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THE CSPP AT WORK:
YIELD HETEROGENEITY AND THE PORTFOLIO REBALANCING CHANNEL

by Andrea Zaghini[‡]

Abstract

We assess the impact of the corporate sector purchase programme (CSPP), the corporate arm of the ECB's quantitative easing policy, in its first year of activity (June 2016 – May 2017). Focusing on the primary bond market, we find evidence of a significant impact of the CSPP on yield spreads, both directly on targeted bonds and indirectly via the portfolio rebalancing channel. While spreads on eligible bonds have declined since the start of the programme (by 60 basis points in 2016), non-eligible bonds remained unaffected until 2017, when the entire corporate market recorded a further decline in spreads of 56 basis points.

JEL Classification: G15,G32, G38.
Keywords: Quantitative easing, CSPP, corporate bond market, portfolio rebalancing channel.

Contents

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1 Introduction[1]

In a context of prolonged low inflation, actual and expected, and policy rates at the effective lower bound (ELB), in January 2015, the ECB joined the group of central banks implementing fully-fledged quantitative easings. The new outright purchases of euro-denominated investment-grade securities issued by euro-area governments, agencies and European institutions in the secondary bond market were undertaken under the so called public sector purchase programme (PSPP). The overall programme was named expanded asset purchase programme (EAPP), since at that time the ECB was already buying some specific securities under two existing schemes: covered bonds (CBPP) and asset-backed securities (ABSPP). The programme was expanded since the purchase schemes already active were falling short of the expectations, in particular regarding the expansion of the Eurosystem's balance sheet required to bring inflation below but close to 2%.

In March 2016 a further expansion of the programme was announced with the aim to strengthen the pass-through of the Eurosystem's asset purchases to the financing conditions of the real economy and to provide additional monetary policy accommodation. In particular, the ECB decided to add to the EAPP also the outright purchases of investment-grade euro-denominated bonds issued by non-bank corporations on the primary and secondary markets. This new arm of the programme was named corporate sector purchase programme (CSPP). The amount of purchases under the EAPP was expanded from 60 to 80 billion euros per month.[2]

As for any other purchase programme, the intention of the CSPP was to

[1]The author would like to thank Mariano De Matteis, Giuseppe Grande, Taneli Makinen, Juri Marcucci, Stefano Neri, Nicola Pellegrini and Andrea Silvestrini for helpful discussions and useful suggestions. The views expressed in the paper do not necessarily reflect those of the Bank of Italy.

[2]In December 2016, the ECB decided to extend the programme also after the initial deadline of March 2017 to December 2017. It was also decided to reduce to 60 billion euros the amount purchased from April 2017.

lower the yield on targeted corporate bonds and, through a broader rebalancing channel, influence also other asset prices, in particular (corporate) non-eligible bonds. The idea being that by generating scarcity in eligible bond segment investors would be encouraged to shift holding into other (riskier) asset classes (Vayanos and Villa 2009, Krishnamurthy and Vissing-Jorgensen 2011, Hancock and Passmore 2011). In addition, the presence of a large player in the euro-area corporate bond market would encourage the issuance activity on the primary market and guarantee an increased liquidity in secondary market trades (Steeley 2015, Boneva and Linton 2017. In turn, easing the funding conditions of corporations would stimulate their business and support euro-area growth in general (Draghi 2015, ECB 2017).

The literature on the effects of large asset purchase programmes by central banks is abundant for the US and UK[3], whereas the evidence on the ECB is rather limited, due to the much later start of the euro-area QE. From the one hand, empirical contributions found a significant announcement effect of some nonstandard ECB measures. For example, Altavilla et al. (2016) and Krishnamurthy et al. (2017) show that the announcement of the Outright Monetary Transactions (OMT) in the second half of 2012 led to an immediate large decrease in Italian and Spanish government bond yields, while the effect in France and Germany was relatively muted. A similar result is reported by De Santis (2016) and Andrade et al. (2016) for the APP announcement in January 2015. From the other hand, less unanimous conclusion can be found on the macroeconomic implications of the purchase programmes (Darracq Paries and Kuhl 2016, Andrade et al. 2016, Gambetti and Musso 2017).

There has been even less research assessing the impact of ECB nonstandard measures on firms.[4] The aim of this paper is to address this gap in the

[3]In addition to the already quoted works, see for instance Joyce et al. (2011), Gagnon et al. (2011), Kapetanios et al. (2012), D'Amico and King (2013), Gilchrist and Zakrajsek (2013), Lo Duca et al. (2016).

[4]One exception is the work by Ferrando et al. (2015), which analyzes the impact of the OMT programme on the credit access by small business in the euro area.

literature. Given the novelty of the CSPP in targeting corporate securities, it provides the perfect framework for the identification of the effects of the ECB purchases on the funding conditions of euro-area corporations. While providing some preliminary evidence on market volumes, the paper focuses on the impact of the CSPP on bond prices over the first year of purchases (June 2016 - May 2017). In particular, we look at the yield spreads on both eligible bonds (direct effect) and non-eligible bonds (indirect effect) on the primary market, which is the market where the funding conditions are established in the first instance.

We contribute to the literature in several aspects. In line with the results on other non-conventional measures, we document a fast decrease of corporate bond spreads after the CSPP announcement in March 2016, well before the actual start of the programme on June 8, 2016. We estimate a strong direct effect of the purchases in the first six months of the programme: eligible bonds showed a significantly lower yield spread of 69 basis points in 2016Q3 and 49 in 2016Q4. However, this differential effect vanished in 2017: in the first five months of the year both eligible and non-eligible bonds witnessed a decrease in the yield spread of 56 basis points. This evidence is consistent with the working and the timing of the portfolio rebalancing channel: in the early months of purchases, the effect of the programme was concentrated on eligible bonds only (actually, non eligible bonds experienced a slight deterioration), while after several months of purchases, the scarcity brought about by the ECB in the segment of eligible bonds pushed investor to rebalance their portfolios towards non eligible bonds, increasing their price and reducing their yield spread.

The paper is organized as follows. Section 2 describes the features of the CSPP; Section 3 analyzes the recent evolution of the euro-area primary bond market; Section 4 introduces the econometric approach; Section 5 assesses the impact of the CSPP on the bond pricing mechanism; Section 6 provides some robustness checks; Section 7 draws the conclusions.

2 The CSPP

In early 2016, in a context in which the heterogeneity in the euro-area bond market had not yet returned to pre-crisis levels, the ECB announced the direct purchase of corporate bonds on both the primary and secondary market (CSPP). The idea under the deployment of the CSPP was that the outright purchase of bonds would have reinforced the link between the financial and real sector of the economy (ECB 2016). In particular, the CSPP would have further strengthen the pass-through of the already accommodative monetary policy stance to the financing conditions of (non-bank) corporations: directly, via the outright purchases of eligible bonds and indirectly, via the working over time of the portfolio rebalancing channel.

The bond and issuer eligibility conditions set forth by the ECB are as follows:

- the bond must be eligible as collateral for Eurosystem credit operations;
- the bond must be denominated in euro;
- the bond must have a minimum first-best credit assessment of at least BBB- or equivalent (obtained from an external credit assessment institution);
- the bond must have a minimum (remaining) maturity of six months and a maximum (remaining) maturity of 30 years;
- the issuer must be a corporation established in the euro area, defined as the location of incorporation of the issuer;
- the issuer must not be a credit institution nor have any parent undertaking which is a credit institution.

In order to ensure that debt instruments with small issuance volumes (often those issued by small firms) can also be purchased, there is no minimum

issuance volume for debt instruments eligible for purchase under the CSPP. In analogy to the other existing purchase programmes within the APP, the Eurosystem applies a maximum issue share limit of 70% per security identification number (ISIN) on the basis of the outstanding amount. In addition, there are also limits per issuer group, following a pre-defined benchmark, to ensure a diversified allocation of purchases across issuers while allowing for sufficient leeway to build up the portfolio. Finally, to sustain market liquidity, CSPP holdings are also made available for securities lending by the Eurosystem.[5]

Bond purchases are conducted directly by the Eurosystem via six national central banks: Banco de España, Banca d'Italia, Banque de France, Deutsche Bundesbank, Nationale Bank van België/Banque Nationale de Belgique, and Suomen Pankki/Finlands Bank. The ECB coordinates the purchases. The transparency of the programme relies on the ex-post disclosure of the monthly holdings (total, primary market and secondary market) and on the weekly publishing of a list of all the bonds purchased and made available for security lending.

After the announcement of the programme in March 2016, eligible bonds have outperformed non-eligible bonds on the secondary market. Option-adjusted spreads indices show that the drop in the spread for a set of representative eligible bonds after the CSPP announcement was more pronounced than that for a set of non-eligible bonds (Figure 1).[6] The gap between the two indices increased even further after the actual launch of the programme (June 2016), levelling off afterwards. Since November 2016, in a context

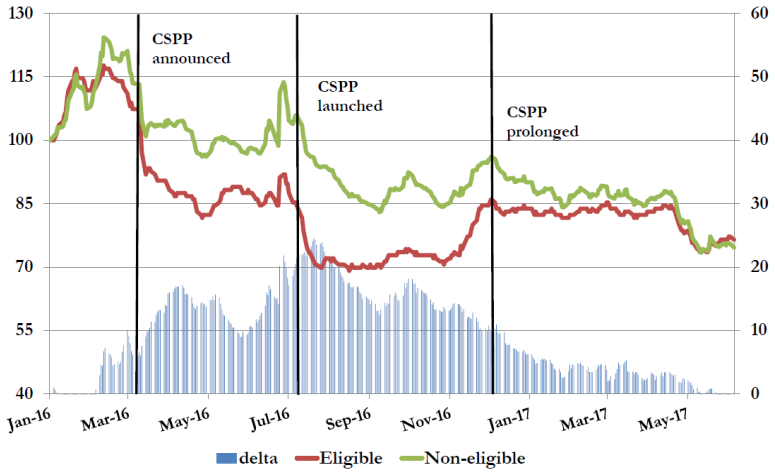
[5] For further the details see the ECB press releases:
https://www.ecb.europa.eu/press/pr/date/2016/html/pr160421_1.en.html,
https://www.ecb.europa.eu/mopo/implement/omt/html/cspp-qa.en.html.

[6] The eligible bonds are proxied by the set of bonds included in the BofA-Merrill Lynch index for investment grade, euro-denominated bonds issued by non-financial corporations, while non-eligible bonds are proxied by bonds included in two BofA-Merrill Lynch indices: one for bonds issued by banks (Index EUR financial corporations-banking) and the other for high-yield, euro-denominated bonds issued by non-financial corporations (Index EUR High yield).

of increased uncertainty and rising risk premia globally, the gap started to decline. The trend went on even after the ECB announced the extension of the programme in December 2016. In May 2017 the gap virtually disappeared.

This basic graphical evidence is thus consistent with a proper timing and functioning of the rebalancing channel: after an initial period in which the ECB has been buying eligible bonds increasing their price, investors have started shifting towards the segment of non-eligible bonds, putting pressure on their prices also, so that the yield of bonds in both categories eventually behaved in the same fashion.

Figure 1. Spread performance of euro-area bonds[1]



Source: Thomson Reuters. 1) Index: 100=1/1/2016; the index Eligible is the BofA-Merrill Lynch Index EUR non-financial corporations; the index Non-eligible is the simple average of BofA-Merrill Lynch Index EUR High yield and BofA-Merrill Lynch Index EUR financial corporations (banking).

While the performance on the secondary market can be thought of as the market assessment of a possible trade in that moment, it does not change the face value of the already issued bonds, in other words it does not change the actual cost for the issuing corporation. Instead, the originating trade

on the primary market exactly defines the actual funding cost for the firm. Another important aspect is that, while the bonds included in the market indices are fully comparable (by maturity, volume, liquidity and credit risk), they are issued by just a limited share of all the issuing corporations. Usually, bonds from new issuers or from small firms do not fulfill all the requirements to be taken into account. Since the aim of the CSPP is to facilitate the pass-trough of the accommodative stance of the ECB to the funding cost of all non-bank corporations, in the paper we focus on the primary market, in which is possible to find a much larger number of corporations.

As for the bond prices, in the paper we rely on the asset swap (ASW) spread as the reference distance from a risk-free asset. For each issue, the ASW spread is the difference between the bond yield and yield of an asset swap contract of similar characteristics. In particular, an asset swap contract is a synthetic instrument which allows an investor to swap the payments on a bond (i.e. coupons) to a floating rate payments (risk free rate plus the ASW spread), while maintaining the original credit exposure to the fixed rate bond. The ASW spread on non-bank bonds averaged 174 basis points over the period June 2016-May 2017, whereas the ASW spread on eligible bonds only was 88 basis points. The correspondent values in 2015 were 185 and 119 basis point, respectively, while over the whole after-crisis period 2013-2017 they were 196 and 116 basis points. Given that the default risk of eligible bonds is usually much smaller (as certified by an "investment grade" rating), it is not surprising that the bonds with the CSPP characteristics were placed at a lower yield than non-eligible bonds. Yet, the spread on eligible bonds seems to have dropped faster than that of non-eligible bonds.

In the next section we show that, in addition to the rating, there are several other sources of heterogeneity in the euro-area primary bond market which have a bearing on the yield of a bond. Thus a fully-fledged econometric approach is needed to assess whether the CSPP has had an impact on the bond market and, if any, on which bonds.

3 The euro-area primary bond market

Over the two waves of the financial crisis the bond pricing mechanism in the euro-area suffered a significant stress, in particular during the sovereign debt crisis in 2010-2012 (Battistini et al. 2014, Durrè et al. 2013). Government bonds spreads spiked in several countries (Ireland, Italy, Portugal and Spain notably) and the Greek debt had to be restructured to avoid the outright default and the exit of Greece from the monetary union. The integration of the financial market achieved since the early year of the monetary union and even the existence of the euro were challenged for the first time. The stress in the sovereign debt market spilled over to the corporate segment via the "transfer risk" phenomenon (Diaz et al. 2013, Bedendo and Colla 2015). Eventually, both banks and firms were involved in the crisis, experiencing a deterioration of their funding abilities. However, the deterioration was unequal across countries and led to an increasing market segmentation along national borders (De Santis 2016, Horny et al. 2016, Zaghini 2017). This market evolution, together with diverging banks' lending rates, was conflicting with the smooth transmission of the common monetary policy. In particular, such developments were the consequences of self-fulfilling expectations, multiple equilibria and contagion (Calvo 1988; Kehoe and Cole 2000, Giordano et al. 2013, Corsetti and Dedola 2016). Indeed, several works suggested that a significant part of the increase in bond spreads in that period did not reflect the underlying fundamentals (De Grauwe and Ji 2012, Di Cesare et al. 2012, Klose and Weigert 2014, Dewachter, et al. 2015).

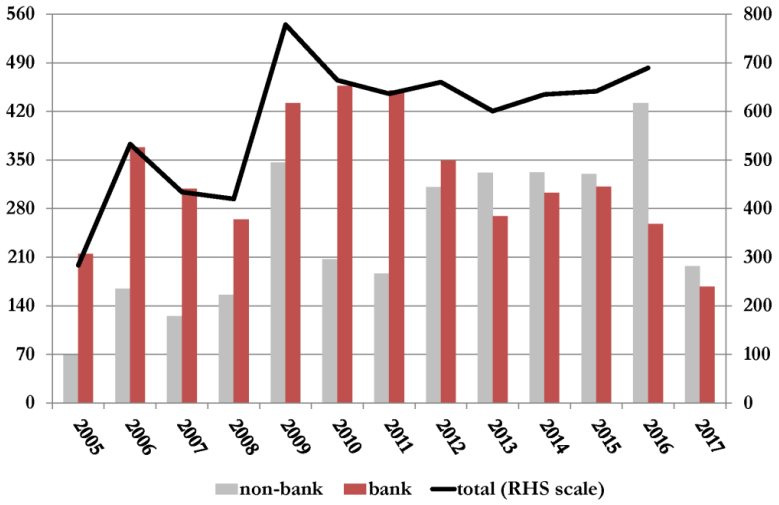
Even though the global financial crisis and the sovereign debt crisis halted the market expansion, the volume of bonds issued on the primary market was close to 700 billion euros in 2016, from an average of 300 billions in the 2005-2007 period, a performance second only to the 2009 peak (Figure 2).[7] In

[7]In this Section, consistently with the dataset employed in the baseline model estimation (Section 5), we rely on bonds issued on international markets by corporations registered in 12 countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland,

addition, the first five months of 2017 recorded the largest issuance ever (365 billions).

While before and during the financial crisis banks were tapping the bond market to a larger extent than non banks, since 2013 it is the other way around. A true boom of non-bank placements is recorded in 2016, in particular in the second half of the year. Bond issuers increased from an average of 235 per year in the pre-crisis period to 459 in 2013, thereafter they constantly declined to reach 404 in 2016. However, corporations other than banks outnumbered banks by a ratio 4:1.

Figure 2. Primary bond market issuance[1]



Source: Dealogic DCM Analytics. 1) Total volume issued by euro-area corporations. Billion euros. Data for 2017 end on May 31, 2017.

Focusing on the bonds issued by non-bank corporations, which are the target of the CSPP, Table 1 depicts a significant heterogeneity across sectors. Over the whole time sample, only four sectors (Financials, Industrials, Telecommunication and Utilities) show a volume share above 10%. However,

Italy, Luxembourg, Netherlands, Portugal, Spain), uniquely identified by an ISIN code and for which the ASW spread at origination is avaliable.

their relative weight has constantly declined over time, with the exception of Utilities which recorded a peak in 2008-2012 and then dropped back to a level smaller than the pre-crisis period. Instead, Consumer goods and Healthcare increased substantially their volume share reaching 11.6% and 8.5%, respectively, in 2013-2017. At the same time, Auto/Truck and Consumer services show a good resilience to business cycle fluctuations and financial crises preserving over time a relatively constant share.

Table 1. Volume share and bond issuance by sector[1]

	2005-2007		2008-2012		2013-2017		2005-2017	
Auto/Truck	10.9	(83)	9.8	(401)	9.8	(474)	9.9	(958)
Basic materials	5.0	(33)	6.2	(160)	6.4	(233)	6.1	(426)
Consumer goods	3.5	(31)	7.9	(197)	11.6	(288)	9.3	(516)
Consumer services	6.5	(52)	5.5	(172)	5.9	(266)	5.8	(490)
Financials	13.0	(87)	11.2	(319)	10.3	(527)	10.9	(933)
Industrials	13.4	(112)	11.8	(409)	11.2	(585)	11.7	(1106)
Insurance	6.7	(70)	3.4	(80)	4.0	(115)	4.1	(265)
Oil/Gas	5.2	(65)	8.4	(197)	7.5	(174)	7.6	(436)
Healthcare	2.8	(24)	3.3	(85)	8.5	(191)	5.9	(300)
Technology	5.7	(27)	2.6	(59)	3.7	(111)	3.5	(197)
Telecommunication	16.9	(90)	12.5	(264)	11.4	(264)	12.5	(618)
Utilities	10.2	(72)	17.4	(340)	9.8	(344)	12.7	(756)
Total	100	(746)	100	(2683)	100	(3572)	100	(7001)

Source: Dealogic DCM Analytics. 1) Number of bonds issued. Relative share of volume issued by sector in parentheses, percentage points. Data for 2017 end on May 31, 2017.

As already mentioned, in addition to the heterogeneity across sectors, the euro-area bond market was characterized over the period under analysis by a significant heterogeneity across countries (De Santis 2016, Horny et al. 2016, Zaghini 2017). Table 2 provides a snapshot of the bond placement by country. The corporations tapping the bond market range from 232 in France (which issued 1,832 bonds) to 20 in Greece (which issued 70 bonds). Several corporations (338) are 1-timers, i.e. they have one bond only in the dataset; the share ranges from 20% in Greece to 38% in Italy. The maturity at launch suggests that Greek corporations rely on bonds with a short re-

demption horizon (below 6 years). Also corporations from Finland, Germany, the Netherlands and Portugal are used to place bonds with a relatively short maturity (around 7 years), whereas Belgian and French firms are those whose bonds have the longest maturity at origination (above 9 years). As for the volume of the placement, firms from three countries (Belgium, Ireland and Italy) place bond tranches with the top average value of 580 millions euro, while Finnish corporate bonds exhibit the smallest value (235 million euros). Given the striking heterogeneity even in the bond basic characteristics of maturity and volume, it is not surprising that also the yield at origination is extremely different across countries: the ASW spread ranges from 146 basis points in Germany to 439 in Greece.

Table 2. Bond issuance by country[1]

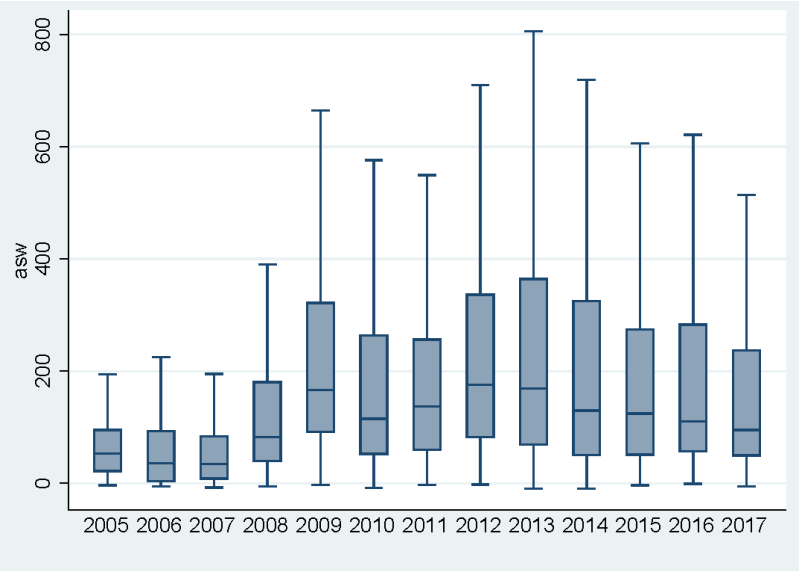
Country	Issuers	1-timer	Bonds	Maturity	Tranche Value	ASW
Austria	55	19	197	3,087	352	205
Belgium	67	24	288	3,432	582	197
Finland	58	18	220	2,476	235	204
France	232	59	1,832	3,386	421	158
Germany	179	68	1,764	2,448	417	146
Greece	20	4	70	2,062	311	439
Ireland	43	9	269	3,050	583	222
Italy	89	34	444	3,179	581	262
Luxembourg	69	25	290	2,884	530	302
Netherlands	127	37	1,034	2,672	509	179
Portugal	30	11	106	2,678	364	279
Spain	82	30	487	3,168	484	231
Total	1,051	338	7,001	2,922	455	187

Source: Dealogic DCM Analytics, Thomson Reuters. 1) Issuers, 1-timer and Bonds in units; Maturity in days (excluding perpetual bonds), Tranche value in million euros, ASW in basis points.

The evolution over time of the ASW spread is directly affected by the two waves of the crisis (Figure 3). The interquartile range (IQR) increased from an average of 79 basis points in the pre-crisis period to values above 200 in almost every year since 2008 (2011 is the only exception). Even though

the ASW spread distribution narrowed somewhat after the sovereign debt crisis and the introduction of unconventional monetary policy measures by the ECB, both the dimension of the IQR and the high level of the top whisker in the box-plot representation in 2016 and 2017 suggest the persistence of large heterogeneity.

Figure 3. ASW spread evolution over time[1]



Source: Thomson Reuters. 1) Basis points. Data for 2017 end on May 31, 2017.

The evidence presented so far suggests that there are several sources of heterogeneity in the euro-area corporate bond market which have to be properly taken into account when analyzing the bond pricing mechanism. The next section tries to disentangle the different sources of price determination to assess the effect of the CSPP not only on the bonds actually purchased under the programme, but on all eligible and non-eligible bonds placed by non banks.

4 The econometric approach

We base our analysis of the CSPP impact on the econometric framework proposed by Sironi (2003) and Zaghini (2016) for the euro-area primary bond market.[8] The spread with respect to a risk-free asset is determined by three main sources of risk: bond features, default risk of the issuer and market sentiments. Analytically:

$$spread_i = \alpha_0 + \sum_k \alpha_k V_{i,k}^{bond} + \sum_l \alpha_l V_{i,l}^{issuer} + \sum_z \alpha_z V_{i,z}^{market} \tag{1}$$

where $spread_i$ is the ASW spread at origination on bond i, V_k^{bond} are the K variables tracking the bond features, V_l^{issuer} are the L variables characterizing the issuing corporation, V_z^{market} are the Z variables which take into account market conditions at the time of issuance. All exogenous variables are taken at time t (the exact issuance day) with the exception of balance sheet data which are lagged by one year (i.e., they refer to the latest annual balance available at t).

The model has a cross-section structure and we take into account the time dimension by a set of time dummies. The estimation can be thought of as equivalent to a standard pooled OLS panel estimation. The cross-section approach allows a much larger selection of bonds and issuing institutions, since many bonds, especially from smaller issuers, are not constantly priced and traded in the secondary market and thus can not be employed in a time-series approach. Indeed, even when secondary market quotes exist, prices are most of the times not coupled with actual trades. By focusing on the primary market, we then avoid the market distortions due to the scarce liquidity of many euro-area bonds in secondary trades (Bao et al. 2011, Dick-Nielsen et al. 2012, Wang and Wu 2015).

[8] Other contributions analyzing the yield spread at origination are Morgan and Stiroh (2001) and Santos (2014) for the US, Zaghini (2017) for the euro area and Pianeselli and Zaghini (2014) for a set of select OECD countries.

The selection of the regressors is based on the traditional drivers of the risk premium.[9] As regards the bond features $\left(V_k^{bond}\right)$, the exogenous variables taken into account are: the time to maturity at origination, the amount issued (single tranche), the currency of denomination, the bond grade. In particular, we expect a positive relation between the ASW spread and the time to maturity due to the roll-over risk associated to long redemption horizons. Instead, concerning the volume of the issue, there might be two effects at work going in opposite directions. While issuing corporations may face higher costs to generate a sufficiently large demand for their placements, a larger issuance volume may imply improved liquidity for secondary market trades.[10] It follows that the relation between the bond volume and the spread is a matter of empirical assessment. To take into account the riskiness of the bond we use a dummy variable which takes 1 if the bond is in the "investment grade" range (BBB- or higher) and 0 otherwise.[11]

The set V_l^{issuer} characterizing the issuer includes a measure of the creditworthiness of the corporations, an indicator of the size and whether the issuing corporation is a 1-timer or has issued more than one bond in the period under consideration. At the same time a set of dummy variables takes into account the (general) industry sector of the issuer.[12] As for the creditworthiness, we rely on the rating provided by the three most important

[9] The literature on the topic is abundant, the interested reader is referred to the seminal contributions by Elton et al. (2001), Collin-Dufresne et al. (2001), Campbell and Taksler (2003). For recent empirical analyses see instead Anginer and Warburton (2014), Ahmed et al. (2015), Badoer and James (2016), Boneva and Linton (2017).

[10] Note that standard measures of bond-specific liquidity used when analysing secondary market spreads (e.g., the number of trades per day or the bid-ask spreads), cannot be used when dealing with the bonds issued on the primary market, since just the features concerning the originating trade are available.

[11] In the baseline regressions we preferred not to use the bond rating (avaliable for 6,100 bonds), since it is highly correlated with the issuer rating (0.934). In Section 6 we propose some robustness checks.

[12] As in Section 3, non-bank corporations are classified into 12 sectors: Auto and track, Basic materials, Consumer goods, Consumer services, Financials, Health care, Industrials, Insurance, Oil and gas, Technology, Telecommunications, Utilities.

rating agencies Moody's, Fitch and Standard&Poors. Given the likely non linear relation between the probability of default and the rating, we use a set of dummy variables, one for each rating grade.[13] The variable size is the log of the total assets, which is expected to negatively affect the bond spread: given their diversified activities large corporations (both financial and non-financial) are better positioned to reduce risks. In addition, their prominence for the domestic economy might make them able to benefit from the too-big-to-fail (TBTF) government support (Mishkin 2006, Kroszner 2016). In the same vein as for banks, the idea is that governments would not allow large corporations to go bankrupt if their failures were to bring about significant distress to the overall economic activity or even the domestic financial stability. It is thus assumed that governments will back the debt of these firms should they face significant financial stress (Ahmed et al. 2015).

Finally, in the set V_z^{market} of variables tracking the euro-area market mood, we have the VSTOXX index, which is a measure of the equity market volatility in the euro area (computed relying on both call- and put-implied volatilities from the DJ Euro STOXX 50 index), and the CISS (Composite Indicator of Systemic Stress), which is the systemic stress indicator for the euro-area financial market proposed by Hollo et al. (2012) and regularly updated at the weekly frequency by the ECB statistical data warehouse (SDW). In particular, we use the CISS sub-index for the bond market, which takes into account measures of both market liquidity and yield dispersion.[14] In

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

[14] The overall CISS index comprises 15 market-based financial stress measures concerning five broad market segments (financial intermediation, money market, equity market, bond market, foreign exchange market). The sub-index of the bond market segment is based on the realised volatility of the German 10-year benchmark government bond, the yield spread between A-rated non-financial corporations and government bonds, the value of the 10-year interest rate swap spread (Hollo et al. 2012).

addition, due to the presence of several episodes of extreme stress recorded over the crisis period and the changes in the political and macroeconomic conditions occurred over the selected time span in the euro area, we also rely on a set of quarterly time dummies. All in all, we expect that higher uncertainty is detrimental for corporate funding and thus leads to an increase in the ASW spread.

Table 3. Summary statistics[1]

	Obs	Mean	Median	Std. Dev.	Min	Max
ASW spread	7,001	187	116	188	-9.7	1,000
Bond maturity	7,001	3,772	2,503	5,906	175	36,540
Bond value	7,001	19.44	19.67	1.14	12.1	23.0
Bond in euros	7,001	0.64	1	0.48	0	1
Bond rating	6,100	13.2	13.0	3.7	1	20
Issuer size	7,001	71.2	10.1	130.7	0.001	1,519
Issuer rating	5,809	13.1	13.0	3.5	1	20
1-timer	7,001	0	0	0.21	0	1
Market sentiment	7,001	0.05	0.05	0.03	0.004	0.14
Market volatility	7,001	22.9	21.1	8.0	12.1	73.1

Source: Dealogic DCM Analytics, Thomson Reuters, Capital IQ, ECB. 1) ASW spread is the difference between the bond yield and the fixed-leg rate of a swap contract with the same maturity (basis points); Bond maturity is the maturity of the bond at issuance (days); Bond value is the log of the tranche value of the bond; Bond in euros is a dummy which takes 1 for euro-denominated bonds and 0 otherwise; Bond rating is the average of the bond rating by Moody's, Fitch and Standard&Poors linearized between 1 (CC/Ca) and 20 (AAA/Aaa); Issuer size is the log of the balance sheet value of all assets; Issuer rating is the average of the issuer rating by Moody's, Fitch and Standard&Poors linearized between 1 (CC/Ca) and 20 (AAA/Aaa); 1-timer is a dummy which takes 1 for corporations which issued only one bond and 0 otherwise, Market stress is the CISS bond index proposed by Hollo et al. (2012); Market volatility is the weekly average of the VSTOXX index.

Table 3 shows the basic statistics of the main variables employed. As for the data sources, we merged information from several providers in order to have a sample of 7,001 bonds issued by euro-area corporations over the period from January 2005 to May 2017. In particular, the ASW spread is taken from Thomson Reuters, balance sheet variables are sourced from

Capital IQ, issuance features come from DCM Analytics by Dealogic, the CISS Index from ECB SDW.[15]

5 Direct and indirect effects of the CSPP

As a first step in the assessment of the CSPP, we check whether the model consistently estimate the different sources of price determination and whether the set of bonds selected by the eligibility criteria was a preferred habitat before the announcement and actual deployment of the programme. Indeed, the literature analyzing the effects of quantitative easings has shown that the rebalancing channel is most effective when there are some frictions causing imperfect substitutability between assets (Vayanos and Villa 2009, Koijen et al. 2016, Gambetti and Musso 2017) and when the financial market is under stress (Altavilla et al. 2016). We thus introduce in the baseline model a variable mimicking the CSPP eligibility criteria, i.e. a dummy which tracks all the bonds which would have been labelled "eligible" before the launch of the programme.[16]

All regressions are run with fixed effects by country of residence, issuer rating and industry sector to take into account the different sources of heterogeneity in the euro-area corporate bond market. In addition also fixed effects by time period (quarters) are estimated to take into account the different market conditions over time, which in turn are influenced by the monetary policy stance.

The first column of Table 4 shows a broad consistency of our ex-ante

[15] We excluded from the sample the top 1% and the lower 1% of bonds according to the ASW spread as reported by Thomson Reuters. We also excluded the bonds issued by corporations whose total assets were negative. Given the paucity of data, we also excluded from the sample 50 bonds issued by other euro-area countries (Cyprus, Estonia, Latvia, Slovak Republic and Slovenia) for which all the variables were available.

[16] In other words, we rely on a dummy variable which takes 1 for euro-denominated bonds with an investment grade rating and a maturity between 1 and 30 years which are issued by a non-bank corporation established in the euro area and 0 otherwise.

expectations with the empirical results. The maturity at issuance has a positive and significant sign confirming the presence of a premium for the risk of holding a long-term security. The coefficient of the amount issued is negative, suggesting that the effect of improved liquidity prevails on the difficulty of placing a large issue. The investment grade dummy signals a large discount for bonds rate BBB- or above (251 basis points), while the euro denomination dummy in not significantly different from zero.

Table 4. Regression results: preferred habitat[1]

	(1)	(2)	(3)	(4)
Maturity	0.0061	0.0061	0.0056	0.0060
	[0.000]	[0.000]	[0.000]	[0.000]
Value	-5.9812	-5.9789	-5.8926	-10.702
	[0.022]	[0.021]	[0.045]	[0.001]
Bond IG	-251.12	-251.05	-246.27	-240.50
	[0.000]	[0.000]	[0.000]	[0.000]
Issuance in euros	-6.2117	-6.1345	8.9606	-4.6532
	[0.203]	[0.428]	[0.408]	[0.569]
Issuer size	-0.0523	-0.0523	-0.0545	-0.0353
	[0.010]	[0.000]	[0.000]	[0.000]
1-timer	50.208	50.206	49.756	49.157
	[0.000]	[0.000]	[0.000]	[0.000]
CISS index	154.96	154.95	132.95	135.84
	[0.37]	[0.370]	[0.494]	[0.543]
Market volatility	0.0547	0.0547	-0.0253	-0.6514
	[0.928]	[0.928]	[0.969]	[0.401]
CSPP habitat		-0.1136	-13.239	-11.451
		[0.989]	[0.283]	[0.202]
FE by country	YES	YES	YES	YES
FE by sector	YES	YES	YES	YES
FE by rating	YES	YES	YES	YES
FE by quarter	YES	YES	YES	YES
FE by coupon	YES	YES	YES	YES
$\mathbf{R^2}$	0.680	0.680	0.673	0.720

1) Dependent variable: ASW spread; robust standard errors are clustered by issuer; regression includes FE by country, sector, issuer rating and time period (quarter); *p*-value in parentheses. Bond IG is a dummy which takes 1 for "investment grade" bonds (rated BBB- or above) and 0 otherwise; CSPP habitat is a dummy which takes 1 for bonds which are euro-denominated, investment grade, with a maturity within the range 1-30 years and issued before March 10, 2016 and 0 otherwise. For all other variables' definition see Table 3. Columns (1)-(2) include 7,001 observations (2005M1-2017M5); column (3) includes 5,979 observations (2005M1-2016M2); column (4) includes 3,572 observations (2013M1-2017M5).

As far as the issuer characteristics are concerned, the coefficient on size is significant and negative. Estimates thus confirm the existence of a bias in favour of issuers of larger dimension. As already explained, larger corporations are able to get a discount on their issues, not only because they tap more often the bond market and are able to diversify risks, but also because their absolute and relative dimension make them of (domestic) systemic relevance and beneficiary of the too-big-to-fail support. At the same time, being a 1-timer is costly: they pay an increased ASW spread of 50 basis points.

Finally, the two indicators of market sentiments are not significantly different from zero, suggesting that the set of quarterly dummies adequately proxies the market conditions at the time of issuance.[17]

When the variable mimicking the CSPP eligibility criteria (CSPP habitat) is introduced, the estimated coefficient is not significantly different from zero (column 2). To check for the robustness of this result we also look at two other time samples (2005M1-2016M2 and 2013M1-2017M5 in column (3) and (4), respectively). Estimation results confirm that the segment identified by the CSPP cannot be considered a preferred habitat by bond market agents. According to previous studies (Vayanos and Villa 2009, Gambetti and Musso 2017) this in turn may hamper the unfolding of the rebalancing channel, which operates faster when there are market segmentations.

Since the aims of the CSPP is to improve the corporate funding conditions in the bond market, we analyze the evolution of the quarterly time dummies, which are a proxy of the overall market conditions and are thus influenced by the ECB measures. Table 5 reports the estimated coefficients from the baseline regression starting from 2016Q1 (column 1). The improvement from

[17] The strong cross-country heterogeneity and segmentation along national borders documented in Section 3 clearly emerges from the estimates of the country dummies (results not reported, available upon request). For four of the countries most involved in the sovereign debt crisis in 2010-2012 (Greece, Italy, Portugal and Spain) the coefficient is positive and statistically significant, suggesting an increased cost of funding enterely due to the residence of the issuer. For Ireland instead, the coefficient is not significant due to a faster recovery started in 2012.

the first quarter to the second one is large (25 basis points) and statistically significant ($p = 0.032$), confirming the immediate positive effect of the CSPP announcement on market mood and bonds' ASW spread.[18] Surprisingly, in the two following quarters, the changes in the estimates are not statistically significant, hinting at unchanged funding conditions, notwithstanding the purchases under the CSPP. The improvement in the market resume in 2017 only, for a total amount of 44 basis points. In order to give an interpretation to this somewhat puzzling evidence we have to delve further into the effects of the CSPP purchases. In particular, we have to assess separately the evolution in the funding conditions of the two market segments: eligible bonds and non-eligible bonds.

A straightforward way to test the direct effect of the CSPP on the corporate bond pricing is to estimate whether being an eligible bond affects the ASW spread. We thus introduce among the exogenous variables a dummy tracking all the eligible bonds issued from the start of the programme. The coefficient is estimated at 28.5 basis points, hinting at a large discount in the ASW spread at issuance on eligible bonds, regardless of the actual buying from the Eurosystem (Table 5, column 2).[19] At the same time, while slightly deteriorating in 2016Q3 and 2016Q4, the coefficients on the time dummies do not signal a significant change in the funding conditions for the rest of the market before 2017Q1.

[18] Given that the CSPP was announced in early March, and that the effect on secondary market trades was very fast (as reported in Figure 1, in Section 2), the 2016Q1 coefficient may well already incorporate an improvement in the funding conditions. This in turn means that the market progress in 2016Q2 may be somewhat underestimated. Another possible source of underestimation may come from the fact that the analysis focuses on the spread from a risk-free rate. If the CSPP were able to reduce also that rate the overall effect would be larger than estimated.

[19] Over the 12 months from June 2016 to May 2017, the average ASW spread was 169 basis points. The estimated coefficient thus points to a discount of 18%.

Table 5. Regression results: rebalancing channel[1]

	(1)	(2)	(3)	(4)	(5)
Maturity	0.0061	0.0060	0.0060	0.0060	0.0060
	[0.000]	[0.000]	[0.000]	[0.000]	[0.0060]
Value	-5.9812	-5.9341	-6.0436	-5.8694	-5.9878
	[0.022]	[0.022]	[0.020]	[0.023]	[0.022]
Bond IG	-251.12	-248.83	-249.22	-248.96	-249.33
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Issuance in euros	-6.212	-3.7004	-3.663	-3.680	-3.658
	[0.203]	[0.453]	[0.459]	[0.456]	[0.460]
Issuer size	-0.052	-0.053	-0.053	-0.053	-0.053
	[0.010]	[0.000]	[0.000]	[0.000]	[0.000]
1-timer	50.208	50.527	50.373	50.491	50.340
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
CISS index	154.96	162.21	171.28	161.74	170.80
	[0.370]	[0.346]	[0.315]	[0.347]	[0.317]
Market volatility	0.0547	0.0760	0.0776	0.0745	0.0781
	[0.928]	[0.900]	[0.898]	[0.902]	[0.898]
CSPP eligible		-28.471		-22.274	
		[0.001]		[0.022]	
CSPP bond				-12.873	-11.281
				[0.133]	[0.1501]
2016Q1	81.828	80.985	80.486	80.989	80.470
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
2016Q2	56.665	58.311	56.415	58.438	56.699
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
2016Q3	53.419	65.133	79.519	65.472	79.489
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
2016Q4	50.925	65.006	75.089	65.115	75.131
	[0.002]	[0.000]	[0.001]	[0.000]	[0.001]
2017Q1	22.031	35.351	23.105	35.649	23.110
	[0.174]	[0.047]	[0.254]	[0.045]	[0.254]
2017Q2	6.925	19.753	10.626	19.334	10.629
	[0.642]	[0.229]	[0.586]	[0.239]	[0.586]
2016Q3*CSPP eligible			-64.560		-58.361
			[0.000]		[0.000]
2016Q4*CSPP eligible			-49.146		-43.623
			[0.016]		[0.037]
2017Q1*CSPP eligible			-3.049		2.926
			[0.848]		[0.859]
2017Q2*CSPP eligible			-8.999		-4.400
			[0.591]		[0.798]
R^2	0.680	0.681	0.681	0.681	0.681

1) Dependent variable: ASW spread; included observations: 7,001; robust standard errors are clustered by issuer; regression includes FE by country, sector, issuer rating and time period (quarters); *p*-value in parentheses. CSPP eligible is a dummy which takes 1 for bonds eligible under the CSPP and 0 otherwise; CSPP bond is a dummy which takes 1 if the bond has been purchased under the CSPP and 0 otherwise. For all other variable definitions see Table 3.

In order to assess whether this direct effect on eligible bonds was constant over time and whether it did spill over to non-eligible bonds through

the possible working of the portfolio rebalancing channel, we interact the variable tracking eligible bonds with the time dummies. By looking, quarter by quarter, at the coefficient on this interaction we can follow the evolution over time of the direct effect on eligible bonds. At the same time, the indirect effect on non-eligible bonds can be assessed by looking at the estimated time dummies. Given that in each quarter the differential effect between eligible and non-eligible bonds is taken into account by an ad hoc variable (the "CSPP eligible" dummy), the changes (quarter by quarter) in the coefficient on the "pure" quarterly dummies measure the effect of the programme on non-eligible bonds only.

Results show that the direct effect on eligible bonds was entirely concentrated and very large in the first two quarters of purchases: it amounts to 65 basis points in 2016Q3 and to 49 basis points in 2016Q4. It completely disappeared in 2017 (Table 5, column 3). Instead, in the second half of 2016, non-eligible bonds witnessed a significant deterioration in the market conditions, which entirely quashed the announcement effect recorded in 2016Q2. However, after six months within the programme, the positive effect spills over also to non-eligible bonds, with the two segments improving by 65 basis points with respect to 2016Q4.

We now have a clearer picture of both direct and indirect effects, which is fully consistent with the previous research on the working and timing of the portfolio rebalancing channel (Krishnamurthy and Vissing-Jorgensen 2011, Hancock and Passmore 2011, Andrade et al. 2016). While in 2016Q2 the whole primary corporate bond market benefited from the announcement of the CSPP, the deployment of the programme led to a large and significant improvement in eligible bonds only. Non-eligible bonds actually witnessed a deterioration in the placement conditions, with the estimated coefficients for 2016Q3 and 2016Q4 back at the pre-announcement levels. Conversely, after six months within the programme, the rebalancing channel kicks in involving also non-eligible bonds. The scarcity of assets in the eligible bond segment

brought about the large ECB purchases (and the consequent increase in their prices) pushed investors to buy other assets, in particular non-eligible bonds. Indeed, in 2017 the whole non-bank corporate sector benefited from a similar improvement in the funding conditions. Eventually, the programme was successful in influencing the yield on all non-bank bonds.[20]

A further feature of the programme which is worth investigating is whether the bonds actually purchased were able to get a better price (smaller ASW spread) than the other eligible bonds.[21] The estimated coefficient however is not significantly different from zero, suggesting that the CSPP had a positive effects on all eligible bonds reducing the cost of funding of non-bank corporations, but it did not introduce any distortion regarding the bonds actually bought (Table 5, column 4). This evidence is confirmed also when the interaction between the variables tracking the eligible bonds and the time dummies is maintained (Table 5, column 5).[22]

6 Robustness

In this section we provide some robustness checks. They concern the role of the sovereign and the choice of the regressors and the time sample. For ease of exposition, we rely on semiannual time dummies instead of quarterly

[20] Also when looking at the total issuance volume, there is the consistency with the timing of the portfolio rebalancing channel. In the context of growing bond placement since the announcement of the programme, the volume share of eligible bonds significantly increased in 2016Q3 and 2016Q4 to reach almost 60% of the total market. Conversely, it steadily declined in the two following quarters to 49%, a value close to the pre-CSPP period (47% in 2015).

[21] The list of bonds actually purchased on the primary market is not publicly available. They can be inferred from the list of bonds "available for lending" from the website of the six central banks involved in the CSPP purchases, which is updated weekly. More precisely, we label a bond as purchased on the primary market when it appears for the first time on the weekly list and has a settlement date in that week.

[22] The dummy traking the bonds actually purchased on the primary bonds market is not significantly different from zero in any quarter (regression not shown for the esase of esposition).

dummies. The baseline results we want to check are: a discount of 57.8 basis points in 2016H2 for the ASW on eligible bonds (which then disappears), and a drop of 56.4 basis points in 2017H1 for both eligible and non-eligible bonds (Table 6, column A).[23]

In times of market stress, the deterioration of the sovereign creditworthiness may spill over to domestic corporations, negatively affecting their funding conditions (Diaz et al. 2013, Ferrando et al. 2015, Bedendo and Colla 2015). Given the long period of sovereign debt turmoil included in our sample (2010-2012), we check whether sovereign creditworthiness influences our results. As a proxy of the sovereign stress we use four different variables involving ratings, credit default swap (CDS) spreads and yield spreads. As done for firms' rating, we rely on the rating provided by the three most important rating agencies (Moody's, Fitch and Standard&Poors) and employ both a set of dummy variables (one for each rating grade) and a linearization between 1 (CC/Ca) and 20 (AAA/Aaa). Sovereign CDS spreads refer to the 5-year maturity and are sourced from CapitalIQ. Yield spreads are constructed as the difference between the yield on the 10-year Bund and each 10-year sovereign benchmark bond (OAT, BTP, Bonos...), sourced from Bloomberg.

The introduction of the sovereign creditworthiness does not influence the results concerning the effect of the CSPP on both eligible and non-eligible bonds (Table 6, columns 1-4). However, the sovereign variable is always significantly different from zero, confirming the existence of a role for the sovereign in the market pricing of corporate bonds. For instance, a downgrade of the sovereign rating by one notch increases the corporate ASW spread by 5.5 basis points, or an increase of 100 basis points in the spread to Bund increases the ASW spread by 20 basis points.

[23]The results are in line with the estimates reported in Table 5 column 3, which are based on an identical regression except for the time dummies (quarter vs half year). In this section we report only regressions' results concenrning the effects of the CSPP. Full regressions'results are available upon request.

Table 6. Robustness regressions (2005H1-2017H1)[1]

	(A)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression coefficients									
2016H2*CSPP eligible	-57.78	-58.72	-57.93	-58.22	-56.89	-51.55	-54.66	-56.91	-57.24	-56.57
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
2017H1*CSPP eligible	-4.812	-5.887	-4.190	-5.412	-7.001	-7.405	-13.49	-5.022	-5.022	-5.121
	[0.690]	[0.629]	[0.725]	[0.654]	[0.559]	[0.485]	[0.131]	[0.678]	[0.677]	[0.672]
2016H1	63.21	50.38	49.60	62.60	53.37	29.03	57.33	75.85	68.73	78.50
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]
2016H2	78.70	66.54	64.36	78.28	68.70	50.22	62.32	90.37	83.30	92.72
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.009]	[0.000]	[0.000]	[0.000]	[0.000]
2017H1	22.31	10.04	7.95	21.80	11.57	2.055	16.76	37.72	26.34	39.07
	[0.197]	[0.551]	[0.650]	[0.205]	[0.495]	[0.878]	[0.141]	[0.018]	[0.130]	[0.014]
	Wald T-test									
17H1-16H2	-56.39	-56.50	-56.41	-56.48	-57.13	-48.17	-45.55	-52.66	-56.96	-53.65
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.003]	[0.000]	[0.000]	[0.000]

1) Dependent variable: ASW spread; robust standard errors are clustered by issuer; regression includes FE by country, sector, issuer rating and time period (half year); *p*-value in parentheses. Column (A) is the baseline regression; columns (1)-(2) include the sovereign rating as a set of dummy variables and as a variable linearized between 1 (CC/Ca) and 20 (AAA/Aaa), respectively; column (3) includes the 5-year sovereign CDS; column (4) includes the sovereign 10-year bond spread to Bund; columns (5)-(6) include the bond rating as a set of dummy variables and as a variable linearized between 1 (CC/Ca) and 20 (AAA/Aaa), respectively; column (7) includes the VIX index; column (8) includes the euro-area credit risk index by Gilchrist and Mojon (2014); column (9) includes the EPU index by Baker et al. (2016). 17H1-16H2 is the Wald T-test testing the null hypothesis that the difference between the estimated coefficients 2017H1 and 206H2 is not different from 0. Included observations 7,001 (column (6) 6,100 observations).

A further robustness check concerns the choice of the regressors, in particular those about the bond rating and the indices of market volatility and stress. Regarding the bond rating, we drop the variable tracking the investment grade bonds and use instead the true bond rating. We rely again on both a linearization of the ratings and a set of dummy variables. While the use of dummy variables allows the full exploitation of the dataset, the linearization implies a reduction of the dataset to 6,100 issues, since not all bonds are assessed by the top three rating agencies. The results for the CSPP impact on eligible bonds are in line with the baseline regression at 55 and 52 basis points, respectively (column 5 and 6), the impact on non-eligible is

instead just slightly smaller at 46 and 48 basis points.

The variables proxying the market mood used in column 7 and 8 are the VIX index instead of the VSTOXX and the credit risk indicator for euro-area non-financial corporations by Gilchrist and Mojon (2014) instead of the CISS index. Finally, in column 9, we add to the baseline regression the Economic Policy Uncertainty (EPU) index by Baker et al. (2016). Results are not affected by the change.[24]

Table 7. Robustness regressions (2013H1-2017H1)[1]

	(A)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Regression coefficients									
2016H2*CSPP eligible	-60.99	-61.64	-59.23	-58.87	-60.42	-57.89	-57.12	-58.07	-59.02	-57.70
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
2017H1*CSPP eligible	-4.803	-4.987	-4.990	-5.117	-5.900	-6.049	-9.95	-4.702	-4.880	-5.045
	[0.708]	[0.629]	[0.725]	[0.654]	[0.559]	[0.485]	[0.131]	[0.678]	[0.677]	[0.672]
2016H1	-6.806	-5.938	-5.496	-7.260	-6.698	-12.66	-9.256	-11.48	-9.243	-10.45
	[0.482]	[0.523]	[0.601]	[0.382]	[0.416]	[0.704]	[0.333]	[0.221]	[0.422]	[0.381]
2016H2	2.143	3.044	1.325	2.783	1.298	-0.013	-0.221	1.937	2.330	2.972
	[0.878]	[0.633]	[0.678]	[0.790]	[0.651]	[0.701]	[0.555]	[0.493]	[0.643]	[0.576]
2017H1	-60.11	-61.43	-60.95	-59.95	-61.46	-59.10	-58.76	-61.30	-60.93	-61.65
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
	Wald T-test									
17H1-16H2	-62.25	-64.47	-62.27	-62.73	-62.76	-59.08	-58.54	-63.24	-63.26	-64.62
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.003]	[0.000]	[0.000]	[0.000]

1) Dependent variable: ASW spread; robust standard errors are clustered by issuer; regression includes FE by country, sector, issuer rating and time period (half year); *p*-value in parentheses. Column (A) is the baseline regression; columns (1)-(2) include the sovereign rating as a set of dummy variables and as a variable linearized between 1 (CC/Ca) and 20 (AAA/Aaa), respectively; column (3) includes the 5-year sovereign CDS; column (4) includes the sovereign 10-year bond spread to Bund; columns (5)-(6) include the bond rating as a set of dummy variables and as a variable linearized between 1 (CC/Ca) and 20 (AAA/Aaa), respectively; column (7) includes the VIX index; column (8) includes the euro-area credit risk index by Gilchrist and Mojon (2014); column (9) includes the EPU index by Baker et al. (2016). 17H1-16H2 is the Wald T-test testing the null hypothesis that the difference between the estimated coefficients 2017H1 and 206H2 is not different from 0. Included observations 3,572 (column (6) 2,991 observations).

A final check concerns the time sample: we replicate the baseline re-

[24] Also any other combination of two or more of the indices of bond market stress, equity volatility and political uncertainty failed to bring significant changes to the baseline results.

gression and all the robustness checks reported in Table 6 for the period 2013H1-2017H1. This shorter time span shows more homogeneous market conditions than the overall period 2005H1-2017H2, since it does not include the two waves of the crisis. The baseline estimations of the effect of the CSPP are reported in Table 7 column A: a discount in the ASW spread of 61 basis points in 2016H2 for eligible bonds only, and an further reduction of 62 basis points in 2017H1 for both eligible and non-eligible bonds. The estimates are just few basis points larger than when relying on the whole time sample. In addition, all robustness regressions concerning the role of sovereign, the bond rating and the stress indicators confirm the results of the previous Section: the CSPP sizably affected the price of eligible bonds from the beginning, reducing their ASW spread, whereas the change of non-eligible bonds' price happened at a later stage. The reported market development is again fully consistent with the working of the portfolio rebalancing channel.

7 Concluding remarks

The paper provides an early assessment of the effects of the corporate arm of the ECB quantitative easing named CSPP. The programme, which was announced in March 2016, had an immediate effect on bond trades on the secondary market before the actual start (June 2016). The decline in the yield spreads was more pronounced on eligible bonds, but it was also evident on non-eligible bonds.

Since the announced aim of the programme is to sustain the pass-through of the accommodative monetary policy stance to the funding conditions of non-bank corporations, the analysis focuses on the primary bond market, which is the place where the cost of funding is set in the first instance. By looking at the ASW spread on 7,001 security placements, we are able to detect: i) an announcement effect of 25 basis, which involves both eligible and non-eligible bonds; ii) an initial direct effect of the CSPP purchases on

eligible bonds only; iii) a later indirect effect on non-eligible bonds through the portfolio rebalancing channel.

In the second half of 2016, in a context of growing bond placements (55% with respect to the same period of 2015), the share of eligible bonds rises to 60%, most likely to reap the benefit of the increased demand due to the ECB purchases. Indeed, the direct effect of the CSPP is very strong: the difference in the ASW spread between eligible and non-eligible bonds is estimated at 69 basis points in 2016Q3 and 49 basis points in 2016Q4.

The picture changes in the first 5 months of 2017. While bond placements are still growing, the share of eligible bonds goes back almost to the pre-CSPP level (47%). The positive effects of the programme spills over to non-eligible bonds: the difference in the ASW spread between the two segments disappears. In 2017, both eligible and non-eligible bonds benefit from an improvement in the funding conditions: the estimated declines in the ASW spread amounts to 56 basis points.

The empirical evidence gathered for the corporate arm of the ECB quantitative easing is thus in line with the timing and the working of the portfolio rebalancing channel reported for other nonstandard measures (Koijen et al. 2016, Krishnamurthy et. al 2017, Gambetti and Musso 2017). The CSPP, in the first months of purchases, exerted an upward pressure on the price of targeted bonds, while other bonds were almost unaffected. Over time, with declining returns in eligible bonds, investors had the incentive to shift their investments towards assets with higher expected return (non-eligible bonds). As a consequence also the price on non-eligible bonds eventually increased and the difference in the ASW spread with respect to eligible bonds vanished

All in all, the paper suggests that the CSPP has exerted in the first year of purchases a positive and significant effect on the whole non-bank corporate bond market. Indeed, through different channels (announcement, direct, and portfolio rebalancing) it affected both eligible and non-eligible bonds.

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