The impact of the PEPP on the corporate commercial paper market*

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Abstract

The Covid-19 crisis triggered a "dash for cash" phenomenon that revealed vulnerabilities on short-term debt markets. To ensure firms' short-term financing needs, the Eurosystem effectively intervened for the first time on the corporate commercial paper (CP) market in March 2020, as part of the Pandemic Emergency Purchase Programme (PEPP). This paper documents the aggregate and dynamic effects of this intervention on corporate CP in terms of i) volumes issued, ii) maturity and iii) yields at issuance. Using a difference-in-differences approach that exploits the presence of eligibility criteria at the security and issuer –level, our findings suggest that the PEPP triggered a shift in the debt composition of eligible firms. Maturity at issuance increased on average by 42 days for eligible issuers, which contributed to a reduction in rollover risk. This asset purchase program was effective in easing financing conditions, which translated into a compression of yields between 8 and 11 basis points for eligible firms. Eligible issuances increased but we do not find that the PEPP fostered issuance at the aggregate level. For issuers whose debt was mainly held by money market funds prior to the crisis, we found that the effect on maturity is more contained, indicating that firms' investor sector matters.

JEL codes: E52, E58, G01, G12, G20, G23.

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1 Introduction

In March 2020, money market funds (MMFs) faced heightened outflows from investors with urgent cash management needs, as a direct consequence of the implementation of the lock-down measures to fight the pandemic. To honor these redemptions, they raised cash by selling part of their assets, including corporate commercial papers (CPs) which represented on average 19.6% [1] of their assets before the crisis. Corporate CPs are issued by non-financial corporations to cover cash needs with a maximum maturity of 12 months. While being traditionally the main investor on this market, MMFs were not anymore in a buying position. This big players' withdrawal led to an impairment of firms' short-term funding: financing conditions started tightening as interest rates [2] increased on average from -0.21% to -0.01% between the first week of February and mid-March, and issuance volumes plummeted from 6.7 bn € to 2 bn € over the same period [3]). As this market is crucial for firms' short-term financing needs and money market is of primary importance for monetary policy transmission, these market turbulences justified the first effective intervention of the Eurosystem on the corporate CP market.

On March 18th, 2020, as part of the Pandemic Emergency Purchase Programme (PEPP), the Eurosystem announced new eligibility criteria for corporate CPs. The main objective was similar to the one having triggered asset purchases on the bond market: by easing financing conditions, CPs purchases were meant to boost issuance amounts for large and creditworthy firms relying on market-based finance, with potential spillovers on others firms (Grosse-Rueschkamp et al. (2019)). In particular, ensuring that these large firms effectively made use of this market is key to release banks' financing capacity for smaller firms without market access. Corporate CPs were already eligible under the Corporate Sector Purchase Programme (CSPP), with different eligibility criteria. As no purchase was conducted under the CSPP, the introduction of the PEPP is well suited to study the effects of asset purchases rather than the effect of their announcement: as corporate CPs were already eligible to the CSPP, the true "surprise" was the effective start of the purchase shortly after the announcement, on March 27th 2020.

In this paper, we provide evidence of the aggregate and dynamic effects of the PEPP on

[1] Source: BdF data on investment funds, merged with TCN dataset (BdF), Q4-2019.

[2] Average rates are weighted by the maturity at issuance, only issuances in euros are included. Source: TCN dataset.

[3] Source: TCN dataset, issuances in euros only.

the French corporate CP market, the largest national market in the Euro Area (de Guindos and Schnabel (2020)). Using a difference-in-differences framework, we exploit the new eligibility criteria introduced by the PEPP compared to the CSPP, where corporate CPs were eligible under different conditions, but no effective purchases was conducted. This feature enables us to study the effect of asset purchases on the corporate CP market compared to a situation with the announcement only. We exploit transaction-level data of commercial paper issuances, enriched with firm-level variables relative to their balance sheets, income statements and credit ratings from January 2020 to September 2020. While net asset purchases were negative starting in June, we include one more quarter to assess the potential impact of the programme while being active, but without any significant market footprint on new issuances.

In our paper, we study the effects of the PEPP on CPs according to three dimensions: i) volumes issued, ii) yields and iii) maturity. We found weak evidence that the PEPP was effective in reactivating issuance programs: the amount issued per transaction increased by 3.27 mn € on average, but this effect is not robust to controlling for aggregate shocks and time-invariant differences across issuers (inclusion of firm- and time-fixed effects). However, we do find a significant effect on the issued amount of eligible transactions, e.g. transactions meeting the criteria regarding the currency, the minimum amount and the maturity, while being issued by Investment Grade (IG)-rated firms. The issued amount on these transactions increased on average by 8.40 mn €, which corresponds to a 31.57% increase compared to the pre-crisis level [4]of non-eligible firms' issuance. This effect is particularly strong during the first month after the start of the purchases. Splitting our sample by rating buckets, we found, similar to Todorov (2020) for bonds during the CSPP, that firms just above the eligibility threshold regarding their credit rating drove most of this increase in debt issuance. The impact on total debt issued is however more limited: on aggregate, eligible firms reduced their aggregate issued amounts by 89.73 mn €, which only represents 0.14% of the issued amounts by eligible firms before the crisis. All in all, these results suggest that eligible firms modified their debt composition to fit PEPP criteria, but without increasing their aggregate issued amounts.

Turning to the terms of issuance, we indeed found that maturities substantially increased by 42 days on average for eligible firms after the start of the purchases, corresponding

[4]The average of issued amount by non-eligible firms before the crisis is computed using data from January to March 2020.

to a 54.24% increase for eligible issuers compared to their pre-crisis levels[5]. Given that longer maturity contributes to a decline in rollover risk and therefore to credit risk (He and Xiong (2012)), this result suggests that the PEPP contributed to a reduction in eligible firms' vulnerabilities. This effect was immediate after the start of the purchases and was persistent up to four months. The effect vanished afterwards, e.g. during the period where net purchases by the Eurosystem became negative. This result is consistent with Duygan-Bump et al. (2012): central banks' interventions on commercial paper markets are usually short-lived and the effects hold when the facility has a significant market footprint but vanish when it is still active without effective purchases.
In addition, the maturity of corporate CPs is particularly important from an investors' viewpoint: their short maturity makes them particularly attractive for MMFs, given the European regulatory limit on their portfolio weighted average maturity. We found that eligible issuers which were mainly hold by MMFs [6]before the Covid-19 crisis increased their maturity at issuance by 32.8 days, compared to 42 days in the full sample. In comparison, eligible issuers that were not mainly hold by MMFs before the crisis increased their maturity by 86.7 days, probably driving most of our aggregate results. These results shed light on the importance of investors for firms' terms of issuance and can drive a differentiated impact of central banks' interventions.

One objective of the PEPP was also to ease financing conditions, to make commercial paper issuance more attractive and boost issuance amounts. We found a decrease in the interest rate at issuance of corporate CPs by eligible issuers between 8 and 11 basis points after the first purchases took place. This effect is economically significant given that, after the PEPP, interest rates at issuance increased by 21 basis points on average compared to their pre-crisis levels. Splitting our sample between short- and long-term maturity CPs, we found that the effect is mainly driven by the former. Given that the PEPP introduced a new maturity criteria of 28 days, compared to six months in the case of the CSPP, this result suggests that the effect is particularly stronger for the market segment of newly eligible debt.

We contribute to several strands of the literature. We relate to the literature on the market structure of corporate CPs market: similar to Kacperczyk and Schnabl (2010), we found that the investor universe is dominated by MMFs and that issuers are usually large and creditworthy firms (Table 1). We also relate to the literature regarding the impact of Large-

[5]This corresponds to a 40.38% increase for non-eligible issuers compared to their pre-crisis levels.

[6]We define a firm as being mainly hold by MMFs if its total issued CP debt during Q4-2019 is hold at least by 75% by MMFs (see Section 6 for more details).

Scale Asset Purchases (LSAPs) on terms of issuance (yields, amounts and maturity). To the best of our knowledge, the only paper studying the impact of the PEPP on the corporate CP market is Breckenfelder and Schepens (2022) at the Euro Area level. Using transaction-level data on the French market, we confirm some of their results regarding maturities and interest rates. We stress the role of credit rating and MMFs as investors when assessing the impact of the PEPP. Our analysis also differs insofar as by exploiting daily transaction data on CP issuances, giving us an exhaustive view of the corporate market, contrary to inferring issuances from the monthly ECB's Centralised Securities Database (CSDB). Interventions on the corporate CP market also took place in the US in 2008 (Duygan-Bump et al. (2012)) and 2020 (Anadu et al. (2022)) under different frameworks. They also found an easing of financial conditions, and found significant effects on issued amounts.

The rest of the paper is structured as follows. In Section 2, we summarize the March 2020 turmoil on the corporate commercial paper market, and review the PEPP design in Section 3 and the related literature in Section 4. We presebt the data in Section 5, and our empirical strategy in Section 6. Finally, we present our results and robustness tests respectively in Section 7 and Section 8. Section 9 concludes.

2 The corporate commercial paper market during the March 2020 turmoil

The commercial paper market under pressure during the Covid crisis. In March 2020, the uncertain environment led institutional investors to withdraw their shares from investment funds and, in particular, from money market funds (MMFs). The cask-like properties of these funds render them particularly attractive in normal times : they offer daily redemptions, while investing in short-term securities and holding regulatory cash buffers. They are thus particularly enticing for institutional investors looking for cash management opportunities. This is the case for instance of non-financial corporations (NFCs). In France, for the last quarter of 2019, just prior to the pandemic, non-financial firms held 21.95% of French MMFs [7]. Facing an uncertain outlook, firms started requesting redemptions of their MMFs' shares, to honor their potential upcoming cash needs.

To meet these heightened outflows, MMFs raised cash by selling assets, including corporate commercial papers (CPs), which represented 19.6% of French MMF's assets under manage-

[7] Source: SHS-S data merged with TCN data at Q4-2019.

ment (314 billion € in December 2019)[8]. Corporate CPs are usually bought by MMFs since their short maturity matches the investment horizon of these funds. Corporate commercial papers are unsecured debt, without coupons, and with a fixed maturity at issuance. They can issued at a certain fixed rate or their interest rate can correspond to some interest (overnight index swap rate for the relevant maturity) plus some fixed spread or margin. These marketable debt securities are issued by firms, banks or public entities[9].

Characteristics of the CP market. The market is very concentrated both from a supply and demand side point of view. Very few firms are active on this market: there were 132 active corporate issuers of commercial papers in euros in 2019, before the crisis. However, these non-financial corporations are usually large (50% of the sample had total assets higher than 10 billion € on average in 2019, Figure 1). They also use this market relatively frequently: before the crisis, 50.8% of the issuers issued commercial paper at least during 25 trading days out of the 251 working days in 2019, before the crisis (Figure 2). The investor universe is also very condensed. MMFs are the main investors on this market, holding 71.63% of the newly issued corporate CPs in Q4-2019.

The selling position of MMFs in March 2020 quickly triggered a market freeze, possibly impairing firms' short-term funding , as highlighted in Breckenfelder and Schepens (2022) at the Euro Area level. A comparable mechanism also happened with asset-backed commercial paper (ABCP) in the US during the 2008 crisis (Duygan-Bump et al. (2012)). Banks do not represent significant investors in that market in normal times (7.79% of the newly issued corporate CP at Q4-2019) and were thus not incentivized to step in. Moreover, since investors usually hold CPs to maturity, the secondary market is very small and illiquid (Kacperczyk and Schnabl (2010)). One key difference with the US is that there is no financial sponsor providing credit guarantees for commercial papers in the Euro Area: commercial paper issuers were thus not able to find investors to meet their funding needs.

Commercial paper market disruptions started to materialize at the end of February 2020. Issuance volumes plummeted: outstanding amounts decreased from 68 bn € to 62.5 bn € between February and March 2020, while weekly issuance decreased from 6.7 bn € during

[8]Source: BdF data on French investment funds, Q4-2019

[9]Before 2016, commercial papers issued by financial institutions were called certificates of deposits in Europe. Since 2016, commercial papers refer to all the unsecured short-term marketable debt instruments, regardless of the issuing sector (public, financial, corporate)., directly or through dealer-brokers, to cover cash needs with a maximum maturity of 12 months

the first week of February to 2 bn € mid-March (Figure 3). Firms were facing difficulties to rollover their debt, e.g. to rely on new issuances to finance the repayments from their maturing commercial papers. Financing conditions tightened as the average yield on newly issued papers increased across all maturity buckets, and the dynamic was stronger for long tenors (Figure 5). As underlined by Kacperczyk and Schnabl (2010) for ABCP during the 2008 crisis, the combination of simultaneous decline in outstanding amounts and tightening of financing conditions seems to reflect a negative net demand shock for commercial papers rather than a negative shock emanating from the supply side, e.g. issuing firms, that should have translated into lower volumes but also in lower yields. The context of March 2020 supports this hypothesis. As firms were facing stronger cash needs, they potentially increased their use of the CPs market even if synonymous to higher borrowing rates. Finally, consistently with the findings of Covitz et al. (2013) on the ABCP market, and Gorton et al. (2014) for commercial papers during periods of financial market tensions , firms started shortening their debt maturity. The average maturity at issuance, weighted by the volumes issued, gradually decreased from 91 days at the end of January 2020, when uncertainty about the pandemic started mounting, to 61 days the week of the PEPP announcement (Figure 4).

The commercial paper market provides an important alternative source of funding for large and creditworthy firms while constituting a way to increase their funding diversification. Given their short maturity and the operational facility to issue debt on this market at usually cheap conditions, CPs are mainly used to cover short-term liabilities, such as inventories or payrolls (Kacperczyk and Schnabl (2010)). They can also be used for "bridge financing" (Kahl et al. (2015)), i.e. allowing firms to create a bridge to long-term financing.

The vulnerabilities observed on this market in March 2020, together with the potential spillovers to the real economy, justified the intervention of the Eurosystem on this market for the first time in 2020. Commercial papers issued by firms were eligible to asset purchases, as part of the PEPP announced on March 18, 2020.

3 Design of the Pandemic Emergency Purchase Programme

The market disruptions highlighted in Section 2 and the role played by short-term interest rates in monetary policy transmission justified the need for the Eurosystem to effectively intervene for the first time through asset purchases on the corporate commercial paper market in March 2020 . As highlighted by Todorov (2020) for corporate bonds, asset purchases

are conducted by central banks to ease financing conditions, improve market liquidity and foster monetary policy transmission: in periods of high market stress, corporate bond interest rates tend to rise and in stronger proportions for riskier assets. By buying eligible marketable, high quality debt securities, central banks aim at improving market liquidity, boosting asset prices and thus reducing financial stability risks that could arise with any fire-sales phenomenon.

In response to the economic and the financial consequences of the health crisis, the Governing Council of the European Central Bank launched on March 2020 the *Pandemic Emergency Purchase Programme* (PEPP)[10]. This programme had a dual objective. Its main direct goal was to reactivate issuances on the commercial paper market at reasonable financing conditions for large and creditworthy firms. Ensuring that firms would raise cash through this market was key, as short-term cash needs were rising in the Covid-19 context driven by high levels of uncertainty. Moreover, facilitating issuance on this market would decrease the financing needs of those firms from banks (Grosse-Rueschkamp et al. (2019) for corporate bonds), thus increasing banks' financing capacity for smaller firms without market access (de Guindos and Schnabel (2020)). The other goal, more indirect, was to alleviate pressures on money market funds, massively invested in commercial papers. The Eurosystem was able to buy on both the primary and the secondary markets. It could therefore increase the liquidity of these papers in the secondary market and facilitate money market funds' sales of corporate commercial papers to honor their redemptions. Finally, the presence of the Eurosystem on this market could restore confidence for other investors and incentivize them to buy again corporate CPs and not at a large discount.

Before the PEPP, commercial papers had never been in practice purchased by the Eurosystem. However, they were technically eligible under the *Corporate Sector Purchase Programme* (CSPP) but with different eligibility criteria than the PEPP:

- No minimum amount at issuance was required.
- The maturity at issuance had to be higher than six months.
- The credit rating of the security or the issuer needed to be *Investment Grade* (IG).
- Only CPs issued by corporates were eligible.
- Only euro-denominated CP were eligible.

[10]Sources: (1) Announcement and (2) Decision.

As part of the PEPP, corporate CPs needed to meet several requirements to be eligible:

- The minimum issued amount should be equal or higher than 10 million €.
- The maturity at issuance should be higher than 28 days and lower than one year. The PEPP thus introduced a reduction in the maturity criterion, compared to the CSPP. This criterion was key to ensure the transmission of monetary policy.
- The rating (long-term or short-term) of the commercial paper or the issuer should be IG.
- The commercial paper needs to be issued in euros.

Among these requirements, the only exogenous criterion is the credit rating: the issued amount, the maturity at issuance and the currency of issuance all depend on and are therefore endogenous to the issuers' decision. Therefore, the eligibility according to the credit rating dimension will be our first criterion to form our treatment and control groups later in our difference-in-difference analysis (see Section 6 for more details).

The implementation of the facility was quick. The facility itself was ultimately short-lived compared to other typical asset purchase programmes such as the Eurosystem's CSPP. The first commercial paper purchases started on March 27th, 2020. According to the ECB's aggregate official statistics, net purchases of commercial papers for the euro area were standing at 35.4 billion € at the end of May 2020. They rapidly decreased, suggesting that the facility was designed to alleviate pressures in this market only in the short run. Net purchases have been negative since June 2020. The Eurosystem bought commercial papers on both the primary and the secondary segments of the market. However, the vast majority of the purchases were conducted on the primary market (81.23% of the purchases between March and May 2020)[11].

We conduct our analysis from January 2020 to September 2020. We are interested in quantifying both i) the short run effects of the PEPP, i.e. during the active period of the net purchases by the Eurosystem, and ii) the medium-term impact it could have had during the recovery of the market, justifying the expansion of our sample period to September 2020.

[11] Source: ECB aggregate statistics.

4 Data

We exploit transaction-level data of corporate commercial paper issuances, enriched with firm-level variables relative to their balance sheets, income statements and credit ratings, from January 2020 to September 2020.

We use the *Titres de Créances Négociables* (TCN) dataset from Banque de France. This database consists of daily transaction-level information on commercial papers issued by non-financial corporations, banks and public entities. This dataset does not contain information regarding the secondary market. However, this market being mainly a buy-and-hold one (Kacperczyk and Schnabl (2010)), we do not anticipate this to be an obstacle in our analysis. The dataset includes the following variables: ISIN, the issued, repurchased or repaid amount, maturity date, interest rate at issuance and the currency of the issued commercial paper[12]. The micro nature of these data is key to our analysis: since it is transaction-level observations, we are able to capture the different transactions on the same ISIN. An ISIN has usually a date of expiration, and firms issue several times using the same ISIN: in other words, it means that several transactions with the same ISIN have different maturities at issuance, with the same maturity date. This feature is essential to our analysis, and explains why we do not use the Centralised Securities Data Base (CSDB) in this paper, which usually has one observation by ISIN by month for CPs. In our analysis, we target only commercial paper issued by non-financial corporations[13].

To obtain comparable rates between securities, we convert variables rates to fixed rates. We compute the average between the maximum and the minimum values of the daily EONIA swaps by maturity bucket (from Banque de France), and we sum the declared rate and the average EONIA swap.

To match TCN data with firms' variables, we consolidate them at the issuer level. TCN provides data at the security level (ISIN), and indicates the SIREN (French identifier) of the issuing company. We use the corresponding LEI of the SIREN, obtained by GLEIF, to match these data with variables from Bloomberg. We also include the LEI of the ultimate parent

[12] We filter out issuances in other currencies than euros given their small number

[13] To identify them, we first exclude all the CIB identifiers since they are relative to banks, to only keep the SIREN (French identifier for firms). To disentangle between firms and public entities, which have both a SIREN, we rely on CSDB (Centralized Securities Data Base) to obtain the institutional sector associated to the SIREN. Among public entities, we exclude local governments, but we keep firms which are partially state-owned.

company (via GLEIF), since companies can issue commercial papers through their financial holdings. In our analysis, it will be important to capture the cash level and short-term borrowing of the ultimate parent company, rather than the financial entity issuing securities. Moreover, these financial entities are usually not rated, while their ultimate parent company are rated, and thus eligible at the PEPP.

This consolidation enables us to add variables related to firms' balance sheet, income statement and credit ratings. We retrieved at the publication frequency (quarterly when available, semi-annually otherwise) of firms' financial reports from Bloomberg. To capture the size of the firm, we include the total assets (preferred variable in the regression, taken in logarithm to normalize the data). To capture firms' financing needs, we match their cash and near cash items over their total assets, expressed in percents, and their short-term and long-term borrowing over their current liabilities, also expressed in percents.

We obtain short-term and long-term credit rating at a daily frequency. To be eligible to the PEPP, firms need to be rated investment grade by at least one recognized Credit Rating Agency (CRA). We compute the maximum of the short-term and long-term credit rating between the four CRAs accepted by the Eurosystem: Moody's, Standard & Poor's, Fitch and DRBS. We have a small number of firms (6) which are eligible at the announcement date of the PEPP, but become ineligible over our analysis timespan. To be conservative, we exclude them from our sample. Other credit rating changes occur in our sample, but without impacting the eligibility status of the issuer.
Finally, we windsorize (right-hand side only) at the 2% level the following variables: total assets, issued amount, cash ratio, short-term debt ratio, long-term debt ratio, and the total debt ratio.

Our final sample comprises 6173 daily transactions between January 1st, 2020 and September 30th, 2020 representing 215 bn € of issuance (including all maturities) denominated in euros by 135 corporates on the French primary market. 74 issuers are eligible to the PEPP due to their credit ratings, and 61 are not, thus constituting our control group. In the latter group, 51 are not rated.

Since the characteristics between eligible and non-eligible firms differ (Table 20), we control for their characteristics in our regression, either by including covariates or issuer fixed effects to reduce selection bias.

In the last part of our analysis, we use the Securities Holdings Statistics by Sector (SHS-S) dataset at Q4-2019 and merge it with the TCN dataset to identify the share of different institutional investor holding the newly issued CPs during the Q4-2019, at the issuer level. We are able to compute these shares for 93 issuers (out of 135 issuers). We focus on the money market fund sector, given its strong footprint on the corporate CP market. Other institutional investors do not represent a sufficiently high share for our analysis. Figure 6 plots the distribution of the share of MMFs holding newly issued debt during Q4-2019 by firms, at the issuer level.

5 Related literature

We firstly relate to the literature on the market structure of the commercial paper market for corporates. Most of the literature concerning this market is concentrated on the US. Kacperczyk and Schnabl (2010) described extensively this market during financial crisis, as well as the potential determinants of a collapse. The market structure they described is very similar to the we found for the French market: the investor universe is dominated by MMFs, although it appears to be even more concentrated in the French case. On the supply side, issuers are large (see Figure 1), and mostly constituted of creditworthy firms. One key difference between the US and the European market is that corporate issuers do not have sponsors, such as banks. Sponsors are an important backstop, since they repurchase maturating CPs when other investors are not willing to. They also highlight the link between the regulatory constraints of MMFs and their CPs holdings, underlying the role of institutional investors in the decline of a market.

Few papers relates to the Euro Area. Part of the explanation is that in the Euro Area, national markets coexist with the European one. The ECB releases on a regular basis a report on money markets[14], which draws an overview of secured and unsecured money markets, including commercial papers. For the latter, they encompass the STEP market (Short Term Euro Paper), a European initiative launched to develop common standards for commercial paper issuance, and French data. Studying national markets altogether is complicated given the lack of harmonized data: even if the Centralised Securities DataBase (CSDB) encompasses CPs issued in several countries, the dataset is at ISIN level at a monthly frequency, and not at the transaction level (see Section 5 for more details). National regulatory report-

[14]Source: ECB money market study 2020.

ing, such as the TCN dataset used in this paper, allows a more granular analysis, at the transaction level.

The US literature already documents several episodes of runs on commercial papers. Covitz et al. (2013) documented the run on the ABCP market in 2007 in the US. They define a measure at the program level to identify runs on a CP program, depending on the maturing debt and the outstanding amounts. They contribute to characterize run on CPs with the "asymmetric information" framework of bank panics. We found that the 2020 market turmoil presented similitudes with the run described, including shorter maturities and decreasing outstanding amounts. Together with rising yields, these seems to indicate a decrease in the demand side of the market. The determinants of the run cannot be strictly compared with the European market, since the sponsor type is one of the main determinants in their results, while being absent in the European framework.

We relate to the literature studying the impact of large scale asset purchases on yields (Krishnamurthy and Vissing-Jorgensen (2011)). When purchasing securities, central banks contribute to reduce risk premium, which translates into a yield reduction (Todorov (2020)). Ensuring that firms could issue at reasonable financing conditions is also key to foster debt issuance (de Guindos and Schnabel (2020)). The effect of LSAP on yields is different across maturity buckets: Breckenfelder and Schepens (2022) showed a yield reduction of 12 bps for eligible CPs issued with a maturity lower than six months, with a stronger effect for the maturity bucket between three and six months. We found a similar effect: we observe a yield reduction for the buckets higher than 28 days, e.g. the maturity buckets corresponding to the new eligibility criteria between the CSPP and the PEPP. Stronger effects were observed in the US (around 95 bps according to Anadu et al. (2022) for the 30 days maturity bucket). Duygan-Bump et al. (2012) also underlined the decrease in yields after the implementation of the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility (AMLF) in 2008.

Results were similar for the effects of the CSPP on bond yields: Todorov (2020) indicates a drop of 30 bps after the CSPP announcement on secondary market, while Zaghini (2019) found an initial decrease of 71 bps on the primary market for eligible bonds, associated to an indirect effect of 50 bps for non-eligible bonds, which appears one semester later.

We also contribute to the literature on the impact of LSAPs on eligible and total debt is-

suance. As mentioned by de Santis and Zaghini (2021), the credit channel of monetary policy will be active only if central bank purchases help to foster corporate debt issuance, in addition to decrease yields. This increase in issuance will contribute to financing diversification, thereby reducing the negative impact of shocks (de Fiore and Uhlig (2011)). Two aspects of corporate issuance are important: by setting eligibility criteria, central banks contribute to a shift into debt decomposition. On the contrary to de Santis and Zaghini (2021) for corporate bonds, we do not find an economically significant increase of the total debt issued after the PEPP. We found that firms issued more eligible debt and modified their debt structure, without impacting the total issued amount. Breckenfelder and Schepens (2022) showed that the PEPP contributed to increase the issued amount of eligible debt (per issuance), and showed how the eligibility criteria affected the rollover capacity of CPs issuers, reducing the dependency of issuers to MMFs holding their debt. However, the effect needs to hold for the total debt, to ensure that central bank increased the total issued amounts, in addition to affect the debt composition, which we cannot confirm. de Santis and Zaghini (2021) used the currency eligibility criterion of the CSPP to identify the effect of the CSPP on corporate bond issuance: on average, 10 bn € of bond purchases on the primary market translated into an increase of issuance by eligible firms between 2,5 bn € and 3,3 bn €. They showed that the effect took six months after the start of the purchases to unfold, indicating that new firms probably entered the market for the first time. Using a shorter time window, Todorov (2020) showed that the CSPP increased the issuance of QE-eligible debt by 25%, consistent with our findings for CPs under the PEPP.

Research on LSAP also mentions impact on debt maturity. In a New Keynesian model with heterogeneous firms, Jungherr et al. (2022) show that firms with a higher fraction of maturing debt are more affected by monetary policy: their higher rollover risk makes them more sensitive to real interest rates. Short-term debt, such as CPs, can exacerbate rollover risk (He and Xiong (2012)). These results motivates the analysis of the impact of unconventional monetary policy, through asset purchases, on debt maturity: if they are able to increase debt maturity, it means that they can contribute to a decrease in rollover risk for issuing firms. Breckenfelder and Schepens (2022) found an increase of the eligible debt in the maturity bucket higher than six months, which corresponds to a 62.5% increase of debt maturity issued by eligible issuers, compared to non-eligible issuers. We found a similar effect on the maturity, however strongly driven by the newly eligible bucket, and we add a dynamic analysis of this effect. We found that the effect is immediate after the start of PEPP purchases, but vanished when the Eurosystem's market footprint decreases. We also

study the impact of the investor sector holding CP debt before the crisis: we found that being mainly hold by MMFs before the crisis reduces the impact of the PEPP on maturity.

Finally, we relate to the impact of investors present on underlying markets. de Santis and Zaghini (2021) already included the lagged flows and stocks of insurance companies and pension funds as an explanatory variable of the probability of issuing a CSPP- eligible bond. However, they did not include the share of investor type holding corporate bonds by issuer. Lugo (2021) showed that firms' investors matter for their debt maturity choices: using US data, he found that the demand for CPs by MMFs is positively correlated with the use of CPs by firms, unveiling the role of investors in capital debt structure. We relate to this literature by matching the share of institutional sectors to CPs issued during Q4-2019, before the crisis, to study a potential differentiated effect of LSAPs depending on the investor universe of a firm.

In order to identify the effects of LSAPs on the French commercial paper market, we differ from the existing literature by relying on the new eligibility criteria introduced by the PEPP compared to the CSPP, and we take into account their possible endogeneity. The PEPP introduced a minimum issuance amount, and reduced the maturity at issuance: both are at the hand of the firm, which can decide to issue eligible debt or not, given its credit rating. When studying the effect on yields and maturity, we exclude the criteria related to the dependent variable in our regression.

Using a comprehensive dataset of transactions on the French market, we are also able to identify all the issuers, eligible and non-eligible, possibly affected by the PEPP. This dataset enables us to precisely identify the maturity and the issued amount at the transaction level, which are the two eligibility criteria differentiating the PEPP from the CSPP regarding commercial papers.

We contribute to the literature by studying both the aggregate and dynamic effects of the first effective purchases on the corporate CP market, using transaction-level data. We found that while the PEPP was efficient in reactivating transactions on the market, it did not foster issuance at the aggregate firm level: firms changed their debt composition to meet the eligibility criteria, without shifting their total debt to more CP debt. Relying on Callaway and Sant'Anna (2021) estimator, we show the dynamic impact of the PEPP on amounts, yields, and maturity. Finally, we link the pre-crisis investor universe of firms issuing CPs

on their maturity debt structure, highlighting how investors could affect monetary policy transmission.

6 Empirical strategy

6.1 Identification strategy and eligibility criteria

We study the impact of the PEPP on the corporate commercial paper market using transaction-level data of commercial papers issued by corporates between January and September 2020. The micro nature of our data is essential to precisely define the control and treatment groups, both at the issuer and security level.

To identify the impact of the PEPP on the CP market, we rely on the start of the asset purchases (March 27th, 2020), rather than on the announcement date (March 18th, 2020). The reason why we do so is that in 2016, the Eurosystem already announced an intervention on the CP market, without effectively purchasing any securities. As it is the second announcement related to this market, we prefer relying on the start of the purchases, which is the real new feature of the PEPP, together with new eligibility criteria.

The small lag between the announcement of new eligibility criteria and the start of the purchases (8 trading days) is also important in our identification strategy, and supports our choice of defining our cut-off date on the day of the purchases.

Finally, our identification strategy also relies on the fact that no other asset purchase programs were targeting corporate commercial papers simultaneously to the PEPP. More broadly, to the best of our knowledge, no other measures have impacted the commercial paper market during our time window.

We have eligibility criteria at two levels: issuers need to be rated investment grade, and the newly issued CPs need to have a maturity of 28 days minimum, with a minimum issued amount of 10 mn € [15].

For the majority of our specifications and unless stated otherwise, we will conduct our

[15] There is an additional criteria on the currency, that we do not consider since we filtered out all non-euros issuances (because of their small number, they could not constitute a proper control group as in de Santis and Zaghini (2021)).

regression using alternatively issuers' ratings alone, or interacted with eligibility criteria concerning the security itself. However, in the latter case, regressing for example the issued amounts on the eligibility criteria at the CP level, which already integrates a minimum threshold for issued amounts, would generate some endogeneity. Therefore, when considering the issued amounts as our dependent variable (respectively, the maturity at issuance), we will exclude this crtierion as part of the eligibility of the CP. This strategy allows us to avoid any endogeneity issue that might arise at the ISIN-level with the two other endogenous criteria, namely the maturity and volume thresholds.

6.2 Two-periods set-up

The empirical strategy in this paper exploits the PEPP start of the purchases to construct a before-after comparison between commercial papers that were eligible for purchases and commercial papers that did not satisfy the eligibility criteria. To do so, we rely on the canonical difference-in-difference (DiD) approach, in a two-periods set-up, $t = 0$ and $t = 1$ (i.e. before and after the implementation of the PEPP).

For the majority of our specifications, we rely on the eligibility at the issuer level. The treatment group of our DiD approach therefore corresponds to the set of commercial papers issued by investment grade firms, i.e. firms eligible for the PEPP according to the credit rating criterion. In contrast, the control group is composed of commercial papers issued by firms that are non-eligible to the PEPP owing to their credit rating, or non-rated.

In a standard DiD setting, the goal is to estimate the average treatment effect on the treated in period $t = 1$, generally defined as follows:

$$\begin{aligned} \beta \quad = \quad & \left(\underbrace{\mathbb{E}[Y_{\text{Eligible,t=1}}|Eligible]}_{=\alpha+\delta+\gamma+\beta} - \underbrace{\mathbb{E}[Y_{\text{Eligible,t=0}}|Eligible]}_{=\alpha+\delta} \right) + \\ & \left(\underbrace{\mathbb{E}[Y_{\text{Non Eligible,t=1}}|NonEligible]}_{=\alpha+\gamma} - \underbrace{\mathbb{E}[Y_{\text{Non Eligible,t=0}}|NonEligible]}_{=\alpha} \right) \end{aligned} \tag{1}$$

Where β can be interpreted in our case as the causal estimate for issued amounts, maturity, or yields, under the assumptions that parallel trends hold (see Subsection 6.4) and that there is no anticipation of the treatment.
To estimate β in a two-periods panel set-up, at the transaction level, we use several specifi-

cations of two-way fixed effect regressions (TWFE). The simplest one is the following:

$$Y_{i,j,t} = \delta \times \mathbb{1}_{\{i \in \text{eligible}\}} + \gamma \mathbb{1}_{\{t=1\}} + \beta \times \mathbb{1}_{\{i \in \text{eligible}\}} \times \mathbb{1}_{\{t=1\}} + \varepsilon_{i,j,t} \tag{2}$$

Where $Y_{i,j,t}$ is the outcome of interest measured for commercial paper j issued by firm i and at date t, $\mathbb{1}_{\{i \in \text{eligible}\}}$ is a dummy variable that indicates whether firm i is eligible to the PEPP based on the credit rating criterion and therefore takes 1 for any investment grade issuing firm and 0 otherwise. $\mathbb{1}_{\{t=1\}}$ takes 1 if the variable is observed after the implementation of the PEPP. The coefficient of interest is β, which measures the average treatment on Y_i following the implementation of the PEPP for eligible firms, relative to their control group.

Because of differences between eligible and non-eligibles firms that could bias our estimate, we include in the previous model control variables, $X_{i,t}$ such as the firm's size (in logarithm), and its ratio of short-term debt over total debt. We therefore estimate the following model:

$$Y_{i,j,t} = \delta \times \mathbb{1}_{\{i \in \text{eligible}\}} + \gamma \mathbb{1}_{\{t=1\}} + \beta \times \mathbb{1}_{\{i \in \text{eligible}\}} \times \mathbb{1}_{\{t=1\}} + X_{i,t} \times \theta' + \varepsilon_{i,j,t} \tag{3}$$

Where $X_{i,t}$ is a $1 \times K$ vector of K control variables specific to each issuing entity and θ is a $1 \times K$ parameter vector. The previous model relying on a limited set of control variables might not fully account for structural differences that might exist between entities of the treated and those of the control groups. In addition, when considering a panel dataset made of more than two periods (as we will do in the next subsection), the presence of shocks occurring at different points in time and that can simultaneously affect all the issuing entities in our sample can lead to biased estimates of β. To address these two sources of endogeneity concern, we estimate the following regression augmented with firm fixed effects and control variables, and with firm-level and time-fixed effects (without controls):

$$Y_{i,j,t} = \alpha_i + \gamma_t + \beta \times \mathbb{1}_{\{i \in \text{eligible}\}} \times \mathbb{1}_{\{t \geq t*\}} + \varepsilon_{i,t} \tag{4}$$

Where t^* is the moment of the PEPP implementation, α_i correspond to the firm-fixed effects capturing structural differences across entities and γ_t the time-fixed effects that can account for macroeconomic shocks affecting all entities. Standard errors are double-clustered at the firm and time-level.

Finally, in the latter specification, we add the eligibility criteria at the security level (which is equivalent to a triple DiD), excluding the amount (respectively, the maturity), when

considering it as our dependent variable.

6.3 Dynamic set-up

The evaluation of the impact of the PEPP on the corporate CP market is interesting in a dynamic set-up to assess the persistency of the effects, or the time it took to unfold the different effects on yields, maturity and amounts.

While two-way fixed effect specifications provides asymptotically valid inference in a two-period set-up, they do not hold anymore in a dynamic set-up (Borusyak et al. (2022), de Chaisemartin and D'Haultfœuille (2020), Goodman-Bacon (2021)). This literature indeed showed that TWFE specifications provide consistent estimates in a dynamic setting only under two assumptions:

- Treatment effects are constant over time
- Treatment effects are constant across units

Duygan-Bump et al. (2012) and de Santis and Zaghini (2021) showed that unconventional monetary policy effects are not constant over time. Moreover, the intervention on the CP market was scheduled to be effective in the short run, on the contrary to asset purchases conducted on bonds during the CSPP, where it took more time for effects to unfold (de Santis and Zaghini (2021)). We cannot therefore rely on TWFE specifications with time dummies for our dynamic analysis.

When treatment effects can be heterogenous across time, TWFE do not provide consistent estimates mostly because of what the literature called the "negative weights issue" (Roth et al. (2022)). This issue arises when considering multiple time periods. The total estimate of the PEPP on our variables of interest is equal to the sum of weights by time periods. Following Roth et al. (2022) notations, we define the treatment effect in the s-th period after firms received the treatment in period g as follows:

$$\tau_{i,t}(g) = \sum_{s \geq 0} \tau_s \mathbb{1}[t - g = s] \tag{5}$$

The total effect of the treatment (β) on eligible firms across periods is thus the following:

$$\beta = \sum_{s} \omega_s \tau_s \tag{6}$$

The fact that negative weights can appear is particularly problematic when the effect τ is positive.

To circumvent this issue, several new estimators have been developed. We use the one by Callaway and Sant'Anna (2021), which introduces group-time average treatment effects[16]. This estimator avoids negative weights, allowing proper estimations when treatment effects are supposed to be heterogenous over time, by requiring weights to be positive. Moreover, the estimator first averages all treatment effects by firms over months, and then averages these effects across firms, to get the final average treatment effect. More formally, the average effect of the treated group is the following:

$$\theta_c(t) = \sum_{g \in G} (\mathbb{1}(t \geq g) P(G = g) ATT(g, t) \tag{7}$$

Where ATT(g,t) is the Average Treatment Effect on Treated between the time t and the time first treated g (March 27th, 2020 for everyone in our case), and where the first terms of the expression ensures that the weights on ATT(g,t) are positive and sum up to one.

6.4 Internal validity: Parallel trends

To ensure the internal validity of our results, we first check the parallel trend assumption, using Callaway and Sant'Anna (2021) framework. Parallel trends hold for our three main variables of interest (maturity, amounts, yields), with pre-trends being non-significant. Results are provided in Table 21.

7 Results

7.1 Volume issued

One objective of the PEPP was to reactivate the activity on the corporate CP market in terms of volumes.

To assess if the PEPP succeeded in boosting CP issuance, we first study the impact on the issued amount per transaction. Table 1 presents the results of the specifications presented above, run on the sample between January and September 2020 and where the dependent

[16] Their estimator fits particularly well framework staggered intervention, where not all units received the treatment at the same time.

variable, $Y_{i,t}$, is the issued amount. The elasticity of interest obtained with control variables is statistically significant at 5% (Column 2) and suggests that the PEPP increased the issued amount per transaction by 3.27 bn € for PEPP-eligible issuers. This corresponds to an increase of 15.66% of the issued amount per transaction compared to non-eligible issuers before the crisis, and to a 8.58% increase for eligible issuers. Column 4 provides the estimates including time and firm fixed effects: results are not robust to their inclusion, indicating weak evidence of an effect of the PEPP on fostering issuance. The magnitude at the transaction-level is however stronger when considering the eligible debt: issued amounts of eligible debt increased by 8.40 mn € (Column 5), which corresponds to a 41.97% increase compared to the pre-crisis level for our control group, and to 23.43% for the treated group average before the crisis. This result is significant, both economically and statistically, at the 10% level. This result points towards a shift in debt composition by issuers to be eligible, rather than to a boost in CP issuance, triggered by the PEPP.

Following Todorov (2020), we aim at assessing whether there is a differentiated impact depending on the credit rating of the eligible firm. We run the same analysis by splitting our sample of issuing firms into four categories:

- The first one is made of 29 firms rated between AAA and AA- (corresponding to the first credit quality step (CQS) according to the CEBS[17] mapping)
- The second one includes 34 firms rated from A+ to A-
- The third one targets the 13 firms rated above the threshold of PEPP
- Finally, the last one encompasses the 49 non-rated firms and therefore non-eligible firms of our sample.

Even if the representativity of our sample of firms above the threshold is low, given their small number, we would like to see if the result of Todorov (2020) for corporate bond issuance holds for corporate CPs, e.g. if firms just above the threshold given their rating make more use of the facility than the others. We also include non-eligible firms to assess potential spillovers from the eligible to the non-eligible firms.

Table 2 presents the results of the estimation including time and firm fixed effects, for the eligible debt. We found that non-eligible issuers reduced their issued amount of eligible debt

[17]CEBS stands for Committee of European Banking Supervisors.

by 9.21 mn € (statistically significant at 10% level), while issuers just above the rating eligibility threshold increased their issued amount by 38.67 mn €, significant at 1%. We do not find a statistically significant effect for firms in the second credit quality step . However, firms in the first CQS increased their issued amount by 18.19 mn €, significant at 5%.

To summarize, these first results indicate that firms eligible due to their credit rating issued more debt, and more precisely, more eligible debt (debt with maturity at issuance higher than 28 days and volume larger than 10 millions €) than before the crisis. Firms just above the credit rating threshold were the primary beneficiaries of the PEPP in terms of volumes issued. However, our analysis does not reveal any spillovers to non-eligible firms.

To confirm a possible boost in issuance, we then look at the number of transactions, and at the aggregated issued amounts. To do so, we aggregate all transactions at the monthly frequency. Table 3 provides the estimates for the number of transactions. We found that eligible firms issued less (-2.42) transactions. This result is robust to the inclusion of time and month fixed effects, and is statistically significant at 5%. This suggests that eligible firms issued less frequently, but with higher amounts. The PEPP might have contributed to ensure that firms would be able to raise cash with higher amounts and less transactions than before the crisis, indicating a stabilizing impact, with greater confidence on this market.

However, to assess the credit channel of monetary policy, we need to ensure that the aggregate issued amounts at the monthly frequency did increased. Otherwise, it would suggest that firms issued more by transaction, but this did not helped to boost the total issued amount. Firms would not have used more the CP market than traditionally. This could be partially explained by the fact that other financing guarantees, such as state-guaranteed loans, were available for them.

Table 4 provides the result. On aggregate, eligible firms reduced their aggregate issued amounts by 89.73 mn €, statistically significant at the 10% level. The economic magnitude is however negligible, since it only represents 0.57% of the issued amounts by non-eligible firms before the crisis, and 0.14% for eligible issuers.

These results suggest that we did not find an economically significant impact on the aggregate issued amount of corporate CPs by eligible issuers. However, eligible issuers issued more eligible debt at lower frequency. They seem to have mainly changed the composition of

their issued short-term debt to make sure that their commercial papers were indeed eligible for the PEPP and could benefit from this safety net deployed by the Eurosystem.

Finally, we turn to the dynamic effect analysis to assess the persistence of our effect, and the length of time necessary to unfold. Figure 7 presents the result for the issued amounts by transaction, indicating that the effect was mostly significant shortly after the start of the purchases (first month). The decrease in the number of transactions is however very persistent, until month 4 (Figure 8). We do not observe any statistically significant impact on the aggregate debt (Figure 9), confirming our previous conclusion that the PEPP did not boost the aggregate issuance.

7.2 Maturity at issuance

Traditionally, during periods of stress, investors try to reduce their exposure to enhanced credit risk through the debt securities that they hold in their portfolio. As a result, the demand for short-term debt securities tend to increase in relative terms to long-term debt securities. This maturity shift in demand generates more difficulties for firms to issue long-term debt, thus increasing their rollover risk. In this section, we explore the impact of the PEPP on debt maturity, to assess if it contributed to a shift in debt maturity structure.

The new eligibility criteria announced with the PEPP modified the ones announced in 2016, as part of the CSPP: CPs with a maturity higher than 28 days were eligible to the PEPP, against six months under the CSPP. The maturity bucket between 28 days and six months thus corresponds to the newly eligible one under the PEPP.

We first evaluate the impact of the start of purchases on all the transactions (Table 5, Columns 1-4), under different specifications. We found that maturity increased by 42 days on average, for the specification including time and firm fixed effect. This corresponds to an increase of 40.20% of the maturity at issuance, compared to pre-crisis level for non-eligible issuers. While the main objective of the PEPP was not to increase maturity at issuance, this result underlines the importance of eligibility criteria, since eligible issuer shift their debt composition, and here, their debt maturity structure. This effect can lower vulnerabilities on firm' debt structure, since increasing maturity contributes to a reduction in rollover risk (He and Xiong (2012)) and in the uncertainty surrounding their financing capacity.

Turning to the eligible debt, we conduct two specifications. In the first one, the eligible debt

dummy equals one when a transaction meets all the requirements to be eligible (amount, maturity and currency). In the second one, we exclude the maturity criteria from the eligible debt dummy (which thus equals to one if the issued amount is higher than 10 mn € and is in euros), given the potential endogenous criteria, when regressing the maturity at issuance on covariates.

Our results confirm that firm shifted their debt maturity structure to issue more eligible debt: using the first specification, we do find a significant effect of 29 days, just above the threshold of 28 days to be eligible to the PEPP. However, the second specification does not lead to any statistically significant result, indicating that firms shifted their debt structure just above the eligibility threshold.

Finally, we consider the dynamic effects on debt maturity, using Callaway and Sant'Anna (2021) estimator. The effects of the PEPP on the maturity of commercial papers issued by eligible firms is immediate and faded away only 5 months after the program was launched (Figure 10). Not only the effect was statistically and economically significant, but this effect on the maturity was also persistent with a low rate of decay. The effect vanished when the net purchases by the Eurosystem started to be negative. This result is in line with what Duygan-Bump et al. (2012) found for the effect of the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility on MMFs' portfolios. Even if the framework is different, central banks' interventions on these markets appears to mainly have short-term effects, consistent with their market footprint.

These results suggest that the start of the purchases did contribute to reduce the rollover risk of eligible firms by creating incentives for them to increase their maturity at issuance to be eligible to the PEPP. This effect is persistent up to four months, and vanished when the Eurosystem's market footprint became lower, at the start of the summer 2020.

7.3 Interest rates

A crucial question with the implementation of the PEPP is to assess whether firms that were eligible to this program were able to issue commercial papers at a reduced cost or not.

Table 6 presents the DiD estimates of the effect of the PEPP implementation on the yield at issuance of commercial papers under the different econometric specifications considered

in our empirical strategy.

Unsurprisingly, columns (1), (2), (3) and (4) unveils that, after the implementation of the PEPP and on average, both eligible and non-eligible firms were able to issue commercial papers but at a higher cost. A first interpretation of this coefficient would argue that the PEPP had a negative effect on the borrowing cost of firms via the commercial paper market as it led to a statistically significant average increase in commercial papers' yield of between 16 and 21 bps depending on the specification (Columns (1), (2) and (3)) considered. .
The estimate obtained for the interaction term $\mathbb{1}_{\{i \in \text{eligible}\}} \times \mathbb{1}_{\{t \geq t*\}}$ allows us to better isolate the causal impact of the PEPP on yields from the repercussions of the sanitary crisis itself. While the first column of Table 6 does not seem to suggest any statistically significant effect of being eligible on the yield at issuance, the inclusion of either control variables (Column (2)), firm-fixed effects (Column (3)) or both firm- and time-fixed effects (Column (4)) reveals that the effect was both statistically and economically significant. Indeed, the estimate varies between -8 and -11 bps depending on the specification. This effect correspond to the double of the estimate on the dummy Post, underlying the important economic magnitude of the effect on yields. Such a finding suggests that eligible firms benefited from a relatively large discount on the commercial papers that they issued in comparison to non-eligible firms. This result echoes the conclusions drawn in Todorov (2020) that argues that the implementation of the Eurosystem's CSPP announced on March 10^{th} led eligible corporate bond yields to drop on average by 30 basis points compared to non-eligible ones.

A natural question arises: can this average effect of the PEPP implementation on the paper yield of eligible firms be mostly explained by what happened in the eligible debt segment (i.e. maturity at issuance greater than 28 days and volume larger than 10 millions €)? The coefficient in front of the interaction term $\mathbb{1}_{\{j \in \text{eligible}\}} \times \mathbb{1}_{\{i \in \text{eligible}\}} \times \mathbb{1}_{\{t \geq t*\}}$ presented in Column (5) tends to suggest that this overall effect on the yield of eligible firms does not emanate from the eligible debt segment in particular.

To further investigate this finding, Table 7 presents the same results as the ones obtained in Column (5) of Table 6 but by maturity bucket. For this analysis, we consider three maturity buckets: commercial papers issued with a maturity strictly lower than 28 days (approximately 1 month, never eligible), the ones issued with a maturity comprised between 28 days and 183 days (corresponding roughly to 6 months, newly eligible compared to the CSPP) and the ones issued with a maturity larger than 6 months and lower than a year (eligible

both for CSPP and PEPP). For the different specifications behind the results displayed in Columns (4)-(6), the dummy variable $\mathbb{1}_{\{j \in \text{eligible}\}}$ takes one if the issuance volume of the commercial paper is greater than 10 millions euros. Columns (1), (2) and (3) suggest that the overall reduction in the yield of eligible firms that can be attributed to the PEPP and evidenced in Table 6 was only observed for the maturity-eligible segment. Indeed, commercial papers issued by eligible firms but with a maturity lower than one month, therefore being *de facto* excluded from the PEPP, did not benefit from a lower yield compared to the less-than-one-month commercial papers issued by non-eligible firms. Within the market segment eligible according to the sole maturity criterion, the effect of the PEPP was larger for commercial papers with longer maturities compared to the ones with shorter maturities (Columns (2) and (3)). Indeed, the reduction in yield for eligible firms was -12bps for papers with a maturity between one month and 6 months and -18 bps for the ones with a maturity larger than 6 months and lower than a year. However, these effects observed for the maturity-eligible segment are not statistically different depending on whether the volume issued is greater than 10 millions € or not. All commercial papers issued by eligible firms and with a maturity larger than 28 days were uniformly impacted regardless of the volume issued.

Figure 11 displays our coefficient of interest (i.e. the effect of the PEPP on commercial papers eligible to the programme due to the rating of their issuing firms) over time. Our empirical strategy reveals that the effect of the programme on the yield of eligible commercial papers was not instantaneous: it only materialized two months after the first purchases were made. A study of the impact of the CSPP on euro-area corporate bond issuance by de Santis and Zaghini (2021) highlights that central banks interventions seem to be only effective with a certain time lag. This paper shows that the volume of corporate bond issued by eligible non-financial corporations increased only 6 months after the programme was announced in contrast to issuances by non-eligible firms. We argue here that this delay of the impact on yields could be explained by the implementation of the PEPP was concomitant with the deployment of many other fiscal and monetary support measures such as the state-guaranteed loans programme (Prêts Garantis par l'Etat) in France that benefited all firms regardless of their credit rating and therefore temporarily reduced non-financial corporations' need to issue commercial papers to finance their day-to-day activities (supply side).

7.4 Impact of investors' universe

In this last part, we want to examine the potential impact of MMFs as investors of corporate CPs on maturity at issuance after the PEPP. MMFs are massively invested on the corpo-

rate CP market partly because their short maturity matches the investment horizon of their portfolio. It would then be interesting to assess whether the impact we observed on maturity is different according to the investor type holding CP debt at the issuer level before the crisis.

The direction of the sign we expect is unclear. It could be that issuers being mainly hold by MMFs increased their debt maturity to reduce their future rollover risks, given the role of the MMF in the CP market freeze. In that case, we would expect maturity to increase. Given the previous results we had on the increase in maturity, this would suggest that the impact of MMF before the crisis had a contained impact on CPs' terms of issuance. The effect on the eligible debt is also unclear: firms could behave differently on this segment, because they know that the Eurosystem could possibly buy them, in addition to their traditional investor universe. On the other hand, if the investor's universe of a firm is very concentrated, it could be difficult to find other investors, and firms would adapt their terms of issuance to their initial main holding investor. In that case, we expect a negative sign for the subset of firms being mainly hold by MMFs. After the March turmoil, the latter decreased the maturity of their portfolio to get more maturing assets, and make it easier to raise cash to face heightened redemptions if necessary. This result would confirm the different results in the literature on the importance of investors on corporate debt (Massa et al. (2013)).

We define the dummy variable MMF_i, which is equal to one if the share of the total issued amount in Q4-2019 by a firm is hold at least at 75% by MMFs. This threshold corresponds to the distribution of this share across firms (Figure 6), and allows us to split our sample into two broadly equal groups.

We conduct the same analysis as previously done for maturity with different subsets. The first subsample encompasses all the transactions with issuers being hold by more than 75% by MMFs before the crisis. Results are presented in Table 8 for the different specifications. IG-rated issuers who were mainly hold by MMFs before the crisis increase the maturity at issuance of their total debt by 32.8 days (significant at the 5% level). This result is lower than what the eligible issuers issued after the PEPP, regardless of their investor type (see Table 5): for the same specification, we observe that the maturity at issuance increased by 42 days on average for eligible issuers (Table 5, but only by 32 days for eligible issuers being mainly hold by MMFs, indicating that issuers seem to internalize their investors' constraints in their terms of issuance. To confirm this result, we conduct the same analysis on the subset of firms having a share of MMF as investors before the crisis lower than 50%, corresponding

to 34 firms, (Table 9). We found that these firms increased much more their maturity at issuance than firms with a higher MMF footprint, by 86.7 days. This result do not hold when focusing on eligible debt only. These results suggest that being mostly hold by MMFs, with regulatory constraints on their weighted average maturity, do play a role in debt maturity structure.

The results on the eligible debt (i.e. debt with issued amount higher than 10 mn €) depicts an interesting behavior: in the regressions not including the investor type, the increase on debt maturity is of similar magnitude between all transactions and eligible transactions only. However, in the MMF subset, we observe a decrease in the maturity of eligible debt of 18 days. This might suggest that on average, eligible firms increased their maturity, except for eligible debt. One possible explanation is that MMFs were more active on this segment of the market, and that issuers decreased their maturity at issuance to better fit their investors' constraints. Results are insignificant for the subset of firms with lower share of MMFs as investors.

These results suggest that the high footprint of MMFs matter for corporate issuers eligible to the PEPP. They increased less their maturity than issuers with a lower share of MMFs holding their commercial paper debt before the PEPP.

8 Robustness tests

To assess the robustness of our results, we conduct one placebo test and one robustness test.

8.1 Results on the 2016 CSPP announcement

Our first placebo test consists of the 2016 announcement of the CSPP by the ECB, including commercial papers. The latter were targeted with different and less eligibility criteria than the PEPP. Since the announcement was not followed by effective purchases, it enables us to measure the possible effect of announcement in restoring market confidence. We define $Post_t$ a dummy variable which equals zero before March 10, 2016 and one afterwards, and we conduct the same analysis for issued amounts, yields and maturity using data from January 1st, 2016 to September 30th, 2016. The CSPP did not have any criterion related to the minimum issued amount; concerning maturity, only CPs with a remaining maturity of at

least six months were eligible. We thus modify our eligibility criteria in our regression at the security level to integrate them.

Results are presented in Table 10, and bring new evidence about the difference between central banks' announcement and asset purchases. The CSPP announcement lead to a decrease in interest rates of the same magnitude than the start of the effective purchases as part of the PEPP (between 6 and 8 basis points, significant at 1% level). However, these results are not robust to the inclusion of firm and time fixed effects (Columns 3-4). We conduct the same analysis using two maturity buckets (Table 11): the one eligible at the CSPP (between six and twelve months), and the non-eligible one. We do not find any statistically significant results. These results differ from our baseline results, indicating that central banks' announcement of eligibility criteria are not sufficient to create two distinct segments and have a differentiated effect on financing conditions on both segments, on the contrary to effective purchases. As an additional robustness test, we conduct the same analysis on the maturity buckets of the PEPP (Table 12): we do not find any statistically significant results, supporting our baseline results.

We now study the effect of the CSPP announcement on maturity (Table 13). As we showed earlier, the PEPP contributed to reduce the rollover risk by increasing the maturity at issuance of corporate CPs. We do not find any statistically significant effect of the CSPP on maturity, indicating that announcement are not sufficient to modify issuers' debt structure, on the contrary to asset purchases.

Finally, the effects on the amounts (Table 14) are weakly significant (at 10% level), with a comparable economic magnitude of 2.9 mn €. However, the effect vanishes when including control variables or firm and time fixed effects: we cannot conclude to any effect on the issued amounts related to the CSPP announcement.

All in all, these results suggest that central banks' announcements might restore market confidence by decreasing the interest rates at issuance, but these results are not robust to the inclusion of fixed effects. However, announcements do not seem to be sufficient to change the maturity structure of newly issued corporate CPs. This comforts our result that the increase in maturity observed in 2020 is caused by the change in the eligibility criteria of corporate CPs under the PEPP.

8.2 Results on issuers issuing in both segments before the PEPP

Finally, we conduct the same analysis as in Section 7, but we restrict the sample to firms who issued on both the eligible and non-eligible segment of corporate CP during the S2-2019, before the crisis. This approach is similar to Todorov (2020) for corporate bond issuers for the CSPP. The intuition behind this test is that firms issuing before the PEPP on both segments might be more likely to drive the results, because they are more prone to switch their debt structure towards the eligible segment. The new sample consists of 100 firms, with the following repartition among credit quality steps: 13 firms are in the first group, 29 in the second, 14 in the CQS 3, and 40 are non-rated.

We find similar results compared to the one obtained with the full sample of issuers. Eligible issuers increased their issued amounts by 3.25 mn € by transaction on average (Table 15), and 8.45 mn € for the eligible debt (compared to 8.40 mn € with the full sample). Conducting the estimation by credit step ratings, we also find similar results: we did not find any statistically significant result for the CRS2, but firms rated BBB issued on average 39.7 mn € more by transaction (Table 16), while non-rated firms issued less (-12.2 mn € on average, compared to -9.21 bn € in our baseline regression). While the effect is not statistically significant for top-rated issuers compared to our results using the full sample, the economic magnitude is broadly similar (13 mn € against 18 mn € with the full sample). These results confirm the statistical effect the PEPP had on issuance for eligible issuers.

We also obtain results with comparable economic magnitude for maturity (Table 17): for firms who were already active on both segments before the crisis, they increased their maturity at issuance by at least one month, and by 39 days when controlling for firms' fixed effects (significant at the 1% level). This result is not robust to the inclusion of firm and time fixed effects.

Finally, we found similar effects for interest yields, both for all maturities (Table 18) and by maturity buckets (Table 19). The magnitude is comparable: interest rates decreased between 8 and 10 bps for all maturities, and decreased by 15 bps for longer maturities (-14 bps for the full sample).

9 Conclusion

Money markets are crucial for ensuring a good and smooth transmission of monetary policy to the real economy. In March 2020, the first lockdown measures adopted to combat the coronavirus associated led to severe tensions in these markets. Issued volumes decreased by 5.5 bn € between February and March 2020 while interest rates started rising and maturity at issuance decreased, exacerbating rollover risk for the issuers. These first signs of stress justified the intervention of the Eurosystem on the corporate CP market via the PEPP. What were the effects of this asset purchase programme on these short-term debt maturities? Relying on a difference-in-different set-up, this paper studies the impact of the Euroystem's intervention on commercial papers eligible to PEPP the according to three dimensions: i) volume issued, ii) yield and iii) maturity.

In particular, we found that the PEPP contributed to a reduction in rollover risk for issuing firms eligible to the program by increasing the maturity at issuance of their commercial papers between 30 and 41 days depending on the specifications. However, this increase is lower for commercial papers issued by firms for which MMFs were the main investor before the crisis, which sheds light on the importance of the investor universe and its concentration for firms. The effect on debt maturity is relatively persistent. This finding also reveals the importance of the calibration of the eligibility criteria when designing new tools. The PEPP also contributed to easing financing conditions by decreasing yields between 8 and 11 basis points for eligible firms in line with the literature that studies the effects of the Eurosystem's Corporate Securities Purchase Programme (CSPP) on bonds. The results on volumes are mixed. While the amounts of eligible (commercial papers that satisfied the volume, the maturity and the credit rating criteria) transactions increased by 8.10 mn €, the aggregate debt issued on the corporate CP market slightly decreased for eligible firms. The PEPP therefore triggered a change in debt composition, without boosting the volume issued by eligible firms compared to ineligible firms before the crisis (absence of windall effect).

The PEPP thus seems to have mostly modified the issuing conditions of eligible firms compared to non-eligible ones. The Eurosystem acted as a new investor on this very concentrated market where MMFs traditionally constitute the main debt holders on the demand side.

The results on the issued amounts are mixed: while the issued amounts by of eligible transactions increased by 8.10 mn €, the aggregate debt on the corporate CP market decreased: the PEPP triggered a change in debt composition, without boosting its activity compared

to ineligible firms before the crisis.

This episode highlighted the key role played by investors in causing disruptions for short-term funding markets. This episode highlighted the role of investors in disrupting short-term funding markets. The international and European fora increased their vigilance towards these topics (ESMA and FSB)[18], and identified the very high concentration of MMFs on the CP market, which is even stronger in the Euro Area than in the USA. Taking stock of this episode, new policy proposals are under study, to increase market liquidity and enhance investor diversification.

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[18] Sources: ESMA and FSB.

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10 Figures and Tables

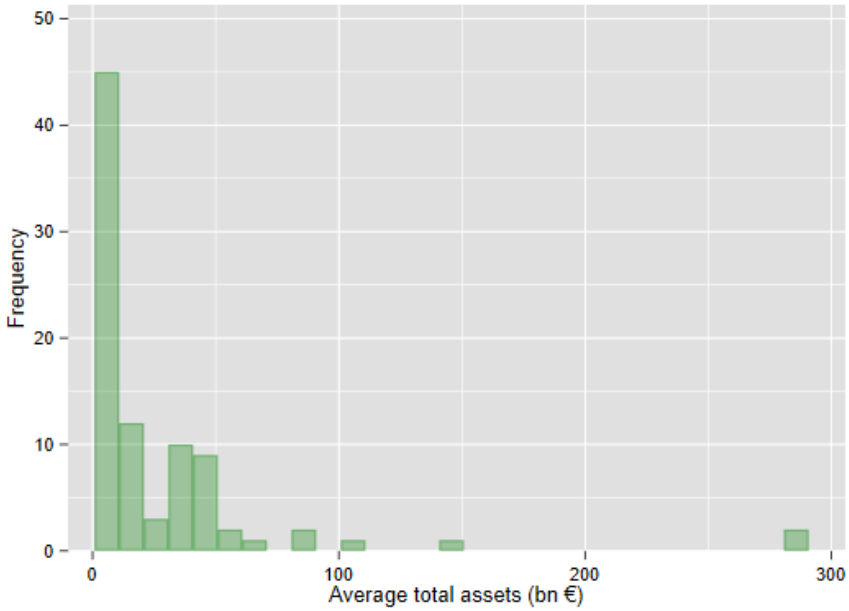

Figure 1. **Distribution of total assets over 2019 by issuer**.
Source: Bloomberg merged with TCN data (BdF).

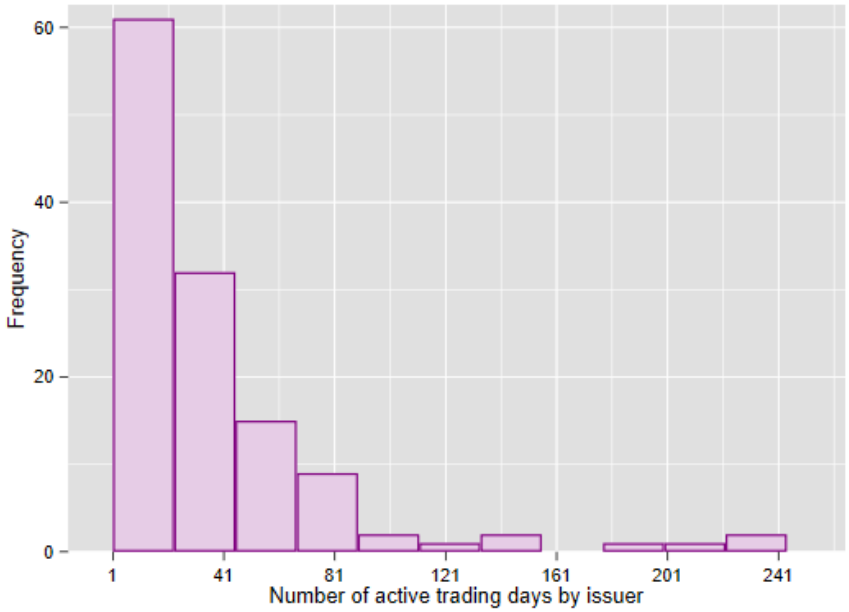

Figure 2. **Distribution of the number of active trading days by issuer in 2019**.
Source: TCN data (BdF).

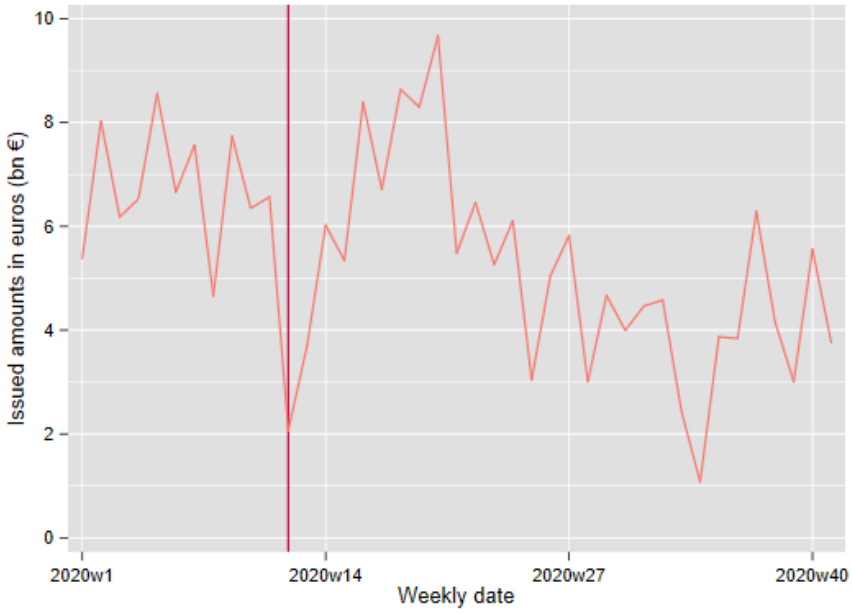

Figure 3. **Weekly volume of CPs issued by corporates**.
Note : The vertical red line corresponds to the week of the PEPP announcement.
Source: TCN data (BdF).

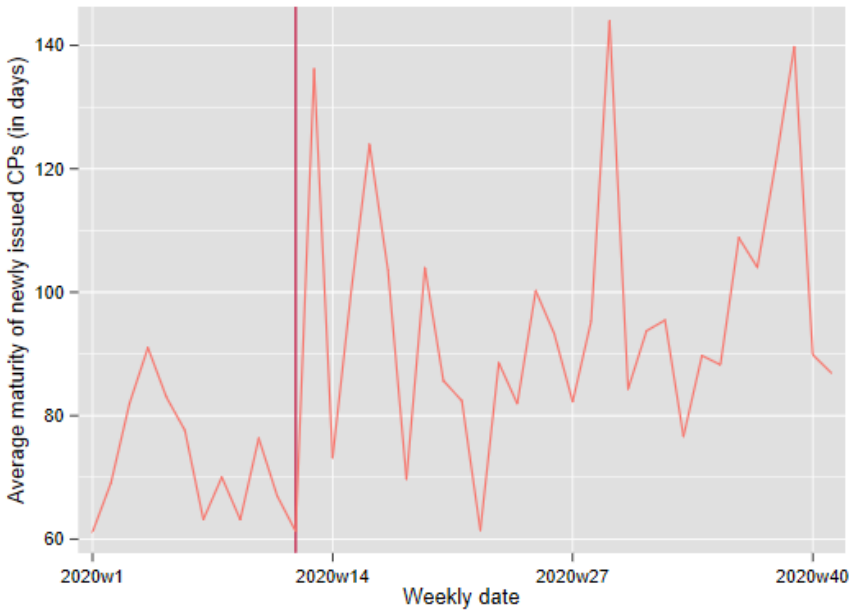

Figure 4. **Weekly average maturity of CPs issued by corporates**.
Note : The vertical red line corresponds to the week of the PEPP announcement. The maturity at issuance is weighted by the issued amount.
Source: TCN data (BdF).

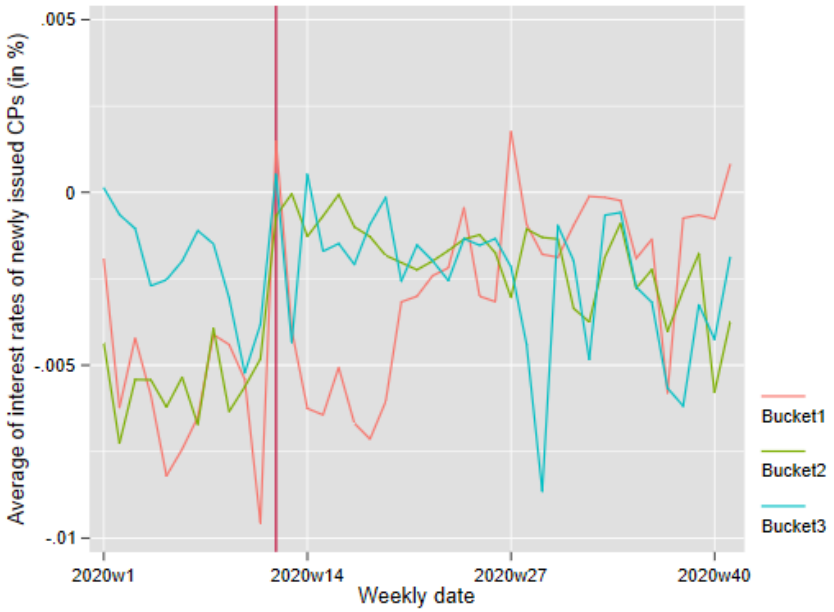

Figure 5. **Weekly average rates of CPs issued by corporates**.
Note : Yields-to-maturity are weighted by the issued amounts issued. Only issuances in euros are included. The first bucket corresponds to the maturity bucket of ineligible debt for the PEPP according to the maturity criterion (lower than 28 days), the second bucket encompasses maturities between 28 days and six months, and the last one maturities higher than six months. The red vertical bar corresponds to the announcement week of the PEPP.
Source: TCN data (BdF).

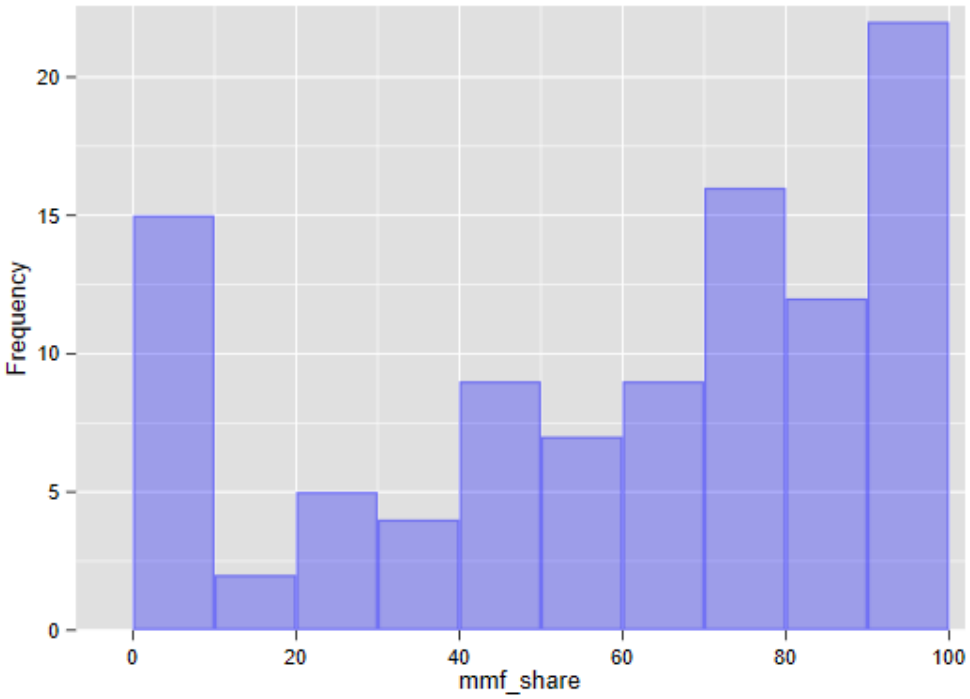

Figure 6. **Share of corporate CP issued in Q4-2019 hold by MMFs by issuer**.
Source: SHS-S merged with TCN data (BdF).

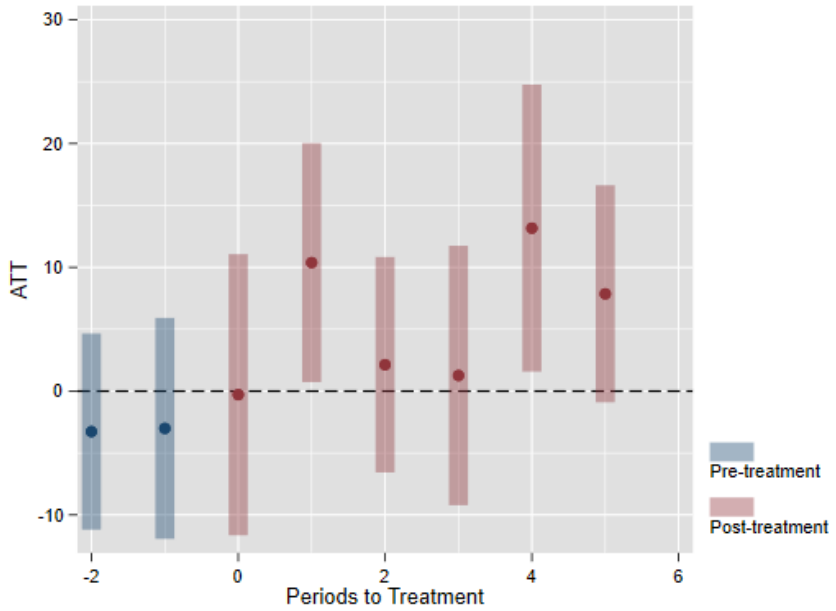

Figure 7. **Impact of the PEPP on the volume issued at the transaction-level, in mn euros, using Callaway and Sant'Anna (2021) estimator**.

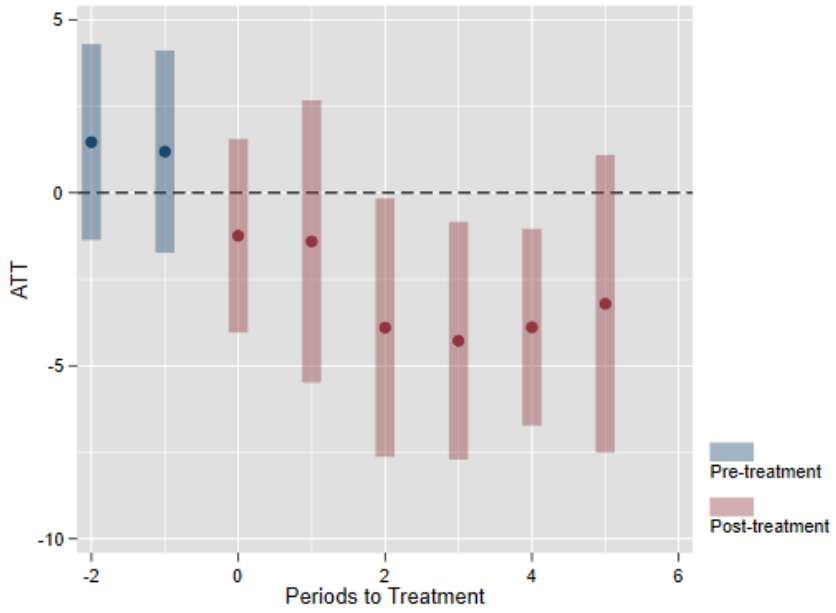

Figure 8. **Impact of the PEPP on the number of transactions using Callaway and Sant'Anna (2021) estimator.**

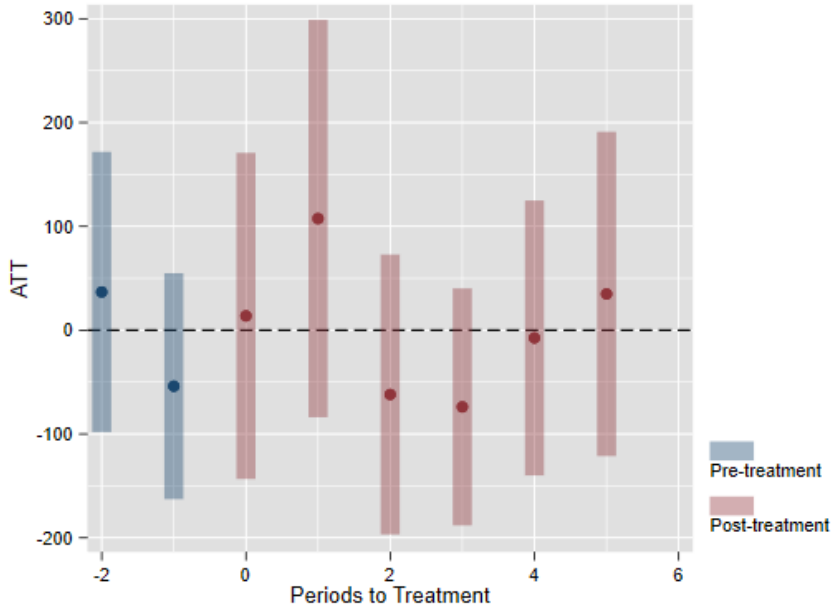

Figure 9. **Impact of the PEPP on the aggregated monthly volume of issuance using Callaway and Sant'Anna (2021) estimator.**

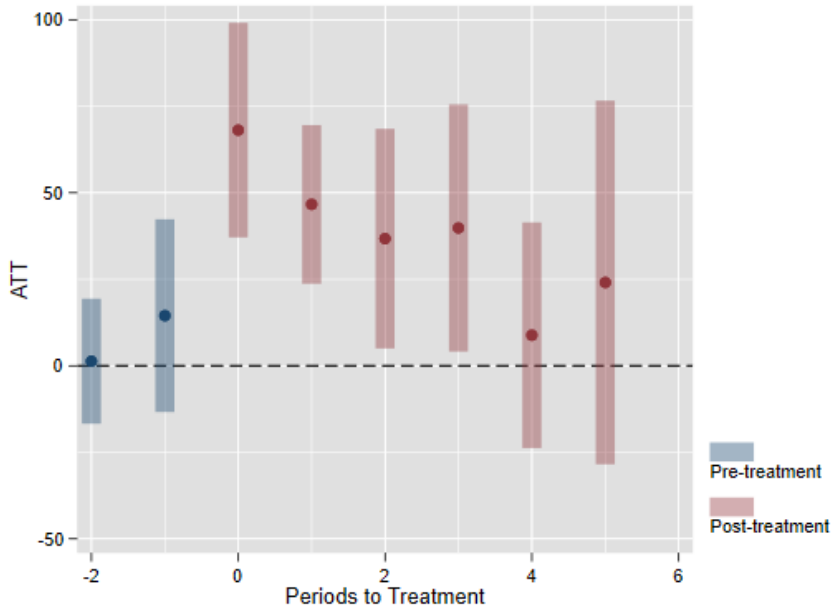

Figure 10. **Impact of the PEPP on maturity at issuance using Callaway and Sant'Anna (2021) estimator.**

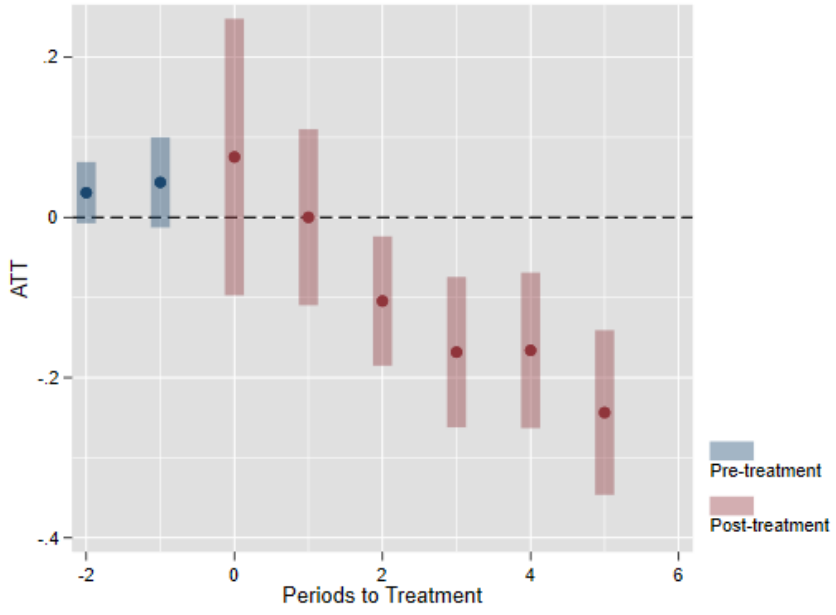

Figure 11. **Impact of the PEPP on maturity on yields at issuance using Callaway and Sant'Anna (2021) estimator.**

Table 1. **Impact of the PEPP on the volume issued in mn by transaction.**
Note: Column 1 estimates regression 2 for the volume issuedper transaction in mn €. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the amount, e.g. taking one when the issued CP has a maturity higher than 28 days). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post	4.42	1.19	−0.32		
	(3.27)	(0.85)	(1.07)		
IG rating	17.21***	10.30			
	(4.23)	(6.70)			
Post*IG rating	−0.38	3.27**	3.45	1.81	−3.93
	(1.16)	(1.25)	(2.81)	(2.68)	(3.12)
Cash		−0.24			
		(0.35)			
Short-term debt		−0.10**			
		(0.04)			
Size (log)		6.79***			
		(1.99)			
Eligible debt					−12.48***
					(3.19)
Post*Eligible debt					2.36
					(3.79)
Post*Eligible debt*IG rating					8.41***
					(2.40)
Firm FE	*No*	*No*	*Yes*	*Yes*	
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	6173	4080	6169	6169	6169
R2	0.06	0.16	0.37	0.37	0.38

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2. **Impact of the PEPP on the volume issued in mn per transaction by credit rating subsample.**

Note: Column 1 estimates regression 4 for eligible debt (excluding the criterion on the amount, e.g. taking one when the issued CP has a maturity higher than 28 days) for firms rated in the first credit quality step (from AAA to AA-), corresponding to 29 firms. Columns 2 produces the same results for the 34 firms rated between A+ and A-. Column 3 displays the same results for the 13 firms above the PEPP eligibility thresholds, e.g. between BBB+ and BBB-. Column 4 presents the regression for the 49 non-rated non-eligible firms. The coefficient Post*Eligible debt refers to the impact of the PEPP on the eligible debt in our DiD framework. Standard errors are double-clustered by firm and time.

	(1)	(2)	(3)	(4)
Eligible debt	-21.75^{***}	-8.35	-25.12^{***}	-3.53
	(5.25)	(5.04)	(6.12)	(3.09)
Post*Eligible debt	18.19^{**}	7.51	38.67^{***}	-9.22^{*}
	(6.74)	(4.08)	(1.10)	(4.25)
Firm FE Yes	Yes	Yes	Yes	Yes
Time FE Yes	Yes	Yes	Yes	Yes
N	1684	2015	384	1743
R2	0.33	0.25	0.23	0.55

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3. **Impact of the PEPP on the number of transaction by month by issuer.** Note: Column 1 estimates regression 2 for the number of transactions per month. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms in our DiD framework. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)
Post	0.63	0.69	0.29	
	(0.66)	(0.96)	(0.93)	
IG rating	4.38***	1.74		
	(0.91)	(1.02)		
Post*IG rating	−2.49***	−2.17***	−2.29**	−2.43**
	(0.25)	(0.51)	(0.85)	(0.92)
Cash		0.01		
		(0.12)		
Short-term debt		0.03		
		(0.02)		
Size (log)		1.73**		
		(0.58)		
Firm FE	*No*	*No*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*
N	857	556	850	850
R2	0.04	0.11	0.62	0.64

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 4. **Impact of the PEPP on the aggregate monthly volume issued in mn.** Note: Column 1 estimates regression 2 for the aggregate issued amount per month. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. The coefficient Post*IG rating estimates the impact of the PEPP for eligible firms in our DiD framework. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)
Post	39.07*	31.60	34.20	
	(19.82)	(22.40)	(20.21)	
IG rating	256.92***	140.13**		
	(44.67)	(50.24)		
Post*IG rating	−78.82**	−48.82	−72.34	−89.73*
	(23.66)	(29.93)	(42.84)	(41.39)
Cash		−2.22		
		(5.91)		
Short-term debt		−0.24		
		(0.59)		
Size (log)		109.76**		
		(35.98)		
Firm FE	*No*	*No*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*
N	857	556	850	850
R2	0.08	0.21	0.67	0.69

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. **Impact of the PEPP on the maturity at issuance (in days)**

Note: Column 1 estimates regression 2 for the maturity at issuance per transaction in days. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the maturity, e.g. taking one when the issued CP has an issued amount higher than 10 mn €). Column 6 estimates the same regression than 4 for eligible debt (with all the criteria , e.g. taking one when the issued CP has an issued amount higher than 10 mn € and a maturity higher than 28 days). The coefficient Post*IG estimates the impact of the PEPP for eligible firms in our DiD framework. The coefficient Post*IG*Eli.debt displays the same estimates for eligible debt issued by IG rated firms. The coefficient Post*IG*Eli.debt(alt) displays the same results with the alternative definition of eligible debt. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)	(6)
Post	−26.12**	−25.18**	−23.57**			
	(9.17)	(9.04)	(8.86)			
IG	−27.04***	−8.55				
	(7.92)	(11.63)				
Post*IG	44.55***	43.03***	38.24***	42.93***	31.21***	17.51**
	(4.39)	(6.81)	(7.08)	(7.61)	(8.38)	(7.54)
Cash		1.99				
		(1.19)				
Short-term debt		0.45**				
		(0.17)				
Size (log)		0.23				
		(3.85)				
Eli. debt					−15.23**	
					(5.62)	
Post*Eli. debt					8.07	
					(8.07)	
Post*IG*Eli. debt					11.82	
					(7.44)	
Eli. debt (alt)						25.48**
						(8.63)
Post*Eli. debt (alt)						−0.72
						(10.78)
Post*IG*Eli. debt(alt)						29.51**
						(12.25)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*	*Yes*
N	6173	4080	6169	6169	6169	6169
R2	0.01	0.05	0.26	0.28	0.28	0.31

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 6. **Impact of the PEPP on the yield at issuance in % by transaction.**
Note: Column 1 estimates regression 2 for the yield per transaction in %. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (e.g. taking one when the issued CP has a maturity higher than 28 days and the issued amount is higher than 10 mn €). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Maturity	0.00**	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Post	0.16***	0.18***	0.21***		
	(0.03)	(0.03)	(0.03)		
IG rating	−0.26***	−0.24***			
	(0.03)	(0.04)			
Post*IG rating	−0.05	−0.09*	−0.08**	−0.11***	−0.10**
	(0.05)	(0.04)	(0.04)	(0.03)	(0.04)
Cash		−0.00			
		(0.00)			
Short-term debt		−0.00			
		(0.00)			
Size (log)		−0.03**			
		(0.01)			
Eligible debt					−0.01
					(0.02)
Post*Eligible debt					0.03
					(0.02)
Post*IG rating*Eligible debt					−0.02
					(0.03)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	6172	4079	6168	6168	6168
R2	0.42	0.55	0.71	0.77	0.77

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 7. **Impact of the PEPP on the yields in % by transaction and maturity bucket.**

Note: Column 1 estimates regression 4 for the yield per transaction in % for the maturity bucket of transactions lower than 28 days. Column 2 estimates regression 4 for the yield per transaction in % for the newly eligible maturity bucket of transactions between 28 days and six months. Column 3 estimates regression 4 for the yield per transaction in % for the maturity bucket of transactions higher than six months (eligible for both the PEPP and the CSPP). Columns 4, 5 and 6 displays the same results for eligible debt. The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eli. debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)	(6)
Maturity	0.00	0.00***	0.00***	0.00	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Post*IG rating	−0.07	−0.12***	−0.18***	0.02	−0.08*	−0.18**
	(0.05)	(0.03)	(0.05)	(0.07)	(0.04)	(0.06)
Eli. debt				0.03	0.00	0.04**
				(0.02)	(0.02)	(0.01)
Post*Eli. debt				−0.03	0.01	−0.06**
				(0.03)	(0.02)	(0.02)
Pot*IG rating*Eli. debt				−0.08***	−0.05	0.01
				(0.02)	(0.03)	(0.03)
Firm FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Time FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
N	858	4400	761	858	4400	761
R2	0.86	0.81	0.86	0.86	0.81	0.86

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 8. **Role of MMFs as main holders of CP debt on the maturity at issuance (in days).**

Note: Results in the table below displays estimates on the sample of firms being mainly hold before the crisis by MMFs. Column 1 estimates regression 2 for the maturity at issuance per transaction in days. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the maturity, e.g. taking one when the issued CP has an issued amount higher than 10 mn €). The coefficient Post*IG rating estimates the impact of the PEPP for eligible firms in our DiD framework. The coefficient Post*IG rating*Eligible debt displays the same estimates for eligible debt issued by IG rated firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post*IG rating	19.72***	16.95**	28.51***	32.84***	47.80***
	(5.18)	(7.18)	(6.59)	(7.20)	(11.53)
Short-term debt		1.33			
		(0.85)			
Cash		3.67			
		(2.57)			
Size (log)		77.87			
		(102.40)			
Post			−8.31		
			(12.53)		
Eligible debt					−10.28
					(9.99)
Post*Eligible debt					27.02**
					(9.85)
Post*IG rating*Eligible debt					−18.55*
					(8.86)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	3599	2484	3596	3596	3596
R2	0.01	0.25	0.28	0.31	0.31

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 9. **Role of investors other than MMFs as holders of CP debt on the maturity at issuance (in days).**

Note: Results in the table below displays estimates on the sample of firms not being mainly hold before the crisis by MMFs. Column 1 estimates regression 2 for the maturity at issuance per transaction in days. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the maturity, e.g. taking one when the issued CP has an issued amount higher than 10 mn €). The coefficient Post*IG rating estimates the impact of the PEPP for eligible firms in our DiD framework. The coefficient Post*IG rating*Eligible debt displays the same estimates for eligible debt issued by IG rated firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post*IG rating	24.18	60.99	77.68**	86.71**	34.61
	(18.67)	(40.33)	(24.64)	(26.21)	(67.82)
Short-term debt		0.17			
		(0.61)			
Cash		−1.74			
		(1.73)			
Size (log)		−55.38*			
		(29.50)			
Post			−39.35***		
			(9.87)		
Eligible debt					−1.99
					(10.26)
Post*Eligible debt					−22.93
					(16.45)
Post*IG rating*Eligible debt					61.97
					(61.49)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	1182	768	1181	1181	1181
R2	0.01	0.11	0.16	0.18	0.19

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 10. **Placebo test: Impact of the CSPP on the yields in % per transaction.** Note: Column 1 estimates regression 2 for the yield per transaction in %. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (e.g. taking one when the issued CP has a maturity higher than 28 days and the issued amount is higher than 10 mn €). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Maturity	0.00***	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Post	−0.02	−0.02*	−0.04		
	(0.01)	(0.01)	(0.02)		
IG rating	−0.15***	−0.21**			
	(0.04)	(0.07)			
Post*IG rating	−0.07***	−0.08***	−0.05	−0.05	−0.04
	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
Cash					
		(0.00)			
Short-term debt		0.00			
		(0.00)			
Size (log)		−0.00			
		(0.03)			
Eligible debt					−0.09***
					(0.03)
Post*Eligible debt					0.10***
					(0.01)
Post*IG rating*Eligible debt					−0.04
					(0.03)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	6072	4371	6069	6069	6069
R2	0.16	0.21	0.47	0.47	0.47

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 11. **Placebo test: Impact of the CSPP on the yields in % by transaction and maturity buckets.**

Note: Column 1 estimates the same regression than 4 for eligible debt (e.g. taking one when the issued CP has a maturity higher than 28 days and the issued amount is higher than 10 mn €) for transactions below than six months. Column 2 displays the same results for transactions with maturities higher than six months. The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms. Standard errors are double-clustered by firm and time.

	(1)	(2)
Maturity	0.00***	0.00***
	(0.00)	(0.00)
Post*IG rating	−0.04	0.02
	(0.03)	(0.02)
Firm FE	*Yes*	*Yes*
Time FE	*Yes*	*Yes*
N	5401	663
R2	0.46	0.78

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 12. **Placebo test: Impact of the CSPP on the yields in % by transaction and PEPP maturity buckets.**

Note: Column 1 estimates the same regression than 4 for eligible debt (e.g. taking one when the issued CP has a maturity higher than 28 days and the issued amount is higher than 10 mn €) for transactions lower than 28 days (not eligible to the PEPP). Column 2 displays the same results for transactions with maturities between 28 days and six months (newly eligible to the PEPP). Column 3 displays the same results for transactions with maturities higher than six months (eligible to both the CSPP and the PEPP). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms. Standard errors are double-clustered by firm and time.

	(1)	(2)	(3)
Maturity	0.00	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Post*IG rating	−0.05	−0.02	0.02
	(0.05)	(0.02)	(0.02)
Firm FE	*Yes*	*Yes*	*Yes*
Time FE	*Yes*	*Yes*	*Yes*
N	896	4410	663
R2	0.76	0.47	0.78

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 13. **Placebo test: Impact of the CSPP on the maturity at issuance in days per transaction.**

Note: Column 1 estimates regression 2 for the maturity at issuance. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (e.g. taking one when the issued amount is higher than 10 mn €). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post	3.44	0.92	9.76		
	(5.13)	(8.34)	(6.65)		
IG rating	−2.28	−30.00**			
	(11.65)	(11.69)			
Post*IG rating	2.27	7.14	−2.01	−1.97	3.97
	(2.15)	(6.58)	(8.21)	(7.27)	(3.68)
Cash		−0.87			
		(0.84)			
Short-term debt		0.51**			
		(0.21)			
Size (log)		9.71			
		(8.77)			
Eligible debt					172.61***
					(26.32)
Post*Eligible debt					−0.86
					(28.38)
Post*IG rating*Eligible debt					−31.45
					(22.12)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	6077	4375	6074	6074	6074
R2	0.00	0.05	0.36	0.36	0.69

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14. **Placebo test: Impact of the CSPP on the volume issued in mn per transaction.**

Note: Column 1 estimates regression 2 for the issued amount at issuance. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (e.g. taking one when the maturity at issuance is higher than 28 days). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post	−1.88**	−2.03**	1.28		
	(0.81)	(0.71)	(1.31)		
IG rating	10.37**	13.16**			
	(3.87)	(4.61)			
Post*IG rating	2.91**	−0.43	−3.03	−2.14	−1.89
	(0.90)	(1.10)	(2.16)	(2.30)	(2.49)
Cash		−0.36			
		(0.30)			
Short-term debt		−0.13***			
		(0.03)			
Size (log)		4.50**			
		(1.75)			
Eligible debt					−1.84**
					(0.78)
Post*Eligible debt					−2.20
					(1.61)
Post*IG rating*Eligible debt					−1.76
					(2.41)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	6077	4375	6074	6074	6074
R2	0.05	0.20	0.43	0.43	0.43

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 15. **Robustness test: Impact of the PEPP on the volume issued in mn by transaction, on the subset of issuers active on the eligible and non-eligible segment before the crisis.**

Note: Results are displayed for the subset of issuers being active during the pre-crisis period on both the eligible and non-eligible segments. Column 1 estimates regression 2 for the issued amount at issuance. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (e.g. taking one when the maturity at issuance is higher than 28 days). The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms, and the coefficient Post*IG rating*Eligible debt refers to the impact of the PEPP on the eligible debt issued by eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post	5.28	0.96	−0.22		
	(3.51)	(0.71)	(1.20)		
IG rating	15.48***	9.93			
	(4.29)	(6.26)			
Post*IG rating	−0.02	3.26**	4.07	2.40	−3.94
	(1.53)	(1.26)	(2.80)	(2.64)	(2.89)
Cash		−0.30			
		(0.36)			
Short-term debt		−0.12**			
		(0.04)			
Size (log)		7.33***			
		(1.93)			
Eligible debt					−9.20**
					(3.03)
Post*Eligible debt					−1.60
					(4.05)
Post*IG rating*Eligible debt					8.46***
					(2.29)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	5570	3847	5569	5569	5569
R2	0.05	0.17	0.37	0.37	0.38

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 16. **Robustness test: Impact of the PEPP on the volume issued in mn by transaction, on the subset of issuers active on the eligible and non-eligible segment before the crisis, by credit rating buckets.**

Note: Results are displayed for the subset of issuers being active during the pre-crisis period on both the eligible and non-eligible segments. Column 1 estimates regression 4 for eligible debt (excluding the criterion on the amount, e.g. taking one when the issued CP has a maturity higher than 28 days) for firms rated in the first credit quality step (from AAA to AA-). Columns 2 produces the same results for firms rated between A+ and A-. Column 3 displays the same results for firms above the PEPP eligibility thresholds, e.g. between BBB+ and BBB-. Column 4 presents the regression for the non-rated non-eligible firms. The coefficient Post**Eligible debt refers to the impact of the PEPP on the eligible debt in our DiD framework. Standard errors are double-clustered by firm and time.

	(1)	(2)	(3)	(4)
Post	0.00	0.00	0.00	0.00
	(.)	(.)	(.)	(.)
Eligible debt	-18.76^{**}	-4.72	-24.15^{***}	-2.33
	(7.08)	(2.88)	(5.48)	(1.97)
Post*Eligible debt	13.41	3.39	39.72^{***}	-12.23^{**}
	(9.34)	(3.01)	(1.52)	(3.79)
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
N	1339	1819	413	1626
R2	0.33	0.27	0.20	0.55

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 17. **Robustness test: Impact of the PEPP on the maturity at issuance, on the subset of issuers active on the eligible and non-eligible segment before the crisis.**

Note: Results are displayed for the subset of issuers being active during the pre-crisis period on both the eligible and non-eligible segments. Column 1 estimates regression 2 for the maturity at issuance per transaction in days. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the maturity, e.g. taking one when the issued CP has an issued amount higher than 10 mn €). The coefficient Post*IG estimates the impact of the PEPP for eligible firms in our DiD framework. The coefficient Post*IG rating*Eligible debt displays the same estimates for eligible debt issued by IG rated firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Post	−25.52**	−24.69**	−23.17**		
	(10.33)	(8.76)	(8.95)		
IG rating	−22.90**	−6.45			
	(8.57)	(11.47)			
Post*IG rating	39.32***	34.98***	32.56***	39.09***	14.77
	(5.04)	(5.44)	(6.40)	(6.95)	(12.19)
Cash		2.03			
		(1.17)			
Short-term debt		0.46**			
		(0.15)			
Size (log)		−0.54			
		(3.92)			
Eligible debt					68.51***
					(8.49)
Post*Eligible debt					−11.81
					(12.63)
Post*IG rating*Eligible debt					19.25
					(14.59)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	5570	3847	5569	5569	5569
R2	0.01	0.05	0.25	0.27	0.32

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 18. **Robustness test: Impact of the PEPP on the yields at issuance, on the subset of issuers active on the eligible and non-eligible segment before the crisis.**

Note: Results are displayed for the subset of issuers being active during the pre-crisis period on both the eligible and non-eligible segments. Column 1 estimates regression 2 for the yield at issuance per transaction in days. Column 2 estimates regression 3 with additional controls (short-term debt, cash and size). Column 3 estimates regression 4 with firm fixed effects only, and Column 4 includes time and firm fixed effects. Column 5 estimates the same regression than 4 for eligible debt (excluding the criterion on the maturity, e.g. taking one when the issued CP has an issued amount higher than 10 mn € and has a maturity higher than 28 days). The coefficient Post*IG estimates the impact of the PEPP for eligible firms in our DiD framework. The coefficient Post*IG rating*Eligible debt displays the same estimates for eligible debt issued by IG rated firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)	(4)	(5)
Maturity	0.00**	0.00***	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Post	0.16***	0.18***	0.21***		
	(0.03)	(0.02)	(0.03)		
IG rating	−0.26***	−0.26***			
	(0.03)	(0.04)			
Post*IG rating	−0.04	−0.08*	−0.07	−0.10**	−0.09*
	(0.06)	(0.04)	(0.04)	(0.03)	(0.04)
Cash		−0.00			
		(0.00)			
Short-term debt		−0.00			
		(0.00)			
Size (log)		−0.02			
		(0.01)			
Eligible debt					−0.03*
					(0.01)
Post*Eligible debt					0.07*
					(0.03)
Post*IG rating*Eligible debt					−0.01
					(0.04)
Firm FE	*No*	*No*	*Yes*	*Yes*	*Yes*
Time FE	*No*	*No*	*No*	*Yes*	*Yes*
N	5569	3846	5568	5568	5568
r2	0.41	0.52	0.72	0.77	0.77

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 19. **Robustness test: Impact of the PEPP on the yields at issuance by buckets, on the subset of issuers active on the eligible and non-eligible segment before the crisis.**

Note: Results are displayed for the subset of issuers being active during the pre-crisis period on both the eligible and non-eligible segments. Column 1 estimates regression 4 for the yield per transaction in % for the maturity bucket of transactions lower than 28 days. Column 2 estimates regression 4 for the yield per transaction in % for the newly eligible maturity bucket of transactions between 28 days and six months. Column 3 estimates regression 4 for the yield per transaction in % for the eligible maturity bucket (for both PEPP and CSPP) of transactions higher than six months. Columns 4, 5 and 6 displays the same for eligible debt. The coefficient Post*IG rating estimates the impact of the PEPP on eligible firms. Standard errors are double-clustered by firm and time. Units for cash and short-term debt ratio: %. Units for size: log.

	(1)	(2)	(3)
Maturity	0.00	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Post*IG rating	−0.04	−0.12***	−0.16**
	(0.05)	(0.03)	(0.06)
Firm FE	*Yes*	*Yes*	*Yes*
Time FE	*Yes*	*Yes*	*Yes*
N	731	4037	665
R2	0.85	0.80	0.89

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 20. **Issuers' characteristics before the Covid-19 crisis**.

Note: t-test for equality of means between groups. Cash ratios are expressed in % of total assets, short-term debt and total debt ratios in % of current liabilities. Sample averages are computed using data between January and December 2019.

Variable	Eligible issuers (1) Average	Non-eligible issuers (2) Average	Difference (2) - (1)
Cash ratio	6.3	9.5	3.2***
Size (log)	9.9	8.8	−1.2***
Short-term debt ratio	33	29.2	-3.8
Total debt ratio	139	110.7	−28.3*

Table 21. **Parallel trends: pre-treatment effects**

Note: This table presents results of the regression for the parallel trend assumption for eligible and non-eligible firms issued amounts, maturity and yields before the PEPP start of purchases with respect to their credit rating . It reports the estimated coefficients and p-values as described in Equation (7) for pre-treatment months only, but the regression is conducted on the full sample.

	(1) Amounts	(2) Maturity	(3) Rates
January	−3.26	1.32	0.03
	(0.42)	(0.89)	(0.11)
February	−3.00	14.48	0.04
	(0.51)	(0.31)	(0.13)
N	4080	4080	4080

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$