reallocation effects of the ECB's corporate QE. Working Papers 1743, Banco de España.

Beck, T., R. de Haas, H. Degryse, and N. Van Horen (2014). When arm's length is too far. Relationship banking over the business cycle. CEPR Discussion Papers 10050, C.E.P.R. Discussion Papers.

Bernanke, B. and A. Blinder (1988). Credit, money, and aggregate demand. *American Economic Review 78*(2), 435–39.

Cecchetti, S. (2017). A quantitative analysis of risk premia in the corporate bond market. Temi di discussione (Economic working papers) 1141, Banca d'Italia.

Darracq-Paries, M. and R. A. De Santis (2015). A non-standard monetary policy shock: The ECB's 3-year LTROs and the shift in credit supply. *Journal of International Money and Finance 54*(C), 1–34.

De Santis, R. A., A. Geis, A. Juskaite, and L. Vaz Cruz (2018). The impact of the corporate sector purchase programme on corporate bond markets and the financing of euro area non-financial corporations. *ECB Economic Bulletin* (3), 66–84.

De Santis, R. A. and A. Zaghini (2019). Unconventional monetary policy and corporate bond issuance. mimeo, European Central Bank.

Dovern, J., U. Fritsche, and J. Slacalek (2012). Disagreement among forecasters in g7 countries. *The Review of Economics and Statistics 94*(4), 1081–1096.

ECB (2016). The corporate bond market and the ECB's corporate sector purchase programme. *ECB Economic Bulletin* (5), 20–23.

Ertan, A., A. Kleymenova, and M. Tuijn (2018). Financial intermediation through financial disintermediation: Evidence from the ecb corporate sector purchase programme. mimeo, London Business School.

Ferrando, A., A. Popov, and G. F. Udell (2017). Sovereign stress and SMEs' access to finance: Evidence from the ECB's SAFE survey. *Journal of Banking and Finance 81*(C), 65–80.

Ferrando, A., A. Popov, and G. F. Udell (2019). Do smes benefit from unconventional monetary policy and how? microevidence from the eurozone. *Journal of Money, Credit and Banking 51*(4), 895–928.

Foley-Fisher, N., R. Ramcharan, and E. Yu (2016). The impact of unconventional monetary policy on firm financing constraints: Evidence from the maturity extension program. *Journal of Financial Economics 122*(2), 409–429.

Giannone, D., M. Lenza, H. Pill, and L. Reichlin (2012). The ECB and the Interbank Market. *Economic Journal 122*(564), 467–486.

Gilchrist, S., D. López-Salido, and E. Zakrajšek (2015). Monetary Policy and Real Borrowing Costs at the Zero Lower Bound. *American Economic Journal: Macroeconomics 7*(1), 77–109.

Gilchrist, S. and E. Zakrajšek (2013). The Impact of the Federal Reserve's large-scale asset purchase programs on corporate credit risk. *Journal of Money, Credit and Banking 45*(s2), 29–57.

Grosse-Rueschkamp, B., S. Steffen, and D. Streitz (2019). A capital structure channel of monetary policy. *Journal of Financial Economics*, forthcoming.

Kashyap, A. K. and J. C. Stein (1995). The impact of monetary policy on bank balance sheets. *Carnegie-Rochester Conference Series on Public Policy 42*(1), 151–195.

Kleibergen, F. and R. Paap (2006). Generalized reduced rank tests using the singular value decomposition. *Journal of Econometrics 133*(1), 97–126.

Krishnamurthy, A. and A. Vissing-Jorgensen (2011). The effects of quantitative easing on interest rates: Channels and implications for policy. *Brookings Papers on Economic Activity 42*(2 (Fall)), 215–287.

Li, F., A. Mercatanti, T. Mäkinen, and A. Silvestrini (2019). A regression discontinuity design for categorical ordered running variables with an application to central bank purchases of corporate bonds. Temi di discussione (Economic working papers) 1213, Banca d'Italia.

Pigini, C., A. F. Presbitero, and A. Zazzaro (2016). State dependence in access to credit. *Journal of Financial Stability 27*(C), 17–34.

Popov, A. and G. Udell (2012). Cross-border banking, credit access, and the financial crisis. *Journal of International Economics 87*(1), 147–161.

Presbitero, A. F., G. F. Udell, and A. Zazzaro (2014). The Home Bias and the Credit Crunch: A Regional Perspective. *Journal of Money, Credit and Banking 46*(s1), 53–85.

Rischen, T. and E. Theissen (2018). Underpricing in the euro area corporate bond market: New evidence from post-crisis regulation and quantitative easing. CFR Working Papers 18-03, University of Cologne, Centre for Financial Research (CFR).

Stock, J. and M. Yogo (2005). Testing for weak instruments in linear IV regression. In D. W. Andrews (Ed.), *Identification and Inference for Econometric Models*, pp. 80–108. Cambridge University Press.

Todorov, K. (2019). Quantify the quantitative easing: Impact on bonds and corporate debt issuance. *Journal of Financial Economics*, forthcoming.

Zaghini, A. (2019). A tale of fragmentation: Corporate funding in the euro-area bond market. *Journal of Corporate Finance 49*, 59–68.

Figures and Tables

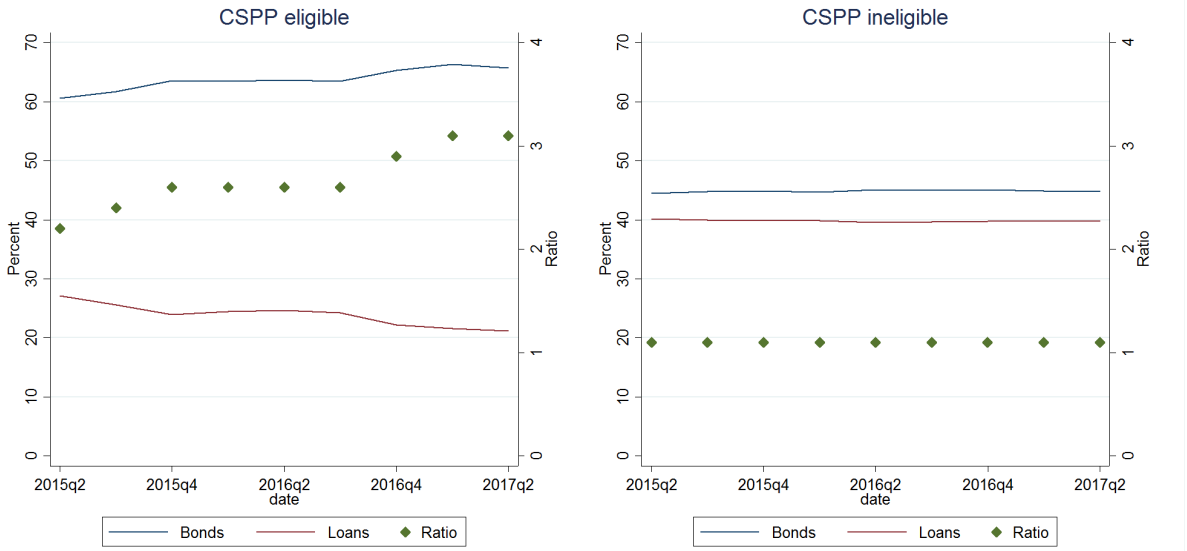

Figure 1: Debt structure of non-financial corporations eligible (LHS) and ineligible (RHS) for CSPP. Note: The Figure shows the share of bank loans and bonds in the debt structure of NFCs. Ratio is defined as bond/loan volumes. The computation is based upon 534 euro area NFCs, of which 113 issue CSPP eligible bonds. Source: De Santis et al. (2018).

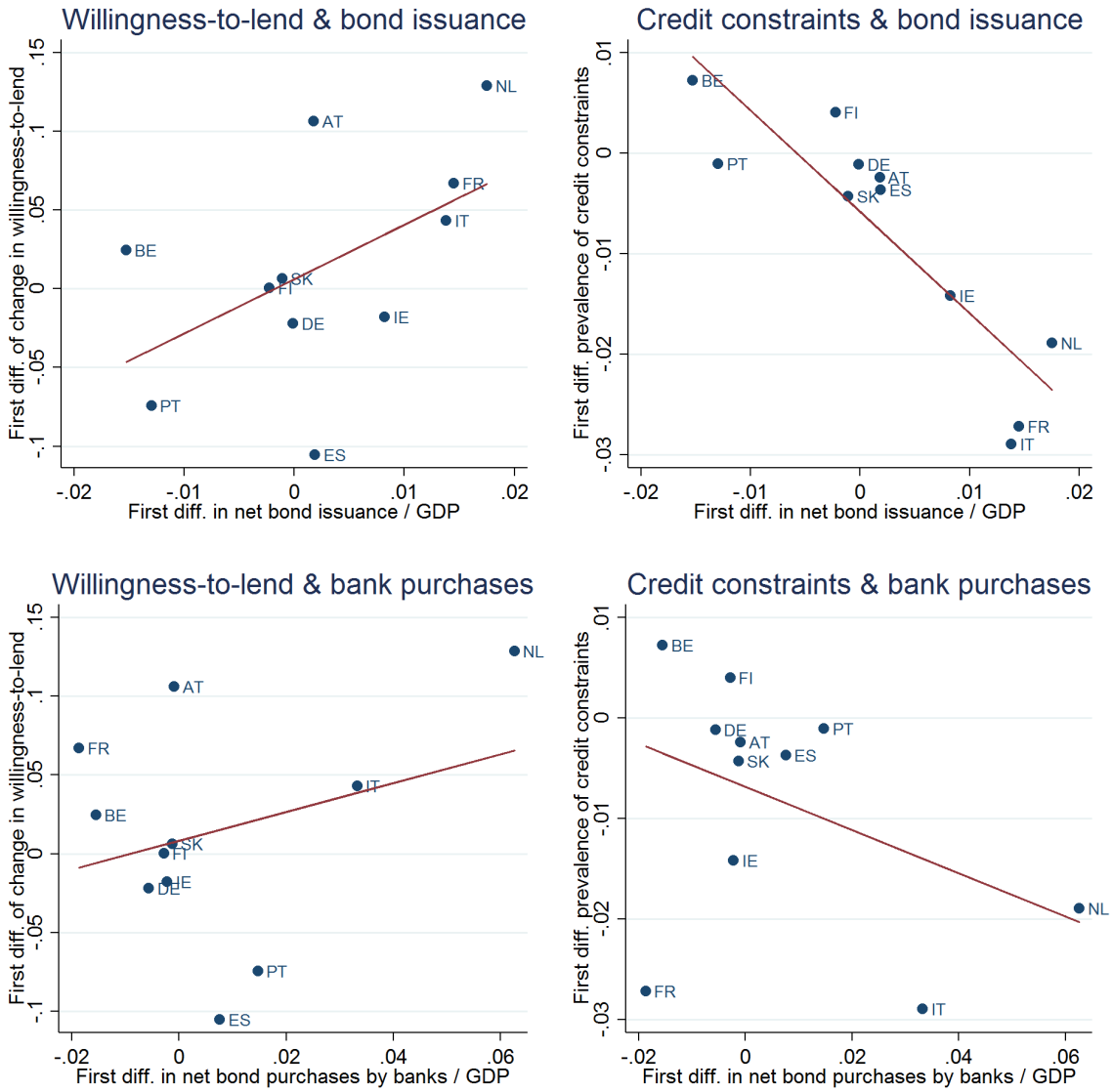

Figure 2: Change in credit supply and net bond issuance by non-financial corporations (first row), and net purchases of corporate bonds by banks (second row). Note: The first difference is computed as one-year after minus one-year before the CSPP announcement.

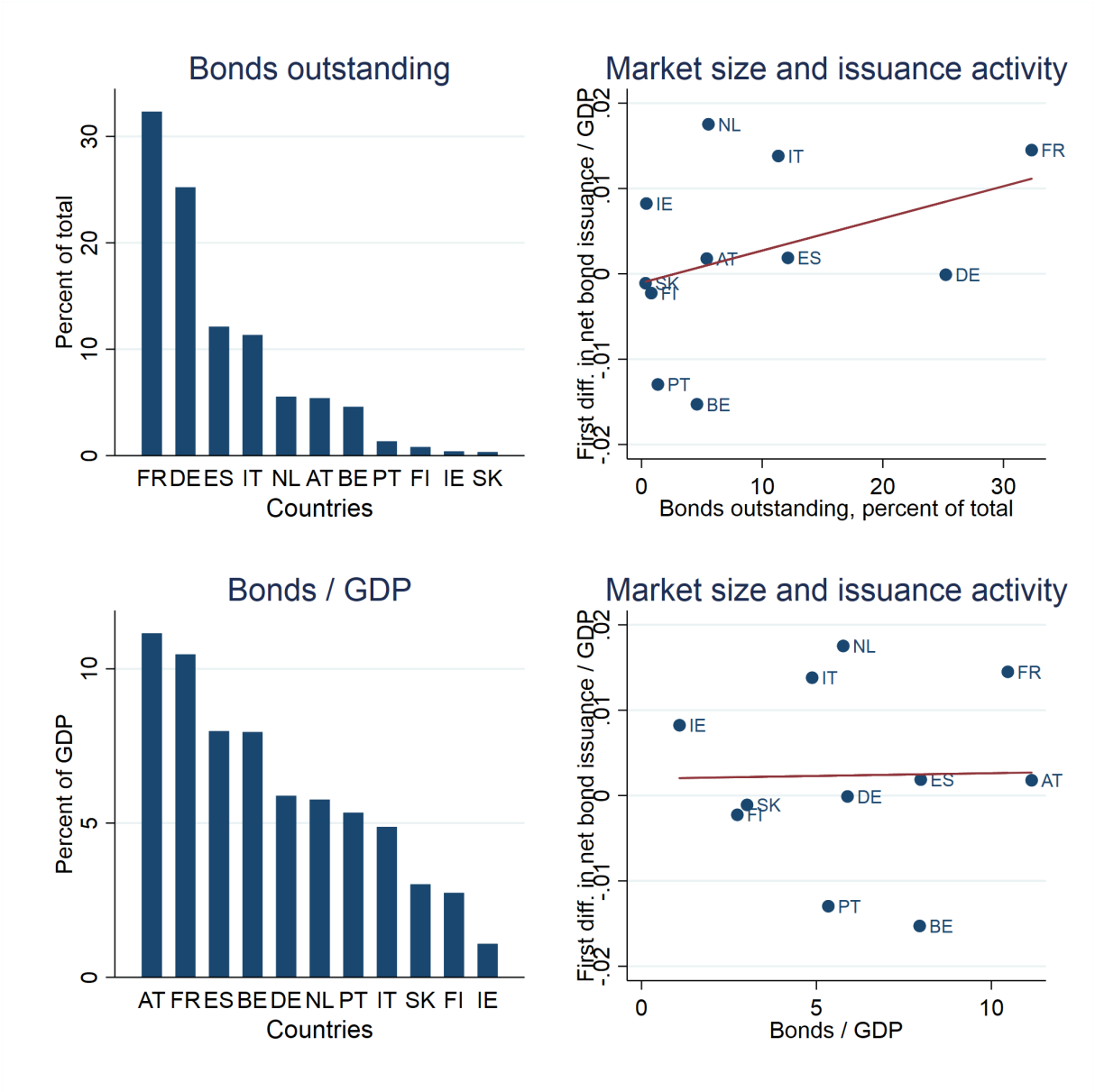

Figure 3: Financial system features and issuance activity. Note: Bonds outstanding GDP refer to 2015. The first difference is computed as one-year after minus one-year before the CSPP announcement.

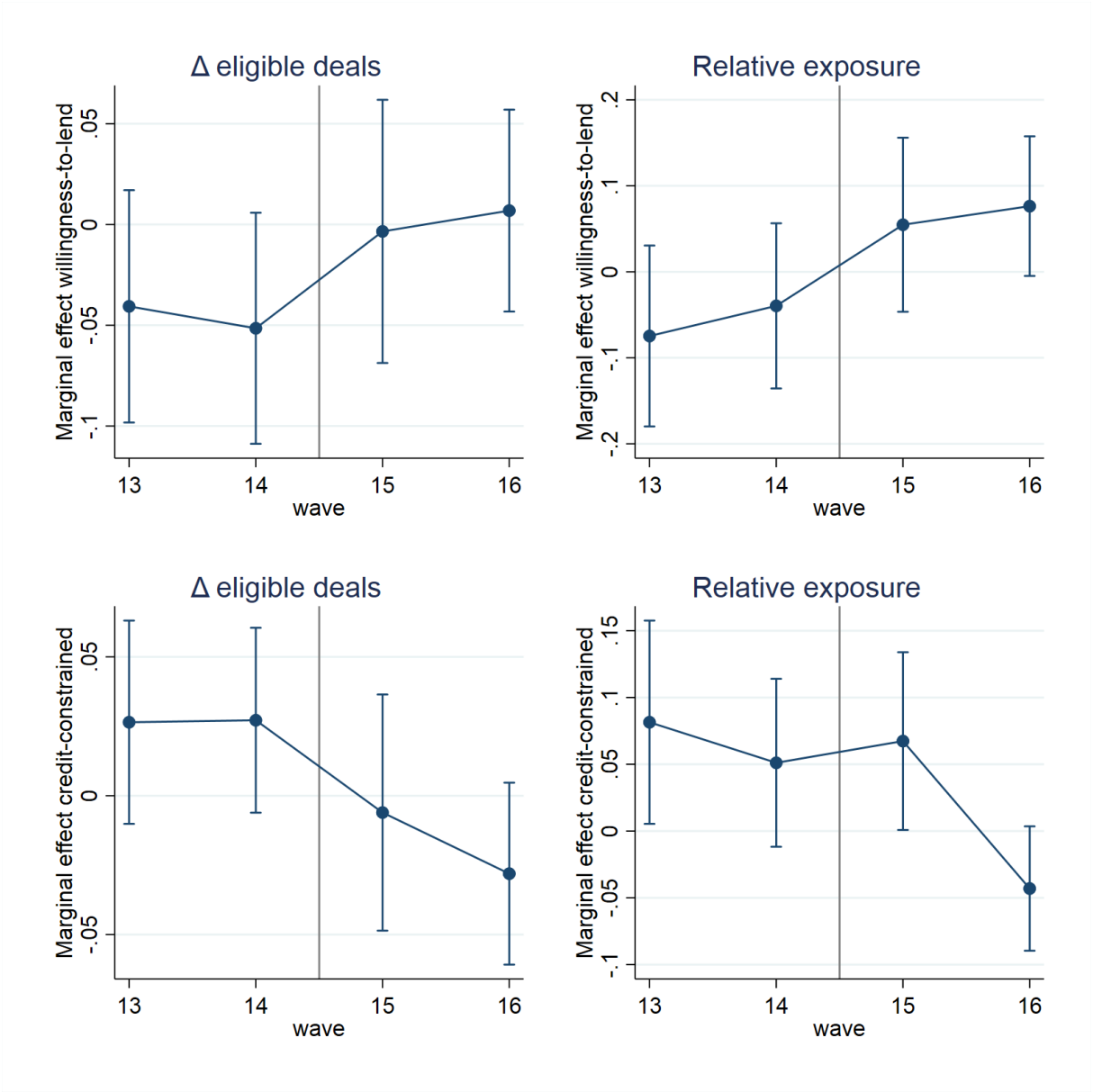

Figure 4: Visual evidence on the parallel trend assumption. Note: The Figure shows marginal effects from a variant of Equation 2 where the treatment is interacted with indicators for each survey wave and 90% confidence intervals.

Table 1: Summary statistics

Panel A:	SAFE		
	Pre-CSPP Waves 13 &14	Post-CSPP Waves 15 & 16	Difference
Willingness-to-lend	0.212	0.219	0.007
Bank-loan-availability	0.172	0.182	0.01
Credit constrained	0.112	0.099	-0.013
Outlook improved	0.343	0.352	0.009
Outlook deteriorated	0.174	0.151	-0.023
Capital improved	0.314	0.323	0.009
Capital deteriorated	0.099	0.079	-0.020
Credit history improved	0.296	0.311	0.015
Credit history deteriorated	0.081	0.066	-0.015
Log employment	3.682	3.678	-0.004
Firm age 5y-10y	0.106	0.097	-0.009
Firm age <5y	0.047	0.041	-0.006
Panel B:	Macro data		
	Pre-CSPP	Post-CSPP	Difference
CSPP / GDP	0.00	0.66	0.66
Net bond issuance / GDP	0.27	0.51	0.24
PSPP / GDP	6.33	7.52	1.19
MRO / GDP	-0.80	-0.37	0.43
TLTRO / GDP	0.28	2.63	2.35
Expected GDP growth	1.91	1.77	-0.14 0
Expected inflation	0.84	1.25	0.410

Panel A shows survey-weighted averages. CSPP purchase flows, net corporate bond issuance, PSPP, MROs and LTROs net flows are all expressed in percent of GDP. Waves 13 & 14 cover the one-year period before the CSPP announcement, April 15 - March 16. Waves 15 & 16 cover the one-year period after the CSPP announcement, April 16 - March 17.

Table 2: ECB March 2016 package and banks' willingness-to-lend: OLS regression

	CSPP	MRO	TLTRO	PSPP
CSPP / GDP(c,t)	0.024***			
	(5.41)			
MRO / GDP(c,t)		-0.002		
		(-0.64)		
TLTRO / GDP(c,t)			0.001	
			(0.30)	
PSPP / GDP(c,t)				0.007
				(1.60)
Expected GDP growth(c,t)	0.026**	0.039*	0.040*	0.036*
	(2.26)	(2.11)	(2.17)	(2.04)
Expected inflation(c,t)	-0.095***	-0.094***	-0.097***	-0.099***
	(-10.57)	(-7.94)	(-9.25)	(-9.55)
Outlook deteriorated(i,t)	-0.085***	-0.085***	-0.085***	-0.085***
	(-5.86)	(-5.87)	(-5.92)	(-5.90)
Outlook improved(i,t)	0.074***	0.074***	0.074***	0.074***
	(4.19)	(4.21)	(4.19)	(4.18)
Capital deteriorated(i,t)	-0.098***	-0.099***	-0.099***	-0.098***
	(-4.04)	(-4.12)	(-4.10)	(-4.07)
Capital improved(i,t)	0.069***	0.069***	0.070***	0.069***
	(4.85)	(4.82)	(4.86)	(4.83)
Credit history deteriorated(i,t)	-0.105**	-0.104**	-0.104**	-0.105**
	(-2.63)	(-2.62)	(-2.62)	(-2.62)
Credit history improved(i,t)	0.220***	0.221***	0.221***	0.220***
	(15.38)	(15.68)	(15.73)	(15.44)
Employment(i,t)	0.013	0.013	0.013	0.013
	(0.72)	(0.72)	(0.72)	(0.72)
Firm age 5y-10y (i,t)	0.008	0.006	0.006	0.006
	(0.19)	(0.14)	(0.14)	(0.15)
Firm age <5y (i,t)	0.113*	0.113*	0.113*	0.112*
	(2.12)	(2.09)	(2.10)	(2.10)
Constant	0.095	0.068	0.072	0.038
	(1.56)	(0.87)	(0.99)	(0.48)
N	13945	13945	13945	13945
R2	0.078	0.077	0.077	0.077

Dependent variable: Change in willingness-to-lend to SMEs and large firms that do not consider debt securities relevant. All specifications include firm-specific and time fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 3: ECB March 2016 package and credit constraints: OLS regression

	CSPP	MRO	TLTRO	PSPP
CSPP / GDP(c,t)	-0.016***			
	(-3.51)			
MRO / GDP(c,t)		0.003		
		(1.20)		
TLTRO / GDP(c,t)			-0.002*	
			(-2.01)	
PSPP / GDP(c,t)				-0.004
				(-1.33)
Expected GDP growth(c,t)	0.042**	0.034	0.033	0.035*
	(2.86)	(1.81)	(1.75)	(2.03)
Expected inflation(c,t)	-0.018*	-0.021*	-0.016*	-0.016
	(-2.09)	(-2.18)	(-1.95)	(-1.72)
Outlook deteriorated(i,t)	0.015	0.014	0.014	0.015
	(0.97)	(0.95)	(0.96)	(0.97)
Outlook improved(i,t)	-0.001	-0.001	-0.001	-0.001
	(-0.19)	(-0.17)	(-0.13)	(-0.13)
Capital deteriorated(i,t)	0.006	0.007	0.007	0.006
	(0.24)	(0.28)	(0.28)	(0.26)
Capital improved(i,t)	0.001	0.002	0.001	0.001
	(0.10)	(0.16)	(0.14)	(0.10)
Credit history deteriorated(i,t)	0.048***	0.048***	0.048***	0.047***
	(3.99)	(4.01)	(3.99)	(3.99)
Credit history improved(i,t)	-0.018	-0.018	-0.019	-0.019
	(-1.35)	(-1.35)	(-1.35)	(-1.35)
Employment(i,t)	-0.012	-0.012	-0.012	-0.012
	(-1.00)	(-0.96)	(-0.98)	(-1.01)
Firm age 5y-10y (i,t)	-0.004	-0.001	-0.001	-0.002
	(-0.10)	(-0.03)	(-0.03)	(-0.06)
Firm age <5y (i,t)	-0.046	-0.046	-0.046	-0.045
	(-0.82)	(-0.83)	(-0.82)	(-0.81)
Constant	0.098*	0.119**	0.114**	0.132***
	(1.95)	(2.84)	(2.39)	(3.22)
N	9711	9711	9711	9711
R2	0.009	0.008	0.008	0.008

Dependent variable: Credit constraints of SMEs and large firms that do not consider debt securities relevant. All specifications include firm-specific and time fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 4: Channels of the CSPP spillover effect: IV regression

	Willingness-to-lend		Credit constrained	
	NFC net bond issuance	Bank bond purchase	NFC net bond issuance	Bank bond purchase
NFC net issuance/GDP(c,t)	0.037***		-0.024**	
	(3.79)		(-2.00)	
Bank purchase/GDP(c,t)		1.764*		-1.268*
		(1.74)		(-1.93)
Expected GDP growth(c,t)	0.075**	0.058*	0.009	0.019
	(2.23)	(1.79)	(0.36)	(0.92)
Expected inflation(c,t)	-0.077***	-0.097***	-0.028***	-0.015**
	(-7.92)	(-10.41)	(-2.63)	(-1.96)
Outlook deteriorated(i,t)	-0.084***	-0.085***	0.016	0.015
	(-6.08)	(-6.32)	(1.07)	(1.09)
Outlook improved(i,t)	0.074***	0.075***	-0.000	-0.002
	(4.34)	(4.34)	(-0.07)	(-0.25)
Capital deteriorated(i,t)	-0.097***	-0.096***	0.006	0.001
	(-4.19)	(-4.13)	(0.25)	(0.04)
Capital improved(i,t)	0.070***	0.071***	0.001	-0.000
	(4.92)	(5.36)	(0.09)	(-0.02)
Credit history deteriorated(i,t)	-0.105***	-0.106***	0.048***	0.049***
	(-2.75)	(-2.83)	(4.14)	(4.11)
Credit history improved(i,t)	0.219***	0.220***	-0.018	-0.019
	(16.25)	(16.99)	(-1.38)	(-1.42)
Employment(i,t)	0.011	0.013	-0.011	-0.010
	(0.67)	(0.70)	(-0.93)	(-0.83)
Firm age <5y (i,t)	0.112**	0.116**	-0.045	-0.046
	(2.16)	(2.27)	(-0.84)	(-0.89)
Firm age 5y-10y (i,t)	0.004	0.006	0.001	0.000
	(0.09)	(0.17)	(0.02)	(0.01)
N	12656	12656	7747	7747
R2	0.076	0.071	0.006	-0.001
	First stage regression			
CSPP / GDP(c,t)	0.658***	0.014	0.696***	0.013
	(3.42)	(1.56)	(3.28)	(1.25)
K-P Stat	11.664	2.440	10.739	1.569
S-Y 10% critical values	16.38	16.38	16.38	16.38
S-Y 15% critical values	8.96	8.96	8.96	8.96

Bank dependent firms include SMEs and large firms that do not consider debt securities relevant. All specifications include firm-specific and time fixed effects. The first stage regression shows only the coefficients of the excluded instruments. "K-P Stat" denotes the Kleibergen-Paap rk Wald statistic. "S-Y 10% and 15% critical values" correspond to Stock-Yogo critical values for 10% and 15% maximal Wald test size distortion. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 5: Channels of the ECB March 2016 package spillover effect: IV regression

	CSPP	MRO	TLTRO	PSPP
Panel A		Willingness-to-lend		
		Second stage regression		
NFC net issuance/GDP(c,t)	0.037***	0.010	0.010	0.025***
	(3.79)	(0.81)	(0.37)	(2.70)
N. obs.	12656	12656	12656	12656
R2	0.076	0.077	0.077	0.077
		First stage regression		
CSPP / GDP(c,t)	0.658***			
	(3.42)			
MRO / GDP(c,t)		-0.228		
		(-1.35)		
TLTRO / GDP(c,t)			0.066	
			(0.74)	
PSPP / GDP(c,t)				0.272***
				(2.66)
K-P Stat	11.664	1.813	0.542	7.071
S-Y 10% critical values	16.38	16.38	16.38	16.38
S-Y 15% critical values	8.96	8.96	8.96	8.96
Panel B		Credit constraints		
		Second stage regression		
NFC net issuance/GDP(c,t)	-0.024**	-0.014	-0.038	-0.013
	(-2.00)	(-0.91)	(-0.70)	(-1.33)
N. obs.	7747	7747	7747	7747
R2	0.014	0.015	-0.008	0.014
		First stage regression		
CSPP / GDP(c,t)	0.696***			
	(3.28)			
MRO / GDP(c,t)		-0.235		
		(-1.39)		
TLTRO / GDP(c,t)			0.058	
			(0.61)	
PSPP / GDP(c,t)				0.288***
				(2.82)
K-P Stat	10.739	1.945	0.369	7.928
S-Y 10% critical values	16.38	16.38	16.38	16.38
S-Y 15% critical values	8.96	8.96	8.96	8.96

Coefficients of interest from second and first stage IV regressions. All country- and firm-specific control variables from Table 2 are included. All specifications include firm-specific and time fixed effects. The first stage regression shows only the coefficients of the excluded instruments. "K-P Stat" denotes the Kleibergen-Paap rk Wald statistic. "S-Y 10% and 15% critical values" correspond to Stock-Yogo critical values for 10% and 15% maximal Wald test size distortion. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 6: The role of market size

	Bonds / GDP		Bond market share	
Panel A		Willingness-to-lend		
	(1)	(2)	(3)	(4)
CSPP/GDP (c,t)	0.114***	0.027***	-0.016	0.024***
	(0.00)	(0.00)	(0.28)	(0.00)
CSPP/GDP (c,t) * country1	-0.085***			
	(0.00)			
CSPP/GDP (c,t) * country2		-0.023		
		(0.18)		
CSPP/GDP (c,t) * country3			0.041***	
			(0.00)	
CSPP/GDP (c,t) * country4				0.015
				(0.41)
N	13945	13945	13945	13945
R2	0.078	0.078	0.078	0.078
Panel B		Credit constraints		
	(1)	(2)	(3)	(4)
CSPP/GDP (c,t)	-0.054**	-0.019***	0.000	-0.017***
	(0.04)	(0.00)	(0.98)	(0.00)
CSPP/GDP (c,t) * country1	0.036			
	(0.11)			
CSPP/GDP (c,t) * country2		0.022***		
		(0.00)		
CSPP/GDP (c,t) * country3			-0.017	
			(0.14)	
CSPP/GDP (c,t) * country4				0.009
				(0.30)
N	9711	9711	9711	9711
R2	0.009	0.009	0.009	0.009

Country1 is a dummy which takes value of 1 for firms resident in Austria, France, Spain, Belgium, Germany and the Netherlands. Country2 as Country1 without the Netherlands. Country3 is a dummy which takes value of 1 for firms resident in France, Germany, Spain, Italy, the Netherlands and Austria. Country4 as Country3 without Austria. All country- and firm-specific control variables from Table 2 are included in the regressions. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 7: CSPP and firm-bank linkages: baseline results

	Willingness-to-lend		Credit constraints	
	(1)	(2)	(3)	(4)
CSPP indicator	0.055	0.042	0.009	0.003
	(1.08)	(0.83)	(0.33)	(0.10)
Δ eligible deals	-0.041		0.023	
	(-1.50)		(1.41)	
CSPP ind. x Δ eligible deals	0.050		-0.046**	
	(1.62)		(-2.49)	
Relative exposure		-0.055		0.065**
		(-1.21)		(2.06)
CSPP ind. x Relative exposure		0.122**		-0.064**
		(2.20)		(-1.99)
GSIB	-0.038*	-0.040**	0.025**	0.025**
	(-1.96)	(-2.06)	(2.00)	(1.98)
Savings bank	-0.037	-0.032	0.024	0.026*
	(-1.52)	(-1.35)	(1.58)	(1.82)
Cooperative	-0.046**	-0.047**	0.017	0.012
	(-2.00)	(-2.03)	(1.22)	(0.88)
Foreign subsidiary	0.010	0.004	-0.009	-0.013
	(0.35)	(0.15)	(-0.47)	(-0.71)
N	8750	8750	6336	6336
R2	0.224	0.224	0.076	0.076

Coefficients of interest from OLS regressions. The CSPP indicator equals one in SAFE waves 15 and 16. Δ *eligible deals* is an indicator equal to one if the number of syndicated loan deals with CSPP-eligible borrowers declines with the implementation of CSPP. *Relative expsoure* is an indicator equal to one if a bank ranks higher in the distribution of loans to CSPP-eligible than to CSPP-ineligible borrowers in the syndicated loan market. All firm-specific control variables from Table 2 are included in the regressions. All specifications include country-wave and country-sector fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 8: CSPP and firm-bank linkages: bank capital

	Willingness-to-lend		Credit constraints	
	(1)	(2)	(3)	(4)
CSPP indicator	0.027	0.018	0.004	-0.007
	(0.48)	(0.33)	(0.12)	(-0.22)
Δ eligible deals	-0.043		0.023	
	(-1.33)		(1.19)	
Relative exposure		-0.046		0.063*
		(-0.97)		(1.92)
Tier 1	0.003	0.005	0.005	0.011
	(0.14)	(0.27)	(0.35)	(0.95)
CSPP ind. x Δ eligible deals	0.054		-0.047**	
	(1.60)		(-2.28)	
CSPP ind. x Δ eligible deals x Tier 1	-0.002		0.007	
	(-0.07)		(0.38)	
CSPP ind. x Relative exposure		0.109*		-0.055
		(1.89)		(-1.62)
CSPP ind. x Relative exposure x Tier 1		0.129		-0.023
		(1.36)		(-0.32)
GSIB	-0.048**	-0.053**	0.032**	0.032**
	(-2.02)	(-2.22)	(2.06)	(2.05)
Savings bank	-0.043	-0.038	0.030*	0.034**
	(-1.55)	(-1.53)	(1.74)	(2.25)
Cooperative	-0.045*	-0.050*	0.019	0.014
	(-1.72)	(-1.89)	(1.24)	(0.89)
N	8011	8011	5776	5776
R2	0.216	0.217	0.076	0.076

Coefficients of interest from OLS regressions. Tier1 is an indicator equal to one if the firm borrows from a bank with a Tier 1 ratio above the country median. The CSPP indicator equals one in SAFE waves 15 an 16. Δ *eligible deals* is an indicator equal to one if the number of syndicated loan deals with CSPP-eligible borrowers declines with the implementation of CSPP. *Relative expsoure* is an indicator equal to one if a bank ranks higher in the distribution of loans to CSPP-eligible borrowers than to CSPP-ineligible borrowers. All firm-specific control variables from Table 2 are included in the regressions except for log employment. All specifications include country-wave and country-sector fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 9: CSPP and firm-bank linkages: bank asset quality

	Willingness-to-lend		Credit constraints	
	(1)	(2)	(3)	(4)
CSPP indicator	0.023	0.022	0.007	-0.007
	(0.40)	(0.40)	(0.21)	(-0.23)
Δ eligible deals	-0.044		0.017	
	(-1.49)		(0.97)	
Relative exposure		-0.047		0.059*
		(-1.01)		(1.82)
NPL	-0.002	0.015	-0.021	-0.026
	(-0.05)	(0.57)	(-1.10)	(-1.49)
CSPP ind. x Δ eligible deals	0.042		-0.041*	
	(1.07)		(-1.78)	
CSPP ind. x Δ eligible deals x NPL	0.020		-0.007	
	(0.60)		(-0.33)	
CSPP ind. x Relative exposure		0.189**		-0.083
		(2.43)		(-1.57)
CSPP ind. x Relative exposure x NPL		-0.092		0.034
		(-1.15)		(0.62)
GSIB	-0.045*	-0.046*	0.029*	0.029*
	(-1.91)	(-1.94)	(1.91)	(1.92)
Savings bank	-0.042	-0.033	0.020	0.024
	(-1.52)	(-1.29)	(1.11)	(1.54)
Cooperative	-0.040	-0.035	0.009	0.004
	(-1.42)	(-1.23)	(0.53)	(0.22)
N	8011	8011	5776	5776
R2	0.217	0.217	0.076	0.076

Coefficients of interest from OLS regressions. NPL is an indicator equal to one if the firm borrows from a bank with a NPL ratio above the country median. The CSPP indicator equals one in SAFE waves 15 an 16. Δ *eligible deals* is an indicator equal to one if the number of syndicated loan deals with CSPP-eligible borrowers declines with the implementation of CSPP. *Relative expsoure* is an indicator equal to one if a bank ranks higher in the distribution of loans to CSPP-eligible borrowers than to CSPP-ineligible borrowers. All firm-specific control variables from Table 2 are included in the regressions except for log employment. All specifications include country-wave and country-sector fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 10: CSPP and firm-bank linkages: placebo treatment

	Willingness-to-lend		Credit constraints	
	(1)	(2)	(3)	(4)
Placebo treatment	0.114*	0.123*	0.015	0.028
	(1.76)	(1.94)	(0.43)	(0.84)
Δ eligible deals	-0.007		-0.018	
	(-0.18)		(-0.74)	
Placebo x Δ eligible deals	-0.020		0.015	
	(-0.48)		(0.58)	
Relative exposure		0.034		0.024
		(0.59)		(0.61)
Placebo x Relative exposure		-0.059		-0.010
		(-0.89)		(-0.23)
GSIB	-0.007	-0.008	-0.017	-0.018
	(-0.30)	(-0.38)	(-1.14)	(-1.21)
Savings bank	-0.026	-0.019	-0.010	-0.006
	(-0.94)	(-0.74)	(-0.57)	(-0.35)
Cooperative	-0.022	-0.021	-0.012	-0.013
	(-0.89)	(-0.84)	(-0.77)	(-0.82)
Foreign subsidiary	-0.013	-0.020	0.014	0.009
	(-0.41)	(-0.64)	(0.67)	(0.46)
N	7118	7118	5153	5153
R2	0.270	0.270	0.110	0.110

Coefficients of interest from OLS regressions. Placebo treatment equals one in SAFE waves 12 and 13 (October 2014 - September 2015) and corresponds to the implementation of the first TLTRO and the announcement of PSPP. Δ *eligible deals* is an indicator equal to one if the number of syndicated loan deals with CSPP-eligible borrowers declines with the implementation of CSPP. *Relative expsoure* is an indicator equal to one if a bank ranks higher in the distribution of loans to CSPP-eligible borrowers than to CSPP-ineligible borrowers. All firm-specific control variables from Table 2 are included in the regressions. All specifications include country-wave and country-sector fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: October 2013 - September 2015.

Table 11: CSPP and firm-bank linkages: exclude bank mergers

	Willingness-to-lend		Credit constraints	
	(1)	(2)	(3)	(4)
CSPP indicator	0.061	0.043	0.009	0.005
	(1.19)	(0.85)	(0.33)	(0.18)
Δ eligible deals	-0.044		0.031*	
	(-1.57)		(1.82)	
CSPP ind. x Δ eligible deals	0.041		-0.044**	
	(1.25)		(-2.27)	
Relative exposure		-0.055		0.061*
		(-1.19)		(1.95)
CSPP ind. x Relative exposure		0.124**		-0.064**
		(2.23)		(-2.00)
GSIB	-0.050**	-0.052**	0.029*	0.029*
	(-2.16)	(-2.27)	(1.80)	(1.82)
Savings bank	-0.047*	-0.038	0.030*	0.028*
	(-1.88)	(-1.60)	(1.93)	(1.95)
Cooperative	-0.050**	-0.052**	0.020	0.016
	(-2.16)	(-2.19)	(1.41)	(1.12)
Foreign subsidiary	0.011	0.003	0.001	0.000
	(0.36)	(0.10)	(0.05)	(0.02)
N	8012	8012	5784	5784
R2	0.224	0.224	0.083	0.083

Coefficients of interest from OLS regressions. The CSPP indicator equals one in SAFE waves 15 and 16. Δ *eligible deals* is an indicator equal to one if the number of syndicated loan deals with CSPP-eligible borrowers declines with the implementation of CSPP. *Relative expsoure* is an indicator equal to one if a bank ranks higher in the distribution of loans to CSPP-eligible than to CSPP-ineligible borrowers in the syndicated loan market. Firms borrowing from banks that were taken over by another bank during the sample period are excluded. All firm-specific control variables from Table 2 are included in the regressions. All specifications include country-wave and country-sector fixed effects. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Appendix

The Appendix provides additional robustness checks based on purchase flows. As Table 12 shows, the results are robust to changes in the dependent variable. The use of bank loan availability based on SAFE question Q9 does not change the results qualitatively. In analogy to the change in willingness-to-lend, an improvement in bank-loan-availability is coded as 1 a deterioration as -1, and unchanged availability as 0.

The results become stronger if we include the firms that are interviewed only once. In this case, the sample size more than doubles. To run this exercise, we substitute the firm fixed effects with the interaction of sector and country fixed effects (see Tables 13). The inclusion of firm fixed effects controls for unobserved time invariant heterogeneity across firms. The interaction of sector and country fixed effects is less stringent, as it controls for unobserved time invariant heterogeneity at the level of a particular industry in a particular country.

It should be noticed that, unlike in Table 2 where the p-value of the countries' PSPP/GDP ratio coefficient is 14%, the PSPP coefficient becomes statistically significant at 5% when a less stringent model is considered by excluding firm fixed effects (see Tables 13). However, given that the Kleibergen-Paap rk Wald statistic remains quite small in the IV regression available for the linear probability models (see Tables 13), this corroborates the conclusion that the estimated PSPP-induced loan supply effect due to the banks' spare capacity does not occur though the corporate bond markets.

Table 12: ECB March 2016 package and bank loan availability: OLS regression

Panel A	OLS regression			
	(1)	(2)	(3)	(4)
CSPP / GDP (c,t)	0.020**			
	(2.77)			
MRO / GDP (c,t)		-0.002		
		(-0.64)		
TLTRO / GDP (c,t)			0.005*	
			(1.97)	
PSPP / GDP (c,t)				0.011**
				(2.84)
N. obs.	10142	10142	10142	10142
R2	0.049	0.077	0.049	0.049
Panel B	IV regression			
	Second stage			
Issuance / GDP (c,t)	0.029***	0.029	0.077	0.040**
	(2.60)	(1.33)	(0.90)	(1.96)
N. obs.	10142	10142	10142	10142
R2	0.049	0.049	0.040	0.048
	First stage			
CSPP / GDP (c,t)	0.687***			
	(3.07)			
MRO / GDP (c,t)		-0.237		
		(-1.40)		
TLTRO / GDP (c,t)			0.066	
			(0.72)	
PSPP / GDP (c,t)				0.289***
				(2.80)
K-P Stat	9.445	1.948	0.523	7.828
S-Y 10% critical values	16.38	16.38	16.38	16.38
S-Y 15% critical values	8.96	8.96	8.96	8.96

Dependent variable: Change in bank-loan-availability to SMEs and large firms that do not consider debt securities relevant. Coefficients of interest from reduced form, second stage and first stage regressions. All country- and firm-specific control variables from Table 2 are included in the regressions. "K-P Stat" denotes the Kleibergen-Paap rk Wald statistic. "S-Y 10% and 15% critical values" correspond to Stock-Yogo critical values for 10% and 15% maximal Wald test size distortion. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

Table 13: ECB March 2016 package and banks' willingness-to-lend - country/sector FE

Panel A	OLS regression			
	(1)	(2)	(3)	(4)
CSPP / GDP (c,t)	0.031***			
	(4.70)			
MRO / GDP (c,t)		-0.003		
		(-1.04)		
TLTRO / GDP (c,t)			0.001	
			(0.65)	
PSPP / GDP (c,t)				0.010**
				(2.52)
N. obs.	27115	27115	27115	27115
R2	0.221	0.220	0.220	0.221
Panel B	IV regression			
	Second stage			
Issuance / GDP (c,t)	0.050***	0.015	0.019	0.042***
	(3.94)	(1.21)	(0.91)	(3.38)
N. obs.	27115	27115	27115	27115
R2	0.219	0.220	0.220	0.219
	First stage			
CSPP / GDP (c,t)	0.615***			
	(3.49)			
MRO / GDP (c,t)		-0.194		
		(-1.21)		
TLTRO / GDP (c,t)			0.062	
			(0.68)	
PSPP / GDP (c,t)				0.245**
				(2.36)
K-P Stat	12.148	1.475	0.456	5.581
S-Y 10% critical values	16.38	16.38	16.38	16.38
S-Y 15% critical values	8.96	8.96	8.96	8.96

Dependent variable: Change in willingness-to-lend to SMEs and large firms that do not consider debt securities relevant. Coefficients of interest from reduced form, second stage and first stage regressions. All country- and firm-specific control variables from Table 2 are included in the regressions. Firm fixed effects are replaced by country-sector fixed effects. "K-P Stat" denotes the Kleibergen-Paap rk Wald statistic. "S-Y 10% and 15% critical values" correspond to Stock-Yogo critical values for 10% and 15% maximal Wald test size distortion. T-statistics in parentheses. * p < 10%, ** p < 5%, *** p < 1%. Sample period: April 2015 - March 2017.

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