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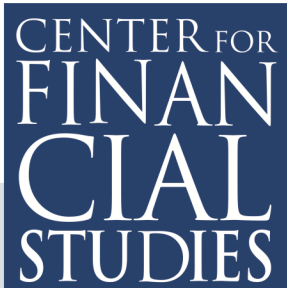
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No. 654

Roberto A. De Santis and Andrea Zaghini

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Corporate Bond Issuance

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Unconventional Monetary Policy and Corporate Bond Issuance^{*}

Roberto A. De Santis[†] and Andrea Zaghini[‡]

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Abstract

We assess the effect and the timing of the corporate arm of the ECB quantitative easing (CSPP) on corporate bond issuance. Because of several contemporaneous measures, to isolate the programme effects we rely on one key eligibility feature: the euro denomination of newly issued bonds. We find that the significant increase in bonds issuance by eligible firms is due to the CSPP and that this effect took at least six months to unfold. This result holds even when comparing firms with similar ratings, thus providing evidence that unconventional monetary policy can foster a financing diversification regardless of firms' risk profile. We also highlight the impact of the programme on the real economic activity. The evidence suggests that while all firms increased investment in capital expenditures and intangible assets, the CSPP induced eligible firms to invest in marketable and equity securities, to repurchase their own stocks, to hold cash and to carry out short-term investment.

Keywords: Quantitative easing, CSPP, corporate bond market.

JEL classification: E52, G15, G32.

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I Introduction

One important lesson coming from the global financial crisis in 2008 and 2009 is that firms' ability to switch across alternative instruments of debt finance is a key element of resilience, since diversified sources of external finance can help absorb the negative implications of adverse financial and real economic shocks (De Fiore and Uhlig, 2015). However, many European firms are still almost entirely relying on the banking system as the source of the economic activity funding. Can central banks stimulate the credit provision through the corporate bond issuance, thereby fostering a diversification process?

Central banks around the world have implemented a broad set of conventional and unconventional monetary policy measures (in particular, large-scale asset purchase programs or LSAPs for short) to drag the economies out of the global financial crisis and the great recession and a lively literature has suggested several channels of how LSAPs transmit to the real economy (Vayanos and Vila, 2009; Krishnamurthy and Vissing-Jorgensen, 2011; Rodnyansky and Darmouni, 2017; Kojen et al., 2017; Hachula et al., 2019). However, the link between LSAPs and the financing decisions of firms is by far less studied (Acharya et al., 2019; Ferrando et al., 2019; Grosse-Rueschkamp et al., 2019).

In this paper, we investigate one feature of the credit channel of the monetary policy through the Corporate Sector Purchase Programme (CSPP) of the European Central Bank (ECB). The impact of CSPP on corporate bond issuance is the first link at work in order to gauge the successfulness of a monetary policy on credit supply. Specifically, we explore the effect of the CSPP, first on the bond issuance of euro-area corporations and then on their economic performance. In the first part of the paper we address the following research questions: (i) Can monetary policy stimulate the supply of corporate bonds? (ii) If yes, how long does it take to affect the primary bond market? We then investigate whether the funds attracted through the CSPP were used to sustain firms' business operations, quantifying their effects on firms' real economic activity.

To address these questions we make use of the difference-in-differences (DID) method

with the treated group being the firms eligible to the CSPP and the control group formed by the non-eligible firms to the ECB purchases. Addressing these questions is relevant and important, given that the purchase of corporate bonds has become part of the toolkit all major central banks including the Federal Reserve Board of the United States, which announced in June 2020 the purchases of individual corporate bonds in the context of the coronavirus pandemic.

The euro area is a good case study to empirically address the proposed questions because the ECB, already in 2016, and earlier than other central banks, started relying on the relatively unusual measure of outright purchases of corporate bonds, not only in the secondary market but also in the primary markets through the CSPP.

In a nutshell, the CSPP entails the purchase of investment-grade euro-denominated bonds issued by non-bank corporations that are established in the euro area. It was announced on 10 March, 2016 together with other important policy measures, among which: the lowering of the deposit facility rate to -40 basis points, the adjustment of the Public Sector Purchase Programme (PSPP) and the introduction of a new series of four targeted longer-term refinancing operations (TLTRO-II), which provided liquidity at favorable rates to banks expanding their credit to non-financial corporations (NFCs).

All ECB policy measures, which were launched contemporaneously in March 2016, aimed at improving firms' financing conditions with potentially similar implications for corporate bond yields and issuance. In order to disentangle the effect of the CSPP from the other policies, we propose an identification strategy based on the currency of denomination of bonds. One key characteristic, which differentiates the CSPP from the other monetary policy measures, is that corporate bonds must be denominated in euro in order to be eligible to the programme. A stimulus stemming from other ECB policy measures would instead not influence the choice of the currency of denomination of the bond.

Disentangling the specific effects of CSPP over time is of outmost importance from at least two points of view. On the one hand, it is relevant to check whether this new instru-

ment was indeed successful in stimulating the corporate bond issuance; on the other hand, understanding its timing and effect can help calibrate the monetary stimulus originating from LSAPs and plan the withdrawal of that stimulus in a following phase.

We construct the CSPP eligible and non-eligible groups very carefully. Instead of looking at a predetermined group of firms (such as, for instance, the euro-area set of listed NFCs), we select all corporations that directly or indirectly were affected by the CSPP, following a three-step procedure. First, by employing proprietary ECB databases, we take all bond placements on the market relevant to the CSPP, ISIN by ISIN (International Securities Identification Number); we then associate the ISIN to the issuing corporations; finally, we select the eligible corporations according to all the CSPP requirements, both at the firm and bond level.¹ By employing a probit DID model, we then test whether after the CSPP announcement the probability of issuing a higher fraction of bonds in euro for the treated group (eligible firms) increased relative to the control group (non-eligible firms). The accurate sample construction and the strategy of relying on the euro-denomination criterion allow a neat identification of the effects of the CSPP on corporate bond issuance.

We show that the impact of the CSPP on corporate bond issuance is overwhelming. After the introduction of the 10 March, 2016 policy package, the probability of issuing bonds in euro relative to other currencies significantly increased for CSPP eligible firms with respect to non-eligible firms by an estimated 14%. It is this change in the currency composition of the placements by the eligible firms relative to the non-eligible firms that suggests that the increased bond issuance is due to the CSPP and not to other monetary policy measures. In addition, we find that the switch towards euro-denominated bonds by eligible corporations took time to unfold. Our estimates suggest that the CSPP started to have a statistically significant effect from the beginning of 2017 (i.e. six months after the start of the purchases). Only corporations already financing their activity on the bond market in multiple currencies could rapidly adjust to the CSPP framework. This evidence squares well with the fact that

¹The description and discussion on the eligibility criteria on both issuing corporations and bond placements are provided in Section 3.

it takes time to issue a new bond on the primary market, especially by firms which do not often resort to the direct bond-market financing or even first timers. Several parties such as investment bankers, institutional investors and ratings agencies are involved in the placement process that starts after the management decision and the approval by the corporate board, which protect shareholder interests (Bhojraj and Sengupta, 2003).

Our results hold also when restricting the control sample to non-banks only and to investment grade corporations only. The former analysis guarantees that the result is not driven by the funding decisions of banks, which had also access to other policy measures, as the TLTRO. The latter finding is instead particularly relevant from a policy perspective, since it avoids the possibly flawed, but not rare in the literature, comparison of decisions made by firms with different risk profiles (investment grade versus high yield).

While it could be argued that CSPP eligible firms simply switched their issuance away from non-euro currencies, with no implications for aggregate issuance at firm level, we show that eligible issuers increased their bond issuance and that the increase was stronger than for other issuers. Our estimates suggest that EUR 10 billion purchases through the CSPP in the primary market increase the issuance of eligible versus non-eligible issuers by 2.5-3.3 billion.

A possible caveat concerns the implications of the negative interest rate policy. The reduction of the deposit facility rate into negative territory could have caused banks to tighten their credit supply to NFCs (Brunnermeier and Koby, 2018; Eggertsson et al., 2019), forcing firms to issue euro-denominated bonds to finance their activity in the domestic economy. In order to address the potential “reversal interest rate” hypothesis, we run a placebo test over the period when the deposit facility rate entered into negative territory, but before the announcement of the CSPP (i.e., between 11 June, 2014 and 9 March, 2016). The results suggest that the negative interest rates did not cause any relative shift in euro-denominated bonds by firms issuing investment grade bonds, thus confirming the effectiveness of the CSPP even in a negative interest rate environment.

Finally, we investigate whether the funds attracted through the ECB monetary policy package of March 2016, and the CSPP in particular, were used to sustain firms' business operations. We find that while there is a widespread increase in investment in capital expenditures and intangible assets, CSPP eligible firms increased (relative to non eligible firms) the purchase of marketable and equity securities and their own shares (buy-back), the holding of cash and the short-term investment expenditures.

The remaining of the paper is organized as follows: Section 2 places the paper in the current literature debate; Section 3 describes the CSPP features; Section 4 introduces the econometric approach; Section 5 discusses the empirical results; Section 6 performs several additional investigations and controls for a possible alternative hypothesis of monetary policy transmission; Section 7 shows how the policy package influenced investment and real economic activity; Section 8 draws the conclusions.

II Related literature

The paper contributes to the current debate on the effects of the launch of the CSPP. A first group of studies documents a significant reduction in corporate bond spreads in several market segments (Rischen and Theissen, 2018; De Santis et al., 2018; Abidi and Miquel-Flores, 2018; Li et al., 2019; Todorov, 2019) and analyze the working of the portfolio rebalancing channel (Zaghini 2019). After the CSPP announcement, both yields of eligible versus non-eligible bonds in the the secondary market (Todorov, 2019) and corporate spreads in the primary market (Zaghini 2019) dropped by 30 basis points. Other studies find a smaller, but still relatively large and statistically significant, impact of the CSPP on corporate spreads by about 20 basis points in the primary market (Li et al., 2019) and by about 15 basis points in the secondary market (De Santis et al., 2018; Abidi and Miquel-Flores, 2018). A positive impact on corporate bond prices due to the CSPP has a wealth effect, which could have some implications on the real economy. However, the credit channel of the

monetary policy through the CSPP is fully at work only if also the corporate debt issuance is stimulated. If the CSPP had only an impact on corporate bond prices, but not on issuance, then the transmission of the monetary policy would be limited in scope (given the relatively small size of the euro-area bond market).

A second group of fewer papers looks at the effect of the CSPP on the financing decision of firms. For instance, Grosse-Rueschkamp et al. (2019), by using the balance sheets of listed NFCs registered in the euro area over the one-year period after 10 March, 2016, find a significant increase in a “bond debt” aggregate for investment grade (IG) firms relative to non-IG firms.² However, an increase in debt in firms’ balance sheet can be simply due to mergers and acquisitions (M&A). If a CSPP eligible firm acquire in this period a non-CSPP eligible firm, who raised its capital from the bond market, the increase in “bond debt” would be classified incorrectly as due to the CSPP. In addition, “bond debt” in balance sheet data is a very aggregate concept, because it includes a broad set of securities (commercial papers, senior bonds and notes, subordinated bonds and notes, bonds issued in foreign currency), many of which are not targeted by the CSPP, posing a challenge for the assessment of the ECB policy measures. For example, an increase in issuance of debt in foreign markets would increase bond debt, but not affect the euro-area bond market. Thus, one cannot rule out that the reported increase in the corporate debt of the selected NFCs was due to issuance not suitable for CSPP purchases. Increase in debt due to M&As, issuance in foreign markets and currencies, private placements and short term issuance do challenge the database employed by Grosse-Rueschkamp et al. (2019).³

In addition, corporate debt could also increase due to other monetary policy measures, unfolded in the same period, for example the expansion of the PSPP. As the ECB purchases government bonds, private investors, such as banks, pension funds and insurances, could shift their investment in the corporate bond market. One would attribute to the CSPP an

²In a similar exercise, Arce et al. (2020) documented a surge in bond placements one-quarter after the CSPP announcement by Spanish eligible firms.

³A private placement is a sale of bonds to pre-selected investors and institutions rather than on the open market.

increase in corporate bond issuance that instead is brought about by the PSPP, thereby misleading the policymaker. The novelty of our database is that, rather than using balance sheet data, we collect directly all bond issuances of all euro area firms issued in all currencies and provide an identification scheme that allows to disentangle the effect of the CSPP from the other contemporaneous monetary policy measures.

Todorov (2020) also studies the impact of the CSPP programme on bond issuance, controlling for the currency of denomination of the bonds to identify the CSPP shock. He finds a weak statistical significance, since his analysis is not only purposely based on a very short horizon (13 weeks after the announcement date of 10 March, 2016 and before the program starts in June 2016), but also relies on an incomplete sample of issuers drawn from the secondary market.⁴ Moreover, over the chosen short lapse of time, only corporations already relying on the bond market might have been able to increase the issuance volume through new placements or by tapping existing bonds. The latter decision is very different from the one concerning the issuance of a new bond (via a new ISIN) fulfilling the eligibility criteria, which were disclosed more than a month after the CSPP announcement (21 April, 2016).⁵ Indeed, firms' decision about a new bond issuance and the process associated to it require a longer time span (up to three months for newcomers).⁶ By employing the entire universe of bond issuance from the primary market and looking at periods beyond one or two quarters, we show that the impact of CSPP on issuance is overwhelming with statistically significant effects from the beginning of 2017.

A related literature investigates a different spillover effect of the CSPP: NFCs eligible to

⁴In particular, Todorov (2020) filters out the bonds in the secondary market which were less than one week old to obtain a panel of bond-week observations, which is used as proxy of the true issuance in the primary bond market. According to Figure 8 in Todorov (2020), the analysis based on new bonds issued by firms issuing in multiple currencies is carried out using about 120 placements. The database is not necessarily representative, because 1,632 new bonds were placed over the period from 1 January to 10 June, 2016.

⁵The author acknowledges that the statistical significance of the results (often at the 10% level) was driven by the interim period between 10 March and 21 April, 2016, a period in which the CSPP eligibility criteria were still unknown by market participants.

⁶Typically, a detailed offering prospectus must be provided and a roadshow involving potential investors organized in order to negotiate rates and ancillary conditions. If issuing corporations are not rated, the involvement of a rating agency must also be taken into account.

the CSPP substituted bank loans with bond debt; this, in turn, allowed banks to increase the lending to the NFCs which did not benefit from the CSPP. Grosse-Rueschkamp et al. (2019), which named this mechanism as the capital structure channel of monetary policy, address the issue by looking at loan syndication and large corporations, Ertan et al. (2018) and Betz and De Santis (2019) focus on the credit supply of bank-dependent firms, particularly small and medium enterprises.

All in all, while the results of the literature are informative and go a long way in the right direction, the findings about the direct effect of the CSPP on the corporate bond issuance and its timing are still not conclusive.

In order to identify the CSPP effects, we propose a direct approach relying on the primary bond market, based on the currency of denomination of the newly issued bonds, at the daily frequency and on a long horizon of 2 years after the CSPP announcement. The use of this rich database allows to disentangle the effect of the CSPP from the other confounding sources (i.e., the other monetary policy measures announced on the same day). Moreover, while Grosse-Rueschkamp et al. (2019) and Todorov (2019) studied the topic using continuous-time linear models, given that bond issuance is not a continuous phenomenon, we address the following key question by using a cross-section probit model: has the probability of issuing bonds denominated in euro (relative to other currencies) by CSPP eligible firms increased relative to non-eligible firms after the CSPP announcement?

We also differ from the existing literature as we cover all corporations that directly or indirectly were affected by the CSPP. In order to isolate the CSPP-induced shift in the corporate bond issuance, we focus on the primary bond market and carry out an identification strategy along two dimensions. First we allocate the euro-area corporate bond issuers in the two segments of eligible and non-eligible corporations taking into account all the CSPP eligibility criteria (at the bond and issuer level). Secondly, we distinguish the issuance at the ISIN level according to the bond currency of denomination, thus making use of one key CSPP eligibility feature (the euro-denomination of newly issued bonds), which uniquely

distinguishes the programme from the other measures announced on the same day.

Another distinguishing feature of our paper is that we are interested in the timing of the programme. We show that the CSPP effects took time to unfold and to involve the whole corporate bond market, since in the very first months after the CSPP announcement only corporations already regularly financing on the bond market could benefit from the programme (around 10% of the total sample).

Finally, with regard to the effect of the CSPP on economic activity, we find evidence that the CSPP induced eligible firms, relative to the control group, to hold cash and short-term securities and to increase non-capex expenditures, such as the purchase of marketable and equity securities and the buyback activity.

III The CSPP at work

On 10 March, 2016 the ECB announced a set of measures in pursuit of its price stability objective. Three measures concerned the official policy rates and three were of a more unconventional nature:

1. The interest rate on the main refinancing operations (MRO) was decreased by 5 basis points to 0.00%. The interest rate on the marginal lending facility was decreased by 5 basis points to 0.25%. The interest rate on the deposit facility was decreased by 10 basis points to -0.40%.
2. The monthly purchases under the asset purchase programme were expanded to EUR 80 from EUR 60 billion starting in April 2016.
3. Investment grade euro-denominated bonds issued by non-bank corporations established in the euro area were included in the list of assets eligible for regular purchases under a new programme named “Corporate sector purchase programme” (CSPP).
4. A new series of four targeted longer-term refinancing operations (TLTRO), at the

interest rate on the deposit facility and with a maturity of four years, were scheduled starting from June 2016.

In particular, the three unconventional measures were aimed at strengthening the pass through of the accommodative monetary policy stance to the real sector of the economy. Among them, the introduction of the CSPP within the broader asset purchasing programme directly targeted the bond issuance of corporations, which in the euro area is historically a largely less used source of financing than bank loans.

The aim of the CSPP, in addition to a broad signalling effect, was to lower the yield on targeted bonds and, mainly through the work of the portfolio rebalancing channel, influence also other asset prices, in particular (corporate) non-eligible bonds. The idea behind rebalancing channel is that by generating scarcity in the eligible bond segment investors would be encouraged to shift holding into other (riskier) asset classes (Draghi 2015). In addition, the presence of a large player in the euro-area bond market would encourage the issuance activity on the primary market and guarantee an increased liquidity in secondary market trades (Steeley 2015, Boneva and Linton 2017). In turn, the improved funding conditions of corporations would stimulate their business and support euro-area economic growth.

The bond and issuer eligibility conditions set forth by the ECB after the Governing Council meeting on 21 April, 2016 were as follows:

- the bond must be eligible as collateral for Eurosystem credit operations;
- the bond must be denominated in euro;
- the bond must have a minimum first-best credit assessment of at least BBB- or equivalent (obtained from an external credit assessment institution);
- the bond must have a minimum (remaining) maturity of six months and a maximum (remaining) maturity of less than 31 years;

- the issuer must be a corporation established in the euro area, defined as the location of incorporation of the issuer;
- the issuer must not be a credit institution nor have any parent undertaking which is a credit institution.

In addition, other conditions were introduced to ensure a diversified allocation of purchases across issuers, to sustain the market liquidity, and to guarantee the transparency of the programme.⁷

Note that from the joint working of the eligibility criteria, it turns out that not all euro-denominated bonds are eligible. Provided that the other criteria are fulfilled, when an IG firm incorporated in the euro area issues euro-denominated bonds they are eligible, but the same firm may well issue bonds in currencies other than euro, which are not eligible under the ECB programmes. For instance, a 10-year euro-denominated bond issued by the Spanish Banco Santander SA is not eligible because, while meeting the requirements concerning the maturity at issuance, the denomination currency, the incorporation of the issuer and the minimum credit rating, it does not meet the criterion that the issuer must not be a credit institution. Yet, the same bond issued by BMW Finance NV, the financial vehicle of the German car maker incorporated in the Netherlands (also with an IG rating) is eligible. Thus, the difference in this example does not just lay on the euro denomination of the bond. At the same time, BMW Finance NV can issue dollar-denominated bonds, which instead are not eligible because of the currency of denomination. This implies that only eligible firm can issue CSPP eligible bonds, but not all bonds issued by eligible firms are CSPP eligible, since they must meet additional criteria, the most important of which being the currency of denomination.

By using individual corporate bond spreads at the ISIN level with daily frequency and focusing only on senior unsecured bonds, Figure 1 shows that, immediately after the an-

⁷For further details see the ECB press releases:
https://www.ecb.europa.eu/press/pr/date/2016/html/pr160421_1.en.html,
<https://www.ecb.europa.eu/mopo/implement/omt/html/cspp-qa.en.html>.

nouncement of the policy measures, corporate bond spreads declined on secondary market trades on both eligible and non-eligible segments. Also the net issuance by NFCs picked up in March 2016 from historically low levels and remained strong in both 2016 and 2017 (see Figure 2).

With regard to the placement volume, bond issuance in the whole euro-area primary market increased from a quarterly average of 201 billion euro before the CSPP to 210 billion after the CSPP, with the share of euro denominated bonds increasing from 68% to 72%.⁸ However, this basic evidence about the corporate issuance is not sufficient to attribute to the CSPP the merit of the sizable increase of the bond market, since other expansionary monetary policy measures were implemented at the same time.

<Figure 1 Corporate bond spreads by issuer>

<Figure 2 Corporate bond issuance>

In the next section we rely on the single characteristics of the CSPP which make its effect different from those stemming from the other monetary policy measures announced on the same day: the currency of denominations of the bonds. Indeed, only euro-denominated bonds are eligible to the programme. While a stimulus to increase bond issuance stemming from the other measures would not impact the choice about the currency of denomination of the bond, which is a decision pertaining the characteristics of the firm, the market liquidity, and the macroeconomic and institutional environment (McBrady et al. 2010), a significant change in the currency composition of newly issued bonds by eligible firms relative to non-eligible firms would suggest that the increase in the bond issuance is due to the CSPP.

IV Data and the econometric approach

We study the CSPP impact on bond supply by looking at more than 12,000 placements in the primary bond market over the period from October 2013 to June 2018. Since the bond

⁸Data collected over the period 2013Q3-2018Q2 from more than 12,000 bonds placed by issuers registered in the euro area.

issuance is a phenomenon which is not continuous over time, we resort to a cross-section econometric approach, in which the time dimension is taken into account by a set of time dummies. Focusing on the period after the CSPP announcement, only 22 corporations out of the over 1,000 in the sample issued at least one bond in each quarter. In other words, about 2% of the sample showed a time-continuous issuance at the quarterly frequency. Therefore, adopting a panel approach – as carried out for instance by Todorov (2019) – with our data would not be appropriate. In addition, given that a relatively long time span is needed to assess the development over time of the CSPP, we preferred to rely on a probit model.⁹

To introduce the econometric approach, we start with the traditional linear DID framework. Let Y_i be the outcome of interest for firm i , $D_i=1$ if the firm i belongs to the treatment group, $D_i=0$ if the firm i belongs to the control group and $POST$ is a dummy equal to 1 after the introduction of the policy. The typical DID approach takes the following form:

$$Y_i = \alpha_0 + \beta_1 Post \times D_i + \beta_2 D_i + \eta_i + \epsilon_i \quad (1)$$

where η_i is an individual-specific component and ϵ_i is an individual-transitory shock that has mean zero. Y_i , D_i and $Post$ are observed. The effect of the treatment is β_1 , if the selection of the treatment does not depend on ϵ_i (Ashenfelter and Card, 1985; Abadie, 2005). This condition is satisfied in our context, because the treatment and the control groups (being eligible and non-eligible to the CSPP) are not random variables, but they are predetermined to the ECB announcement.

In this paper, the outcome of interest is the probability of issuing bonds in euro relative to other currencies. The econometric approach is based on a probit DID framework employing two sources of identifying variation: the time before and after the announcement of the CSPP, and the cross section of firms affected (treatment group) and not affected by CSPP

⁹All the results of the paper are confirmed when using linear OLS regressions.

(control group). The specification takes the following form:

$$P(Euro_i = 1) = \varphi(\alpha_0 + \beta_1 Post \times Eligible_i + \beta_2 Eligible_i + \sum_k \gamma_k V_{i,k}^{bond} + \sum_l \gamma_l V_{i,l}^{issuer} + \sum_z \gamma_z Dummy_{i,z} + \varepsilon_i) \quad (2)$$

where $P(Euro_i = 1)$ is the probability of issuing bonds in euro relative to other currencies, $Euro_i$ is a dummy variable equal to 1 if the currency of denomination of the bond i is the euro and 0 otherwise; $Post$ is a dummy equal to 1 from March 10, 2016 onwards and 0 before; $Eligible_i$ is a dummy equal to 1 if the firm issuing bond i is CSPP-eligible and 0 if the firm is not CSPP-eligible; V_k^{bond} are the K variables tracking the bond i features; V_l^{issuer} are the L variables characterizing the corporation issuing bond i ; $Dummy_{i,z}$ are the Z sets of the industry sector of the issuer, country and time dummies. Bond placements are clustered into sector-country bins, reflecting the assumption that placements in the same bin might exhibit the same credit demand.¹⁰ The interaction between sectors, countries and quarterly time dummies control for demand shocks, specific at sector-country level. We saturate the model with weekly time dummies to take into account the time-varying euro-area market conditions and aggregate shocks.¹¹ Note that the issuance date in the cross-section structure of equation (2) is just another characteristic of the i -th bond. As in all DID approaches, the coefficient of interest for the analysis is β_1 which assesses the differential effect of the CSPP on the probability of issuing bonds in euro by eligible issuers.¹²

¹⁰We use a 19-sector classification: 9 for financial corporations (Banks, Investment management, Leasing companies, Special purpose vehicles, Finance-automobile, Finance-miscellaneous, Insurance, Holding companies and Real estate); and 10 for non-financial corporations (Auto and track, Basic materials, Consumer goods, Consumer services, Healthcare, Industrials, Oil and gas, Technology, Telecommunications and Utilities).

¹¹We cannot interact weekly or monthly dummies with sector and/or country fixed effects, because the model would not have sufficient degree of freedom for the estimation. Similarly, even if the database of the corporate bonds issued in the primary market is daily, the issuance of specific ISINs typically occurs once; therefore, a time fixed effect with higher frequency is not technically feasible.

¹²An eligible firm may issue bonds denominated in euro which are not suitable for purchase under the CSPP if the maturity at issuance of the bond is below 6 months and over 31 years. Dropping the latter bonds from the sample or correcting the dependent variable for this circumstance does not change the results, since a tiny fraction of the bonds (around 0.4%) shows a maturity below 6 months or longer than 31 years.

All exogenous variables are taken at the bond issuance date (time t) with the exception of balance sheet data which refer to the end-year prior to the issuance. We double cluster the standard errors to correct for cross correlations across bond issues by the same corporation (issuer level) and across all corporations in each point in time (time level).¹³

With regard to the bond features, the exogenous variables taken into account are: the time to maturity at origination, the amount issued (single tranche) and the coupon frequency. Concerning the firm-level controls, we use a measure of the creditworthiness of the corporation, an indicator of the size and the frequency of issuance. As for the creditworthiness, we rely on the rating provided by the three most important rating agencies: Moody's, Fitch and S&P. Given the likely non-linear relation between the probability of default and the rating, we use a set of dummy variables, one for each rating grade.¹⁴ The variable size is the log of the total assets. To take into account whether the corporations does not often tap the bond market we use a 1-timer dummy, which is equal 1 if the corporation has issued only one bond in the period under consideration and 0 otherwise.

As for the data sources, we merged information from several providers in order to have the final sample of 12,113 bonds for which all variables' values are available. In particular, balance sheet variables are sourced from S&P Capital IQ, financial indices from Bloomberg, issuance features from DCM Analytics by Dealogic, the CISS index and the euro exchange rates from ECB Statistical Data Warehouse (SDW).

Starting from the list of bonds in the sample, we select all the issuing corporations fulfilling the CSPP eligibility criteria published by the ECB according to Dealogic data (425 corporations). It turns out that 295 corporations had at least one bond purchased either on the primary or the secondary market under the CSPP. Finally, the control sample is simply

¹³Each corporation issues on average about 11 bond/ISINs and by construction there is a need to address the correlation across bond issuances within the corporation by clustering (see also Bertrand et al., 2004; Cameron and Miller, 2015).

¹⁴The rating of the issuer is first linearized between 1 (CC/Ca) and 20 (AAA/Aaa), so that when the same bond receives more than one assessment from Moody's, Fitch and Standard&Poors they can be averaged. Then the average is transformed into a set of dummy variables. We rely on the rating of the parent company when the issuer's rating is not available but the parent's is. We also add a dummy tracking the corporations whose rating is not available at all.

made of all issuers not already in the treated sample. All in all, our sample contains 1,078 corporations, 39% of which are eligible issuers.¹⁵

<Table 1 Bond issuance by period and sector>

An advantage of our database is that we can assess the change in the bond issuance by eligible and non-eligible corporations, split by currency of denomination, over a relatively long time-span before and after the announcement of the CSPP. Table 1 provides a snapshot of the issuance over time of different market segments. The issuance by eligible issuers significantly increased and was entirely driven by the euro-denominated bonds. Banks reduced their placement volume (almost equally divided between bonds in euro and in other currencies), most likely because of the cheaper funding source provided by the TLTROs. Non-bank non-eligible issuers increased their issuance, again almost equally shared between euro-denominated and non euro-denominated bonds.¹⁶ This preliminary evidence would suggest that the ECB corporate programme was effective in sustaining the bond market with the exception of banks: in a first phase after the start of the CSPP purchases the average quarterly issuance increased for eligible bonds and the increase was stronger in euro denominated bonds, then it involved also the segment of (non-bank) non-eligible bonds.

<Figure 3 Relative bond issuance in euro: Parallel trend shift>

Before exploiting the DID framework, we must note that a causal interpretation of Equation (2) relies on the assumption of a parallel trend in euro-denominated bond issuance between eligible and non-eligible issuers before the CSPP announcement. It requires that in the absence of treatment, the difference between the ‘treatment’ and ‘control’ group is constant over time. We thus perform a test of the assumption by running a probit regression

¹⁵Table A1 in the online Appendix reports summary statistics of the euro-area bond market.

¹⁶Given the overall market development, the segment of non-eligible issuers significantly caught-up with eligible issuers in the last part of the sample period. Indeed, during the first four quarters of CSPP purchases (2016Q3-2017Q2), the difference in the average issuance between eligible and non-eligible issuers was 70 billion, while it reduced to 45 billion in the following four quarters (2017Q3-2018Q2). A development in line with the timing of the unfolding of the portfolio rebalancing channel (Zaghini, 2019).

as in Equation (2) adding the interaction of the semiannual and the CSPP-eligible dummies over the whole time span. We employ the semi-annual frequency for this exercise in order to have a sufficient number of bonds in every period, given the non-continuous nature of the database. Figure 3 shows the estimated interaction coefficients together with the 90% and the 95% confidence intervals. There is not a different trend in euro-denominated bond issuance between the treated and non-treated group of issuers before the first half of 2016: all the coefficients are not statistically significant. The trend is downward in the first half of 2014 and the first half of 2016 and it is upward between Jun 2014 and December 2015. It cuts the horizontal axis three times. Conversely, the trend is clearly upwards from June 2016, when the CSPP purchases started, and onwards. In the period of CSPP purchases, eligible corporations significantly increased the fraction of bonds issued in euro relative to non-eligible issuers.

V The empirical evidence

In the previous sections we made clear that the issuance activity is not a time-continuous phenomenon and that the time needed to place a new bond may be long depending on several factors, particularly whether the corporation is an established issuer or it is new to the investors (an irregular issuer or even a new issuer). In addition, the details about the CSPP features offering the eligibility criteria were released on 21 April, 2016, more than one month after the initial announcement of the programme. Thus, we may expect that, also in the case of the increased demand due to the CSPP, the market needed a sufficiently long time span to adjust the issuance volumes.

We start our empirical analysis showing in Table 2 the coefficients of OLS and probit DID regressions of the euro dummy over three different horizons in columns (1)-(3) and (4)-(6), respectively.¹⁷ In columns (1) and (4) we rely on the 23 weeks from January 2016

¹⁷All regressions are run with weekly, sector and country fixed effects. For the ease of comparison, the coefficients reported in Table 2 concerning the probit regressions are the average marginal effects as in

to June 2016 as in Todorov (2019); in columns (2) and (5) we extend the horizon backward as far as our dataset allows (October 2013 to June 2016); in columns (3) and (6) we employ the maximum time-span available (October 2013 to June 2018). As in Todorov (2019), we rely on weekly time dummy to take into account the different market conditions, but we cannot control for issuers fixed effects, because many firms are first time issuers. However, we saturate the specification with country and sector dummies.

<Table 2 OLS and Probit estimations>

<Figure 4 Expanding probit regressions>

The CSPP-induced supply shift in the euro denomination of bonds did not take place by the end of June 2016. The variable tracking the interaction of the time dummy over the treatment period and the treated group of eligible issuers ($Post \times Eligible$) is not statistically significant, neither over the 23-week horizon (columns 1 and 4), nor over the backward-extended horizon (columns 2 and 5). Instead, the effect of the CSPP kicks in (and it is statistically significant under both estimation methodologies) over the relatively long horizon ending two years after the launch of the purchases, occurred on 8 June, 2016 (columns 3 and 6). We show in the robustness check that only corporations already supplying bonds in multiple currencies could rapidly adjust to the CSPP framework.

The analysis carried out by expanding probit regressions from October 2013 shows that the horizon must be extended up to the first quarter of 2017, in order to achieve an effect which is statistically significant, and it is after the fourth quarter of 2017 that the effect levels off (see Figure 4). Thus, in order to take into account the latter circumstance and take advantage of the full sample, henceforth we focus the analysis on regressions over the period October 2013 - June 2018.¹⁸

Table 3 reports in column (1) the coefficients of a baseline regression which includes both the variables tracking the bond features and the variables concerning the characteristics of

Williams (2012), whereas the standard errors are computed according to the Delta method.

¹⁸In the Appendix (Table A2), we show that the results remain invariant if the analysis is carried out over the period January 2016-June 2018.

the issuing corporations as described in the previous section. In addition, we also rely on weekly time dummy and on the interaction of quarter, country and sector dummies to take into account of the different time-varying sector-specific shocks at the country level. The coefficient on the ($Post \times Eligible$) variable is strongly significant and the estimated impact (the average marginal effect) can be calculated at 14.4%, which indicates that the CSPP effect on the treated group was also economically relevant.

<Table 3 CSPP impact and additional probit estimations>

Looking for other possible sources of influence at work with the CSPP on both the supply and demand side, we expand the baseline regression by introducing several new regressors, the influence of which is not taken into account by the time dummies either because of a different cross-section structure or a higher frequency (columns 2 to 7). Specifically, we look at three possible sources of influence. On the one hand, the decision about issuing in a given currency might well be affected by international competitiveness (actual and expected). Therefore, we introduce the euro real effective exchange rate (column 2) and the 5-year currency basis vis-à-vis the US dollar (column 3).¹⁹ On the other hand, in the period under analysis, there have been several changes in regulation for institutional investors such as pension funds and insurance corporations (PF&IC). In particular, the requirements included in the new supervisory regime Solvency II for the insurance corporations started to be binding in 2016Q1. Since in the euro area a significant part of the demand for corporate bonds historically comes from PF&IC, we also introduce the sector assets' holding of these institutions in each euro area country both in lagged stocks (column 4) and as quarterly flows (column 5). Finally, the systemic stress in the financial markets both in the euro area and the US, may have an addition influence on the corporations' issuing decisions. Thus we include the CISS index by Hollo et. al. (2012) to control for a daily indicator of systemic

¹⁹The currency basis is a common measure of expected appreciation of the euro via-a-vis the dollar. It is constructed as the difference between the 5-year currency swap contract in euro and the 5-year currency swap contract in dollar.

stress which averages the financial conditions of several markets in the euro area (column 6) and the US (column 7)

While the coefficients of the real effective exchange rate, the lagged stock of assets' holdings by PF&IC and the euro-area CISS are significantly different from zero, thus providing evidence of an active role of the exchange rate, the institutional investors PF&IC and the systemic stress in influencing the decision about the currency of denomination of the bond placement, the CSPP effect on the treated group is confirmed in both sign and magnitude. This in turn suggests that: i) the influence of the added controls is not different for the eligible firms and the control group; ii) the effect of the CSPP is economically relevant for the euro-area bond market.²⁰

In the next section: we focus on three relevant sets of issuers, whose characteristics help shed further light on the timing and the size of the CSPP effects; we cross-check for the quantity placed by eligible issuers to be sure that the increase in the probability of issuing euro-denominated bonds is not just a reshuffling of the bonds' currency of denomination without effects on the quantities placed; finally, we test whether our results are driven by an alternative hypothesis of the monetary policy transmission mechanism.

VI Further investigations

VI.A Relevant sets of issuers

The first set of further checks concerns three issues: the credit risk of the issuer, the ability of the issuer in placing bonds denominated in different currencies, and the role of banks in

²⁰In the Appendix we report several robustness checks of the 7 baselines regressions. As a first step, we replicate Table 3 using linear OLS estimates (Table A3). Secondly, given that in several instances, (especially for bond issuance in the first three months of the year), the date of the bond placement occurs before the release of the firm previous year balance sheet, we rely to the total assets reported two calendar years prior to the issuance day (Table A4). Finally, we check for any additional effects associated to the issuer size in the Post CSPP period. Specifically, we assess whether the probability of issuing euro-denominated bonds is linked to a change of behavior on the part of issuers that experienced a change in that characteristic (Table A5). Results are not significantly affected.

influencing the results of the analysis.

As for the first issue, our test consists in relying on corporations with an investment grade rating only. This exercise differs from the analyses proposed in the literature about the CSPP since we are comparing the issuance activity of corporations with a similar credit risk. The less risky firms need less monitoring and usually face less constraints, and, consequently, can benefit from several of the measures included in the 10 March, 2016 ECB policy package. Instead, by focusing on corporations with a similar credit risk we can better disentangle the CSPP effect. The number of corporations declines to 695, 479 of which issued more than one bond. We focus on the latter sample in order to control for unobserved heterogeneity among corporations through issuer fixed effects.

Table 4 (column IG) shows that β_1 (the effect on the eligible set of issuers) is statistically significant ($p < 0.05$) and larger than in the baseline regressions (the average marginal effect stands at 19% versus 14%). In addition, it emerges that the firms' characteristics, size and eligibility to the programme (essentially the business sector), are not significantly different from zero, which in turn suggests that a more homogeneous sample of corporations is used for the regression. Hence, we can safely argue that monetary policy can affect the financing choice of corporations regardless of their risk profile. Also for this restricted sample, the effect of the CSPP started to be significantly different from zero in the second half of 2017 (Figure 5, top panel). It took more than one year after the start of the purchases to fully adjust to the increased ECB demand.

<Table 4 Robustness checks>

In a further adjustment, we restrict the sample to corporations financing on the bond market in multiple currency before and after the CSPP announcement. There are only 108 corporations (out of the over 1,000 with at least one bond placed over the period under analysis) which issued bonds in euro and in other currencies, both before and after the CSPP announcement. Despite the reduced number of corporations, the sample remains relatively large, as they issued more than half of the total value of the primary bond market.

<Figure 5 Expanding regressions from robustness checks>

Analyzing their behavior is relevant because these corporations were already managing the currency of denomination of their issued bonds and could switch to euro-denominated placements much faster than other corporations. Firm fixed effects control again for unobserved heterogeneity among firms. Regression estimations (column Multi-currency) confirm that (i) the increase in the probability of issuing in euro is significantly larger for eligible corporations ($p < 0.05$), (ii) the effect is larger than in the baseline scenario (24% versus 14%) and (iii) the eligibility status is no longer statistically significant, suggesting that the sample is formed by more homogeneous corporations. In addition, time expanding regressions for the set of multi-currency issuers show that the CSPP effect was statistically significant already in June 2016 with the actual start of purchases by the ECB (Figure 5, central panel). This evidence supports the argument that only a very restricted group of corporations (i.e., large companies already financing on the bond market) could benefit from the programme from the beginning.

A final check concerns banks, whose bonds are not CSPP-eligible, and which benefited from other ECB non-conventional monetary policy measure as, for instance, the two waves of TLTRO (the second announced on 10 March, 2016), which provided a cheaper funding to credit institutions willing to increase the credit to the private sector. Therefore, the last test is carried out relying on non-banks only (column Non-banks). In other words, we employ as control sample only potentially eligible corporations: corporations belonging to the non-financial sector and financial corporations other than banks. Even though the number of observations shrinks to almost one third of the initial sample, the β_1 coefficient on the ($Post \times Eligible$) variable is statistically significant ($p < 0.01$) and very similar to the baseline estimation, implying a 13% average marginal effect. According to the expanding regressions, the effect is significant from the first quarter of 2017 (Figure 5, lower panel).

VI.B Cross-checking the quantity issued

From the preliminary evidence in Table 1 about the evolution of the total amount placed it turns out that, on aggregate, eligible issuers increased their bond issuance over the CSPP purchases. Table 5 reports instead the econometric evidence about the relative increase in the amount issued at the bond level with respect to non-eligible issuers, when taking into account all the control variables employed in regression (1). With this exercise we check whether the increase in euro-denominated bonds is not just a switch away from an other currency, but an actual increase in volume at issuer level.

Analytically:

$$\begin{aligned}
 Value_i = & \alpha_0 + \beta_1 Post \times Eligible_i + \beta_2 Eligible_i + \sum_k \gamma_k V_{i,k}^{bond} \\
 & + \sum_l \gamma_l V_{i,l}^{issuer} + \sum_z \gamma_z Dummy_{i,z} + \varepsilon_i
 \end{aligned} \tag{3}$$

where $Value_i$ is the logarithm of the amount placed via bond i issued in all currencies and converted in euro. Equation (3) is estimated via pooled OLS and standard errors are clustered at the double level of issuer and time.

<Table 5 Robustness with values>

We again rely on four different samples of corporations: the whole set of issuers; IG issuers only; issuers placing bonds in different currencies only; non-bank corporations only.

All the four specifications suggest that the increase in the amount placed at the ISIN level was statistically stronger for eligible corporations after the CSPP announcement with respect to non-eligible issuers. This circumstance applies regardless of whether the eligible issuers were placing larger or smaller amount before the CSPP, as signalled by the different sign of the β_2 coefficient.

All in all, not only eligible corporations increased the probability of issuing euro-denominated bonds, but they also increased the size of each bond placement more than non-eligible cor-

porations. This combined evidence confirms that the CSPP was behind the rise in the bond market issuance, as reported in Table 1 and depicted in Figure 2. In addition, we can estimate that EUR 10 billion purchases through the CSPP in the primary market increase issuance of eligible versus non-eligible issuers by 2.5-3.3 billion. Given that the Eurosystem purchased EUR 30 billion of corporate bonds in the primary market up to the second quarter of 2018, the regression results imply a rise in bond issuance directly due to the CSPP of EUR 7.5-10 billion over the same period.

VI.C The negative interest rate hypothesis

The CSPP was announced together with several other measures, including the lowering of the deposit facility rate from -30 to -40 basis points. Under the “reversal interest rate” hypothesis, it could be argued that the further reduction of the deposit facility rate into negative territory could have caused banks to tighten their credit supply to NFCs (Brunnermeier and Koby, 2018; Eggertsson et al., 2019), inducing firms to issue (euro-denominated) bonds to finance their activity in the domestic economy.

We have been arguing that the euro denomination of the bond issued by certain firms is a specific feature of the CSPP. There is no immediate reason to relate a potential credit crunch due to the negative interest rate policy to the increase in the relative supply of euro-denominated bonds by eligible versus non-eligible issuers. The working of the “reversal interest rate” channel would require two assumptions, which theoretically are not easy to justify: 1) a more stringent credit tightening for investment grade than high yield corporations, 2) an induced increase of bond issuance in euro relative to other currencies. Yet, we can run over our dataset a robustness exercise to test the validity of the hypothesis.

<Table 6 Placebo tests under negative rates>

In order to investigate the possibility of a rotation from bank loans to corporate bond issuance in a negative interest rate environment, we run a DID placebo test using regression

(2) over a time horizon which includes the period when the deposit facility rate entered into negative territory (11 June, 2014), but before the announcement of the CSPP (10 March, 2016). The estimation results suggest that the negative interest rates did not cause any relative shift in euro-denominated bonds by firms issuing investment grade bonds. The interaction term between the placebo time dummy, which takes the value of one between 11 June, 2014 and 9 March, 2016, and the CSPP eligibility dummy is not statistically significant (Table 6). This is true not only for the case of the baseline model, which includes all bonds (column 1), but also when limiting the analysis to corporations with an investment grade rating only (column 2), when restricting to corporations issuing bonds in multiple currency (column 3) and when relying on non-banks only (column 4). Overall, these results corroborate the main findings of the effectiveness of the CSPP on corporate bond issuance, even in a negative interest rate environment.²¹

VII The real effects of the additional issuance

In this Section we perform a further analysis looking at the real effects stemming from the unconventional monetary policy. Particularly, we provide evidence which aims at answering the following question: Did the March 2016 monetary policy package and the ensuing increase in bond issuance translate into an improved real outcome for the euro-area firms and specifically for CSPP eligible firms? To address these questions we use both flows' data from firms' cash flow and income statements and growth rates of stocks from firms' balance sheet data identifying proxies for the real outcome.

We study the effects on the growth rate of firms' assets and its main sub-items such as net property, plant and equipment, long-term investment and total cash and short-term investments, as well as the growth rate of working capital, defined as the difference between current assets and current liabilities, employing information from firms' balance sheets (Sufi,

²¹In Table A6 in the Appendix we report the results of an additional rolling placebo test in which probit DID regressions are run over two symmetrical six-month periods before and after selected dates starting from June 2016, when the actual CSPP purchase started. The results so far discussed are corroborated.

2009; Grosse-Rueschkamp et al., 2019). We also investigate the implications for cash investment on capital expenditures (Capex) and other (cash) investment items such as cash acquisitions, purchased securities and intangible, as well as other cash flow activities such as distributed dividends and repurchases of stocks.

Analytically, for each dependent variable we estimate the following model:

$$z_{it} = \alpha_{1i} + \alpha_{2sct} + \beta_1 Post + \beta_2 Post \times Eligible_i + \beta_3 X_{i,t-1} + \varepsilon_{it} \quad (4)$$

where *Post* is again a dummy variable that equals one in the period after the CSPP announcement (10 March, 2016), and zero otherwise. *Eligible* is a dummy variable that equals one if the firm is part of the treatment sample (CSPP eligible), and zero otherwise. $X_{i,t-1}$ is a set of firm-level variables to control for the heterogeneity in firm characteristics that determine their economic activity; it includes: firm size, measured as the natural logarithm of the total assets, firm profitability, measured by the ratio of EBITDA over total assets, and leverage, measured by total debt over total assets (Faulkender and Petersen, 2006; Sufi, 2009; Grosse-Rueschkamp et al., 2019). All control variables enter our regressions with a one-quarter lag. All regressions further include firm fixed effects (α_{1i}) and industry \times country \times year fixed effects (α_{2sct}). The latter fixed effects account for supply and demand shocks affecting firms' activity in narrowly defined industry groups (two-digit SIC codes) in each country and in each year. Given the use of the firm fixed effects, the *Eligible_i* dummy is redundant. The coefficients of interest are β_1 and β_2 : the former assesses the impact of the monetary policy for the whole set of firms, the latter disentangles the impact for the treatment group relative to the control group.

We obtain quarterly data from S&P's Capital IQ for all firms that are incorporated in the euro area. We supplement the data set with CSPP eligibility characteristics from the ECB proprietary database.²² To make our analysis comparable with the existing literature, we

²²Some firms provide financial statements only semi-annually (typically Q2 and Q4). For these firms, we fill the missing values with a linear interpolation using the previous and the following quarters.

exclude all financial firms and also non-financial firms with missing key financial information, such as credit ratings. The sample period includes 1,597 unique euro-area firms and contains nine quarters before and eleven quarters after the start of CSPP purchases. Given our main focus on real economic activity and particularly on investment, we also exclude firms that do not report data on capital expenditure over the entire sample period. This leaves us with 784 unique euro-area firms. Finally, the sample is further reduced as we consider only firms reporting data on capital expenditures for at least five of the eight quarters in the period from 2015Q2 to 2017Q1, namely one year before and one year after the CSPP announcement. This leaves us with 523 unique euro-area firms, 200 of which are CSPP eligible.

Table 7 reports the summary statistics over the period before and after the CSPP purchases, distinguishing between treated and control groups. Focusing on the period before the CSPP purchases, the treated group has a lower debt relative to their assets: the average total debt-to-assets ratio for the treated group is 30% and for the control group is 38%. The treated group is, on average, larger compared to the control group ($\ln(\text{Assets})$ being 10 and 8, respectively). Both groups show similar performances in terms of profit as the EBITDA is about 2.5% of the total assets. All regressors remain on average broadly stable in the period after the implementation of the programme.

The standard deviation of the variables measured at firm level is rather large. Given that units with large errors tend to dominate the fit, the endogenous variable is standardized with mean and standard deviation computed at firm level over the entire sample period (from 2014Q1 to 2019Q2). Table 7 suggests that the key endogenous variables rose after the introduction of the March 2016 monetary policy measures for both the treatment and control groups. This would tentatively suggest that the policy package was successful.

<Table 7 Descriptive statistics>

The regression results are reported in Tables 8 and 9. Focusing firstly on β_1 , we find a statistically significant increase for both treatment and control groups in capital expenditures, the purchase of intangibles, asset growth, the growth of net property, plant and equipment

and the growth of cash holdings and short term investment. The results also point to a decline in shares' buyback. All in all, these findings suggest that the March 2016 monetary package did provide a boost to the real economy. However, we find no evidence that the CSPP had an additional effect on real investment activities of eligible firms. Conversely, the coefficient of our treatment variable is statistically significant in the case of investment in non-capital expenditure, particularly the purchases of marketable and equity securities and the repurchase of stocks, and in the case of cash holding and short term investment. The latter evidence should not come as a surprise. Indeed, from a simplified perspective, firms can decide to use their additional funds in one or more of the following three ways: i) build a cash pile: ii) invest in capital expenditure and intangible goods; iii) return the cash to shareholders via dividends or share buy-backs. While building cash to help weather uncertainty has merits, investors may have trouble seeing their cash sitting idle after too long. This either forces re-investment on capital expenditure and financial assets, or a return of cash to shareholders, especially during uncertain times. It thus seems that CSPP eligible firms preferred to dispose of the additional funds gathered by bond issuance by buying securities and their own shares, holding cash and carrying out short-term investment.

<Table 8 Real effects using cash flows, dividends and repurchase of stocks>

<Table 9 Real effects using balance sheet data>

The results of this Section are robust to a variety of exercises. The slope coefficients β_1 and β_2 are very similar if we include in the sample also firms with at least just one observation of capital expenditures before and after 2016Q1 over the sample period (see Table 10). In this case, the CSPP might have also induced eligible firms to increase their working capital. Similarly, the results are qualitatively unchanged if we use only public firms and when controlling for the heterogeneity in the market to book value.

<Table 10 Real effects when least one observation before and after 2016Q1>

VIII Conclusions

A diversified access to external finance is key for corporations to face the challenges caused by real economic and financial shocks. Often the fixed costs needed to shift from bank- to market-based financing are relatively large and, as a result, the *status quo* among firms' decisions prevails, despite the potential diversification benefits. In the paper, we assess whether monetary policy can stimulate credit provision through the issuance of corporate bonds and, as a result, economic activity.

In order to address this question, we focus on the effect of the CSPP, the corporate arm of the ECB's quantitative easing. In March 2016, together with the CSPP announcement, the ECB introduced several other conventional and unconventional policy measures, which may act as confounding sources for the identification of the effect of the CSPP on bond issuance. However, according to the CSPP requirements, all investment grade bonds issued by eligible firms have to be denominated in euro. Thus, differently from the other measures, a stimulus stemming from the CSPP would also impact the bonds' denomination currency.

We setup a detailed dataset, which considers the bonds issued during the sample period October 2013 - June 2018, and distinguishes the issuers between eligible and non-eligible corporations according to all the CSPP eligibility criteria. By relying on the key feature of the CSPP that the bond issued by eligible firms must be denominated in euro, we isolate the CSPP-induced shift in the corporate bond issuance in the euro area.

We take advantage of this feature by implementing a probit difference-in-difference analysis by which we study the differential effect on the currency of denomination of placements by eligible corporations (the treatment group) with respect to non-eligible corporations (the control group). Over the period in which the CSPP is active, we find a significant increase in the issuance of euro denominated bonds relative to other foreign currencies of around 14% for the treated corporations with respect to the control group. The change in the currency composition of the newly issued bonds by CSPP-eligible firms thus suggests that the increased bond issuance is due to the CSPP and not to the other monetary policy measures

announced on the same day.

In addition, we find that the switch towards euro-denominated bonds by eligible corporations took time to unfold. Our estimates suggest that the CSPP started to have a statistically significant effect from the beginning of 2017 (i.e. at least six months after the start of the purchases). This finding is backed by the fact that it takes time for new bond placements to reach the primary market, especially when the issuing corporation does not often resort to the direct bond-market financing, because several parties are involved in the process and a number of actions must be taken (management decisions, discussions with investment bankers and institutional investors, engagements with ratings agencies, etc.). Our evidence suggests that in the few months between the announcement of the programme (March 2016) and the actual starting of purchases (June 2016), only companies already issuing bonds in multiple currencies adjusted to the CSPP features by significantly increasing the issuance of euro-denominated bonds.

The findings of the paper are robust to several checks, but particularly they still holds (and are even reinforced) when restricting the analysis to the sample of investment grade corporations only. The latter exercise provides a policy-relevant result, which eluded, at least partially, the literature on the effects of the CSPP. By comparing the issuance activity of corporations with a similar creditworthiness, we can claim that the ECB unconventional monetary policy affected the propensity of corporations to take advantage of the bond financing regardless of their risk profile. We also show that CSPP eligible firms increased the issuance of euro-denominated bonds as well as aggregate bond issuance. Finally, a placebo test suggests that the negative interest rates are not behind the recorded rotation from bank to debt financing.

We also highlight the impact of the programme on real economic activity. We compile a database with a well disaggregated balance sheet at firm level covering the quarterly profile from 2014Q1 to 2019Q2. The evidence suggests that, while all firms increased investment in capital expenditure and intangible assets, the CSPP also induced eligible firms to invest in

marketable and equity securities, to repurchase their own stocks, to hold cash and carry out short-term investment.

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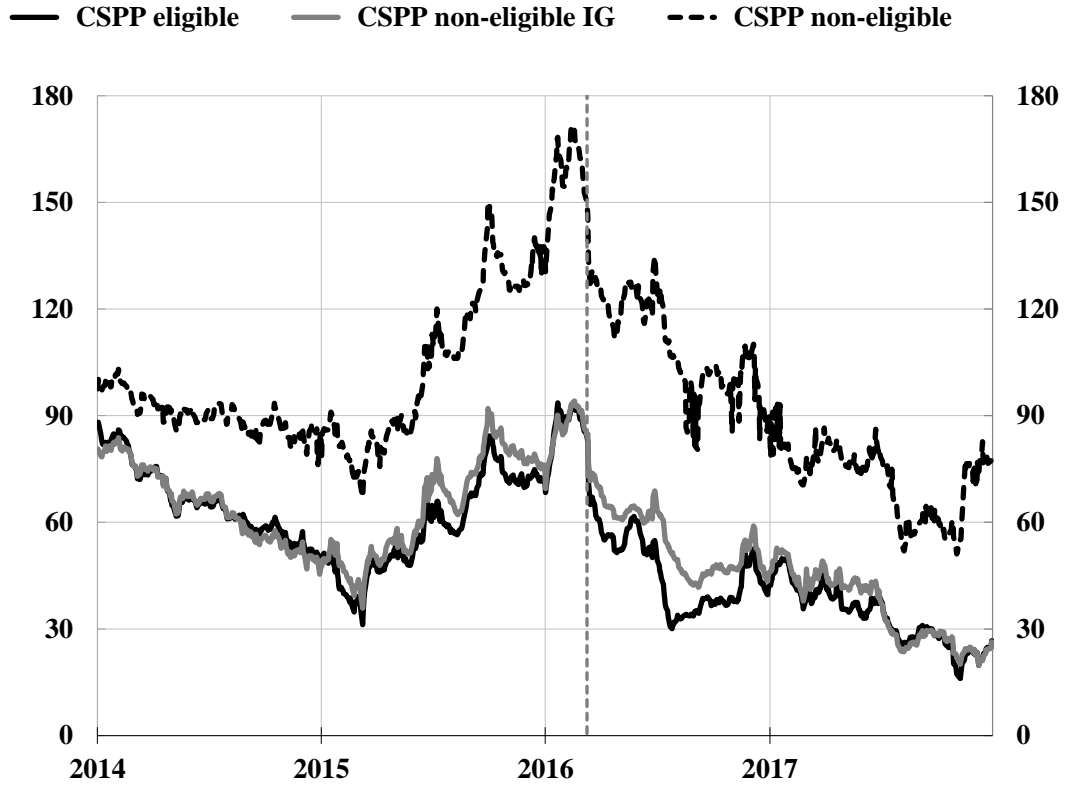
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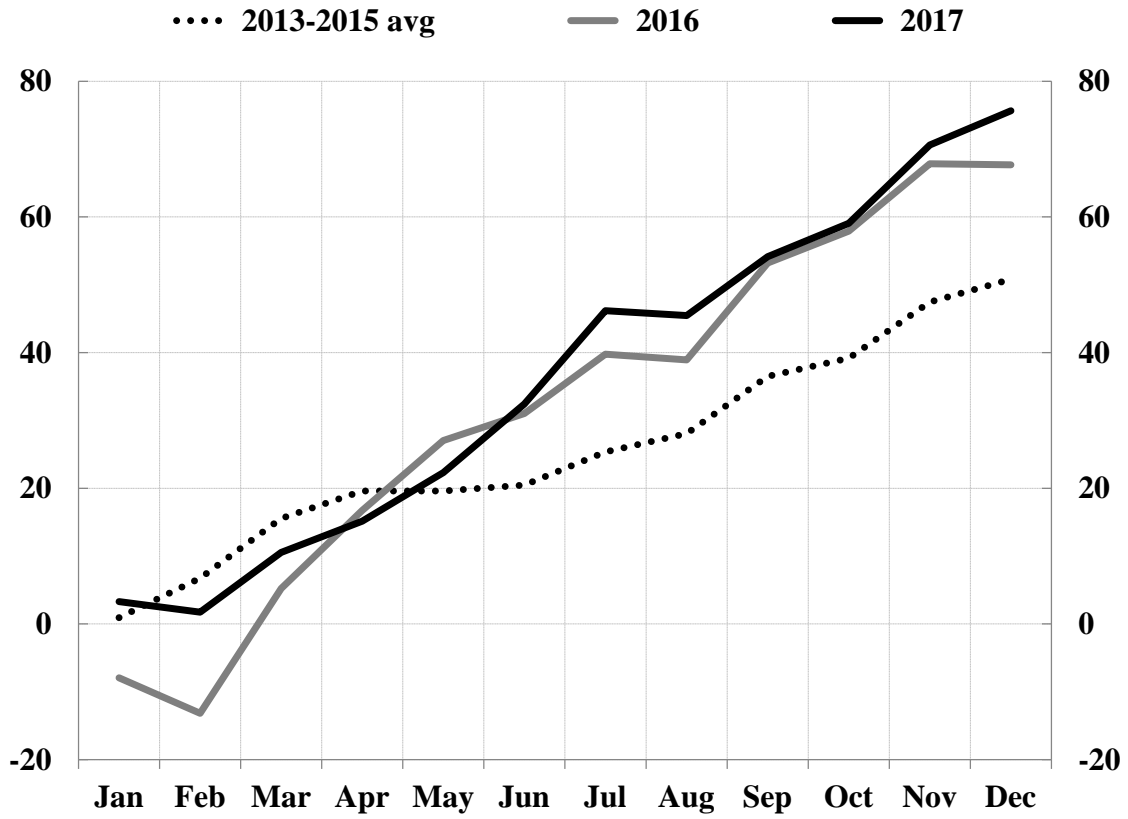
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Figure 1. Corporate bond spreads by issuer



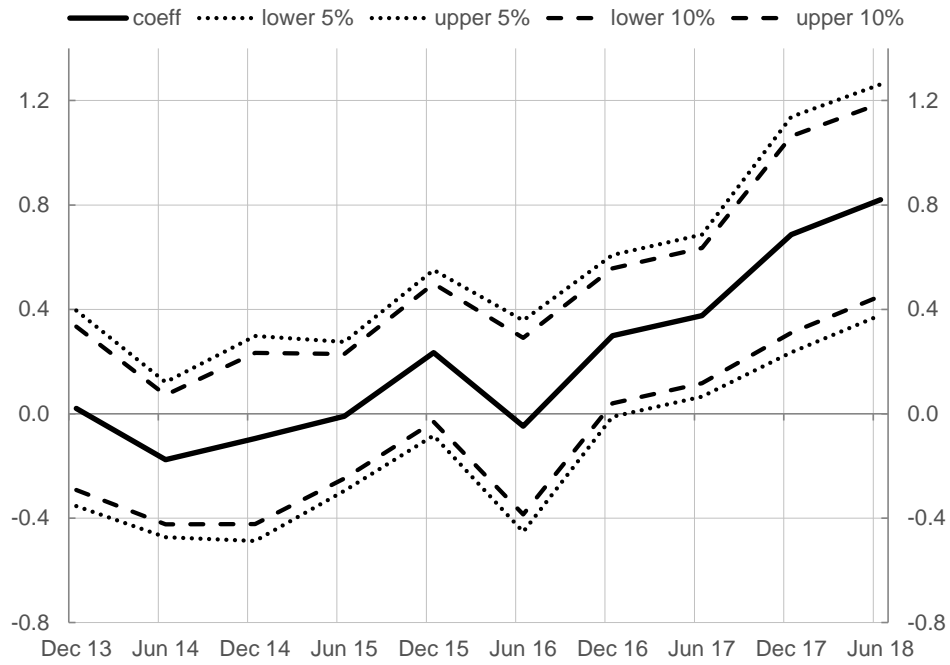
Note: Corporate bond spreads are measured by the Z-spread, which is the spread over the EURIBOR curve required to discount a pre-determined cash flow (basis points). The indices are constructed as a weighted average of the individual ISINs' corporate spreads with weights provided by the outstanding amount. The vertical line marks the announcement of the CSPP on 10 March, 2016. Sources: Bloomberg and authors' calculations.

Figure 2. Net corporate bond issuance



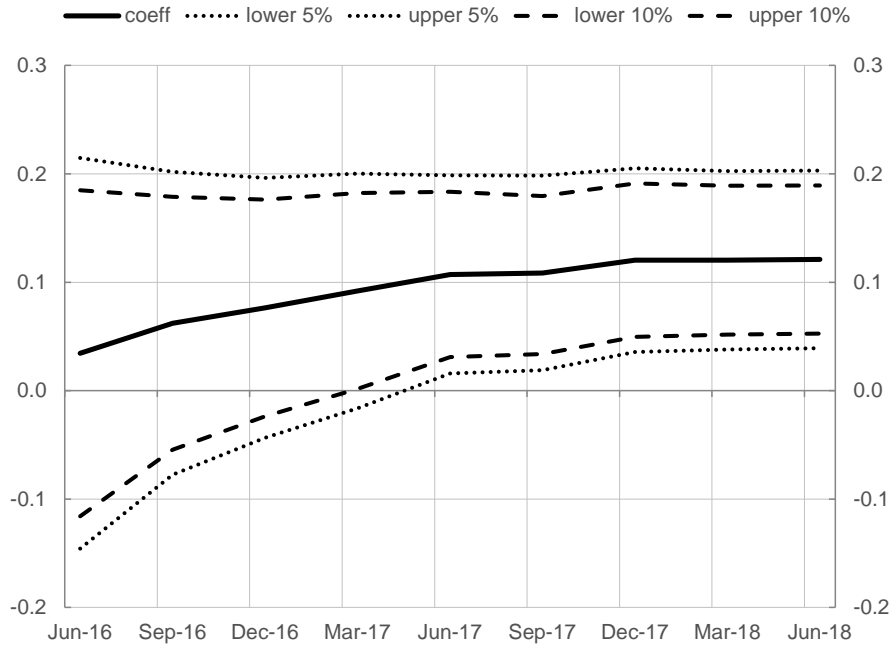
Note: Cumulated net issuance (issue minus redeemed bonds) of euro-denominated long-term debt securities by NFCs in the euro area. Monthly flows (billion euros). Source: ECB.

Figure 3. Relative bond issuance in euro: Parallel trend shift



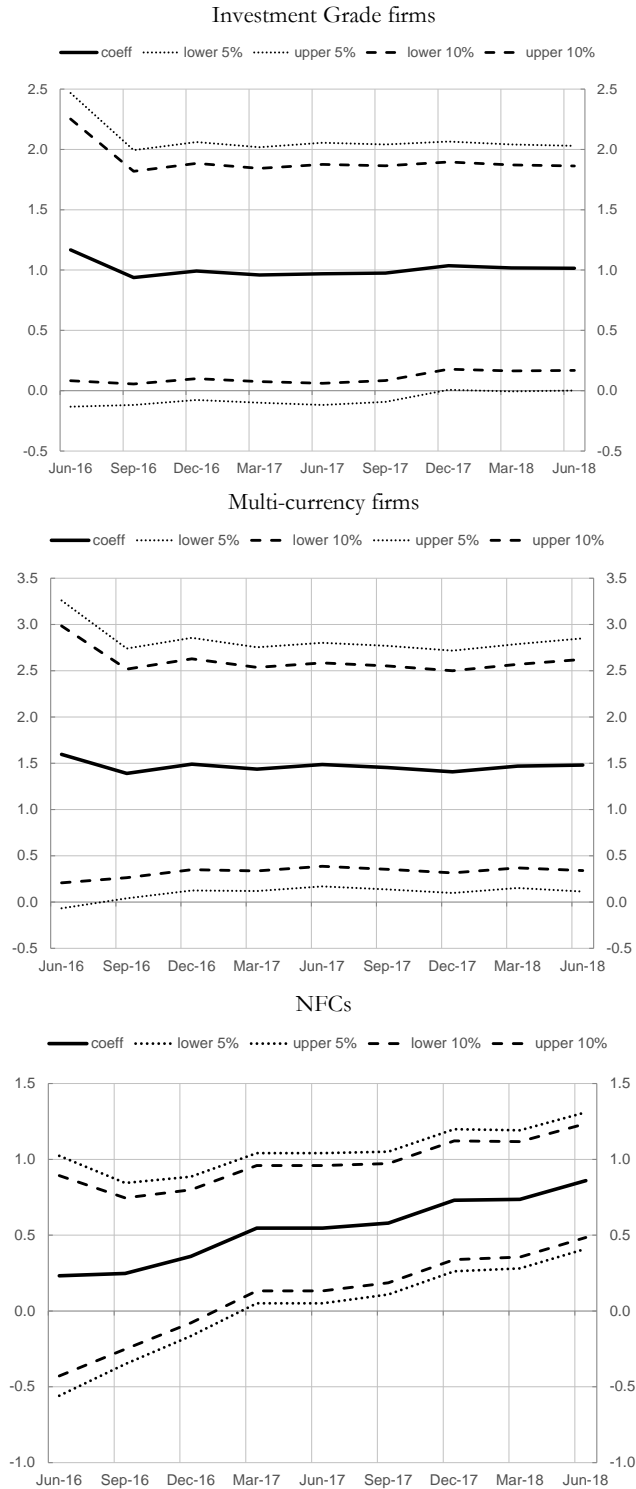
This figure plots a test for the parallel trend assumption for eligible and non-eligible corporations issuance before the announcement of the CSPP with respect to the currency denomination of bonds. It reports the estimated coefficients together with the 90% and 95% confidence intervals of the interaction of the semi-annual time dummy with the CSPP-eligible dummy in a probit regression in which the dependent variable is a dummy which takes 1 when the bond is denominated in euro as described in Equation (1).

Figure 4. Expanding probit regressions



This figure plots the values of the coefficient β_1 together with the 90% and 95% confidence intervals in Equation (1) from a set of expanding regressions in which the starting date is always October 2013.

Figure 5. Expanding regressions from robustness checks



This figure plots the values of the coefficient β_1 together with the 90% and 95% confidence intervals in Equation (1) from a set of expanding regressions from the robustness checks reported in Table 5 (starting date is October 2013). The top panel concerns IG firms, the central panel the multi-currency firms, the lower panel NFCs.

Table 1. Bond issuance by period and sector

	Eligible		Banks		Other non-eligible		TOTAL	
	Total	Euro	Total	Euro	Total	Euro	Total	Euro
2013Q3-2018Q2	87,221	63,584	83,734	59,629	33,692	19,460	204,646	142,673
Pre-CSPP	80,855	56,981	89,309	62,259	30,994	18,172	201,158	137,413
CSPP	96,416	73,122	75,681	55,829	37,589	21,320	209,685	150,272
CSPP - (Pre-CSPP)	15,561	16,141	-13,629	-6,429	6,595	3,148	8,526	12,859
	[0.053]	[0.011]	[0.761]	[0.802]	[0.074]	[0.143]	[0.098]	[0.081]

Note: this table shows the quartely average bond issuance in million euros by euro-area corporations. Pre-CSPP is the period 2013Q3-2016Q1; CSPP is the period 2016Q2-2018Q2; CSPP - (Pre-CSPP) is the difference between values in CSPP and Pre-CSPP; the p-value associated to the t-test with $H_1: CSPP - (Pre-CSPP) > 0$ is reported in brackets. Source: Dealogic Analytics.

Table 2. CSPP impact: OLS and Probit estimations

	OLS			PROBIT		
	Jan16-Jun16 (1)	Oct13-Jun16 (2)	Oct13-Jun18 (3)	Jan16-Jun16 (4)	Oct13-Jun16 (5)	Oct13-Jun18 (6)
Post x Eligible	0.0486 (0.0904)	0.0550 (0.0767)	0.1057 *** (0.0439)	0.0619 (0.0787)	0.0763 (0.0775)	0.1241 *** (0.0421)
Eligible	0.1435 (0.1224)	0.1459 *** (0.0351)	0.1267 *** (0.0381)	0.1540 (0.1149)	0.1480 *** (0.0351)	0.1271 *** (0.0356)
Post	-0.0911 (0.1256)	-0.1443 (0.1399)	-0.1717 (0.1495)	-0.0759 (0.1021)	-0.1348 (0.1241)	-0.1506 (0.1269)
Weekly dummies	YES	YES	YES	YES	YES	YES
Sector dummies	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES
No. observations	1,632	7,925	12,113	1,622	7,874	12,075
R2	0.223	0.168	0.174	0.192	0.133	0.150

Note: This table presents difference-in-differences estimates where the dependent variable is a dummy which takes 1 if the bond is denominated in euro and 0 otherwise. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after 10 March, 2016. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. For the probit regression (columns 4 to 6) the coefficient in the table is the average marginal effect and the standard error is computed according to the Delta method. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table 3. CSPP impact: Additional Probit estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post x Eligible	0.7044 *** (0.2292)	0.7098 *** (0.2288)	0.7046 *** (0.2290)	0.6687 *** (0.2345)	0.7058 *** (0.2421)	0.7086 ** (0.2296)	0.7050 *** (0.2292)
Eligible	0.5132 *** (0.1628)	0.5093 *** (0.1630)	0.5134 *** (0.1631)	0.5496 *** (0.1735)	0.5107 *** (0.1861)	0.5076 *** (0.1629)	0.5127 *** (0.1628)
Issuer size	-0.5849 *** (0.0841)	-0.5850 *** (0.0842)	-0.5850 *** (0.0841)	-0.5747 *** (0.0943)	-0.5640 *** (0.0972)	-0.5856 *** (0.0841)	-0.5847 *** (0.0842)
Bond value	0.6781 *** (0.0965)	0.6793 *** (0.0926)	0.6781 *** (0.0965)	0.6513 *** (0.0998)	0.6452 *** (0.1011)	0.6787 *** (0.0966)	0.6784 *** (0.0936)
Bond maturity	-0.1169 *** (0.0061)	-0.1169 *** (0.0061)	-0.1169 *** (0.0061)	-0.1160 *** (0.0063)	-0.1157 *** (0.0064)	-0.1170 *** (0.0061)	-0.1169 *** (0.0060)
One-timer	0.5096 *** (0.1406)	0.5106 *** (0.1408)	0.5098 *** (0.1405)	0.5624 *** (0.1533)	0.5317 *** (0.1582)	0.5128 *** (0.1509)	0.5101 *** (0.1406)
Exchange rate		0.0919 * (0.0604)	0.6337 (0.6921)				
PF&IC holdings				0.1166 *** (0.0384)	0.0270 (0.0410)		
CISS index						-0.3404 * (0.2013)	-0.8934 (0.8228)
Weekly time dummies	YES	YES	YES	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	YES	YES	YES	YES
Coupon frequency dummies	YES	YES	YES	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	12,056	12,056	12,056	10,749	10,271	12,056	12,056
Pseudo R2	0.467	0.467	0.467	0.473	0.471	0.467	0.436

Note: This table presents difference-in-differences probit estimates where the dependent variable is a dummy which takes 1 when the bond is denominated in euro. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after 10 March, 2016; Issuer size is the log of the balance sheet value of all assets (in billion euros) in the calendar year before the bond issuance; Bond value is the tranche value of the bond (in million euros); Bond maturity is the maturity of the bond at issuance (in days); One-timer is a dummy which takes 1 for corporations which issued only one bond. Exchange rate is the nominal effective exchange rate index computed by the ECB with respect to the 38 major euro-area trading partners in column (2) and the currency basis (i.e. the difference between the 5-year currency swaps contracts in euro and dollar) in column (3); PF&IC holdings is the assets' holding of pension funds and insurance corporations in lagged quarterly stocks in column (4) and in quarterly flows in column (5); CISS index is the financial stress indicator proposed by Hollo et al. (2012) for the euro area (column 6) and the US (column 7). All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table 4. CSPP impact: Further investigations

	Baseline	IG	Multi-currency	Non-banks
Post x Eligible	0.7044 *** (0.2292)	1.0156 ** (0.5162)	1.4817 ** (0.6904)	0.8600 *** (0.2474)
Eligible	0.5132 *** (0.1628)	0.2353 (0.5405)	-1.0325 (1.1964)	0.8873 *** (0.1946)
Issuer size	-0.5849 *** (0.0841)	-0.1762 (0.0952)	-0.8050 * (0.4575)	-1.0936 *** (0.5957)
Bond value	0.6781 *** (0.0965)	0.9418 *** (0.1344)	0.8703 *** (0.1320)	0.6381 *** (0.1234)
Bond maturity	-0.1169 *** (0.0090)	-0.0882 *** (0.0089)	-0.0791 *** (0.0094)	-0.2336 *** (0.0157)
Weekly time dummies	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	NO
Coupon frequency dummies	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES
Issuer dummies	NO	YES	YES	NO
No. observation	12,056	7,697	7,107	4,601
Pseudo R2	0.467	0.509	0.513	0.627

Note: This table presents three robustness checks concerning the control sample of the baseline difference-in-differences estimates reported in the first column. In the second column the sample is made of corporations with an IG rating (namely a rating of at least BBB-); in the third column the sample is made of corporations which issued bonds in euro and in other currency both before and after the announcement of the CSPP; in the fourth column the sample is made of non-bank corporations. The dependent variable is a dummy which takes 1 when the bond is denominated in euro. For the definition of the other variables see Table 3. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic DCM Analytics, Thomson Reuters, Capital IQ, ECB.

Table 5. CSPP impact: DID relying on quantity placed

	Baseline	IG	Multi-currency	Non-banks
Post x Eligible	0.2465 *** (0.1196)	0.2723 * (0.2004)	0.3288 ** (0.1276)	0.2501 ** (0.1242)
Eligible	-0.2240 *** (0.0956)	0.1099 ** (0.2276)	0.2850 (1.1242)	-0.2661 *** (0.2941)
Issuer size	0.1856 *** (0.0954)	0.8823 *** (0.0882)	0.9587 *** (0.1049)	0.7796 *** (0.1087)
Bond maturity	0.0220 *** (0.0036)	0.0136 *** (0.0042)	0.0273 *** (0.0045)	0.0101 *** (0.0036)
Weekly time dummies	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	NO
Coupon frequency dummies	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES
Issuer dummies	NO	YES	YES	NO
No. observation	12,056	7,697	7,107	4,601
Pseudo R2	0.482	0.706	0.499	0.613

Note: This table presents linear OLS difference-in-differences estimates when the dependent variable is the log of the value placed of each bond. The first column employs the full sample. In the second column the sample is made of corporations with an IG rating (namely a rating of at least BBB-); in the third column the sample is made of corporations which issued bonds in euro and in other currency both before and after the announcement of the CSPP; in the fourth column the sample is made of non-bank corporations. For the definition of the other variables see Table 3. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic DCM Analytics, Thomson Reuters, Capital IQ, ECB.

Table 6. CSPP impact: Placebo tests under negative rates

	Full sample	IG	Multi-currency	Non-banks
Placebo x Eligible	0.3156 (0.2268)	0.2833 (0.4970)	-0.0131 (0.5196)	-0.1456 (0.2902)
Eligible	0.6166 *** (0.1968)	0.8778 (0.6082)	-0.1903 (0.1361)	0.9396 *** (0.2389)
Issuer size	-0.6003 *** (0.1217)	0.2652 (0.1695)	0.3766 (0.6935)	-3.6569 *** (0.8967)
Value	0.8659 *** (0.0955)	1.3496 *** (0.1070)	1.2004 *** (0.0977)	0.7214 *** (0.2018)
Maturity	-0.1159 *** (0.0836)	-0.1019 *** (0.0119)	-0.0985 *** (0.0141)	-0.2086 *** (0.0279)
Weekly time dummies	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	NO
Coupon frequency dummies	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES
Issuer dummies	NO	YES	YES	NO
No. observation	7,176	4,594	4,405	2,307
Pseudo R2	0.464	0.536	0.520	0.588

Note: This table presents four placebo tests. They reproduce the regressions reported in Table 4 for a placebo period before the CSPP over which the policy rates were negative (June 2014-March 2016). In the first column the full sample is used. In the second column the sample is made of corporations with an IG rating (namely a rating of at least BBB-); in the third column the sample is made of corporations which issued bonds in euro and other currencies both before and after the announcement of the CSPP; in the fourth column the sample is made of non-bank corporations. The dependent variable is a dummy which takes 1 when the bond is denominated in euro. For the definition of the other variables see Table 3. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic DCM Analytics, Thomson Reuters, Capital IQ, ECB.

Table 7. Descriptive statistics on economic activity

	2014Q1 - 2016Q1						2016Q2 - 2019Q2					
	Treated			Control			Treated			Control		
	N	Mean	Std. D.	N	Mean	Std. D.	N	Mean	Std. D.	N	Mean	Std. D.
<i>endogenous variables, standard deviation</i>												
Capex	1754	-0.184	0.970	2686	-0.218	0.971	2511	0.128	0.961	3793	0.154	0.948
Non-Capex	1754	-0.066	0.978	2686	0.013	0.959	2509	0.046	0.973	3793	-0.009	0.986
Cash Acquisition	1044	-0.068	0.956	1201	-0.025	0.947	1619	0.044	0.974	1598	0.019	0.963
Securities	1368	-0.092	1.015	1511	0.004	0.926	2024	0.062	0.939	2004	-0.003	0.993
Intangible	625	-0.216	0.903	1136	-0.298	0.894	927	0.146	0.988	1582	0.214	0.967
Dividends	1103	-0.301	0.885	946	-0.259	0.930	1665	0.200	0.962	1526	0.160	0.930
Rep. Stocks	668	-0.064	0.949	631	0.019	1.004	1112	0.039	0.964	995	-0.012	0.914
Δ Asset	1758	0.014	1.022	2634	0.002	1.008	2593	-0.009	0.945	3858	-0.001	0.952
Δ Plant & Eq	1752	-0.048	0.890	2616	-0.041	0.890	2593	0.033	1.030	3835	0.028	1.028
Δ LT Inv	1693	0.035	1.000	2209	0.030	1.046	2516	-0.024	0.960	3270	-0.020	0.920
Δ Cash & ST Inv	1760	-0.008	0.995	2671	0.034	1.047	2595	0.005	0.964	3864	-0.024	0.921
Δ Working capital	1758	0.031	1.008	2628	0.034	1.037	2593	-0.021	0.954	3861	-0.023	0.929
<i>exogenous variables, level</i>												
Profitability	1746	0.026	0.014	2619	0.025	0.024	2579	0.025	0.014	3822	0.025	0.021
Leverage	1764	0.305	0.148	2600	0.381	0.242	2596	0.306	0.140	3796	0.397	0.235
Ln(Assets)	1764	9.967	1.184	2682	8.033	1.716	2596	10.117	1.151	3873	8.301	1.642

This table reports summary statistics for the key variables in our sample over the period before CSPP and after implementation, i.e., Q1 2014 to Q1 2016 and Q2 2016 to Q2 2019. Treatment firms are CSPP eligible firms. The control group comprises CSPP non-eligible firms. All variables are standardised over the 2014Q1-2019Q2 sample period except for profitability, leverage and log of assets.

Table 8. CSPP impact: Real effects using cash flows, dividends and repurchase of stocks

	(1) Capex	(2) Non-Capex	(3) Cash Acq.	(4) Securities	(5) Intangible	(6) Dividends	(7) Rep. Stocks
Post	0.373*** (0.049)	-0.030 (0.058)	-0.002 (0.092)	-0.049 (0.067)	0.245*** (0.071)	0.071 (0.077)	-0.189* (0.112)
Post x Treated	-0.025 (0.073)	0.197*** (0.059)	0.039 (0.081)	0.167** (0.066)	-0.088 (0.112)	0.089 (0.088)	0.266** (0.106)
Observations	10,300	10,298	5,303	6,686	4,107	5,088	3,307
Adj. R-squared	0.180	0.065	0.106	0.090	0.235	0.258	0.203
Number of id	519	519	407	423	249	425	296
IND/Country/Year FE	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES

This table reports results from the estimation of a panel regression analyzing the effect of central bank corporate bond purchases on (i) cash investment for Capex (1) and non-Capex (2), such as cash acquisitions (3), purchased securities (4) and intangible (5), (ii) distributed dividends (6) and (7) repurchases of stocks. The regressions include firm-level controls to control for the heterogeneity in firm characteristics [$\ln(\text{Total assets})_{it-1}$, Leverage_{it-1} , $\text{Profitability}_{it-1}$]. The regressions further include firm fixed effects and industry \times country \times year fixed effects. We report standard errors clustered at the firm level in parentheses. ***, **, * denote significance at the 1, 5, and 10% level, respectively. The sample period is 2014Q1 – 2019Q2.

Table 9. CSPP impact: Real effects using balance sheet data

VARIABLES	(1) Asset growth	(2) Property, Plant & Eq. growth	(3) LT Inv. growth	(4) Cash & ST Inv. growth	(5) Work. Cap. growth
Post	0.309*** (0.056)	0.152*** (0.057)	-0.114* (0.069)	0.191*** (0.061)	-0.003 (0.060)
Post x Treated	0.012 (0.051)	0.019 (0.045)	-0.028 (0.046)	0.082** (0.038)	0.059 (0.043)
Observations	10,533	10,529	9,464	10,538	10,531
Adj. R-squared	0.101	0.136	0.040	0.0223	0.028
Number of id	519	519	490	519	519
IND/Country/Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES

This table reports results from the estimation of a pooled panel regression analyzing the effect of central bank corporate bond purchases on (i) asset growth, (ii) net property, plant and equipment growth, (iii) long-term investment growth, (iv) cash and short term investment growth, (v) working capital growth. The regressions include firm-level controls to control for the heterogeneity in firm characteristics [$\ln(\text{Total assets})_{it-1}$, Leverage_{it-1} , $\text{Profitability}_{it-1}$]. The regressions further include firm fixed effects and industry \times country \times year fixed effects. We report standard errors clustered at the firm level in parentheses. ***, **, * denote significance at the 1, 5, and 10% level, respectively. The sample period is 2014Q1 – 2019Q2.

Table 10. CSPP impact: Real effects including firms with at least just one observation of capital expenditures before and after 2016Q1

	(1) Capex	(2) Securities	(3) Intangible	(4) Rep. Stocks	(5) Asset growth	(6) Plant & Eq. growth	(7) LT Inv. growth	(8) Cash & ST Inv. growth	(9) Work. Cap. growth
Post	0.347*** (0.048)	-0.031 (0.065)	0.211*** (0.069)	-0.208* (0.110)	0.309*** (0.053)	0.150*** (0.054)	-0.127** (0.064)	0.178*** (0.058)	-0.015 (0.056)
Post x Treated	-0.002 (0.071)	0.137** (0.067)	-0.082 (0.109)	0.246** (0.106)	-0.027 (0.047)	0.000 (0.043)	-0.050 (0.042)	0.072** (0.035)	0.079** (0.040)
Observations	10,898	7,103	4,458	3,425	11,502	11,495	10,324	11,502	11,498
Adj. R-squared	0.172	0.089	0.225	0.204	0.096	0.128	0.038	0.018	0.025
Number of id	579	468	290	318	579	579	544	579	579
IND/Country/Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES

This table reports results from the estimation of a panel regression analyzing the effect of central bank corporate bond purchases on cash investment for Capex (1), purchased securities (2) and intangible (3), repurchases of stocks (4), asset growth (5), net property, plant and equipment growth (6), long-term investment growth (7), cash and short term investment growth (8), working capital growth (9). The regressions include firm-level controls to control for the heterogeneity in firm characteristics [$\ln(\text{Total assets})_{it-1}$, Leverage_{it-1} , $\text{Profitability}_{it-1}$]. The regressions further include firm fixed effects and industry \times country \times year fixed effects. We include firms with a least one observation of capital expenditures before and after 2016Q1. We report standard errors clustered at the firm level in parentheses. ***, **, * denote significance at the 1, 5, and 10% level, respectively. The sample period is 2014Q1 – 2019Q2.

Appendix

Table A1. Euro-area bond market: summary statistics (October 2013 - June 2018)

Nationality	Issuers	Placements	Eligible bonds	Market share	1-timers
Austria	32	251	2	1.7	14
Belgium	26	286	6	4.3	6
Cyprus	1	2	0	0.0	0
Estonia	6	7	1	0.0	5
Finland	48	183	5	1.4	12
France	258	2,817	171	27.2	67
Germany	172	2,999	148	18.6	44
Greece	11	18	5	0.1	2
Ireland	78	772	336	3.1	12
Italy	103	640	45	8.7	21
Latvia	3	4	1	0.0	2
Lithuania	2	2	1	0.0	2
Luxembourg	66	274	15	2.3	16
Netherlands	165	2,511	272	20.2	30
Portugal	16	43	11	0.2	3
Slovakia	6	16	4	0.2	3
Slovenia	4	6	2	0.0	3
Spain	81	1,282	64	11.7	24
Grand Total	1,078	12,113	1,089	100	266

Note: this Table reports summary statistics about the placements in the euro-area bond market by the nationality of the issuer. Issuers is the number of distinct issuer, Placements is the number of tranche ISINs placed, Eligible bonds is the number of bonds which fulfill the CSPP eligibility criteria, Market share is the percentage value of the total amount in EUR placed by the issuers of each country divided by the total bond market value, 1-timers is the number of issuers which placed just one bond. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table A2. CSPP impact (January 2016 – June 2018)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post x Eligible	0.6441 *** (0.2279)	0.6796 *** (0.2224)	0.6379 *** (0.2340)	0.6441 *** (0.2280)	0.6432 *** (0.2282)	0.6444 *** (0.2351)	0.6337 *** (0.2340)
Eligible	0.5281 * (0.2972)	0.5004 * (0.2921)	0.5334 * (0.3007)	0.5279 * (0.2973)	0.5295 * (0.2970)	0.5277 * (0.3053)	0.5366 * (0.2972)
Issuer size	-0.5492 *** (0.0567)	-0.5498 *** (0.0565)	-0.5489 *** (0.0560)	-0.5492 *** (0.0667)	-0.5488 *** (0.0567)	-0.5492 *** (0.0568)	-0.5506 *** (0.0565)
Bond value	0.6141 *** (0.0998)	0.6173 *** (0.0989)	0.6140 *** (0.0997)	0.6142 *** (0.0999)	0.6150 *** (0.1000)	0.6141 *** (0.1003)	0.6103 *** (0.1003)
Bond maturity	-0.1130 *** (0.0101)	-0.1133 *** (0.0101)	-0.1137 *** (0.0101)	-0.1130 *** (0.0101)	-0.1131 *** (0.0102)	-0.1130 *** (0.0101)	-0.1129 *** (0.0101)
One-timer	0.7386 *** (0.2739)	0.7378 *** (0.2719)	0.7368 *** (0.2709)	0.7385 *** (0.2737)	0.7470 *** (0.2754)	0.7387 *** (0.2741)	0.7344 *** (0.2729)
Exchange rate		0.2336 ** (0.1226)	-0.0021 (0.0119)				
PF&IC holdings				-0.0713 (0.5179)	0.0413 (0.0496)		
CISS index						-0.0875 (3.2213)	4.8791 (4.2018)
Weekly time dummies	YES	YES	YES	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	YES	YES	YES	YES
Coupon frequency dummies	YES	YES	YES	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	5,425	5,425	5,425	5,425	5,425	5,425	5,425
Pseudo R2	0.499	0.500	0.499	0.499	0.499	0.499	0.499

Note: This table presents difference-in-differences probit estimates where the dependent variable is a dummy which takes 1 when the bond is denominated in euro. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after 10 March, 2016; Issuer size is the log of the balance sheet value of all assets (in billion euros) in the calendar year before the bond issuance; Bond value is the tranche value of the bond (in million euros); Bond maturity is the maturity of the bond at issuance (in days); One-timer is a dummy which takes 1 for corporations which issued only one bond. Exchange rate is the nominal effective exchange rate index computed by the ECB with respect to the 38 major euro-area trading partners in column (2) and the currency basis (i.e. the difference between the 5-year currency swaps contracts in euro and dollar) in column (3); PF&IC holdings is the assets' holding of pension funds and insurance corporations in lagged quarterly stocks in column (4) and in quarterly flows in column (5); CISS index is the financial stress indicator proposed by Hollo et al. (2012) for the euro area (column 6) and the US (column 7). Sample period: January 2016 - June 2018. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table A3. CSPP impact (linear OLS regressions)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post x Eligible	0.1142 ** (0.0508)	0.1150 ** (0.0508)	0.1144 ** (0.0509)	0.1021 ** (0.0529)	0.1081 ** (0.0553)	0.1140 ** (0.0508)	0.1142 ** (0.0508)
Eligible	0.0886 ** (0.0372)	0.0880 ** (0.0372)	0.0884 ** (0.0373)	0.0984 ** (0.0409)	0.0920 ** (0.0446)	0.0883 *** (0.0372)	0.0887 *** (0.0372)
Issuer size	-0.1576 *** (0.0218)	-0.1576 *** (0.0218)	-0.1575 *** (0.0217)	-0.1556 *** (0.0246)	-0.1544 *** (0.0257)	-0.1577 *** (0.0218)	-0.1576 *** (0.0218)
Bond value	0.1587 *** (0.0236)	0.1588 *** (0.0238)	0.1586 *** (0.0238)	0.1512 *** (0.0025)	0.1496 *** (0.0257)	0.1586 *** (0.0239)	0.1586 *** (0.0239)
Bond maturity	-0.0204 *** (0.0012)	-0.0204 *** (0.0013)	-0.0204 *** (0.0013)	-0.0203 *** (0.0014)	-0.0202 *** (0.0014)	-0.0204 *** (0.0013)	-0.0204 *** (0.0013)
One-timer	0.1170 *** (0.0293)	0.1168 *** (0.0294)	0.1169 *** (0.0294)	0.1242 *** (0.0316)	0.1193 *** (0.0331)	0.1173 *** (0.0293)	0.1170 *** (0.0293)
Exchange rate		0.0181 (0.0158)	0.0007 (0.0016)				
PF&IC holdings				0.2112 *** (0.0533)	0.0004 (0.0008)		
CISS index						-0.6320 (0.5033)	0.1393 (0.6711)
Weekly time dummies	YES	YES	YES	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	YES	YES	YES	YES
Coupon frequency dummies	YES	YES	YES	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	12,078	12,078	12,078	10,791	10,293	12,078	12,078
Pseudo R2	0.496	0.496	0.496	0.500	0.497	0.496	0.496

Note: This table presents difference-in-differences OLS estimates where the dependent variable is a dummy which takes 1 when the bond is denominated in euro. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after 10 March, 2016; Issuer size is the log of the balance sheet value of all assets (in billion euros) in the calendar year before the bond issuance; Bond value is the tranche value of the bond (in million euros); Bond maturity is the maturity of the bond at issuance (in days); One-timer is a dummy which takes 1 for corporations which issued only one bond. Exchange rate is the nominal effective exchange rate index computed by the ECB with respect to the 38 major euro-area trading partners in column (2) and the currency basis (i.e. the difference between the 5-year currency swaps contracts in euro and dollar) in column (3); PF&IC holdings is the assets' holding of pension funds and insurance corporations in lagged quarterly stocks in column (4) and in quarterly flows in column (5); CISS index is the financial stress indicator proposed by Hollo et al. (2012) for the euro area (column 6) and the US (column 7). All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table A4. CSPP impact (Issuer size at time $t-2$)

\	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post x Eligible	0.7046 *** (0.2291)	0.7100 *** (0.2288)	0.7048 *** (0.2289)	0.6689 *** (0.2345)	0.7060 *** (0.2421)	0.7088 ** (0.2296)	0.7051 *** (0.2292)
Eligible	0.5135 *** (0.1628)	0.5096 *** (0.1630)	0.5137 *** (0.1631)	0.5497 *** (0.1735)	0.5107 *** (0.1861)	0.5079 *** (0.1629)	0.5131 *** (0.1628)
Issuer size y-2	-0.5847 *** (0.0847)	-0.5849 *** (0.0847)	-0.5848 *** (0.0846)	-0.5750 *** (0.0947)	-0.5631 *** (0.0976)	-0.5854 *** (0.0847)	-0.5845 *** (0.0848)
Bond value	0.6772 *** (0.0964)	0.6784 *** (0.0961)	0.6772 *** (0.0965)	0.6505 *** (0.0997)	0.6444 *** (0.1010)	0.6780 *** (0.0965)	0.6775 *** (0.0962)
Bond maturity	-0.1169 *** (0.0060)	-0.1169 *** (0.0061)	-0.1169 *** (0.0068)	-0.1160 *** (0.0063)	-0.1157 *** (0.0064)	-0.1171 *** (0.0061)	-0.1169 *** (0.0061)
One-timer	0.5094 *** (0.1450)	0.5104 *** (0.1407)	0.5096 *** (0.1404)	0.5621 *** (0.1533)	0.5316 *** (0.1582)	0.5126 *** (0.1405)	0.5099 *** (0.1406)
Exchange rate		0.0927 * (0.0604)	0.6075 (0.6915)				
PF&IC holdings				0.1166 *** (0.0384)	0.0270 (0.0411)		
CISS index						-0.3405 * (0.2112)	-0.8805 (0.8258)
Weekly time dummies	YES	YES	YES	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	YES	YES	YES	YES
Coupon frequency dummies	YES	YES	YES	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	12,056	12,056	12,056	10,749	10,271	12,056	12,056
Pseudo R2	0.467	0.467	0.467	0.473	0.471	0.467	0.436

Note: This table presents difference-in-differences probit estimates where the dependent variable is a dummy which takes 1 when the bond is denominated in euro. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which takes 1 after 10 March, 2016; Issuer size y-2 is the log of the balance sheet value of all assets (in billion euros) two calendar years before the bond issuance; Bond value is the tranche value of the bond (in million euros); Bond maturity is the maturity of the bond at issuance (in days); One-timer is a dummy which takes 1 for corporations which issued only one bond. Exchange rate is the nominal effective exchange rate index computed by the ECB with respect to the 38 major euro-area trading partners in column (2) and the currency basis (i.e. the difference between the 5-year currency swaps contracts in euro and dollar) in column (3); PF&IC holdings is the assets' holding of pension funds and insurance corporations in lagged quarterly stocks in column (4) and in quarterly flows in column (5); CISS index is the financial stress indicator proposed by Hollo et al. (2012) for the euro area (column 6) and the US (column 7). All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table A5. CSPP impact (Post x Issuer size)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Post x Eligible	0.7055 *** (0.2290)	0.7108 *** (0.2286)	0.7057 *** (0.2287)	0.6698 *** (0.2342)	0.7059 *** (0.2417)	0.7098 ** (0.2294)	0.7060 *** (0.2292)
Eligible	0.5130 *** (0.1628)	0.5092 *** (0.1631)	0.5133 *** (0.1631)	0.5494 *** (0.1735)	0.5106 *** (0.1861)	0.5074 *** (0.1629)	0.5126 *** (0.1628)
Issuer size	-0.5910 *** (0.1012)	-0.5908 *** (0.1011)	-0.5911 *** (0.1012)	-0.5819 *** (0.1205)	-0.5649 *** (0.1276)	-0.5922 *** (0.1013)	-0.5909 *** (0.1013)
Post x Issuer size	0.0162 (0.1424)	0.0152 (0.1421)	0.0162 (0.1424)	0.0158 (0.1499)	0.0019 (0.1539)	0.0173 (0.1426)	-0.5845 (0.1425)
Bond value	0.6679 *** (0.0965)	0.6791 *** (0.0962)	0.6779 *** (0.0965)	0.6512 *** (0.09978)	0.6452 *** (0.1010)	0.6785 *** (0.0966)	0.6782 *** (0.0963)
Bond maturity	-0.1169 *** (0.0061)	-0.1169 *** (0.0061)	-0.1169 *** (0.0068)	-0.1161 *** (0.0063)	-0.1157 *** (0.0064)	-0.1169 *** (0.0061)	-0.1169 *** (0.0060)
One-timer	0.5100 *** (0.1406)	0.5110 *** (0.1409)	0.5103 *** (0.1405)	0.5628 *** (0.1534)	0.5318 *** (0.1584)	0.5133 *** (0.1405)	0.5105 *** (0.1406)
Exchange rate		0.0917 * (0.0604)	0.6297 (0.6920)				
PF&IC holdings				0.1166 *** (0.0384)	0.0270 (0.0412)		
CISS index						-0.3407 * (0.2114)	-0.8981 (0.8243)
Weekly time dummies	YES	YES	YES	YES	YES	YES	YES
Issuer rating dummies	YES	YES	YES	YES	YES	YES	YES
Coupon frequency dummies	YES	YES	YES	YES	YES	YES	YES
Sector*Country*Time dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	12,056	12,056	12,056	10,749	10,271	12,056	12,056
Pseudo R2	0.467	0.467	0.467	0.473	0.471	0.467	0.436

Note: This table presents difference-in-differences probit estimates where the dependent variable is a dummy which takes 1 when the bond is denominated in euro. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after 10 March, 2016; Issuer size is the log of the balance sheet value of all assets (in billion euros); Bond value is the tranche value of the bond (in million euros); Bond maturity is the maturity of the bond at issuance (in days); One-timer is a dummy which takes 1 for corporations which issued only one bond. Exchange rate is the nominal effective exchange rate index computed by the ECB with respect to the 38 major euro-area trading partners in column (2) and the currency basis (i.e. the difference between the 5-year currency swaps contracts in euro and dollar) in column (3); PF&IC holdings is the assets' holding of pension funds and insurance corporations in lagged quarterly stocks in column (4) and in quarterly flows in column (5); CISS index is the financial stress indicator proposed by Hollo et al. (2012) for the euro area (column 6) and the US (column 7). All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

Table A6. Rolling placebo test

	Jun-16	Oct-16	Jan-17	Apr-17	Jul-17	Oct-17	Jan-18
Post x Eligible	0.0351 (0.4189)	0.2242 (0.4926)	0.5105 (0.3975)	0.4002 (0.4676)	-0.0479 (0.5299)	0.6105 (0.4682)	0.3498 (0.5003)
Eligible	0.9632 (0.3952)	0.6945 ** (0.3591)	0.7303 *** (0.2925)	0.8626 *** (0.3551)	1.6338 *** (0.3914)	1.3474 *** (0.3858)	1.7089 *** (0.4453)
Post	0.4420 (0.4112)	-0.0085 (0.9661)	-0.9412 (0.9271)	-1.3599 (1.1491)	1.0745 (1.1032)	-0.2318 (0.7528)	1.4109 (0.8716)
Weekly dummies	YES	YES	YES	YES	YES	YES	YES
Sector dummies	YES	YES	YES	YES	YES	YES	YES
Country dummies	YES	YES	YES	YES	YES	YES	YES
No. observations	2,261	2,206	2,502	2,078	2,084	2,305	1,890
R2	0.497	0.475	0.480	0.512	0.516	0.553	0.550

Note: This table presents rolling difference-in-differences probit estimates over symmetrical six-month periods around the reference date of 8 June, 2016 (when the CSPP purchases started) and additional placebo dates. The dependent variable is a dummy which takes 1 if the bond is denominated in euro and 0 otherwise. Eligible is a dummy which takes 1 when the corporation issuing the bond is CSPP-eligible, Post is a dummy which take 1 after the date shown in the heading of each column. All regressions include sets of dummy variables as specified. Robust standard errors are double clustered at the issuer and time level. Symbols ***, **, * indicate significance at the 1%, 5% and 10% level, respectively. Sources: Dealogic Analytics, Thomson Reuters, CapitalIQ, ECB.

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