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The ECB's APP's impact on non-financial firms' cost of borrowing and debt choice☆

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ABSTRACT

We examine the impact of the ECB's asset purchase programmes on euro area non-financial firms' cost of borrowing and their choice between corporate bonds and syndicated loans. Our findings indicate that the Corporate Sector Purchase Programme (CSPP) reduced spreads for both eligible and non-eligible corporate bonds, and that ECB purchases of covered bonds positively affected corporate bond spreads. The CSPP also compressed spreads across all syndicated loans, irrespective of eligibility. We find evidence supporting a "cost of borrowing channel" for covered bonds under the first programme and asset-backed securities, indicating that syndicated loan spreads reflect banks' borrowing costs in the bond market. Additionally, our results reveal that the CSPP significantly influenced firms' debt financing choices, with these effects being more pronounced for non-switchers.

1. Introduction

Following the 2008 global financial crisis, the European Central Bank (ECB) has implemented numerous unconventional monetary policies, particularly through asset purchase programmes (APP), to stimulate economic activity by reducing money market term rates, easing funding conditions, and enhancing debt market liquidity (Zaghini, 2019; Todorov, 2020). With that purpose, the ECB introduced two covered bond purchase programmes (CBPP) in 2009 and 2011 (CBPP1 and CBPP2). In 2014, it announced a third covered bond purchase programme (CBPP3) and an asset-backed securities purchase programme (ABSPP). Between 2014 and 2016, these programmes were integrated into a broader APP, which included the public sector purchase programme (PSPP) in 2015 and the corporate sector purchase programme (CSPP) in 2016, initially amounting to EUR 60 billion per month.

Despite these massive purchases, representing around 40 % of the GDP of euro area countries, further analyses on how these quantitative easing (QE) mechanisms work are still needed. In particular, what are the spillover effects of the ECB's APP on corporate bond and syndicated loan spreads? How do these asset purchases influence non-financial firms' debt choices between market and bank funding? These are the questions that we explore in this paper.

This paper contributes to various strands of the literature. Firstly, we contribute to recent QE literature by examining the direct and indirect impacts of the ECB's APP on corporate bond spreads (e.g., Abidi and Miquel-flores, 2018; De Santis et al., 2018; Grosse-Rueschkamp et al., 2019; Zaghini, 2019; Todorov, 2020; Arce et al., 2021; Rischen and Theissen, 2021). Building on this literature, we examine specific channels - signaling, direct pass-through, and portfolio rebalancing - to isolate the mechanisms by which the ECB's APP influence bond spreads. We differ from previous studies by focusing on primary market spreads and using the ECB's monthly net asset purchases as a direct measure of monetary stimulus (Chakraborty et al., 2020).

The paper also contributes for shedding light on the spillover effects

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of Large-Scale Asset Purchases (LSAP) on bond pricing, primarily through the portfolio rebalancing channel (e.g., Vayanos and Vila, 2009; Krishnamurthy and Vissing-Jorgensen, 2011; Bernanke, 2020; Gagnon et al., 2011). To our knowledge, this study is the first to examine whether the ECB's purchases of covered bonds, ABS, and public sector securities influenced corporate bond spreads through the portfolio rebalancing channel. Unlike Zaghini (2019) and Todorov (2020), who analyze spillovers from purchased eligible bonds to non-purchased eligible and non-eligible bonds, our focus is on broader spillover effects.

Further, the paper contributes to the emerging literature on the ECB's APP effects on the real economy through the bank lending channel (e.g., Grosse-Rueschkamp et al., 2019; Arce et al., 2021; Aramonte et al., 2022). Unlike Ertan et al. (2020) and Betz and De Santis (2022), who explore the CSPP's effects on SMEs, we focus on borrowing costs and the determinants of debt choice between loans and bonds, comparing periods before and after the CSPP's announcement and implementation. Closely related to our study is the work of De Santis et al. (2018), which we expand upon by conducting a micro-level analysis: we examine the primary market and analyze direct measures of financing costs.

Motivated by theories on net worth and capital structure channels of monetary policy (e.g., Brunnermeier and Sannikov, 2016; Grosse-Rueschkamp et al., 2019), we hypothesize that the ECB's APP has induced positive spillover effects from bond markets to the corporate syndicated loan market, prompting banks to offer corporate credit with more favorable terms. Given the size of securitization and covered bond markets for European bank financing (Loutskina, 2011) and evidence that ECB purchases have reduced their spreads (Markmann, 2018; Correia and Pinto, 2023), we expect that loans eligible as ABS or covered bond collateral, subsequently acquired by the ECB (CBPP and ABSPP), are likely to have spreads tied to banks' borrowing costs in bond markets (Nadauld and Weisbach, 2012; Di Maggio et al., 2020). We term this the "cost of borrowing channel."

Finally, we contribute to the literature on firms' choice between public and private debt, namely, to the body of work focusing on how firms adjust their debt structure in response to exogenous events, macroeconomic conditions, or financial performance (e.g., Becker and Ivashina, 2014; Morellec et al., 2015; Grosse-Rueschkamp et al., 2019; Todorov, 2020; Arce et al., 2021; De Santis and Zaghini, 2021). We extend this research by examining non-financial firms' debt choices, controlling for ECB APP impacts, and comparing pre- and post-CSPP periods. Motivated by the capital structure channel and credit reallocation in banks' portfolios toward non-bond issuers, we hypothesize that the CSPP influences debt choice and firm-level characteristics driving the preference for corporate bonds over bank loans. We further hypothesize that this effect is more pronounced for non-switchers - firms that rely on a single debt type - compared to switchers that use both bonds and loans extensively. Unlike previous research (e.g., De Santis et al., 2018; Grosse-Rueschkamp et al., 2019), we examine the choice of new corporate borrowing, rather than the proportion of existing debt financing, assuring that firms in our sample have a non-zero demand for debt financing.

To examine these impacts, we use a proprietary dataset from DCM Analytics and Loans Analytics on euro-denominated bonds and syndicated loans issued between January 2000 and December 2019. After hand-matching this data with non-financial firms' accounting and market information from Datastream, our final sample includes 3222 corporate bond deals (4099 tranches, totaling $2335.4 billion) and 4626 syndicated loan deals (11,611 tranches, totaling $3179.9 billion).

Our analysis begins with the impact of the CSPP on corporate bond spreads, revealing a significant reduction in spreads, with the implementation period strengthening the reduction in spreads verified during the announcement period, consistent with the signaling channel. We also find a negative relationship between the ECB's monthly net asset purchases under the CSPP and bond spreads for eligible and non-eligible bonds, corroborating both direct and portfolio rebalancing channels.

Next, we assess spillover effects from ECB purchases of covered bonds, ABS, and public sector securities on corporate bond spreads. Our findings support the portfolio rebalancing channel for CBPP1 and CBPP3, both of which generated positive spillover effects, while CBPP2 had no significant impact on corporate bond spreads. This lack of impact may stem from CBPP2's failure to lower covered bond yields effectively, as noted by Gürtler and Neelmeier (2018), Markmann and Zietz (2017), and Correia and Pinto (2023). Unlike findings for the Federal Reserve's LSAP1 (Krishnamurthy and Vissing-Jorgensen, 2011; Bernanke, 2020), we detect no spillover effect from ABSPP to euro area corporate bonds, suggesting APP's limited effectiveness when other liquidity mechanisms are in play.

Examining the APP's effects on syndicated loan spreads, we find that the CSPP significantly compressed primary market loan spreads across all syndicated loans, regardless of eligibility. This reduction in loan spreads aligns with an exogenous decline in corporate bond financing costs, leading banks to reduce their interest margins. Consequently, our results support the bank lending channel of monetary policy.

We also identify positive spillover effects from CBPP1 and ABSPP on loan spreads, likely driven by banks holding substantial syndicated loans as collateral for eligible covered bonds and ABS issuance under each programme. These findings align with the cost of borrowing channel, where syndicated loan spreads reflect banks' borrowing costs in the bond market.[1] Results remain consistent when aggregating tranches at the deal level and using an endogenous switching regression model to study the impact of the ECB's APP on bond and loan spreads, taking into consideration the potential self-selection by firms between choosing bond versus syndicated loan deals.

Finally, we examine the CSPP's influence on non-financial firms' debt choice between market and bank debt. Controlling for ECB net purchases across security types, we find a substitution effect, with increased market funding among euro area firms, primarily non-switchers. The CSPP had a limited impact on large firms using both bond and loan funding. Our analysis also suggests that firms selecting bond over bank debt are generally larger, seek long-term financing, and are more profitable, while firms with strong growth opportunities tend to prefer bonds over loans. After the CSPP's announcement and implementation, profitability emerges as the main driver of debt choice, with size and growth opportunities becoming less relevant. Overall, the CSPP's impact on debt financing was more pronounced for non-switchers.

This paper is organized as follows. Section 2 reviews the literature and describes the research hypotheses. Section 3 describes the data, methodology and variables used in our tests. Section 4 presents the results of the direct and indirect impacts of the ECB's APP on the pricing of bonds and loans. Section 5 examines the impact of the CSPP and non-financial firms' characteristics on the choice between public and private debt. Section 6 presents robustness checks and Section 7 concludes the paper.

2. Literature review and hypotheses

2.1. APP and bond spreads: signaling, direct pass-through, and portfolio rebalancing channels

Krishnamurthy and Vissing-Jorgensen (2011) present the "signaling channel" as one of the channels through which APPs affect the real economy. When central banks commit to keeping interest rates low, this non-conventional monetary policy can significantly reduce bond spreads. This commitment is signaled through large-scale purchases of long-duration bonds (Clouse et al., 2000; Eggertson and Woodford,

[1] We conducted tests to analyze the relationship between banks that issued bonds under the APP and their participation in syndicates granting syndicated loans during the same period. The results support the cost of borrowing channel of monetary policy (see Table 3 in the online appendix).

2003), influencing bond spreads across both eligible and non-eligible securities (Todorov, 2020).

QE further impacts the real economy by shifting supply and demand for specific asset classes, which adjusts asset prices and their risk premiums (Vayanos and Vila, 2021). This effect is particularly relevant in segmented markets where investors view assets as imperfect substitutes (Gagnon et al., 2011; Zaghini, 2019). By inflating bond prices and improving liquidity, the ECB reduces bond spreads via the "direct pass-through channel." Additionally, by transferring illiquid assets from private banks to the central bank's balance sheet, QE encourages investors to rebalance toward riskier assets, which further reduces spreads for non-eligible bonds via the "portfolio rebalancing channel" (Hancock and Passmore, 2011; Todorov, 2020). The ECB explicitly aimed to lower yields on eligible bonds through signaling and direct pass-through channels while simultaneously influencing non-eligible bonds through the portfolio rebalancing channel (Draghi, 2015; European Central Bank, 2016).

Empirical evidence supports these channels. Grosse-Rueschkamp et al. (2019) show that eligible corporate bonds issued after the CSPP announcement had significantly lower yields. Abidi and Miquel-flores (2018) extend this by demonstrating a 15 bps reduction in bond yield spreads across the euro area, with effects concentrated in bonds near the 'BBB-market' cutoff. Zaghini (2019) reports a signaling effect of approximately 30 bps on primary market issuance and notes that CSPP significantly reduced yield spreads on both targeted and other bonds, consistent with the portfolio rebalancing channel. De Santis et al. (2018) find similar impacts on the secondary market, and Todorov (2020) shows an average drop of 30 bps in corporate bond yields post-CSPP announcement, with larger effects for lower-rated, longer-maturity bonds. Arce et al. (2021) further demonstrate a significant decrease in bond yields for both eligible and below-investment-grade Spanish corporates.

Considering that the CSPP announcement was intended, in addition to a broad signaling effect, to reduce spreads not only on targeted bonds, but also on non-eligible bonds, through the work of the rebalancing channel (Draghi, 2015; European Central Bank, 2016; Zaghini, 2019), we hypothesize:

Hypothesis 1a. *(H1a): The CSPP announcement led to a significant reduction in corporate bond spreads through the signaling channel.*

Hypothesis 1b. *(H1b): The CSPP led to a significant reduction in spreads of eligible corporate bonds through the direct pass-through channel.*

Hypothesis 1c. *(H1c): The CSPP led to a significant reduction in spreads of non-eligible corporate bonds through the portfolio rebalancing channel.*

Recent literature documents substantial spillover effects from central bank interventions. Neely (2010) and Gagnon et al. (2011) show that prices of assets not directly purchased by the Fed, including corporate bonds, responded significantly to APP announcements. Similarly, studies on portfolio rebalancing effects (e.g., Altavilla et al., 2016; Andrade et al., 2016) indicate that LSAP lead to declines in sovereign bond yields. Koijen et al. (2018) confirm these effects for sovereign bonds, while Albagli et al. (2019) find that Federal Open Market Committee actions influenced international bond markets. Within the eurozone, Krishnamurthy et al. (2018) observe that the SMP and Outright Monetary Transactions drove substantial sovereign yield reductions, especially in Italy, Spain, and Portugal. Andrade et al. (2016) further show that the January 2015 PSPP announcement significantly lowered sovereign yields on long-term bonds.

Empirical studies on the effects of central bank asset purchases on corporate bond spreads have largely focused on the US market. For example, Krishnamurthy and Vissing-Jorgensen (2011) find that LSAP1 led to lower yields on MBS and corporate bonds, with spillover from MBS purchases to the corporate bond market. Hancock and Passmore (2011) report that both MBS and sovereign bond purchases tightened yields, while Bernanke (2020) finds that LSAP1 reduced corporate bond spreads, with an average reduction of 89 bps for AAA-rated bonds. Additionally, Gilchrist and Zakrajšek (2013) show that QE reduced corporate credit risk costs, as measured through credit default swaps.

The primary theoretical explanation for these spillover effects is the portfolio rebalancing channel.[2] By altering the supply of specific securities, central banks create scarcity in the targeted asset segments, prompting investors to shift into close substitutes, thus raising the values of those assets (Gagnon et al., 2011; Vayanos and Vila, 2009, 2021). Bernanke (2020) supports this mechanism, showing that by removing duration risk from Treasury markets, LSAP pushed investors to increase holdings in close substitutes such as MBS and corporate bonds. Krishnamurthy and Vissing-Jorgensen (2011) further elaborate on the portfolio rebalancing channel, identifying a corporate bond default risk channel within the LSAP1 framework, where MBS purchases indirectly reduced corporate credit risk, thereby lowering corporate yields. Under this framework, we expect positive spillover effects from the ECB's CBPP1, CBPP2, CBPP3, ABSPP, and PSPP programmes on corporate bond spreads for euro area non-financial firms. Accordingly, we hypothesize:

Hypothesis 2. *(H2): The ECB's APP, other than the CSPP, led to a reduction in corporate bond spreads via the portfolio rebalancing channel.*

2.2. LSAPs and syndicated loan credit spreads: the bank lending channel

The literature on the bank lending channel of monetary policy transmission is extensive,[3] with recent research exploring how APP affect the real economy through bank balance sheets. LSAP by central banks increase the value of banks' asset holdings, leading to a recapitalization that enhances corporate lending via the "net worth channel" (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Bernanke et al., 1999). Brunnermeier and Sannikov (2016) provide a theoretical basis for this channel, arguing that banks holding long-term bonds particularly benefit from APP. Empirical evidence supports this view: Chakraborty et al. (2020) and Di Maggio et al. (2020) show that the targeted asset type and market segmentation significantly shape the bank lending channel's impact. Rodnyansky and Darmouni (2017) document strong effects from the first and third rounds of the US Federal Reserve's LSAP on credit provision by banks most exposed to LSAP, while Chakraborty et al. (2020) and Di Maggio et al. (2020) find that banks benefiting from MBS purchases increased mortgage origination, fueling mortgage refinancing and consumption.

In the euro area, Grosse-Rueschkamp et al. (2019) introduce a "capital structure channel" of monetary policy, positing that as the CSPP reduces corporate bond yields, firms shift from bank loans to long-term bonds, thereby easing banks' lending constraints and indirectly boosting credit supply to firms outside the CSPP. Similarly, Arce et al. (2021) show that the CSPP announcement prompted Spanish firms to shift from loans to bonds, with approximately 75 % of the reduced loan demand redirected to smaller firms with limited access to bond markets. Ertan et al. (2020) find that banks whose clients benefited from CSPP purchases expanded lending to these firms by 12 %, and Betz and De Santis (2022) demonstrate that CSPP encouraged banks to shift loan supply toward firms lacking bond market access.

Together, the net worth and capital structure channels can increase bank risk-taking and lead to lower spreads, especially for loans with

[2] Existing literature also highlights the signaling channel, wherein APP act as commitment mechanisms, indicating that central banks intend to maintain low short-term policy rates for an extended period, at least for the duration of the programmes (Gagnon et al., 2011; Bernanke, 2020).

[3] Authors show that the impact of monetary policy on credit supply is influenced by banks' size (Kashyap and Stein, 1995), ownership structure (Campello, 2002), liquidity (Kashyap and Stein, 2000), leverage (Kishan and Opiela, 2000; Gambacorta and Mistrulli, 2004), and cash flow exposure to interest rate risk (Gomez et al., 2021).

distinct characteristics from CSPP-eligible bonds. Evidence for this risk-taking channel includes findings from Jiménez et al. (2014), Ioannidou et al. (2015), and Aramonte et al. (2022), with Dell'Ariccia et al. (2017) further showing that interest rate reductions prompt well-capitalized banks to increase loan portfolio risk.[4]

Under this framework, we expect CSPP to have positive spillover effects on the syndicated loan market. As firms shift from loans to long-term bonds due to lower bond yields, banks face reduced loan demand. This, in turn, drives banks to increase loan supply to firms without bond market access (e.g., non-switchers) at more favorable rates. If lending banks hold a significant share of eligible bonds, the "net worth channel" could further amplify this effect. Additionally, syndicated loans closely resemble corporate bonds in terms of size and maturity, making them viable substitutes (Altunbaş et al., 2010). Consequently, a reduction in loan spreads aligns with an exogenous drop in corporate bond financing costs, prompting banks to narrow their interest margins. Therefore, we propose:

Hypothesis 3. *(H3): The CSPP effects spilled over to the syndicated loan market, significantly reducing syndicated loan spreads via the bank lending channel.*

We also expect spillover effects from the ECB's APP, excluding the CSPP, on the corporate syndicated loan market, driven by the "cost of borrowing channel." Research shows that ECB acquisitions of securitized and covered bonds have notably affected their spreads. For covered bonds, Szczerbowicz (2015) and Gibson et al. (2016) provide evidence that CBPP1 effectively lowered spreads. However, Gürtler and Neelmeier (2018) observe that while CBPP1 reduced covered bond risk premiums, CBPP2 had no such effect. Similarly, Markmann and Zietz (2017) report a 10–11 bps tightening in covered bond spreads post-CBPP1 announcement, whereas CBPP2 and CBPP3 showed mixed results: CBPP2 had either an insignificant or positive impact on spreads, while CBPP3 had country-specific effects. Correia and Pinto (2023) confirm that CBPP1 and CBPP3 significantly reduced covered bond spreads, while CBPP2 widened them. For the ABSPP, they found that credit spreads for mortgage-backed securities (MBS) declined.

To qualify for APP purchases, ABS and covered bonds must meet eligibility criteria, creating incentives for banks to originate and securitize loans that adhere to these requirements. Evidence from Chakraborty et al. (2020) and Di Maggio et al. (2020) suggests that financial institutions are more likely to issue loans eligible for central bank purchases, as seen with the Federal Reserve's targeted mortgage purchases. Therefore, these effects are likely to extend to non-financial firms through the interest rates applied to syndicated loans. Specifically, loans eligible as collateral for ABS and covered bonds - which the ECB acquires under its APP (CBPP and ABSPP) - are expected to have their interest rates affected by banks' borrowing costs in the bond market. Based on this framework, we propose the following hypothesis:

Hypothesis 4. *(H4): The ECB's APP, other than the CSPP, spilled over to the syndicated loan market, indirectly affecting loan spreads via the cost of borrowing channel.*

2.3. Choice of debt by non-financial firms and APP

Prior research on firms' debt choice between bank and bond financing centers on three main hypotheses. First, the flotation costs hypothesis posits that public bond issuance is cost-efficient only for larger amounts, making smaller firms less likely to use public debt (Houston and James, 1996; Krishnaswami et al., 1999; Esho et al., 2001; Denis and Mihov, 2003; Marshall et al., 2016). Second, the renegotiation and liquidation hypothesis suggests that firms with higher financial distress risk avoid public debt due to limited flexibility in renegotiation (Chemmanur and Fulghieri, 1994; Cantillo and Wright, 2000; Esho et al., 2001; Denis and Mihov, 2003; Fiore and Uhlig, 2011). Finally, the information asymmetry hypothesis argues that firms facing higher information asymmetry costs tend to prefer private debt (Krishnaswami et al., 1999; Denis and Mihov, 2003; Fiore and Uhlig, 2011).

Evidence also suggests that the CSPP affected firms' financing decisions and debt structure. Non-financial firms with CSPP-eligible bonds have shown a shift from bank-based to market-based financing, while this shift is less evident for non-eligible firms (De Santis et al., 2018). Grosse-Rueschkamp et al. (2019) propose a "capital structure channel" of monetary policy, whereby central bank bond purchases lower corporate bond yields, prompting firms to replace bank loans with bond issuance. Arce et al. (2021) similarly find evidence of a substitution effect favoring bonds over bank loans following CSPP announcements. De Santis and Zaghini (2021) and Todorov (2020) further report shifts from non-euro-denominated bonds to euro-denominated debt among eligible issuers.

The CSPP was expected to stimulate corporate financing through three channels: (i) signaling, (ii) direct pass-through, and (iii) portfolio rebalancing (Draghi, 2015; European Central Bank, 2016). The unexpected introduction of the CSPP is likely to have generated a substantial signaling effect, boosting bond issuance. Furthermore, by reducing information asymmetry, the CSPP encouraged firms that previously relied on bank debt to access market financing (Grosse-Rueschkamp et al., 2019). We therefore hypothesize that, controlling for APP targeting other securities besides corporate bonds, the CSPP significantly influenced non-financial firms' debt choice.

Hypothesis 5. *(H5): The CSPP increased the likelihood of bond issuance over loans for European non-financial firms.*

Finally, in line with Holmstrom and Tirole (1997), who argue that an increase in intermediary capital increases the supply of loans to financially constrained firms, Grosse-Rueschkamp et al. (2019) show that private firms, those that have lower access to bond markets, experience an increase in lending. Under this framework, we expect that the CSPP's impact on the choice process is higher for non-switchers, firms that do not use both debt markets extensively.

Hypothesis 6. *(H6): The CSPP's effect on debt choice is stronger for non-switchers than for switching firms.*

3. Data, methodology, and variable definition

3.1. Sample selection

We use data from DCM Analytics and Loan Analytics to select euro-denominated corporate bonds and syndicated loans issued by euro area non-financial firms between 2000 and 2019. This sample period, ending on December 31, 2019, avoids potential effects from the Covid-19 pandemic. Our dataset includes only "corporate bond investment-grade," "corporate bond high-yield," "leveraged," and "investment grade" syndicated loans. The bonds and loans selected are from firms located in euro area countries and are required to have the tranche size available and to be denominated in Euro. Firms classified under "Finance", "Insurance", and "Government" are excluded, as are bonds with complex features (e.g., perpetual, step-up, caps, or floors). Only fixed or variable rate bonds with spread-to-benchmark data and term loans with available all-in-spread-drawn (AISD) data are included. We winsorize spread, tranche size, and transaction size at the 1 % and 99 % levels to control for outliers.

Country credit ratings are sourced from Moody's, while macroeconomic data and firm-specific characteristics are drawn from Datastream. Since DCM and Loan Analytics use different company identifiers than Datastream, we hand-matched firms by company or parent name. We

[4] For an in-depth analysis of the risk-taking channel literature, see, among others, Borio and Zhu (2012), Ioannidou et al. (2015), Dell'Ariccia et al. (2017), and Paligorova and Santos (2017).

linked bonds and loans to firms' characteristics using the fiscal year prior to the bond issuance or loan closing date.

3.2. Methodology

3.2.1. The impact of the ECB's APP on bond and loan spreads

To test H1a, H1b, H1c, H2, H3 and H4, we use the model described in Eq. (1), a reduced-form model similar to existing loan and bond pricing models (Campbell and Taksler, 2003; Gabbi and Sironi, 2005; Chen et al., 2007; Zaghini, 2019; Marques and Pinto, 2020; Alves et al., 2022).

$$Spread_{i,t} = \alpha_0 + \beta APP_{i,t} + \gamma \quad Contractual\ characteristics_{i,t} + \varphi Macroeconomic\ factors_t + \delta Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \tag{1}$$

where the subscripts refer to bond/loan tranche i at time t. $Spread_{i,t}$ is the dependent variable and it represents the bond/loan's credit spread in bps at the time of closing the loans or issuing the bonds.

As our base methodology, we employ OLS regression techniques and adjust for heteroskedasticity, as in Zaghini (2019) and Marques and Pinto (2020). In addition, due to time varying risk premia and as our analysis is conducted by tranches, we estimate standard errors clustered by year and deal in both bond and loan pricing models. However, for loans, OLS estimates will be biased as maturity is an endogenous variable due to the fact that, in the process of loan syndication, both spread and maturity cannot be split and treated separately - Bharath et al. (2011) highlight this joint determination of price and nonprice terms of loans. Thus, we follow an instrumental variable approach to address this fact. Following Alves et al. (2022), we employ GMM regression techniques and use the tranche size and number of tranches per deal as instruments for maturity. We do so for two reasons. First, the tranche size and number of tranches per deal are correlated with maturity. The 2008 financial crisis and the subsequent European sovereign debt crisis manifested a shortage of liquidity, which was reflected in a maturity reduction for loans. Since during these crises, banks lost balance sheet capacity to lend, particularly for longer periods, it is plausible to associate maturity with both tranche size and the number of tranches for syndicated loans. Larger tranches might imply lower maturities since they constitute a larger share in lenders' loan portfolios. Berger et al. (2005), DeMarzo (2005), and Bali and Skinner (2006) point out that the choice of debt maturity is influenced by the level of information asymmetry. Regarding the loan market, Maskara (2010) and Cumming et al. (2020) show that structuring debt into tranches reduces market incompleteness and asymmetric information. Therefore, a large number of tranches might increase loan maturity by reducing the deadweight costs of asymmetric information. Second, the tranche size and number of tranches per deal are not correlated with non-observed determinants of spread, as we control (to the best of our knowledge) for all other variables through which the tranche size and number of tranches per deal impact spreads. In particular, the number of tranches affects loan spreads through credit rating and tranche to transaction variables - in syndicated deals, loans are structured via the creation of different tranches with different risk-return profiles and, therefore, with different spreads. The same goes for the tranche size, which influences the spread via transaction size - larger tranches lead to a larger deal size - and the number of banks - the larger the number of banks involved in the banking syndicate, the larger the number of tranches the deal will have so that the total volume of the operation is shared by all the bank lenders. Furthermore, credit rating, tranche to transaction, transaction size, and number of banks are included as controls in our equation.[5]

In addition to standard firm, contractual, and macro-level controls, our specifications include country, industry, purpose, and quarter fixed effects to account for varying market conditions over time (Zaghini, 2019; Chakraborty et al., 2020).

3.2.2. Cost of borrowing and debt choice

As the choice between bond and loan funding may be endogenous to spreads, to test the robustness of our results, we use an endogenous switching regression model (ESRM) to study pricing, taking into consideration the potential self-selection by firms between issuing bonds and borrowing from banks (Marques and Pinto, 2020; Correia and Pinto, 2023).[6] We perform a full information maximum likelihood (FIML) method on the spread samples of our model specifications simultaneously with a probit selection equation, where the choice between bonds and syndicated loans is a function of contractual and firm characteristics, and macro factors. The empirical model is specified as follows:

$$WASB_{i,t} = \alpha_0 + \beta APP_{i,t} + \gamma \quad Contractual\ characteristics_{i,t} + \varphi Macroeconomic\ factors_t + \delta Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

$$WASL_{i,t} = \alpha_0 + \beta APP_{i,t} + \gamma \quad Contractual\ characteristics_{i,t} + \varphi Macroeconomic\ factors_t + \delta Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \tag{3}$$

$$I^*_{i,t} = \omega_0(WASB_{i,t} - WASL_{i,t}) \quad + \beta APP_{i,t} + \gamma \quad Contractual\ characteristics_{i,t} + \varphi Macroeconomic\ factors_t + \delta Firm\ characteristics_{i,t-1} + \quad u_{i,t} \tag{4}$$

where the third equation models the debt choice: if $I^*_i > 0$, then firm i chooses to issue bonds, otherwise it chooses loan funding. $WAS\ B_{i,t}$ and $WAS\ L_{i,t}$ are the dependent variables for the first/second equation and they represent bond/loan deal's weighted average spread (WAS), at issuance/closing. We adjust for heteroskedasticity and due to time-varying risk premia and cross-country differences, we estimate standard errors clustered by year and country. We use this equation for a deal-level analysis, which allows us to carry out an initial analysis of H5 and H6.

3.2.3. Debt choices

To examine how the CSPP affected the non-financial firms' choice between corporate bonds and syndicated loans, controlling for firms' characteristics, contractual features, and the macroeconomic environment - H5 and H6 -, we estimate a logistic regression model in line with Denis and Mihov (2003), Altunbaş et al. (2010), and Gomes and Phillips (2012). The regression equation is as follows:

[5] Conversely, bond spreads are less likely to be endogenous to the variables included in our model. Bond spreads primarily respond to broad market factors (e.g., interest rates, risk premiums) and issuer-specific credit risk (see Hull et al., 2004; Longstaff et al., 2005). We also applied GMM models to the bond samples. However, as the results are similar to those obtained by OLS regression techniques and there are no endogeneity problems between the maturity and spread of the bonds, we do not present the results. However, they are available upon request.

[6] For a detailed analysis of the structure and functioning of ESRM, refer to Lokshin and Sajaia (2004). Pinto and Santos (2020) provide a direct application of this model to the choice between bonds and loans. Marques and Pinto (2020) apply the model to study the pricing and choice between corporate and structured finance bonds.

$$Choice\ of\ debt_{i,t} = \alpha_0 + \beta CSPP_t + \gamma Contractual\ characteristics_{i,t} + \varphi Macroeconomic\ factors_t + \delta Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \quad (5)$$

where the subscripts refer to firm *i* at time *t*, and the *Choice of debt*$_{i,t}$ is a binary dependent variable that takes the value of 1 if the firm chooses to close a corporate bond deal and 0 if the firm decides to close a syndicated loan deal. In estimating Eq. (5), we adjusted for heteroskedasticity and standard errors are clustered by year and country.

3.2.4. Variable definition and core independent variables

We use several control variables from the debt pricing and debt choice literature, detailed in Section 2 of the online appendix. Table 1 provides definitions and sources for all variables used.

Regarding our core independent variables, to assess the impact of the CSPP on both spreads and debt choices, a dummy variable *CSPP* is used. For some of the models, this variable is then divided into two distinct dummy variables: *CSPP announcement* and *CSPP purchases*. These two variables allow the impact of the announcement vis-à-vis the programme implementation to be separately examined (Zaghini, 2019; Arce et al., 2021). We also use the monthly net purchases under each of the six APP as the direct measure of monetary stimulus and its intensity: *CSPP volume*, *CBPP1 volume*, *CBPP2 volume*, *CBPP3 volume*, *ABSPP volume*, *and PSPP volume*.

3.3. Univariate analysis

3.3.1. The full sample

The full sample comprises 4099 bond tranches (3222 deals, €2335.4 billion) and 11,611 loan tranches (4626 deals, €3179.9 billion). Fig. 1 illustrates the annual distribution by volume, showing a sharp increase in loan issuance until 2007, followed by a decline and subsequent rise from 2008 to 2011, then a fall from €165.9 billion in 2011 to €50.6 billion in 2019. Bond issuance shows a steady increase throughout the period, surpassing loan volume in 2009 and following an opposite trend to loans through 2019. From 2000 to 2019, corporate bond issuance grew by 467.9 %, while loan volume halved. After the CSPP announcement, bond issuance rose 87.5 %, whereas syndicated loan volumes remained stable in 2016–2017, decreasing thereafter. This pattern aligns with the "capital structure channel" of monetary policy (Grosse-Rueschkamp et al., 2019) and findings by Todorov (2020) and De Santis and Zaghini (2021), who observed a rise in euro-denominated bond issuance by non-financial firms.

Fig. 2 shows that average spreads for both bonds and loans surged during the 2008 financial crisis and the European sovereign debt crisis, peaking in 2013 for bonds and 2014 for loans, then gradually narrowing. Spreads on corporate bonds fell markedly after the ECB's 2014–2016 APP announcements (CBPP3, ABSPP, CSPP, PSPP) and continued to decline until 2018, with a slight increase in 2019. These trends support our hypotheses on the ECB's APP effects on spreads.

Panel A of Table 2 details the industry distribution of tranches, with utilities, communications, services, and machinery and equipment comprising over 50 % of volume for both bonds and loans (16.36 % and 17.17 % in utilities; 13.35 % and 14.63 % in communications). Panel B shows a geographic concentration, with corporate bonds primarily issued in France (28.18 %), the Netherlands (26.32 %), and Germany (12.45 %), while loans are most concentrated in Germany (26.41 %), France (26.34 %), and Spain (15.78 %). Panel C describes the purposes of debt funding. Corporate bonds are predominantly used for general corporate purposes (79.47 %), followed by capital structure (14.92 %) and corporate control (5.19 %). Syndicated loans display more diversity, with capital structure (51.96 %), corporate control (33.33 %), and general corporate purposes (10.72 %) receiving the highest allocations.

3.3.2. The eligible sample

To test our hypotheses, we create a subsample of eligible bonds based

Table 1
Definition of variables and sources.

Variable name	Variable Definition	Source
Dependent variables:		
Spread	For bonds, spread represents the margin yielded by the security at issue above a corresponding currency treasury benchmark with a comparable maturity. For loans, spread represents the spread paid by the borrower over Libor or Euribor plus the facility fee (all-in-spread-drawn).	DCM / Loan Analytics
WAS	Weighted average spread, computed as the sum of the product of the tranche's weight in the transaction size and the tranche's spread.	Authors'
Choice of debt	Indicator variable equal to 1 if the firm closes a bond deal, and 0 if the firm closes a syndicated loan deal.	Authors'
Independent variables:		
Core variables		
CSPP	Indicator variable equal to 1 if the bond issuance or loan closing date belongs to the CSPP period (March 10, 2016 - December 31, 2019), and 0 otherwise.	Authors'
CSPP announcement	Indicator variable equal to 1 if the bond issuance or loan closing date belongs to the CSPP announcement period (March 10, 2016 - June 8, 2016), and 0 otherwise.	Authors'
Eligible	Corporate bonds that meet the ECB's eligibility criteria under the CSPP.	Authors'
CSPP purchases	Indicator variable equal to 1 if the bond issuance or loan closing date belongs to the CSPP purchases period (June 8, 2016 - December 31, 2019), and 0 otherwise.	Authors'
CSPP volume	ECB's net purchases of bonds under the CSPP in the month of issuance of the bond or closing the loan.	ECB
CBPP1 volume	ECB's net purchases of bonds under the CBPP1 (from May 7, 2009 through to June 30, 2010) in the month of issuance of the bond or closing the loan.	ECB
CBPP2 volume	ECB's net purchases of bonds under the CBPP2 (from October 6, 2011 through to October 31, 2012) in the month of issuance of the bond or closing the loan.	ECB
CBPP3 volume	ECB's net purchases of bonds under the CBPP3 (from October 20, 2014 through to December 19, 2018 & from November 1, 2019 through to December 31, 2019) in the month of issuance of the bond or closing the loan.	ECB
ABSPP volume	ECB's net purchases of bonds under the ABSPP (from November 21, 2014 through to December 19, 2018 & from November 1, 2019 through to December 31, 2019) in the month of issuance of the bond or closing the loan.	ECB
PSPP volume	ECB's net purchases of bonds under the PSPP (from March 9, 2015 through to December 19, 2018 & from November 1, 2019 through to December 31, 2019) in the month of issuance of the bond or closing the loan.	ECB
Contractual controls		
Rated	Indicator variable equal to 1 if the bond/loan has a credit rating, and 0 otherwise.	DCM / Loan Analytics
Rating	Rating based on the S&P, Moody's and Fitch rating at the bond issuance or loan closing date, with AAA=Aaa= 1, AA+ =Aa1 = 2, and so on until D=RD/D= 22; the average is considered if the ratings differ among rating agencies.	DCM / Loan Analytics
WARating	Weighted average rating, computed as the sum of the product of the tranche's weight	Authors'

(*continued on next page*)

Table 1 (*continued*)

Variable name	Variable Definition	Source
	in the transaction size and the tranche's rating.	
Maturity	Bond/loan maturity in years.	DCM / Loan Analytics
WAMaturity	Weighted average maturity, computed as the sum of the product of the tranche's weight in the transaction size and the tranche's maturity.	Authors'
Transaction size	Bond/loan transaction size in Euro million.	DCM / Loan Analytics
Tranche to transaction	Ratio of tranche size to transaction size of the bond/loan.	DCM / Loan Analytics
Callable	Indicator variable equal to 1 if the bond has a call option, and 0 otherwise.	DCM Analytics
Fixed rate	Indicator variable equal to 1 if the bond or loan has a fixed rate, and 0 otherwise.	DCM / Loan Analytics
Secured loan	Indicator variable equal to 1 if the loan is secured, and 0 otherwise.	Loan Analytics
Term loan	Indicator variable equal to 1 if the loan is a term loan, and 0 otherwise.	Loan Analytics
Number of banks	Number of financial institutions participating in the bond/loan deal.	DCM / Loan Analytics
Number of tranches	Number of tranches of the transaction per bond/loan deal.	DCM / Loan Analytics
Firm characteristics		
Switcher	Indicator variable equal to 1 for a firm using both bond and loan financing within the sample period (January 1, 2000 - December 31, 2019), and 0 otherwise.	Authors'
Total assets	Total assets in Euro million.	Datastream
Return on assets	Net income divided by total assets.	Datastream
Fixed assets to total assets	Ratio of fixed assets to total assets. Fixed assets include property, plant and equipment.	Datastream
Total debt to total assets	Ratio of total debt to total assets.	Datastream
Market to book	Sum of the book value of liabilities and the market value of equity divided by the book value of assets.	Datastream
Current ratio	Ratio of total current assets to total current liabilities.	Datastream
Volatility	VSTOXX (Euro Stoxx 50 Volatility) index.	Datastream
EUSA5y-Libor3M	Difference between the five-year Euro swap rate and the 3-month Libor rate.	Datastream
Country risk	Moody's country credit rating at closing date, with AAA= 1, AA+ =2, and so on until C= 21.	Moody's
Financial crisis	Indicator variable equal to 1 if the bond issuance or loan closing date belongs to the 2007–2008 financial crisis period (September 15, 2008 - Lehman Brothers' bankruptcy filing date - to April 23, 2010), and 0 otherwise.	Authors'
Sovereign crisis	Indicator variable equal to 1 if the bond issuance or loan closing date belongs to the European sovereign debt crisis (April 24, 2010 - December 31, 2019), and 0 otherwise.	Authors'

on the ECB's CSPP eligibility criteria, following Zaghini (2019). Bonds qualify if they meet the following requirements[7]: (*i*) the issuer is incorporated in a euro area country; (*ii*) the issuer is not eligible for the PSPP and is not a credit institution (nor has a parent that is); (*iii*) the bond has a remaining maturity between 6 months and 31 years (or, as of March 18, 2020, a minimum of 28 days if initially under one year); (*iv*) it has at least a BBB- (investment grade) rating; and (*v*) it is euro-denominated. Bonds fulfilling these criteria are assigned a value of 1 for the *eligible* variable, and 0 otherwise.

We apply these same criteria to loans to evaluate potential spillover effects, using a subsample of loans as substitutes for eligible bonds. Table 1 in the online appendix shows that 64.11 % of bonds and only 6.26 % of loans meet the eligibility criteria, largely due to limited credit rating availability for loans in Loan Analytics (12.06 % for loans versus 87.75 % for bonds).

3.3.3. *The high-information sample and switchers*

The high-information sample consists of bonds and loans with complete accounting and market data on borrowing firms, enabling analysis of these characteristics' impact on bond and loan pricing and debt choice. After screening, hand-matching with Datastream, and winsorizing at the 1st and 99th percentiles, we identified 3088 deal-level observations - 1832 for bond issuers and 1256 for loan issuers (4560 tranches: 2316 bonds, 2244 loans), with 1512 deals closed by switchers. Table 3 summarizes firm characteristics across three categories: (I) close only corporate bond deals; (II) close only syndicated loan deals; and (III) close both corporate bond and syndicated loan deals.

On average, borrowers that used only loan deals are smaller and have lower financial leverage and market to book ratios, than those accessing exclusively corporate bond markets. On the contrary, firms in category [II] have higher current ratios than those in category [I]. Fixed assets to total assets and return on assets ratios do not differ at the 1 % significance levels for the two subsets of firms. Firms utilizing both markets, the switchers, are larger than those reliant on syndicated loans exclusively, but smaller than those in category [I]. They have relatively lower asset tangibility than firms using only bonds, but higher fixed assets to total assets versus those in category [II]. Switchers have lower profitability and financial leverage when compared with firms that issued corporate bonds only. Current and market to book ratios are similar for firms in category [III] vis-à-vis categories [I] or [II].

4. APP and non-financial firms' cost of borrowing

4.1. *The CSPP's impact on bond and loan spreads*

We start by examining the CSPP's impact on corporate bond primary market spreads via signaling [H1a], direct pass-through [H1b], and portfolio rebalancing channels [H1c] as well as the indirect impact on syndicated loan spreads via the bank lending channel [H3]. Tables 4 and 5 present the results of estimating Eq. (1) using the samples discussed in Section 3.3. Models [1a], [2a] and [3a] for corporate bonds and models [4a], [5a] and [6a] for syndicated loans are then re-estimated by replacing the CSPP dummy variable per two variables, capturing the effect of both the announcement (*CSPP announcement*) and the implementation (*CSPP purchases*) of the programme. The inclusion of the *CSPP announcement* variable for bonds allows us to directly test the effect of the signaling channel on bond spreads, as stated in H1a. All regressions are run with fixed effects by country, bond/loan's purpose and industry sector to consider the different sources of heterogeneity in the euro area corporate bond and syndicated loan markets.

Models [1a] and [4a] for the full sample indicate that the CSPP significantly reduced spreads for both bonds and loans issued by euro area non-financial firms, suggesting that this APP effectively lowered firms' borrowing costs. Specifically, the CSPP dummy variable corresponds to a 60.8 bps reduction in bond spreads and an 85.4 bps reduction in loan spreads. For bonds, these results support the effectiveness of both the direct pass-through and portfolio rebalancing channels of monetary policy. The CSPP's positive spillover effect on syndicated loan spreads aligns with the bank lending channel, operating through both capital structure and net worth channels.

Model [1b] shows a significant decrease in bond spreads during both the announcement and purchasing periods, by 81.1 bps and 57.6 bps, respectively. The greater reduction in the announcement period aligns

[7] Decision (EU) 2016/948 of the European Central Bank of 1 June 2016 on the implementation of the corporate sector purchase programme (ECB/2016/16).

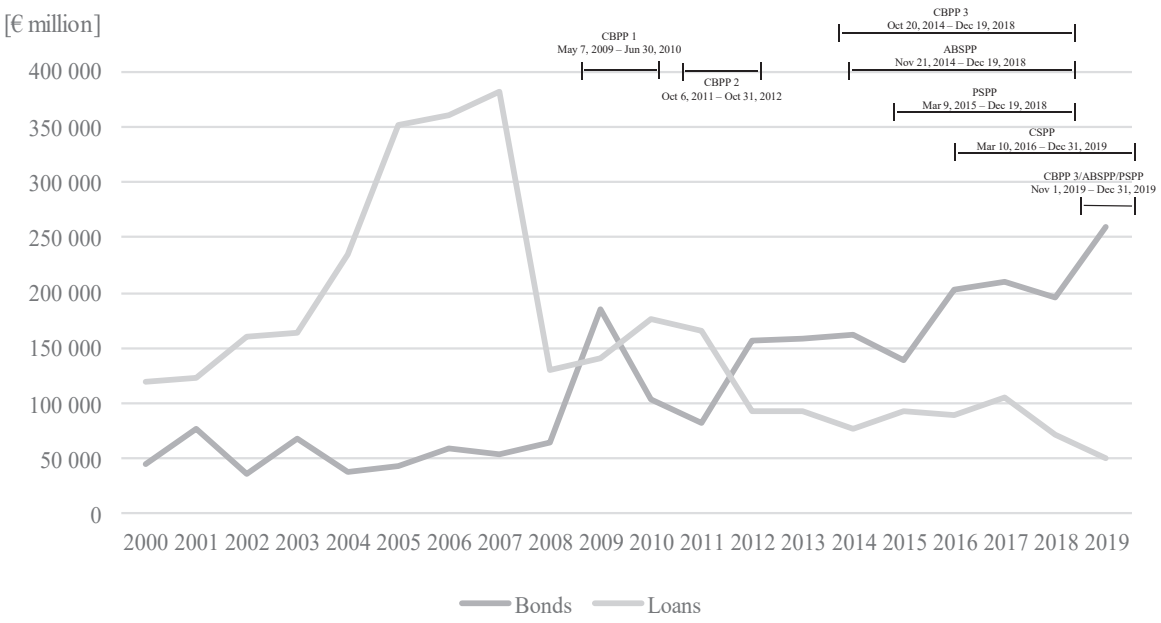

Fig. 1. Distribution of bonds and loans per year. Fig. 1 describes the distribution of the total value of corporate bonds and syndicated loans per year.

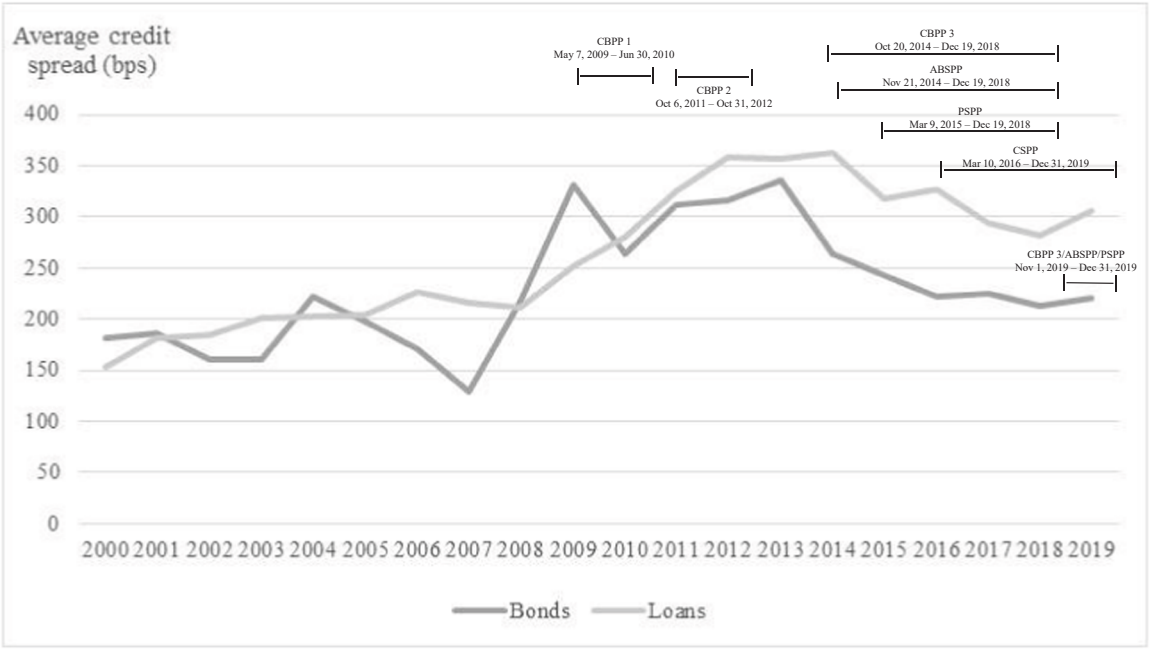

Fig. 2. Average credit spread of bonds and loans per year. Fig. 2 presents the evolution of the sample's average spread (in bps) of bonds and loans by year.

with the signaling channel and supports Beirne et al.'s (2011) findings for covered bonds during CBPP1. As noted by Abidi and Miquel-flores (2018) and Bernanke (2020), this reflects the incorporation of expected future CSPP purchases into bond prices. For loans, Model [4b] shows no impact during the announcement period but a significant 87.9 bps reduction in spreads during the purchasing period. Similar patterns emerge when controlling for firm characteristics - Models [3a] and [3b] for bonds and Models [6a] and [6b] for loans: (*i*) corporate bond spreads drop by an average of 41.8 bps after the CSPP announcement, with a particularly pronounced effect in the announcement period (73.5 bps) compared to the implementation period (36.7 bps); and (*ii*) the CSPP generated a positive spillover effect on loan spreads once the ECB began bond purchases under this programme.

Results differ when analyzing the CSPP's impact on bond and loan spreads within the eligible samples. For bonds, the CSPP is associated with a 27.3 bps reduction in spreads on average (model [2a]). As shown in column 4 of Table 4, bond spreads decrease by 48.8 bps on average during the announcement period, with an additional reduction of 23.3 bps associated with CSPP purchases during the implementation period. However, Models [5a] and [5b] show no significant indirect effects of the CSPP on syndicated loan spreads. This lack of significance for CSPP purchases on loan spreads may be due to reduced demand for syndicated loans when the bond market, supported by the CSPP, provides lower-cost financing for firms with specific risk and maturity profiles. This finding aligns with results in Sections 4.3 and 5, where we observe that the CSPP led public firms to shift from bank loans to long-term bonds. Literature on the bank lending channel further supports this: the capital structure and net worth channels can increase banks'

Table 2
Industrial, geographic and purpose distribution of the full sample at tranche level.

Panel A: Industrial distribution Industrial category of issuer/borrower	Bonds			Loans		
	Number of tranches	Total value [€ Million]	% of total value	Number of tranches	Total value [€ Million]	% of total value
Commercial and Industrial						
Agriculture, Forestry and Fishing	76	20,721.80	0.89 %	266	52,420.83	1.65 %
Communications	434	311,783.12	13.35 %	805	465,112.22	14.63 %
Construction/Heavy Engineering	276	131,087.68	5.61 %	1210	327,563.07	10.30 %
Manufacturing						
Chemicals, Plastic and Rubber	203	97,884.75	4.19 %	877	155,446.89	4.89 %
Food and Beverages	151	93,943.00	4.02 %	692	138,951.21	4.37 %
Machinery and Equipment	433	309,042.87	13.23 %	765	260,080.29	8.18 %
Steel, Aluminum and other Metals	112	53,458.00	2.29 %	361	91,683.89	2.88 %
Other	209	112,912.20	4.83 %	801	154,548.53	4.86 %
Mining and Natural Resources	28	15,020.00	0.64 %	34	8437.20	0.27 %
Oil and Gas	173	116,807.01	5.00 %	77	17,775.34	0.56 %
Real Estate	282	125,760.79	5.39 %	389	119,522.61	3.76 %
Retail Trade	310	152,066.28	6.51 %	1170	212,949.92	6.70 %
Services	412	235,815.55	10.10 %	2052	429,556.40	13.51 %
Utilities	597	381,962.29	16.36 %	1174	546,077.29	17.17 %
Transportation	300	144,120.89	6.17 %	642	139,972.60	4.40 %
Other	103	32,986.00	1.41 %	296	59,824.98	1.88 %
Total	**4099**	**2335,372.23**	**100.00 %**	**11,611**	**3179,923.28**	**100.00 %**
Panel B: Geographic distribution						
Geographic location of issuer/borrower	**Bonds**			**Loans**		
	Number of tranches	**Total value [€ Million]**	**% of total value**	**Number of tranches**	**Total value [€ Million]**	**% of total value**
Austria	107	30,912.09	1.32 %	73	15,071.51	0.47 %
Belgium	102	53,278.00	2.28 %	322	74,477.18	2.34 %
Cyprus	3	1250.00	0.05 %	3	677.25	0.02 %
Estonia	7	1425.00	0.06 %	8	535.40	0.02 %
Finland	115	36,970.00	1.58 %	197	74,769.60	2.35 %
France	1138	658,064.33	28.18 %	3000	837,579.00	26.34 %
Germany	526	290,853.65	12.45 %	2189	839,900.40	26.41 %
Greece	17	6110.00	0.26 %	301	31,115.51	0.98 %
Ireland	134	91,980.05	3.94 %	147	47,454.59	1.49 %
Italy	307	177,298.38	7.59 %	1301	342,968.02	10.79 %
Lithuania	4	940.00	0.04 %	6	460.40	0.01 %
Luxembourg	394	222,368.40	9.52 %	240	71,805.13	2.26 %
Malta	4	277.50	0.01 %	8	2561.89	0.08 %
Netherlands	911	614,631.76	26.32 %	1044	298,425.80	9.38 %
Portugal	123	18,741.30	0.80 %	226	34,582.40	1.09 %
Slovakia	8	2937.70	0.13 %	22	4178.50	0.13 %
Slovenia	2	565.00	0.02 %	19	1461.34	0.05 %
Spain	197	126,769.08	5.43 %	2505	501,899.37	15.78 %
Total	**4099**	**2335,372.23**	**100.00 %**	**11,611**	**3179,923.28**	**100.00 %**

Panel C: Purpose distribution **Purpose of funding**	**Bonds**			**Loans**		
	Number of tranches	**Total value [€ Million]**	**% of total value**	**Number of tranches**	**Total value [€ Million]**	**% of total value**
Corporate control (CC)	249	121,234.70	5.19 %	5067	1059,792.60	33.33 %
Capital structure (CS)	684	348,341.01	14.92 %	4126	1652,203.51	51.96 %
Fixed asset based (FAB)	8	3466.75	0.15 %	139	8545.66	0.27 %
General corporate purpose (GCP)	3146	1855,926.30	79.47 %	1204	340,933.38	10.72 %
Project Finance (PF)	12	6403.48	0.27 %	1075	118,448.14	3.72 %
Total	**4099**	**2335,372.23**	**100.00 %**	**11,611**	**3179,923.28**	**100.00 %**

Panel A describes the industrial distribution of the full sample of bond and loan tranches; Panel B details the tranche allocation to borrowers in a particular country; Panel C presents the distribution of the full sample of bond and loan tranches per funding purpose. We follow the classification of Kleimeier and Megginson (2000): (*i*) corporate control category, which includes funding used for acquisitions, leveraged and management buyouts, private placements or spin-offs; (*ii*) capital structure category, which entails borrowing for refinancing, debt repayment, recapitalization, dividend recapitalization and restructuring; (*iii*) fixed asset based proceeds are used for purchases of aircraft, shipping and general capital expenditures; (*iv*) general corporate purpose category, which includes funding with general corporate purpose stated as its purpose, credit for working capital, public finance and investments, as well as funding with an empty loan purpose code; and (*v*) project finance.

risk-taking and willingness to offer loans at lower spreads, especially for loans with characteristics distinct from those of CSPP-eligible bonds (Dell'Ariccia et al., 2017; Aramonte et al., 2022). Overall, we corroborate our H1a.

Several QE measures were launched contemporaneously with the CSPP. To disentangle the effect of the CSPP from the other APP, we re-estimate our models by replacing CSPP dummy variables per monthly volume purchases of the ECB under this programme, and we control for the ECB's monthly purchases on the contemporaneous APP (CBPP3, ABSPP, and PSPP). This identification strategy is of utmost importance because (*i*) it is relevant to check whether the CSPP was indeed successful in stimulating corporate bond issuance and in reducing corporate bond spreads; and (*ii*) only by using this approach are we able to understand if there are positive or negative spillover effects from a specific APP not targeting corporate bonds on such securities, which is important in calibrating the monetary stimulus originating from the LSAP (e.g., De Santis et al., 2018; Chakraborty et al., 2020). Additionally, as the coefficients of the programme variables may capture both programme

Table 3
Descriptive statistics for firms' characteristics at deal level.

Variable of interest		Firms categorized according to choice of deals					
		[I]		[II]		[III]	
		Bond deals only		Loan deals only		Bond and loan deals (switchers)	
Total assets ($ million)	Number	895	a, b	681	a, c	1512	b, c
	Mean	48,573		19,564		31,461	
	Median	28,425		3513		16,983	
Fixed assets to total assets	Number	895	b	681	c	1512	b, c
	Mean	29.25 %		29.15 %		26.21 %	
	Median	28.70 %		24.35 %		24.58 %	
Debt to total assets	Number	895	a, b	681	a	1512	b
	Mean	34.65 %		32.58 %		31.53 %	
	Median	35.61 %		32.02 %		29.89 %	
Return on assets	Number	895	b	681		1512	b
	Mean	4.11 %		3.80 %		3.43 %	
	Median	3.62 %		3.77 %		3.34 %	
Current ratio	Number	895	a	681	a	1512	
	Mean	116.19 %		124.75 %		118.63 %	
	Median	105.80 %		113.30 %		110.38 %	
Market to book	Number	895	a	681	a	1512	
	Mean	94.50 %		91.65 %		102.82 %	
	Median	79.81 %		77.62 %		77.19 %	

This table reports summary statistics for firms' characteristics of the high-information sample at deal level. We test for similar distributions in nonfinancial firms' characteristics across samples via the Wilcoxon rank-sum test. [a] denotes statistical difference at the 1 % level between 'Bond deals only' and 'Loan deals only' samples. [b] denotes statistical difference at the 1 % level between 'Bond deals only' and 'Bond and loan deals (switchers)' samples. [c] denotes statistical difference at the 1 % level between 'Loan deals only' and 'Bond and loan deals (switchers)' samples. For a definition of the variables, see Table 1.

effects and time-specific factors not accounted for by macroeconomic variables, we incorporated quarter fixed effects into our models, following the approach of Grosse-Rueschkamp et al. (2019) and Zaghini (2019). This adjustment helps to control for unobserved time-specific influences and more accurately isolate the true impact of the programmes.

Model [7] in Table 6 for the full sample indicates a significant negative relationship between CSPP purchase volumes and bond spreads, supporting our earlier findings. However, this approach does not allow us to separately test the effects of the direct pass-through and portfolio rebalancing channels. To address this, model [8] includes an interaction between *CSPP volume* and *eligible* variables. The results indicate that the CSPP reduced spreads for both eligible and non-eligible bonds, as shown by the negative and significant coefficients on both variables. Similar results are obtained in the model [9] for the high information sample. These findings support both the direct pass-through and portfolio rebalancing channels, consistent with H1b and H1c.

Regarding the CSPP's impact on syndicated loan spreads, model [10] in Table 7 shows a significant negative effect of monthly net purchases on loan spreads. Models [11] and [12] reveal that this effect applies to all syndicated loans, regardless of eligibility, as the negative and significant impact appears only for the CSPP volume variable and not its interaction with the eligible dummy. Our findings indicate that the CSPP contributed to spread compression in the primary syndicated term-loan market, confirming H3 and demonstrating that CSPP effects spilled over into the syndicated loan market, significantly reducing loan spreads through the bank lending channel.

As the CSPP encouraged firms to shift from bank loans to longer-term bonds due to lower corporate bond yields, banks saw a reduced demand for syndicated loans. Since the overall volume of bank loans remained stable (De Santis et al., 2018), banks redirected lending to firms with limited access to bond markets, thereby lowering spreads. This effect may have been further amplified through the net worth channel, particularly if eligible corporate bonds were predominantly held by lending banks.

Examining the remaining independent variables, the impact of credit risk on credit spread aligns with expectations across all models in Tables 4, 5, 6, and 7: higher credit risk corresponds to higher credit spreads. These findings are consistent with prior empirical studies that identify rating as a primary determinant of corporate debt spreads. Notably, non-financial firms that use both bonds and loans (*switchers*) obtain lower borrowing costs than firms relying exclusively on either bonds or loans to fund investment projects during the 2000–2019 period. Models [3a], [3b], and [9] reveal that more profitable firms and those with higher asset tangibility incur lower bond spreads. Conversely, there is a positive and significant relationship between bond spreads and firms' total debt-to-assets and current ratios. For syndicated loans, models [6a], [6b], and [12] indicate that firms with higher ROAs and market-to-book ratios secure lower credit spreads. These results align with expectations based on the existing debt pricing literature (see Section 2 of the online appendix).

4.2. *APP spillover effects on bond and loan spreads*

We argue that the ECB's purchases of covered bonds, ABS, and public sector securities led to a reduction in corporate bond spreads through the portfolio rebalancing channel [H2]. Results in Table 6 support our hypothesis for CBPP1 and CBPP3 only. Specifically, CBPP1 and CBPP3 generated the expected positive spillover effects on corporate bond spreads, as indicated by significant and negative coefficients for monthly net asset purchases. However, CBPP2 did not impact spreads. The absence of a spillover effect for CBPP2 may be due to its failure to decrease covered bond spreads, unlike CBPP1 and CBPP3 (Correia and Pinto, 2023; Gürtler and Neelmeier, 2018; Markmann and Zietz, 2017). Szczerbowicz (2015) and Markmann (2018) attribute CBPP2's ineffectiveness to two major factors: (*i*) to address banks' ongoing funding challenges, the ECB introduced two twelve-month longer-term refinancing operations (LTRO) in October 2011 and extended the December LTRO facility to 36 months in December 2011 and February 2012, providing banks with €842.5 billion in total liquidity; and (*ii*) between September 2011 and January 2012, the ECB expanded the monetary base by 50 %. As a result, the Eurosystem purchased only €16 billion of covered bonds under CBPP2 (37 % in the primary and 63 % in the secondary market) compared to the targeted €40 billion. De Santis and Zaghini (2021) and Bernanke (2020) argue that QE may be of limited effectiveness when other mechanisms are available to address liquidity needs, which helps explain these observations.

Additionally, we find no evidence of spillover effects from either the ABSPP or PSPP on corporate bonds in models [7] to [9]. Contrary to Krishnamurthy and Vissing-Jorgensen (2011) and Bernanke (2020), who observed MBS purchases under the Federal Reserve's LSAP1 reducing corporate bond yields, we find no impact of the ABSPP on corporate bonds issued by euro area non-financial firms.

To examine whether ECB's CBPP1, CBPP2, CBPP3, ABSPP, and PSPP indirectly affect syndicated loan spreads through the cost of borrowing channel [H4], we include net monthly asset purchases per bond instrument in models [10] to [12] of Table 7. We find that CBPP1 exerts a positive spillover effect on syndicated loan spreads for both the full and high-information samples, indicating that CBPP1 contributed to lowering the cost of borrowing for non-financial firms in the euro area. Similar effects are found for ABSPP volume and loan spreads in models [10] to [12]. These results align with findings from Chakraborty et al. (2020) and Di Maggio et al. (2020), which show that LSAP increased new mortgage issuance by US banks, with banks benefiting from MBS purchases increasing mortgage origination. Our findings for CBPP1 and

Table 4
Determinants of bond pricing at tranche level – CSPP dummies.

Dependent variable:	Full sample		Eligible sample		High information sample	
Spread (bps)	[1a]	[1b]	[2a]	[2b]	[3a]	[3b]
Independent variables:						
CSPP	−60.800 ***		−27.259 ***		−41.804 ***	
	(0.000)		(0.000)		(0.000)	
CSPP announcement		−81.083 ***		−48.771 ***		−73.474 ***
		(0.000)		(0.000)		(0.000)
CSPP purchases		−57.574 ***		−23.330 ***		−36.684 ***
		(0.000)		(0.000)		(0.000)
Rating*Rated	41.734 ***	41.751 ***	19.543 ***	19.520 ***	38.615 ***	38.692 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Switcher	−26.389 ***	−26.362 ***	−1.146	−1.129	−25.035 ***	−24.936 ***
	(0.000)	(0.000)	(0.751)	(0.753)	(0.000)	(0.000)
Log total assets					0.081	0.103
					(0.982)	(0.977)
Return on assets					−3.886 ***	−3.929 ***
					(0.000)	(0.000)
Fixed assets to total assets					−50.165 ***	−49.035 ***
					(0.003)	(0.003)
Total debt to total assets					58.107 **	57.909 **
					(0.011)	(0.011)
Market to book					0.516	0.689
					(0.784)	(0.712)
Current ratio					14.091 **	13.388 **
					(0.011)	(0.016)
Contractual controls	Yes	Yes	Yes	Yes	Yes	Yes
Macroeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Purpose fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	4099	4099	2628	2628	2316	2316
Adjusted R^2	0.690	0.691	0.575	0.577	0.618	0.620

This table presents the results of OLS regressions analyzing the determinants of bond pricing, at tranche level. Contractual controls include log transaction size, *maturity*, *rated*, *tranche to transaction*, *number of banks*, *callable*, and *fixed rate* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and deal. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

ABSPP align with the cost of borrowing channel, where banks' borrowing costs in the bond market influence syndicated loan rates, particularly for loans eligible as ABS and covered bond collateral. In essence, banks transfer changes in bond spreads to the spreads charged on syndicated loans. We confirmed our results by analyzing banks that sold bonds under the APP and their participation in syndicates issuing loans during the same period (see Table 3 in the online appendix). Finally, no significant impact was observed for CBPP2, CBPP3, or PSPP.

4.3. Cost of borrowing and the choice between bond and loan deals

As shown in Tables 3, 48.96 % of bond and loan deals are closed by switchers. Thus, non-financial firms can choose between corporate bonds and syndicated loans to fund their activities. As the choice between bond and loan deals may be endogenous to spreads, to test the robustness of our results we use an endogenous switching regression model to study the impact of the CSPP on bonds and loans, taking into consideration the potential self-selection by firms between issuing bonds *versus* syndicated loans, as presented in Section 3.2.2. We perform a full information maximum likelihood method on the credit spread samples of our model specifications - models [13] to [15] of Table 8 - simultaneously with a probit selection equation. Based on the Wald test statistics for independent equations, we reject the hypothesis of independence for all models in Table 8.

In all specifications presented in Table 8, the *CSPP volume* and *CSPP volume*Eligible* variables have a negative and significant impact on the WAS for bonds, confirming our earlier findings: the CSPP significantly reduced corporate bond spreads through the direct pass-through and portfolio rebalancing channels. Thus, we corroborate H1b and H1c.

For syndicated loan spreads, Table 8 shows that the CSPP's monthly net purchases have a significant negative impact on loan spreads for the full sample in Model [13]. In addition, the results of models [14] and [15] show that this impact is transversal for all syndicated loans, whether eligible or ineligible, as the coefficient of the interaction between the variables is not statistically significant, aligning with the tranche-level analysis presented in Table 7. This finding indicates that the CSPP's effects spilled over into the syndicated loan market, significantly reducing borrowing costs for European non-financial firms. This result supports the view that the CSPP increased banks' risk-taking through the capital structure and net worth channels, leading to lower spreads. Overall, we corroborate H3.

Regarding H2, results in Table 8 reinforce our previous conclusion that ECB APPs other than the CSPP induced spillover effects on corporate bonds, particularly through CBPPs. Both CBPP1 and CBPP3 reduced corporate bond spreads, while CBPP2, ABSPP, and PSPP showed no impact on bond spreads. We also find that CBPP1 had a positive spillover effect on syndicated loans in Models [14] and [15]. Additionally, there is a significant negative relationship between ABSPP volume and loan spreads across all specifications, corroborating the cost of borrowing channel as outlined in H4.

Preliminary results on the CSPP's impact on funding choices suggest that, after controlling for the ECB's monthly asset purchases across CBPP1, CBPP2, CBPP3, ABSPP, and PSPP, the CSPP (*CSPP* dummy variable) increased the likelihood of firms choosing bonds over loans, consistent with H5 in both full and high-information samples (Models [14] and [15]).

Concerning firm characteristics, our findings support both the renegotiation and liquidation hypothesis, as firms with higher financial distress are less likely to borrow publicly, and the information asymmetry hypothesis, as larger firms tend to issue corporate bonds rather

Table 5
Determinants of loan pricing at tranche level – CSPP dummies.

Dependent variable:	Full sample				Eligible sample				High information sample			
Spread (bps)	[4a]		[4b]		[5a]		[5b]		[6a]		[6b]	
Independent variables:												
CSPP	−85.384	***			172.565				−74.907	***		
	(0.000)				(0.353)				(0.004)			
CSPP announcement			−38.192								102.342	
			(0.195)								(0.206)	
CSPP purchases			−87.910	***			17.297				−82.184	***
			(0.000)				(0.353)				(0.002)	
Rating*Rated	15.041	***	15.064	***	19.476	**	19.154	**	17.325	***	17.671	***
	(0.000)		(0.000)		(0.032)		(0.028)		(0.000)		(0.000)	
Switcher	−13.714	*	−13.887	*	−44.620	*	−43.590	*	−28.536	***	−29.235	***
	(0.055)		(0.052)		(0.065)		(0.061)		(0.002)		(0.002)	
Log total assets									−4.730		−4.710	
									(0.299)		(0.301)	
Return on assets									−4.071	***	−4.032	***
									(0.000)		(0.000)	
Fixed assets to total assets									1.644		3.617	
									(0.968)		(0.930)	
Total debt to total assets									−82.130		−81.638	
									(0.190)		(0.193)	
Market to book									−1.391	**	−1.380	**
									(0.013)		(0.013)	
Current ratio									−2.753		−2.603	
									(0.765)		(0.776)	
Contractual controls	Yes		Yes		Yes		Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes		Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Purpose fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	11,611		11,611		734		734		2244		2244	
Adjusted R^2	0.272		0.272		0.346		0.346		0.313		0.314	
Anderson's LR statistic[a]	74.880		74.882		6.603		6.548		20.339		20.139	
p-value	(0.000)		(0.000)		(0.002)		(0.002)		0.000		(0.000)	
Hansen's J-statistic[b]	1.779		1.838		0.000		0.000		0.000		0.000	
p-value	(0.182)		(0.175)		(1.000)		(1.000)		(1.000)		(1.000)	

This table presents the results of GMM regressions analyzing the determinants of loan pricing, at tranche-level. [a] We employ Anderson's LR test to assess the null hypothesis that the instruments - tranche size and number of tranches - and endogenous variables are not correlated. We reject the null hypothesis for all the models presented, implying that the instruments are strongly correlated with maturity. [b] We conduct Hansen's J-test for overidentification restrictions. The reported statistics indicate that the over-identifying restrictions are not rejected, which provide support to the exogeneity of the tranche size and number of tranches. Thus, our instruments are relevant and valid. Contractual controls include log transaction size, *maturity*, *rated*, *tranche to transaction, number of banks*, *secured*, and *fixed rate* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. The variable *CSPP announcement* does not have a coefficient in Model [6a] because it has been omitted from the model. This occurs because our sample includes only one syndicated loan closed during the CSPP announcement period. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and deal. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

than taking syndicated loans. Additionally, firms opting for bond deals tend to have greater growth opportunities. In the next section, we further explore firms' debt financing choices and how the CSPP has influenced these choices [H6].

5. The CSPP and non-financial firms' debt financing choice

5.1. The choice between corporate bonds and bank loans

The models [16] to [18] of Table 9 report the results of the logistic Eq. (5) used to predict firms' choices of debt between corporate bond and syndicated loan deals. The standard errors are clustered by year and country. In all the models in Table 9, we use the ECB's monthly net asset purchases as a control under the six APP considered.

Column 1 of Table 9 shows that, for the full sample, the CSPP did not impact firms' choice between bonds and loans, indicating no substitution effect. However, in model [17], the CSPP dummy has the expected effect, increasing the likelihood of firms choosing bonds over syndicated loans. For a sample consisting of CSPP-eligible bonds and comparable syndicated loans, we find that the CSPP indeed led to a substitution effect, increasing euro area non-financial firms' reliance on market funding. This result holds in model [18], which includes firm characteristics, supporting the hypothesis that the CSPP influenced debt choice toward bonds. This conclusion aligns with prior studies (De Santis et al., 2018; Grosse-Rueschkamp et al., 2019; Arce et al., 2021), which show an increased share of bonds over bank loans for firms issuing CSPP-eligible bonds. We thus corroborate H5.

Regarding the remaining independent variables in models [16] to [18], our findings also document that *WAMaturity* increases the probability of a firm choosing bond deals in all model specifications and are consistent with the prediction that firms use market over bank debt when looking for long-term financing. In addition, borrowing for shorter maturities can be renegotiated more easily, which is usually verified for bank debt (Johnson, 1997).

Transaction size increases the likelihood of borrowing from syndicated loan markets for all models. According to the flotation costs hypothesis, firms issue public bonds only to borrow large amounts (e.g., Esho et al., 2001; Denis and Mihov, 2003). However, considering that syndicated loan markets allow firms to borrow considerably higher amounts than typical bilateral bank loans, these contradictory results may be due to the similar sizes of syndicated loan and corporate bond deals in our samples. We also find that a firm that borrows from both debt markets within the sample period seems to affect the probability of the firm issuing bonds over loans for the eligible sample only.

Table 6
Determinants of bond pricing at tranche level – APP monthly purchases.

Dependent variable:	Full sample		Full sample		High information sample	
Spread (bps)	[7]		[8]		[9]	
Independent variables:						
CSPP volume	−0.026	**	−0.002	**	−0.005	**
	(0.043)		(0.017)		(0.025)	
CSPP volume*Eligible			−0.007	***	−0.007	***
			(0.000)		(0.000)	
CBPP1 volume	−0.029	**	−0.011	***	−0.011	***
	(0.029)		(0.000)		(0.000)	
CBPP2 volume	0.048		0.009		0.018	*
	(0.132)		(0.270)		(0.055)	
CBPP3 volume	−0.011	**	−0.004	***	−0.003	***
	(0.023)		(0.001)		(0.006)	
ABSPP volume	−0.003		0.004		−0.001	
	(0.856)		(0.530)		(0.867)	
PSPP volume	0.001		0.000		0.000	
	(0.695)		(0.799)		(0.510)	
Rating*Rated	53.060	***	40.134	***	36.638	***
	(0.001)		(0.000)		(0.000)	
Switcher	−55.679		−27.385	***	−24.728	***
	(0.150)		(0.000)		(0.000)	
Log total assets					1.208	
					(0.715)	
Return on assets					−4.761	***
					(0.000)	
Fixed assets to total assets					−34.514	**
					(0.020)	
Total debt to total assets					66.342	***
					(0.001)	
Market to book					1.894	
					(0.237)	
Current ratio					17.048	***
					(0.001)	
Contractual controls	Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes	
Quarter fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Purpose fixed effects	Yes		Yes		Yes	
Number of observations	4099		4099		2316	
Adjusted R^2	0.701		0.724		0.689	

This table presents the results of OLS regressions analyzing the determinants of bond pricing, at tranche level. Contractual controls include log transaction size, *maturity*, *rated*, *tranche to transaction*, *number of banks*, *callable*, and *fixed rate* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and deal. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

Table 7
Determinants of loan pricing at tranche level – APP monthly purchases.

Dependent variable:	Full sample		Full sample		High information sample	
Spread (bps)	[10]		[11]		[12]	
Independent variables:						
CSPP volume	−0.007	***	−0.001	**	−0.007	**
	(0.000)		(0.027)		(0.050)	
CSPP volume*Eligible			−0.006		0.001	
			(0.285)		(0.941)	
CBPP1 volume	−0.002		−0.007	**	−0.039	**
	(0.517)		(0.011)		(0.016)	
CBPP2 volume	0.023		0.009		0.018	
	(0.210)		(0.521)		(0.739)	
CBPP3 volume	−0.002		0.003		−0.004	
	(0.182)		(0.336)		(0.610)	
ABSPP volume	−0.015	*	−0.001	**	−0.004	**
	(0.053)		(0.039)		(0.049)	
PSPP volume	−0.001		0.001		−0.001	
	(0.318)		(0.620)		(0.661)	
Rating*Rated	17.111	***	14.918	***	11.549	*
	(0.000)		(0.000)		(0.065)	
Switcher	−24.642	***	−15.905	**	−30.722	*
	(0.000)		(0.023)		(0.060)	
Log total assets					−9.904	
					(0.152)	
Return on assets					−4.520	***
					(0.000)	
Fixed assets to total assets					51.972	
					(0.479)	
Total debt to total assets					95.691	
					(0.800)	
Market to book					−1.913	**
					(0.035)	
Current ratio					−14.526	
					(0.211)	
Contractual controls	Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes	
Quarter fixed effects	Yes		Yes		Yes	
Country fixed effects	Yes		Yes		Yes	
Industry fixed effects	Yes		Yes		Yes	
Purpose fixed effects	Yes		Yes		Yes	
Number of observations	11,611		11,611		2244	
Adjusted R^2	0.366		0.280		0.334	
Anderson's LR statistic[a]	82.800		74.936		27.603	
p-value	(0.000)		(0.000)		(0.000)	
Hansen's J-statistic[b]	1.137		2.304		0.000	
p-value	(0.248)		(0.169)		(1.000)	

This table presents the results of GMM regressions analyzing the determinants of loan pricing, at tranche-level. [a] We employ Anderson's LR test to assess the null hypothesis that the instruments - tranche size and number of tranches - and endogenous variables are not correlated. We reject the null hypothesis for all the models presented, implying that the instruments are strongly correlated with maturity. [b] We conduct Hansen's J-test for overidentification restrictions. The reported statistics indicate that the over-identifying restrictions are not rejected, which provide support to the exogeneity of the tranche size and number of tranches. Thus, our instruments are relevant and valid. Contractual controls include log transaction size, *maturity*, *rated*, *tranche to transaction*, *number of banks*, *secured*, and *fixed rate* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and deal. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

Results in model [18] also indicate that relatively larger and more profitable firms, and those with more growth options are more likely to issue bonds over loans. Relatively smaller firms prefer syndicated loans *vis-à-vis* corporate bond deals, which supports the hypothesis that firms with more severe information problems are more likely to borrow privately.

Our results are in line with those of Cantillo and Wright (2000) and Denis and Mihov (2003), who report that profitable firms are more likely to issue public debt. The evidence of a significant and positive relation between growth opportunities and the likelihood of observing bond over loan deals contradicts the findings of Krishnaswami et al. (1999), but this is in line with the conclusions of Altunbaş et al. (2010) and Morellec et al. (2015), meaning that corporate bond arrangements may play an important role as a liquidity source, especially for borrowers with relatively higher growth options. Finally, coefficients of *fixed assets to total assets*, *total debt to total assets* and *current ratio* variables are not statistically significant in model [18].

To further examine the impact of the CSPP on the choice of debt financing, we re-estimated model [18] for two subsamples, before and after the CSPP announcement. Results presented in models [19] and [20] show that there is a change in the firms' variables that affect the choice of market *versus* bank debt. In the pre-CSPP announcement period, the variables that determine the likelihood of observing a bond

Table 8
Determinants of firms' cost of borrowing and debt choice.

Dependent variable:	Full sample				Full sample				High information sample			
WAS (bps)	[13]				[14]				[15]			
	Bonds		Loans		Bonds		Loans		Bonds		Loans	
Independent variables:												
CSPP volume	−0.002	**	−0.005	**	−0.006	*	−0.002	***	−0.007	**	−0.007	**
	(0.045)		(0.050)		(0.066)		(0.000)		(0.044)		(0.019)	
CSPP volume*Eligible					−0.011	***	−0.020		−0.010	***	−0.010	
					(0.000)		(0.456)		(0.000)		(0.809)	
CBPP1 volume	−0.012	***	−0.001		−0.011	***	−0.001	***	−0.013	***	−0.005	**
	(0.000)		(0.893)		(0.000)		(0.009)		(0.000)		(0.033)	
CBPP2 volume	0.017		−0.013		0.017	*	−0.013		0.022		0.015	
	(0.180)		(0.388)		(0.052)		(0.385)		(0.500)		(0.513)	
CBPP3 volume	−0.005	***	0.003		−0.005	***	0.004		−0.003	**	0.003	
	(0.001)		(0.173)		(0.001)		(0.135)		(0.024)		(0.483)	
ABSPP volume	0.002		−0.009	**	0.003		−0.008	**	−0.001		−0.005	*
	(0.757)		(0.035)		(0.680)		(0.041)		(0.835)		(0.085)	
PSPP volume	−0.001		−0.001		0.001		−0.001		0.001		0.001	
	(0.987)		(0.910)		(0.988)		(0.910)		(0.296)		(0.834)	
WARating*Rated	47.815	***	19.208	***	46.343	***	19.147	***	40.985	***	19.466	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Switcher	−38.360	***	−29.770	***	−38.567	***	−29.186	***	−34.746	***	−26.329	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Log total assets									−3.012		−1.009	
									(0.314)		(0.686)	
Return on assets									−4.272	***	−1.555	**
									(0.000)		(0.025)	
Fixed assets to total assets									−38.772	***	0.739	
									(0.007)		(0.955)	
Total debt to total assets									61.065	***	−20.513	
									(0.001)		(0.383)	
Market to book									1.208		−0.087	
									(0.412)		(0.722)	
Current ratio									18.868	***	−3.914	
									(0.001)		(0.239)	
Quarter fixed effects	Yes		Yes		Yes		Yes		Yes		Yes	
Contractual controls	Yes		Yes		Yes		Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes		Yes		Yes		Yes	

Dependent variable:	Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0	
Choice of debt						
Independent variables:						
CSPP	−0.392		0.334	**	0.771	**
	(0.254)		(0.033)		(0.037)	
CSPP volume	0.001		−0.001		−0.002	
	(0.692)		(0.194)		(0.172)	
CSPP volume*Eligible			0.001	***	0.001	**
			(0.000)		(0.045)	
CBPP1 volume	0.001		0.001		0.001	
	(0.527)		(0.591)		(0.262)	
CBPP2 volume	−0.002	*	−0.001		−0.002	
	(0.095)		(0.106)		(0.569)	
CBPP3 volume	0.001	*	0.001	*	0.001	
	(0.061)		(0.088)		(0.514)	
ABSPP volume	−0.002		−0.002		−0.001	
	(0.549)		(0.596)		(0.353)	
PSPP volume	0.001		0.002		0.001	
	(0.582)		(0.655)		(0.980)	
WARating*Rated	−0.082	***	−0.070	***	−0.052	**
	(0.000)		(0.000)		(0.027)	
Switcher	0.015		0.025		−0.156	
	(0.846)		(0.754)		(0.102)	
Log total assets					0.144	***
					(0.000)	
Return on assets					0.011	
					(0.209)	
Fixed assets to total assets					−0.198	
					(0.279)	
Total debt to total assets					−0.279	***
					(0.002)	
Market to book					0.019	***
					(0.007)	
Current ratio					−0.089	
					(0.205)	
Quarter fixed effects	Yes		Yes		Yes	

(*continued on next page*)

Table 8 (*continued*)

Dependent variable:	Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0	
Choice of debt						
Contractual controls	Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes	
Number of observations	7848		7848		3088	
Wald chi2	2600.31		3030.59		1905.72	
Log pseudolikelihood	−49,987.31		−49,896.61		−18,915.05	
Wald test of indep. equations	9.51	***	8.72	***	5.22	**

This table presents the results of estimating endogenous switching regression models at deal level. We implement the full information maximum likelihood (FIML) method to simultaneously estimate binary and continuous parts of the model in order to yield consistent standard errors. Contractual controls include log transaction size, *WAMaturity*, *rated*, *number of tranches*, and *number of banks* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and country. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

deal over a syndicated loan deal are log total assets and *market to book ratio*: firms choose to issue corporate bonds when they are relatively larger and have higher growth opportunity sets. With the announcement and implementation of the CSPP, firms' size and growth opportunities insignificantly affect this choice, while a firm's profitability becomes the unique characteristic affecting the propensity of a firm choosing bonds over loans. This is in line with our argument that the CSPP has reduced the deadweight costs of asymmetric information. In fact, during the implementation of the CSPP and as long as bonds meet the ECB eligibility criteria, factors such as size or growth opportunities of the listed sample companies are no longer relevant. What becomes relevant is whether or not the firms will have the profitability necessary to pay the interest and principal associated with the debt service of the bonds issued.

5.2. Switchers vis-à-vis non-switchers

Table 3 shows that approximately 49 % of the deals in our sample are closed by switchers. Thus, further analysis on how both switchers and non-switchers choose between market and private debt may provide valuable insights into the choice process. Additionally, a focus on switchers helps mitigate endogeneity concerns in the choice between market and bank debt, as discussed in previous sections. These firms are concentrated in the communications, services, and utilities sectors, consistent with the distribution of tranches in the full sample, and are predominantly located in France, Germany, Italy, the Netherlands, and Spain.

To explore borrowing choices further, Model [18] in Table 9 is re-estimated for two subsamples: firms that issue both debt types (switchers) and firms that rely exclusively on either bonds or loans. Models [21] and [22] reveal that the CSPP has no impact on the choice between bonds and loans for switchers, suggesting that these larger firms, which access both markets to fund their projects, prioritize factors other than the CSPP - namely, deal size, maturity, and firm-specific characteristics like size, leverage, and growth opportunities. However, for firms relying exclusively on either bonds or loans, the CSPP increased the likelihood of opting for long-term bonds over loans. These results show that Grosse-Rueschkamp et al.'s (2019) and Arce et al.'s (2021) findings that the CSPP leads to a reduction in the demand for bank credit by bond issuers, which are usually large corporations, hold only for non-switchers; i.e., CSPP does not affect debt financing choices for firms that use extensively both bond and syndicated bank debt to fund their activities. Hence, the CSPP is more important for non-switchers. We thus corroborate H6.

For both samples, public firms opting for bonds over loans tend to be larger and exhibit higher growth opportunities. However, there are notable differences in characteristics affecting the likelihood of bond issuance for switchers versus non-switchers. First, the coefficient on ROA positively influences the probability of a bond deal only for non-switchers. Second, while there is a significant negative relationship between total debt-to-asset ratio and bond deal probability for switchers, this relationship is positive and significant for non-switchers. This means that more leveraged firms that before the CSPP implementation used less market financing, which is in line with the renegotiation and liquidation hypothesis (e.g., Cantillo and Wright, 2000; Denis and Mihov, 2003; Fiore and Uhlig, 2011), started using the bond market more extensively as a consequence of the massive corporate bond purchases by the ECB under this programme. Overall, these findings underscore that the CSPP has had a stronger impact on non-switchers than on switchers.

6. Robustness checks

First, since bond and loan deals have, on average, 1.19 and 2.11 tranches per deal, we aggregate tranches at the deal level and check whether our results concerning H1a, H1b, H1c, and H3 hold. We use the model specified in Eq. (1), in which the dependent variable is now the WAS, in basis points. In these regressions, several independent variables are aggregated at the deal level like weighted average maturity - *WAMaturity* - and weighted average rating - *WARating* -, and the *tranche to transaction* is replaced by *number of tranches*. The results are consistent with the tranche-level analysis. In addition, to address self-selection concerns with regard to the endogeneity of the decision to use public *versus* private debt, we re-estimated the models presented in Table 9 for a matched sample of syndicated loans (Roberts and Whited, 2013). To create a matched sample, we employ a propensity score matching approach as used by Parsons (2001), by creating a 1-to-1 matching algorithm that captures the most identical syndicated loan deal in the same industry and year. The propensity score was created using the following deal characteristics: transaction size, WAMaturity, and WARating. Finally, we re-estimate our models in Table 9 by including the same fixed effects as in Tables 6 and 7. Overall, our estimates remain unchanged.

7. Conclusion

This paper provides an insight into the impact of the ECB's APP on the borrowing cost and debt financing choice of euro area non-financial firms, by using a cross-section of bonds and syndicated loans closed in the 2000–2019 period. Results suggest that the CSPP reduces corporate bond spreads across all samples, with the implementation period strengthening the reduction in spreads seen during the announcement period. We find that the ECB's monthly volume purchases under the CSPP significantly reduce corporate bond spreads for both eligible and non-eligible bonds. Therefore, our findings are consistent with the signaling, direct pass-through, and portfolio rebalancing channels of monetary policy. We also find that the ECB's purchases of covered bonds influenced corporate bond spreads via the portfolio rebalancing channel under CBPP1 and CBPP3. In contrast, CBPP2, ABSPP and PSPP did not affect spreads on corporate bond issues.

Table 9
Determinants of firms' debt choice.

Dependent variable:	Full sample		Eligible sample		High information sample		High information sample | Pre-CSPP		High information sample | CSPP		Switchers		Non-switchers	
Choice of debt	[16]		[17]		[18]		[19]		[20]		[21]		[22]	
	Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0		Bond = 1, Loan = 0	
Independent variables:														
CSPP	−0.223		1.330	***	0.885	***					0.623		0.964	**
	(0.118)		(0.000)		(0.001)						(0.159)		(0.011)	
Log transaction size	−0.237	***	−0.949	***	−0.860	***	−0.775	***	−0.726	**	−1.781	***	−0.667	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.034)		(0.000)		(0.000)	
WAMaturity	0.153	***	0.541	***	0.322	***	0.308	***	0.183		0.771	***	0.210	***
	(0.000)		(0.000)		(0.000)		(0.000)		(0.396)		(0.000)		(0.000)	
Rated	5.175	***			3.874	***	3.806	***	7.875	***	2.100	***	7.440	***
	(0.000)				(0.000)		(0.000)		(0.000)		(0.008)		(0.000)	
WARating*Rated	−0.147	***	−0.063		−0.124	***	−0.100	**	−0.483	***	−0.087		−0.272	***
	(0.000)		(0.230)		(0.005)		(0.027)		(0.000)		(0.225)		(0.000)	
Switcher	0.178		−1.166	***	−0.088		−0.055		−0.164					
	(0.231)		(0.000)		(0.622)		(0.748)		(0.759)					
Volatility	−0.029	***	0.004		−0.015		−0.016		−0.007		0.007		−0.041	***
	(0.000)		(0.763)		(0.126)		(0.122)		(0.911)		(0.614)		(0.006)	
EUSA5y-Libor3M	−0.162		−0.681	***	−0.236		−0.402	**	−0.341		−0.453	**	−0.279	
	(0.132)		(0.000)		(0.144)		(0.030)		(0.670)		(0.046)		(0.172)	
Country risk	0.158	***	0.089	*	0.190	***	−0.029		−0.251	***	0.268	***	0.095	
	(0.000)		(0.086)		(0.000)		(0.433)		(0.000)		(0.003)		(0.123)	
Financial crisis	1.892	***	2.335	***	2.461	***	2.293	***			2.680	***	2.957	***
	(0.000)		(0.000)		(0.000)		(0.000)				(0.000)		(0.000)	
Sovereign crisis	1.742	***	1.518	***	1.900	***	2.018	***			1.664	***	2.523	***
	(0.000)		(0.000)		(0.000)		(0.000)				(0.000)		(0.000)	
Log total assets					0.408	***	0.416	***	0.304		0.842	***	0.267	***
					(0.000)		(0.000)		(0.150)		(0.000)		(0.009)	
Return on assets					0.026	*	0.011		0.099	**	0.033		0.026	**
					(0.071)		(0.446)		(0.050)		(0.173)		(0.027)	
Fixed assets to total assets					0.384		0.488		−0.386		0.764		−0.221	
					(0.294)		(0.171)		(0.724)		(0.250)		(0.780)	
Total debt to total assets					0.156		−0.448		0.607		−0.844	*	2.040	**
					(0.685)		(0.289)		(0.570)		(0.092)		(0.031)	
Market to book ratio					0.055	***	0.045	***	0.622		0.073	***	0.302	**
					(0.000)		(0.003)		(0.339)		(0.000)		(0.017)	
Current ratio					−0.081		−0.011		−0.303		−0.178		−0.010	
					(0.526)		(0.935)		(0.309)		(0.294)		(0.964)	
APP volume controls	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Contractual controls	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Macroeconomic controls	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	7848		2553		3088		2417		671		1512		1576	
Wald chi2	2095.370	***	455.050	***	1058.190	***	824.590	***	388.530	***	585.550	***	408.57	***
Log pseudolikelihood	−2416.476		−639.943		−933.020		−906.003		−127.592		−440.749		−281.36	
Pseudo-R^2	0.545		0.503		0.551		0.459		0.505		0.561		0.718	

This table presents the results of logistic regressions that predict nonfinancial firms' choice between bond and loan deals. APP volume controls include *CSPP volume*, *CBPP1 volume*, *CBPP2 volume*, *CBPP3 volume*, *ABSPP volume*, and *PSPP volume* variables. Contractual controls include *rated*, *number of tranches*, and *number of banks* variables. Macroeconomic controls include *volatility*, *EUSA5y-Libor3M*, *country risk*, *financial crisis*, and *sovereign crisis* variables. For each independent variable, the first row reports the estimated coefficient and the second row reports the p-value. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and country. ***, **, and * indicate significant difference at the 1 %, 5 %, and 10 % significance levels, respectively. For a definition of the variables, see Table 1.

Our results support both the capital structure and net worth channels of monetary policy. The effects of the CSPP spilled over into the syndicated loan market, significantly reducing syndicated loan spreads. Additionally, we find evidence supporting the cost of borrowing channel: the ECB's APP, excluding the CSPP, affected the syndicated loan market, showing that both CBPP1 and ABSPP positively impacted the conditions of new loans, particularly those likely to be used as collateral in asset-backed securities and covered bonds under the first purchase programme. Thus, banks transfer changes in their cost of financing via the bond market to the spreads on the loans they grant.

Concerning the impact on non-financial firms' debt choices, results confirm that the CSPP increased the likelihood of firms choosing bond over syndicated loan deals, by stimulating the substitution of bank term loans with bond debt. In addition, we show that the CSPP does not affect debt financing choices for firms that extensively use both bond and syndicated bank debt to fund their activities. Hence, this impact is important for non-switchers. By definition, non-switchers never change their funding source in our sampling period. Therefore, the positive coefficient between the CSPP dummy and the probability of firms issuing bonds *vis-à-vis* loan deals may be because (*i*) either bond-non-switchers increase their bond issuance, or (*ii*) loan-non-switchers obtain fewer loans, or (*iii*) both. We believe that analyzing whether the behavior of each sub-group of non-switchers towards the CSPP changes significantly, particularly for loan-non-switchers, is an opportunity for future research.

In addition, results seem to suggest that with the announcement and implementation of the CSPP, the characteristic that affects firm's choice between market and bank debt is profitability, meaning that factors such as size or growth opportunities of the listed sample companies are no longer relevant. We also believe that a more detailed analysis of how the

ECB's APP affected the debt choice process is a valuable opportunity for future research.

Importantly, we contribute to the debate about the differential effect of purchasing specific assets by central banks. Contrary to conventional wisdom, our results suggest that the ECB's APP had a differential effect not only on the price of corporate bonds, but also on how financial institutions were able to reduce margins by extended syndicated credit with lower spreads. In line with Rodnyansky and Darmouni (2017), this paper provides direct empirical support for the importance of targeting specific assets rather than mere quantity during any large-scale asset purchasing.

CRediT authorship contribution statement

Joana F. Kanda: Software, Investigation, Data curation. **João M. Pinto**: Supervision, Methodology, Conceptualization. **Beatriz P. Silva**: Writing – original draft, Validation, Software, Data curation.

Declarations of interest

None.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jfs.2025.101387.

Data Availability

The authors do not have permission to share data.

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