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# Investment Response to Monetary Policy in a Low Interest Rate Environment: Evidence from the ECB's Corporate QE

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# Investment Response to Monetary Policy in a Low Interest Rate Environment: Evidence from the ECB's Corporate QE <sup>\*</sup>

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## Abstract

We study how an easing in corporate bond funding conditions affect the asset structure of firms' fixed assets. This paper employs ECB's Corporate Sector Purchase Program as a quasi-natural experiment that reduces bond yields for firms eligible to ECB purchases. We identify eligible firms using information on their bond ratings. Using consolidated balance sheet information on non-financial firms in France, we find that firms increase investment expenses but only to replace existing assets, whether tangible and intangible, instead of investing in new equipment to grow in scale. This replacement is however not homogeneous across asset classes, since intangible assets increase in importance relative to tangible ones. The shift towards intangible assets is stronger for firms with a BBB rating than for safer firms (AAA-A rating). This suggest that while BBB rated firms were to some extent constraint in their funding, they do not use the proceeding to reinforce the collateral value of their assets. These effects are robust to the inclusion of several fixed effects. We conclude that an easier access to market debt can have an effect on the mix of fixed assets used by firms to produce. This raises questions as to whether firms eligible to CSPP purchases increased their productivity since new equipment can be more efficient than the deprecated ones.

*Keywords:* CSPP, bond issuances, monetary policy, credit risk, investment

**JEL codes:** D24, E52, G01, G32.

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<sup>\*</sup>The views expressed herein are those of the authors and do not necessarily reflect those of the Banque de France or the Eurosystem.

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# 1 Introduction

Advanced economies have faced a major decline in the interest rate over the last four decades (Laubach and Williams, 2003; Del Negro, Giannone, Giannoni, and Tambalotti, 2019). According to Rachel and Smith (2017), long-term real interest rates have declined by around 450 bps across both emerging and developed economies since the 1980s. The fact that such a large drop occurs in a period of low and stable inflation suggests that observed rates follow a decline in the unobserved “natural” interest rate. The low level of natural interest rate contributes to explaining the massive recourse of central banks worldwide to unconventional monetary policy measures over the last decade, despite the challenges they raise to financial stability, such as excessive risk taking by investors or depressed banks’ financial soundness due to weak net interest margins (Borio and Zhu, 2012; Adrian and Shin, 2010; Farhi and Tirole, 2012; Chodorow-Reich, 2014; Jiménez, Ongena, Peydró, and Saurina, 2014; Ioannidou, Ongena, and Peydró, 2014; Martinez-Miera and Repullo, 2017; Altavilla, Boucinha, and Peydró, 2018; Brunnermeier and Koby, 2018; Heider, Saidi, and Schepens, 2019). The worldwide recession due to the COVID-19 pandemic and the ensuing lockdown decisions led both governments and central banks to engage in large programs so as to support the economic activity. This translates in further monetary easing implemented, among others, by large scale asset purchases.

An effect of lower interest rates is to reduce the discounting rate applied to future cash flows, hereby supporting their net present value. This incentivizes firms to invest in projects that maximize future cash flows by boosting productivity. This line of reasoning is mitigated by the observation that lower rates do not necessarily lead to higher productivity. When capital inflows are channeled towards firms that have a higher net worth but that are not necessarily more productive, this leads to a decrease in total factor productivity (Kiyotaki and Moore, 1997; Restuccia and Rogerson, 2008; Hsieh and Klenow, 2009; Gopinath, Kalemli-Özcan, Karabarbounis, and Villegas-Sanchez, 2017). Potential explanations for such capital misallocation abound, including frictions in the banking system (Caballero, Hoshi, and Kashyap, 2008; Martinez-Miera and Repullo, 2017; Liu, Wang, and Xu, 2021), or in the overall financial sector (Kaat, 2021). How monetary stimulus affect investment among different types of assets?

In this paper, we empirically investigate how an easing firms’ funding conditions that is not due to improved firms’ fundamentals affects the structure of their fixed assets. To do so, we first check that a monetary policy easing in a low rate environment leads to an overall higher investment. This is especially true for firms with a higher credit risk, because they enjoyed a larger drop in the borrowing rates (Abidi and Ixart, 2018; Grosse-Rueschkamp, Steffen, and Streitz, 2019; De Santis and Zaghini, 2021). Hence not all firms react to a monetary policy shock in the same way, in line with recent studies (Gilchrist and Zakrajsek, 2013; Javadi, Nejadmalayeri, and Krehbiel, 2017; Berndt, Douglas, Duffie, and Ferguson, 2018). We then show that credit risk not only affects the quantity of investment but also the type of assets acquired. Firms with lowest credit risk use external growth to acquire more intangibles assets (R&D, human capital, knowledge capital...) and pay higher goodwill in the process.

We use the Corporate Sector Purchase Program ran by the ECB as a quasi-natural experience.

Against concerns on price stability, ECB purchases of debt securities issued by euro area non-financial corporations were announced in March 2016 and started in June 2016. Bonds eligible for purchase must be investment grade for at least one rating agencies among the four largest ones (S&P, Moody's, Fitch Ratings, or DBRS) and must be issued in euro. The peculiarity of this monetary easing is that it is not channeled to firms by financial intermediaries. Its' effects are therefore not altered by the bank lending channel of monetary policy. The program led to an increase in demand for corporate bonds, lower yields and ultimately more market debt in the balance sheet of eligible firms (Grosse-Rueschkamp, Steffen, and Streitz, 2019).

We exploit the annual consolidated balance sheet information on non-financial groups of firms in France from 2013 to 2018. These data come from the FIBEN-groupes database, which reports, for each group, the amounts of tangible assets, intangible assets, goodwill, fixed assets, as well as bank debt and outstanding securities issued. Consolidated data is of importance to study the question at hand, because bond funding decisions and major investment decisions may be decided by the parent company while implemented by subsidiaries. In such cases, intra-group lending and intra-group flows of investment would blur the association between investment and bond funding in an analysis at the subsidiary-level. This data also allows us to trace changes in groups perimeters over time, for instance because of a firm acquisition.

In parallel, we collect information on bonds rating for French groups via Thomson Reuters. Balance sheet data provides us with a sample of 1,298 groups with public debt throughout the sample. The merger with the bond rating data allows us to distinguish eligible groups from the ineligible ones, as well as the time at which a group becomes eligible. About 51 groups were eligible at some point of time. Conversely, a minimum of 593 groups were always ineligible<sup>1</sup>, for instance because their ratings were always below investment grade, or because their public debt have never been rated by one of the major agencies. We can hence compare the investment behavior of firms depending on whether they could directly benefit from the CSPP.

Our baseline analysis assesses how a higher demand for corporate bonds modified assets tangibility in firms balance sheets. We first relate a firm's assets structure to a dummy indicating the firm's current eligibility status, a post-CSPP dummy and their interaction. Differences in ratio of tangible assets, or intangible assets, over fixed assets is explained by our measure of bond eligibility to ECB purchases interacted with the timing of these purchases. Our sample comprises firms with public debt, excluding real estate and financial firms. This allows us to compare shifts in assets tangibility across very heterogeneous sectors. The CSPP-induced caused rise in the intangible is mainly driven by firms with the best credit ratings. Furthermore, the same firms also increased more their goodwill, which shows that they purchased assets for a higher price than their accounting value. Because goodwill increases only when an existing business is acquired, these results altogether are consistent with the notion that cheaper market debt is used by safer firms to fund their external growth. The model also includes, in its most saturated form, industry interacted with year fixed effects, along with firm fixed effects. Industry interacted with year fixed effects control for industry-specific

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<sup>1</sup>The sample for ineligible groups varies from year to year, i.e., from 2013-2016, there was approximately 850 ineligible groups and in the year 2017, there was about 725 ineligible groups.

aggregate dynamics. We also control for firm bond portfolio. Indeed, if it comprises corporate bonds, its value may increase with the CSPP and generate capital gains that might be used by the firm to fund investment projects. Because we are interested solely in the effect of an easier bond funding, we control for this potential confounding factor.

Our paper contributes to the analysis of firm behavior in a low interest rate environment. Dynamic competition literature shows that firms in the same industry compete along two dimensions : intra-temporally through price competition, and inter-temporally through productivity enhancing investments (Aghion, Harris, Howitt, and Vickers, 2001). Following a decrease in interest rates, all firms are incentivized to invest but not the same extent. Technological laggards are incentivized to invest to close the productivity gap with the market leader, which makes the larger profit in the industry. Liu, Wang, and Xu (2021) show that when interest rate are low, the net present value of being persistently a market leader is especially high. Market leaders are hence encouraged to invest more aggressively relative to market followers, to avoid a costly neck-and-neck competition. This gives ground to some observed anti-competitive behaviors such as defensive R&D or predatory acquisitions (Cunningham, Ederer, and Ma, 2021). Such practices are also consistent with the literature on corporates' internal capital market, in which companies' headquarters can do some "winner picking" among competing projects and reallocate resources so as to fund projects with the highest expected returns (Stein, 1997; Khanna and Tice, 2001; Mathews and Robinson, 2008). By highlighting the rise in the intangible and goodwill for firms with best credit rating, which are typically large firms, our results suggest that some race for productivity advantage through external growth took place in the years following the beginning of asset purchases by central bank.

Our work contributes to the literature on the effect of unconventional monetary policy and especially asset purchases. By increasing bond demand, large scale asset purchases by central banks reduce yields (Kryshnamurthy and Vissing-Jorgensen, 2011; Koijen, Koulischer, Nguyen, and Yogo, 2021). This raises the value of assets held by balance sheet-impaired sectors, and ultimately supports economic activity and prices (Brunnermeier and Sannikov, 2016). The effect of corporate bond purchases through the CSPP on bond issuances and yields are studied in (Abidi and Ixart, 2018; Zaghini, 2019; Todorov, 2020; De Santis and Zaghini, 2021). As preliminary step in our study, we show that this materializes also in firms' balance sheet. Firms whose bonds were eligible to ECB purchases issued more market debt and decreased their demand for bank loans. This relaxed banks' lending constraints, who reallocated loans to firms that did not benefit directly from the CSPP (Grosse-Rueschkamp, Steffen, and Streit, 2019; Arce, Mayordomo, and Gimeno, 2020; Ertan, Kleymentova, and Tuijn, 2020). These are typically firms whose bonds were ineligible to ECB purchases or without access to the bond market. Grosse-Rueschkamp, Steffen, and Streit (2019) and De Santis and Zaghini (2021) show that eligible firms use the additional funds raised through new market debt not for expenditures, but instead to invest in non-capital expenditures (purchases of securities, repurchase of stocks, cash holding and other short term financial investments). We focus instead on the program's effect on eligible firms' fixed assets (under a larger time window? on larger firms?).

Our paper also contributes to study of the paradoxical relationship between debt and assets tangi-

bility. While debt funding is made more costly by a lack of tangible collateral, it is made cheaper by the prospects of improved productivity. A literature supports the view that new security issuances are typically not lemons but signal instead new viable investment opportunities. Managers are hence incentivized to maximize returns by exploiting opportunities delivering more growth options. Such growth opportunities are more prevalent among firms investing in R&D, human capital or knowledge capital (Zingales, 2000). A reason for it is that intangible inputs, while resulting from significant investment in R&D or training, can be replicated at a marginal cost much below the marginal cost of tangible inputs (Haskel and Westlake, 2018). Our results support the view that in a low interest rate environment, a monetary policy easing reduces information asymmetries on growth opportunities. Otherwise, frictions due to information asymmetries on the value of intangible assets as a collateral would have channeled funds towards investment in tangible assets.

The paper is organized as follows. Section 2 presents the institutional framework of the CSPP. We detail the datasets we use, how we build our measurement of CSPP exposure, and provide some evidence that the CSPP is a bond funding relief shock in Section 3. Section 4 presents our empirical strategy. We analyze the effect of the CSPP on firms' investment decisions and the structure of their assets in Section 5. Section 6 concludes.

## 2 Institutional background : the Corporate Sector Purchase Program

In the wake of the 2007-09 global financial crisis and the 2011-2012 euro area sovereign debt crisis, policy rates decreased in the euro area and became even negative in 2014. Facing an inflation persistently below the 2% target and given that policy rates were already at an all time low, the European Central Bank (ECB) adopted unconventional measures including various asset purchase programs. Through these programs, central banks purchase either sovereign bonds, covered bonds or asset backed securities. These programs were initiated in early 2015. They were followed by the Corporate Sector Purchase Program (CSPP), announced on March 10, 2016. The actual purchases started on June 8, 2016 and still continue currently.

The CSPP consists of purchases by the Eurosystem of investment-grade euro-denominated bonds issued by non-bank corporations and are carried out by six Eurosystem national central banks (NCBs): Nationale Bank van Belgie/Banque Nationale de Belgique, Deutsche Bundesbank, Banco de Espana, Banque de France, Banca d'Italia and Suomen Pankki/Finlands Bank. The purchases were conducted by individual central bank in the primary and secondary market.<sup>2</sup> and each NCB was allocated market segments for purchases under the CSPP according to the geographical location of the issuer.<sup>3</sup> In addition, national central banks are only allowed to buy up to 70 percent of the outstanding amount, and on the issuer-group level, there is an unspecified cap to ensure "a diversified

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<sup>2</sup>It was decided by the ECB that no primary market purchases will involve debt instruments issued by entities that qualify as public undertakings.

<sup>3</sup>See <https://www.ecb.europa.eu/mopo/implement/app/html/cspp-qa.en.html> for further information on the market segment for each NCB.

allocation of purchases across issuers”.

To ensure a diversified allocation of purchases across issuers and avoid distortion in bond liquidity, purchases comply with rules.<sup>4</sup> Eligibility conditions include that the issuer must be a non-financial corporation established in the euro area, defined as the location of incorporation of the issuer. Furthermore, the bond must have a minimum first-bet credit assessment, obtained from an external credit assessment institution among S&P, Moody’s, Fitch Ratings or DBRS, of at least BBB- or equivalent. This ensures that central bank purchase only bonds whose issuer is investment grade. Additional criteria specify that eligible bond must be denominated in euro and have a minimum remaining maturity of six months.

### 3 Data

This section presents the datasets we use : firm balance sheet information and bond-level rating information. We then explain how we merge and clean these datasets for the purpose of our study.

#### 3.1 Firm balance sheet data

The tangibility of firms’ assets is measured using balance sheet data on non-financial groups of firms collected by the Banque de France (FIBEN). FIBEN is a large database that draws on annual tax statements, including balance sheets, profit and loss accounts, and cash flow statements. It covers all companies in France with an annual turnover over EUR 0.75 million or with a bank loan of at least EUR 0.38 million. We exploit the subsample of the annual consolidated balance sheet. Having access to consolidated data is important here, because bond funding decisions and major investment decisions may be decided by the parent company while implemented by subsidiaries. In such cases, intra-group lending and intra-group flows of investment would blur the association between assets composition and bond funding in an analysis at the subsidiary-level. Consolidation is mandatory for listed groups and for groups above some legal threshold, which were modified in 2016. More specifically, consolidated statements are mandatory for groups exceeding two of the following thresholds : more than EUR 15 mns of total assets, more than EUR 30 mns of net income and more than 250 workers before 2016. From 2016 onward, the first two thresholds were raised to EUR 24 mns and EUR 48 mns respectively. Consolidation can also be voluntary, for instance for groups willing to improve their transparency to ease their funding conditions. Consolidated statements can follow either the international financial reporting standards (IFRS) accounting rules or the French accounting rules.

This data provides us with information on capital expenditures in fixed assets. It also reports the amounts of tangible assets, intangible assets, financial assets, fixed assets and securities held in portfolio. We compute the net values for the different types of fixed assets by subtracting their

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<sup>4</sup>The ECB set forth certain bond and issuer eligibility conditions that can be found: [https://www.ecb.europa.eu/press/pr/date/2016/html/pr160421\\_1.en.html](https://www.ecb.europa.eu/press/pr/date/2016/html/pr160421_1.en.html)

depreciations. On the liability side, this data reports the outstanding amount bank debt and the outstanding amounts of securities issued. Furthermore, this data also allows us to trace changes in group perimeters over time, for instance because of a firm acquisition. Over the period from 2013 to 2018, this data covers on average about 1.000 groups every year with outstanding public debt in France. Among them, more than 300 groups report yearly statement according to the IFRS rules and less than 700 report yearly statement according to the French accounting rules. While there are fewer accounts complying with IFRS, they belong to firms with higher total assets (EUR 11 bns instead of EUR 220 mns for accounts following French rules) and more employees (30.000 employees instead of 1.000).

Fixed assets are defined as the sum of tangible fixed assets (equipment, property...), intangible fixed assets (patents, software, goodwill) and financial fixed assets (loans granted, securities held as fixed assets, participating interests and shareholdings in group...). We also compute a measurement for each company public debt, derived from the outstanding amounts of both the convertible bonds and non-convertible bonds.

## 3.2 Bond eligibility

Firm exposure to the CSPP is determined by the eligibility of its' bonds to CSPP purchases, which requires securities to be investment grade in order to be bought. The reason for this credit risk requirement, along with the transparency requirement implicit to being rated, is to manage the central banks exposure to default risk. Eligibility is assessed using credit rating trajectories computed by Standard and Poor's, Moody's and Fitch, and provided by Refinitiv EIKON. The bond-level rating trajectories are collected over the period from January 2013 to December 2018 with a daily frequency.

Bond characteristics can differ a lot from one security to the other, for instance in terms of maturity or guarantees. Different types of rating may exist for a single firm, depending on the underlying debt instrument it issued. Hence, all the debt instruments of a given company do not necessarily cross the investment grade threshold. To determine eligibility, we follow the Eurosystem's rule giving priority to the long-term issuer ratings over the short-term issue rating. When several agencies rate simultaneously the same bond, we use the following procedure. We first convert the different ratings using the Eurosystem's harmonised rating scale. Then, in case of disagreement on the credit risk among the rating agencies, we follow the Eurosystem's guidelines of considering the first-best rating.

To test our reconstitution of the eligibility criteria, we compare the set of firms in our data to the list of firms whose bonds are held in the CSPP portfolio. Since the beginning of the program, the Banque de France purchased securities of about 60 different groups. We observe a rating trajectory, with an investment grade rating on at least some occasions, for all of them. This indicates that all firms whose bonds have been purchased are in our treatment group. Furthermore, we collect rating trajectories for about 200 more issuers. Among them, about 30 firms are investment grade but do not appear among purchased securities. The reason for it is that they do not comply with



the other eligibility criteria, requiring eligible bonds to be issued by private firms, whose parents are non-financial corporations. This implies that once a bond is eligible, it will be purchased by the central bank. The eligibility rules described above allow to fully identify treated firms.

### 3.3 Data cleaning

Firm-balance sheet data and eligibility data do not share a common identifier that would allow for an exact matching. The closest to it are firm names, but the two data sources do not always contain the official firm names and company names may be sometime abbreviated or subject to misspelling. We hence merge the two datasets by applying a fuzzy matching procedure to firm names. Observations from both datasets are linked using a probabilistic algorithm that looks for similar company names. After a clerical inspection, that allows to clean for duplicates due to multiple issuers within a firm-group, the procedure relates a firm's eligibility status to its' balance sheet.<sup>5</sup>

The sample of firms is restricted to companies that have public debt. This allows to focus on firms whose debt funding cost have been directly affected by the CSPP. We exclude real estate companies. We also exclude observations whose tangible assets, intangible assets and financial assets lie in the top 1% or the bottom 1% of their distribution. Finally, we consider firms with observations on at least 3 consecutive years.

We end up with a sample of more than 4,000 observations, covering more than 1,200 firms headquartered in France. Table 1 presents the summary statistics of the sampled companies. On average, tangible assets represent about 60% of the fixed assets, whereas intangible represent about 30%. Treated firms have public debt eligible to CSPP purchases. The control group is made of non-investment grade firms in France with public debt. The treatment group and control group differ markedly in terms of size. The average eligible firms has about 45 billions total assets, whereas the average non-eligible firm has less than 2 billions. Market debt appears more important for the funding of eligible firms, as it represents 18% of their total assets instead of 14% for non-eligible firms. Furthermore, market debt is the main type of debt for eligible firms since their bank debt is of about 6%. By contrast, bank debt represents about 25% of total assets for non-eligible companies. These values suggest that largest firms are overrepresented in the treatment group and Table 1 also shows a huge heterogeneity in firms' sizes within this group. This highlights the need to control for such a potential confounding factor in our regressions. It also shows that the debt funding mix of eligible firms relies mainly on market debt, making them more susceptible to benefit from a CSPP induced easing in funding conditions.

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<sup>5</sup>Because balance sheet variables will be required in our main model, the estimation sample is restricted to companies that report their consolidated statements to FIBEN. There is only one group whose bonds are purchased that we could not relate to any balance sheet.

### 3.4 The CSPP as a bond funding relief shock

As a preliminary analysis, we check with our sample that the CSPP induced an easing in security funding. This result is already shown in [Grosse-Rueschkamp, Steffen, and Streit \(2019\)](#) for non-financial firms in the Eurozone large enough to appear in Compustat Global, and in [Arce, Mayordomo, and Gimeno \(2020\)](#) for Spanish non-financial firms. Both papers conclude that the CSPP significantly raised firms' propensity to issue eligible bonds and reduced bond yields. We test whether this materializes in the balance sheets of French eligible firms, through a relative increase in market debt and a drop in the average cost of debt.

We begin by analyzing dependent variables measuring the ratio of market debt over total assets, bank debt over total assets, and the ratio of bank debt over market debt. They are regressed on a set of variables, comprising firm-level eligibility status (as defined in the previous section), its' interaction with a dummy variable equal to zero before the beginning CSPP and 1 afterward, and their interaction. The main variable of interest is the firm-level eligibility status interacted with the CSPP dummy. Covariates comprise firm-level controls including the logarithm of total assets, the ratio of security portfolio to total assets and the ratio of current assets to total assets. We control for sector-level business cycles using industry-year fixed effects. Remaining firm-level unobserved heterogeneity is captured using firm-level panel fixed effects.

Estimations are reported in [Table 2](#). These results indicate that our sample convey a message consistent with what is already in the literature. We observe an increase in market debt over total assets for French non-financial eligible firms firms, relative to ineligible companies, after the beginning of the CSPP. At the same time, bank debt remains stable. Breaking the eligibility dummy so as to separate firms with a rating between AAA-A, from firms with a BBB rating, conveys new insights. The increase in market debt for firms with the best ratings is large enough to trigger a drop in the ratio of bank debt over market debt. Firms with a BBB rating experience a slightly less important increase in market debt relative to AAA-A firms. Their bank debt also show an increase of a similar magnitude, leading to a stable ratio of bank debt over market debt. This is in line with the capital structure channel of monetary policy of [Grosse-Rueschkamp, Steffen, and Streit \(2019\)](#) and shows that this channel is also at play among eligible firms.

These results support our assumption that the CSPP is a bond funding shock that affected firms' liability mix, which resulted in larger amount of market debt raised. In the empirical investigation that we detail below, we will use heterogeneity among firms to provide an estimation of the effect of an easing in bond funding on firms' assets structure, while controlling for other drivers of assets structure for all firms.

## 4 Empirical model

We assess the implications of a bond funding shock using the CSPP as a quasi-natural experience. The specification we use is similar to a triple difference-in-differences, in which identification involves

comparing the share of intangible assets among treated and control firms and across more or less capital intensive industries, between the pre- and the post-CSPP periods. Identification hence combines two sources of heterogeneity : a first one due to firm eligibility to CSPP purchases, and a second one due to differences in the stock of capital accross industries. We estimate the following model at the firm-year level:

$$Y_{i,t} = \beta \text{Eligible}_{i,t} * \text{Post}_t + \gamma_1 Z_{i,t} * \text{Post}_t + \gamma_2 Z_{i,t} + \gamma_3 X_{i,t-1} + \delta_i + \delta_{j,t} + \epsilon_{i,t}, \quad (1)$$

where  $i$  denotes a company,  $t$  a year, and  $Y_{i,t}$  an outcome variable, such as the share of intangible assets over fixed assets. The main coefficient of interest is  $\beta$ , which traces the impact of the CSPP on the outcome variable of interest. When  $\beta > 0$  and the dependent variable is the ratio of intangible assets over fixed assets, firms experiencing an easing in their bond funding conditions exploit opportunities delivering more growth options by investing more in intangible assets.  $\text{Eligible}_{i,t}$  is a dummy variable that indicates if firm  $i$  is eligible to CSPP purchases, which requires at least some of firm's  $i$  securities to be investment grade.  $\text{Post}_t$  is a dummy variable equal to zero before the beginning CSPP, i.e. up to 2015, and equal to one afterward, i.e. 2016 onward. For  $\beta$  to measure a causal effect, we need changes in eligibility dimension and time dimension to be orthogonal to the error term. We hence saturate the model with control variables and fixed effects.

$Z_{i,t}$  comprises a measurement for firm  $i$  security portfolio. The sample comprises firms whose finances are to some extent in investment securities. Since the asset purchase programs run by central banks increase the demand for bonds and hence their prices, this allows for some capital gains correlated with the beginning of the CSPP. Since we are interested in the sole effect of a shock in the cost of bond funding, we control for this potential cofounding factor using the ratio of investment securities over total assets. Omitting this control would inflate  $\beta$  if firms used capital gains over their security portfolio, instead of bond issuances, to fund intangible assets.  $X_{i,t-1}$  controls for firms characteristics affecting its access to bond funding, including (log-) total assets as a measurement of firm size and current assets as a measurement of liquidity, without necessarily affecting firms eligibility to CSPP purchases.

Equation (1) includes company fixed effects  $\delta_i$ , that control for firm-level time-invariant characteristics such as the firm's business model and location, to the extent they do not change over time. The baseline model also comprises the industry-year fixed effects  $\delta_{j,t}$ . They absorb trends in capital structure accross industries. Due to innovation, new equipments are regularly available, which ultimately affect the stock of capital from one industry to another. Cost-push shocks implied by changes in regulation or changes in competition among suppliers may have similar effects. Furthermore, to the extent that all firms in a given industry have similar clientele, sector-level fixed effects allow us to capture changes in product demand.

Overall, our set-up implies that any effect related to the CSPP is identified by contrasting changes in assets structure for eligible firms after the beginning of the CSPP to changes in assets structure for firms that have ineligible public debt, across sectors. These differences are net of capital gains, industry dynamics and product demand effect. We cluster standard errors at the firm-level.

## 5 Results

### 5.1 Do eligible firms invest more with the CSPP?

What do firms do with the proceedings of new security issuances? We first document that investment expenses did not increase following the CSPP. To do so, we estimate Equation 1 in which the dependent variable is a measurement for investment derived from the cash flow statements. This allows for a breakdown of investment among two dimensions : investment in tangible assets and intangible assets, which comprises maintenance investment, or investment in financial assets. Maintenance investment covers tangible or intangible assets acquired to replace obsolete or defective existing assets. Such investments replace depreciated assets by new ones, they do not aim to increase the scale of the production. Maintenance investment can nonetheless contribute to raise productivity, since new equipments can be more efficient than the depreciated ones.

Table 3 shows that investment expenses are overall not affected by CSPP. Investment in tangible and intangible remain stable, in line with [Grosse-Rueschkamp, Steffen, and Streit \(2019\)](#) and [De Santis and Zaghini \(2021\)](#). Investment in financial assets remain also stable, suggesting that CSPP induced debt issuances have not been used to extend new within-group loans or purchase new equity securities from firms out of the group. The estimated coefficient of interest here is statistically significant only for maintenance investment, suggesting that investment in capital expenditures or intangible goods took place but only so as to replace obsolete assets. Examples include equipments that can no longer be used safely, no longer operates or are too costly to repair. This comprises also intangible assets that are no longer compatible with other assets or systems. Eligible firms hence use the additional funds raised through new market debt to increase to some extent their investment expenses. Instead of investing in new equipments to grow their scale, companies essentially invest so as to replace legacy assets, whether tangible or intangible. In this process, legacy assets are either retired or sold. As a consequence, neither companies' total assets nor fixed assets grow.

### 5.2 Main results : Do CSPP-induced investments alter companies' asset structure?

The muted response of overall investment expenses and total assets may let think that firms assets did basically not react to the CSPP. Still, the increase in maintenance investment expenditures in tangible and intangible assets let think that some substitution took place among firms' fixed assets. We bring Equation 1 to the data to assess the effect of CSPP on the structure of fixed assets. Results are reported in both Table 4 and Table 5.

Table 4 shows that the CSPP triggered a rise in the net value of intangible assets. This is consistent with the results above on maintenance investments. It highlights that the new intangibles have a higher accounting value than the depreciated assets they replace. The increase in the net value of intangible assets is balanced by a drop in the net value of unconsolidated financial assets. A reason for it could be that firms increased their equity holdings, so that what was a minority

position evolves in the firm being acquired. The net effect would a drop in the financial assets in consolidated accounts, and a corresponding increase in tangible and intangible assets. The overall effect is that fixed assets remain stable, in line with our results in Table 4.

The results, which appear in Table 5 for various sets of fixed effects, confirm that the CSPP associates positively with firms' intangible assets. The estimated coefficient of interest is significantly positive for different degrees of saturation in the model, with column (4) corresponding to Equation 1. Controlling for firm and industry fixed effects (which absorb all unobserved productivity shocks, product demand shocks, etc.), French firms with direct exposure to CSPP increased more their intangible assets than firms without a direct exposure. This shows that an easing in bond funding conditions do not affect similarly all capital assets. Instead, in a low rate environment, this favors intangible assets.

The size of the estimated coefficient increases when we include the control for firm size, measured by their total assets, and firm's security portfolio. This suggests that larger firms developed more the value of their intangible assets. Omitting this covariate hence creates an attenuation bias, observed in columns from (1) to (3).

### 5.3 Do firms with lesser credit risk invest more in intangible assets?

Does this easing in firms' cost of capital affect similarly the assets of all eligible companies? To assess whether the increase in intangible assets is affected by companies credit risk, we include in Equation 1 the interactions terms  $PostCSPP \times AAA - Arating$  and  $PostCSPP \times BBBrating$ .

Table 6 shows that the effects of CSPP are more pronounced for firms closer to the eligibility threshold. Consistent with theories on investment by firms facing financial constraints, BBB-rated firms experience a larger increase in their intangible assets than AAA-A-rated firms.

Interestingly, while our results above also show that investment-grade firms issue more bonds to take advantage of a lower cost of market debt than non-investment grade firms, they do not use the proceeding to reinforce the collateral value of their assets. A reason for it might be that the net gain of reinforcing solvency appears limited when default risk is low enough. This allows the safe firms to exploit investment opportunities in intangible assets, even if it reduces the overall tangibility of their assets and hence may tighten their access to debt funding.

## 5.4 Robustness

### 5.4.1 Placebo and dynamic effect

Our baseline specification contrasts the level of dependent variables before and after the beginning of the CSPP. This set-up may imperfectly reflects the delays underlying bond issuances, investment opportunities findings and the actual investment decisions implementations. Hence, one expects the effects of CSPP to take more time to materialize on fixed assets than on companies' debt structure,

which would lead to understate the overall effect of the program.

We test whether the effects of the bond funding shock appear already right after the shock or if they took some time to show in firms' fixed assets. Table 7 shows the results of a regression where we break the Post CSPP dummy in two separate dummies. The overall effect on intangible assets is separated in an effect that took place only during the year 2016, in column (1), and an effect that took place over the years 2017 and 2018, in column (2). The estimates are significant only when we focus on the latest period, giving supports to the assumption of delays in the transmission of a bond funding shock to real effects. Furthermore, this suggests that the change in intangible assets triggered by the CSPP is not driven by investments that were postponed just after the beginning of the corporate purchase program because firms would have expected it.

We run an additional specification to guard against the possibility that unobserved firm-level characteristics affect our estimates. We create a new Post CSPP dummy variable which is measured one year ahead of the shock and run the corresponding placebo regression. Since the CSPP is posterior to 2015, we expect that this dummy variable has no effect on intangible assets. Table 7, column 3, shows the results. There is no evidence of an association between an investment grade rating and intangible assets before the CSPP. This relationship between firms eligibility and the tangibility of its assets is not altered right before the the CSPP. We can therefore reject the hypothesis that some shift in intangible assets based on unobservable factors may drive our main result.

## 6 Conclusion

In this paper, we characterize how a security funding shock affects the structure of firms' fixed assets. The purchases of corporate securities by central banks within the framework of the ECB's CSPP provides us with a quasi natural experiment. The ensuing higher demand for corporate bonds allowed firms an easier access to market funding, which gives the opportunity to assess how this impacts firms' investment decisions and in turn their assets structure.

We find evidence that an easing in bond funding does not trigger overall higher capital expenses. However, maintenance investment, which is a component of total investment expenditures, appears to benefit from the CSPP. Hence firms do not appear to use the proceedings of new bond issuances to increase their scale, but used them instead to replace some legacy assets, whether tangible or intangible. Interestingly, they adjusted the composition of their fixed assets in the process. Indeed, easier bond funding conditions do not affect tangible assets and intangible assets in the same way, with a larger increase in intangible assets than in tangible assets. Furthermore, this is especially the case for firms that are investment grade and hence are eligible to CSPP purchases, but do not enjoy the lowest default risk. Firms with a BBB rating appear hence constrained in the funding of their intangible assets relative to firms with a AAA-A rating. To them, the easing in bond funding releases some of incentives to invest in tangible assets so as to increase in the collateral value of their assets and hence ease future funding conditions. We also show that fixed assets reaction to the CSPP are not instantaneous in the data. They appear one year after the beginning

of the program. More broadly, we show that an easing in bond funding reduces the importance of information asymmetries on the value of collateral.

These findings have implication for the conduct on monetary policy. They show that unconventional monetary measures, such as asset purchases, affect the way companies produce goods by relying more on intangible assets. This contributes to the rise of intangible assets relative to tangible assets in firms balance sheets observed over the past few decades. It has been documented in both the US (Corrado, Hulten, and Sichel, 2009; Corrado and Hulten, 2010) and Europe Haskel and Westlake (2018). As such, easing in bond conditions helps firms to shift toward intangible the composition of their investment and capital and hence speeds up the transition towards an economy based on intangible assets.

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## 7 Tables

Table 1: Estimation sample: descriptive statistics

	N	mean	sd	p10	p50	p90
<b>Treatment Group</b>						
Tangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	294	44.3	32.9	5.1	40.9	96.5
Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	294	50.7	33.3	1.7	51.6	92.7
Financial Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	294	4.9	7.2	0.1	2.5	11.0
Goodwill <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	294	30.3	25.7	0.0	26.8	70.1
Total Assets <sub>t-1</sub> (Bns)	294	40.6	60.0	4.8	17.8	102.3
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	294	2.5	4.8	0.0	0.0	8.0
Current Assets <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	294	30.7	19.7	4.8	28.9	53.6
Market Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	294	18.6	12.7	2.9	16.4	35.8
Bank Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	294	8.3	13.7	0.5	5.2	16.2
Long-term Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	294	27.3	18.3	8.9	20.9	54.8
AAA-A Rating <sub>t</sub>	294	0.4	0.5	0.0	0.0	1.0
BBB Rating <sub>t</sub>	294	0.6	0.5	0.0	1.0	1.0
<b>Control Group</b>						
Tangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	4,190	45.9	31.7	5.6	42.1	90.9
Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	4,190	49.0	32.8	3.7	51.6	91.9
Financial Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	4,190	4.9	7.3	0.3	2.3	12.2
Goodwill <sub>t</sub> (/Fixed Assets <sub>t</sub> , %)	4,190	30.5	30.0	0.0	21.7	79.3
Total Assets <sub>t-1</sub> (Bns)	4,190	1.8	7.8	0.0	0.1	2.1
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	4,190	1.9	4.5	0.0	0.0	5.9
Current Assets <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	4,190	49.0	21.4	19.9	49.6	77.3
Market Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	4,190	14.1	15.4	1.6	9.1	33.3
Bank Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	4,190	26.2	16.9	6.3	24.7	46.5
Long-term Debt <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	4,190	39.2	22.6	13.9	36.6	65.7
AAA-A Rating <sub>t</sub>	4,190	0.0	0.0	0.0	0.0	0.0
BBB Rating <sub>t</sub>	4,190	0.0	0.0	0.0	0.0	0.0

Note : This table presents the summary statistics of the main variables in our sample. The period of observation is from 2013 to 2018 and the frequency is yearly. Treated firms are firms in France eligible to CSPP purchases. The control group is made of non-investment grade firms in France with public debt. Balance sheet variables are collected via FIBEN. Rating data are collected via Refinitiv - EIKON.

Table 2: The impact of CSPP on Firms Debt Funding

VARIABLES	(1) Market Debt <sub>t</sub> (/Assets <sub>t</sub> , %)	(2) Bank Debt <sub>t</sub> (/Assets <sub>t</sub> , %)	(3) Bank Debt <sub>t</sub> / Market Debt <sub>t</sub>	(4) Market Debt <sub>t</sub> (/Assets <sub>t</sub> , %)	(5) Bank Debt <sub>t</sub> (/Assets <sub>t</sub> , %)	(6) Bank Debt <sub>t</sub> / Market Debt <sub>t</sub>
Post CSPP <sub>t</sub> x IG rating <sub>t</sub>	2.067*** (0.603)	0.572 (0.564)	-2.601 (3.472)			
IG rating <sub>t</sub>	-8.154** (3.682)	-4.112*** (1.508)	3.199 (2.605)			
Post CSPP <sub>t</sub> x AAA-A rating <sub>t</sub>				2.299*** (0.625)	0.021 (0.762)	-7.747** (3.427)
Post CSPP <sub>t</sub> x BBB rating <sub>t</sub>				1.954** (0.928)	1.172 (0.712)	0.424 (5.299)
AAA-A Rating <sub>t</sub>				-8.529* (4.311)	-6.762*** (2.031)	5.873* (3.514)
BBB Rating <sub>t</sub>				-8.089** (3.647)	-4.459*** (1.571)	1.450 (3.199)
(log-)Total Assets <sub>t-1</sub>	1.936* (1.083)	4.412*** (0.967)	-6.001 (4.803)	1.933* (1.095)	4.404*** (0.965)	-5.941 (4.792)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	-0.080* (0.047)	0.054 (0.072)	0.419** (0.191)	-0.081* (0.048)	0.056 (0.072)	0.431** (0.193)
Observations	4,133	4,133	4,133	4,133	4,133	4,133
R-squared	0.879	0.877	0.807	0.879	0.877	0.807
CSPP dummy	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No
Industry x Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note : The dependent variable in columns (1) and (4) is the ratio of market debt to total assets, in columns (2) and (5) is the ratio of bank debt to total assets, in columns (3) and (6) is the ratio of market debt to bank debt.  $IGrating_t$  is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase.  $IGrating_t$  is equal to 0 for firms whose rating is speculative. AAA-A Rating is a dummy that takes the value one for eurozone firms rated AAA-A, and zero otherwise. BBB Rating equals one for eurozone firms rated BBB, and zero otherwise.  $PostCSPP_t$  equals one after the CSPP announcement, i.e., after 2016, 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.

Table 3: The impact of CSPP on Investment Expenses

VARIABLES	(1) Investment <sub>t</sub> (/Assets <sub>t</sub> %)	(2) Investment in Tangible and Intangible <sub>t</sub> (/Assets <sub>t</sub> %)	(3) Maintenance Investment <sub>t</sub> (/Assets <sub>t</sub> %)	(4) Investment in Financial Assets <sub>t</sub> (/Assets <sub>t</sub> %)	(5) $\Delta \log$ Total Assets <sub>t-1t</sub> (%)	(6) $\Delta \log$ Fixed Assets <sub>t-1t</sub> (%)
Post CSPP <sub>t</sub> x IG rating <sub>t</sub>	-0.475 (0.336)	-0.097 (0.317)	0.532*** (0.151)	-0.388 (0.290)	0.391 (1.360)	3.543 (11.600)
IG rating <sub>t</sub>	0.945 (1.459)	0.696 (0.927)	1.329*** (0.328)	0.258 (0.656)	9.354 (7.246)	59.804* (33.037)
(log-)Total Assets <sub>t-1</sub>	-1.439*** (0.542)	-0.221 (0.319)	-0.054 (0.276)	-1.278** (0.571)	-37.195*** (4.795)	-65.110*** (14.137)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	0.093** (0.039)	-0.004 (0.023)	-0.015 (0.013)	0.104** (0.041)	0.155 (0.147)	3.457*** (0.906)
Observations	4,066	3,773	3,273	3,773	4,133	4,133
R-squared	0.741	0.705	0.718	0.589	0.550	0.300
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No	No	No
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level Controls	Yes	Yes	Yes	Yes	Yes	Yes

The dependent variable in column (1) is total investment, column (2) is the investment in tangible and intangible assets, column (3) is the maintenance investment, column (4) is the investment in financial assets, column (5) is the change in the logarithm of total assets and in column (6) is the change in the logarithm of fixed assets. *IGrating<sub>t</sub>* is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase. *IGrating<sub>t</sub>* is equal to 0 for firms whose rating is speculative. *PostCSPP<sub>t</sub>* equals one after the CSPP announcement, i.e., after 2016, 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.

Table 4: The impact of CSPP on the structure of fixed assets

VARIABLES	(1) Net Fixed Assets <sub>t</sub> (/Assets <sub>t</sub> %)	(2) Net Tangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(3) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(4) Net Financial Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)
Post CSPP <sub>t</sub> x IG rating <sub>t</sub>	0.660 (0.740)	0.633 (1.618)	5.561** (2.497)	-6.194** (2.546)
IG rating <sub>t</sub>	10.658*** (1.833)	18.037 (40.233)	-4.145* (2.239)	-13.892 (39.112)
(log-)Total Assets <sub>t-1</sub>	0.328 (0.687)	3.993** (1.800)	6.157*** (2.228)	-10.149*** (2.487)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	0.020 (0.045)	0.134 (0.111)	0.290 (0.181)	-0.423** (0.199)
Observations	3,273	3,273	3,273	3,273
R-squared	0.961	0.905	0.906	0.896
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	No	No	No
Industry x Year FE	Yes	Yes	Yes	Yes
Firm-level Controls	Yes	Yes	Yes	Yes

The dependent variable in column (1) is net fixed assets, column (2) is net tangible assets, column (3) is net intangible asset and column (4) is net financial asset.  $IGrating_t$  is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase.  $IGrating_t$  is equal to 0 for firms whose rating is speculative.  $PostCSPP_t$  equals one after the CSPP announcement, i.e., after 2016, 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.

Table 5: The impact of CSPP on the structure of fixed assets

VARIABLES	(1) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(2) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(3) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(4) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)
Post CSPP <sub>t</sub> x IG rating <sub>t</sub>	5.183** (2.419)	5.322** (2.443)	5.312** (2.460)	5.561** (2.497)
PostCSPP	-3.764*** (0.602)			
IG rating <sub>t</sub>	-3.764*** (0.602)	-5.146*** (0.910)	-4.274*** (0.934)	-4.145* (2.239)
(log-)Total Assets <sub>t-1</sub>				6.157*** (2.228)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)				0.290 (0.181)
Observations	3,273	3,273	3,273	3,273
R-squared	0.903	0.903	0.906	0.906
Firm Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	No	Yes	No	No
Industry x Year FE	No	No	Yes	Yes
Firm-level Controls	No	No	No	Yes

The dependent variable in column (1)-(4) is net intangible assets.  $IGrating_t$  is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase.  $IGrating_t$  is equal to 0 for firms whose rating is speculative.  $PostCSPP_t$  equals one after the CSPP announcement, i.e., after 2016, 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.

Table 6: The impact of CSPP on the structure of fixed assets

VARIABLES	(1) Net Tangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(2) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(3) Net Financial Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)
Post CSPP <sub>t</sub> x AAA-A rating <sub>t</sub>	-2.890 (3.402)	0.339 (4.490)	2.551 (3.112)
Post CSPP <sub>t</sub> x BBB rating <sub>t</sub>	2.987 (3.009)	9.274** (3.577)	-12.260*** (3.982)
AAA-A Rating <sub>t</sub>	20.412 (40.235)	-3.394 (6.056)	-17.018 (39.680)
BBB Rating <sub>t</sub>	18.135 (40.260)	-3.986* (2.207)	-14.149 (39.139)
(log-)Total Assets <sub>t-1</sub>	4.029** (1.796)	6.194*** (2.251)	-10.223*** (2.506)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	0.143 (0.111)	0.303* (0.179)	-0.445** (0.195)
Observations	3,273	3,273	3,273
R-squared	0.905	0.907	0.896
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Industry x Year FE	Yes	Yes	Yes
Firm-level Controls	Yes	Yes	Yes

The dependent variable in column (1) and (2) is the ratio of net tangible assets to fixed assets, while in column (3) is the ratio of net financial assets to fixed assets.  $I\text{Grating}_t$  is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase.  $I\text{Grating}_t$  is equal to 0 for firms whose rating is speculative.  $PostCSPP_t$  equals one after the CSPP announcement, i.e., after 2016, 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.



Table 7: Robustness- Placebo effect

VARIABLES	(1) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(2) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)	(3) Net Intangible Assets <sub>t</sub> (/Fixed Assets <sub>t</sub> %)
CSPP <sub>2016</sub> x IG rating <sub>t</sub>	-1.910 (1.755)		
CSPP <sub>2017,18</sub> x IG rating <sub>t</sub>		6.949*** (2.084)	
CSPP <sub>2015</sub> x IG rating <sub>t</sub>			-0.212 (2.497)
IG rating <sub>t</sub>	-3.501 (2.276)	-4.441* (2.275)	-3.467 (2.275)
(log-)Total Assets <sub>t-1</sub>	6.003*** (2.223)	6.183*** (2.219)	6.008*** (2.224)
Securities held <sub>t-1</sub> (/Assets <sub>t-1</sub> , %)	0.287 (0.190)	0.278 (0.180)	0.290 (0.190)
Observations	3,273	3,273	3,273
R-squared	0.906	0.907	0.906
CSPP dummy	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	No	No	No
Industry x Year FE	Yes	Yes	Yes
Firm-level Controls	Yes	Yes	Yes

The dependent variable in columns (1)- (4) is the ratio of net intangible assets to fixed assets.  $IGrating_t$  is a dummy that takes the value one for firms whose rating is investment grade at  $t$ , satisfying eligibility criteria to CSPP purchase.  $IGrating_t$  is equal to 0 for firms whose rating is speculative. For the dynamic effect, CSPP<sub>2016</sub> is a dummy that takes value one for year 2016, 0 otherwise. CSPP<sub>2017,18</sub> is a dummy that takes value of one for year 2017 and 2018, 0 otherwise. As regards the placebo analysis, CSPP<sub>2015</sub> equals one if year = 2015, i.e., prior to the commencement of CSPP; 0 otherwise. The regressions include firm-level controls including logarithm of total assets and ratio of security portfolio to total assets to control for the heterogeneity in firm characteristics. All controls are included in lagged terms. The regressions further include firm fixed effects, time fixed effects and industry x time fixed effects, when indicated. Standard errors, in parentheses, are clustered at the industry-time level. \*\*\*, \*\*, \* represent significance at the 1%, 5% and 10%, respectively.