Corporate Investment Response to an Easing in Bond Funding Cost *†

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Abstract

Capital structure decisions differ across regular investments and investment spikes. We study the cost of funding channel by investigating how an easing in firms' external financing cost affects corporate investment. This paper employs ECB's corporate security purchase program as a quasi-natural experiment that reduces firms' bond funding costs. Using balance sheet information on non-financial firms in France, we find that firms increase maintenance investment to replace existing assets, instead of investing in new equipment to grow in scale. Our findings suggest that firms face non-convex costs of capital adjustments and do not smoothly adjust investment following a shock in the cost of capital.

Keywords: investment, bond issuance, monetary policy

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1 Introduction

Capital structure decisions associated with routine investments differ from those associated with "major" investments (DeAngelo et al., 2011; Elsas et al., 2013; Im et al., 2020). Unusually large investment expenditures typically result from projects that cannot be smoothed over time, such as the acquisition of another company or the building of new plant. These imply a firm-level investment profile with a low investment dotted by intermittent large changes. A large body of literature shows that firms adjust their capital structure infrequently because of capital adjustment costs (Caballero and Engel, 1999; Nilsen and Schiantarelli, 2003; Leary and Roberts, 2005; Gourio and Kashyap, 2007; Strebulaev, 2007; Miao and Wang, 2014; Disney et al., 2020).

The conceptual framework supporting investment spikes has been formulated in models with non-convex costs of adjustments. In the standard q-theory of investment, firms face investment frictions in the form of convex capital adjustment costs. This implies that firms react to shocks on their marginal q by adjusting investment continuously. Alternatively, non-convex capital adjustment costs imply that the cost of changing the level of capital can be significant even for small adjustments in capital. What happens when firms' marginal cost of funding investment decreases? In a standard q-model, Tobin's marginal q increases and leads to new investments until the marginal benefit of new investment becomes equal to the marginal cost at the equilibrium. The cost of funding shock therefore affects how much a firm invests. In a model with non-convex costs of adjustments, the effect depends on the benefit from investment per unit of capital relative to the cost of investment per unit of capital.

Consider a case where the non-convexity is due to a fixed cost to investment. This fixed cost for adjusting firms capital stock leads to an inaction range, characterized by a threshold value for the benefit from investment at which the firm is indifferent between investing and not investing. Thus, the optimal investment level is positively related to marginal Q only when the fixed cost of investment is below the marginal benefit from investment. On

the opposite, when the fixed cost of investment is above the marginal benefit from investment, optimal investment is not related to marginal Q. Hence, even when the marginal Q decreases due to an exogenous shock on the cost of external funding, investment can remain constant.

Following the q-theory modified for non-convex capital adjustment costs, we empirically investigate how an easing in firms' external financing costs that is not due to improved firms' fundamentals affect corporate investment. We thus focus on a pure cost of funding channel. Our main assumption is that following an exogenous easing in the cost of funding, firms invest more in capital goods whose adjustment costs are low. To test this hypothesis, we follow a difference-in-difference approach that exploits the cross-sectional variation in firms' investment in different types of assets due to an easing in external funding cost. We use the Corporate Sector Purchase Program (CSPP) that was implemented by the European Central Bank (ECB) as a quasi-natural experiment that reduces firms' bond funding costs. Against concerns on price stability, ECB purchases of debt securities issued by euro area non-financial corporations started in June 2016. Under the guidelines of this asset purchase program, the bonds eligible for purchase must be investment grade for at least one rating agencies amongst the four largest (S&P, Moody's, Fitch Ratings, or DBRS Morningstar).

This bond funding shock provides us with an ideal setting to study firms that can raise cash to fund investment without facing a substantial increase in their marginal funding cost. Because firms that issue market debt can typically borrow at limited marginal transaction costs when they adjust their leverage, as opposed to smaller firms with tighter access to external funding, our empirical set-up is closely related to the existence of fixed capital adjustment costs. Furthermore, since this monetary easing is not channeled to firms by financial intermediaries, the effects of the program are therefore not blurred by the bank lending channel of monetary policy.

A major identification channel for our empirical analysis is the potential presence of unobserved changes in firms' fundamentals that would be correlated with the drop in bond

funding cost. This can be explained by a number of reasons. First, new investments tend to be driven by expectations of future activity, which is typically unobserved in the data. We tackle such an omitted variable bias in two ways. First, our set of control variables include analyst forecasts on the firms' earning trajectory at 2-years and at long-term horizons. This data comes from I/B/E/S, the Institutional Brokers' Estimate System. Second, because both investment and bond funding may correlate with the economic activity, one expects both investment and firms' earning prospects to improve following an easing in monetary policy. Our specification tackles this challenge with various types of fixed effects. The most detailed specification includes industry-time fixed effects. They absorb industry-level dynamics, such as sector-specific trend growth, and control for demand assuming that firms in the same industry face similar demand shocks. Our sample allows us to compare shifts in investment across very heterogeneous sectors.

To control for another confounding effect due to asset purchases by central banks, namely the potential capital gains on a firm's bond portfolio, we include the size of the portfolio, normalized by total assets, prior to the beginning of the corporate security purchase program among the explanatory variables. We also run a placebo analysis showing that the estimated impact disappears when the funding shock is moved one year earlier than the actual shock, at the time when the ECB started an asset purchase program targeting sovereign bonds. Our set of controls also comprise the ratio of current assets to total assets, leverage, sales, total assets and its square and firm fixed effects, to take into account other potential sources of unobserved heterogeneity as regards credit risk and the access to external funding. These variables are used as of 2015, to avoid endogeneity with the bond funding shock.

We exploit the annual consolidated balance sheet information on non-financial groups of firms in France from 2013 to 2018. Focusing on France allows us to study the largest corporate bond market in the euro area. The balance sheet data come from the FIBEN-groupes database, which reports, for each group, the amounts of investment in various types of assets. Consolidated data is of particular 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.

In parallel, we collect information on the universe of existing corporate bonds issued by French groups from the Centralized Security Database; data maintained by Central Banks in the Eurosystem. The bonds rating for French groups are collected via Thomson Reuters. The merger of balance sheet data 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 29 groups were eligible at some point of time. Conversely, a minimum of 462 groups were always ineligible[1], for instance because their ratings were always below investment grade. We can hence compare the investment behavior of firms depending on whether they could directly benefit from the easing in their bond funding cost caused by the shock.

Our baseline analysis assesses how cheaper bond funding modifies firms' investment. We find heterogeneous developments: while gross investment remains constant, maintenance investment increases strongly. Maintenance investment covers tangible and intangible assets acquired to replace obsolete or defective existing assets. Still, these results show that firms do not replace capital only when it has depreciated to a critical level, since this would have basically excluded any effect for a cost of funding shock. Conversely, firms time their maintenance investment because it contributes to raise productivity, to the extent new equipment are more efficient or less susceptible to fail than the deprecated one. The effect is important since the implementation of the program led to an increase in maintenance investment by about 0.57 percentage point, which is a 25% rise in maintenance investment for the average firm in the sample.

The finding provides support for the idea that capital goods with relatively smaller adjustment costs benefit more from a drop in the cost of external funding. We confirm further this

[1]The sample for ineligible groups varies from year to year, i.e., from 2013-2016, there was approximately 610 ineligible groups and in the year 2017, there was about 496 ineligible groups.

result by showing that firms did not increase their fixed assets and total assets following the easing in the cost of funding. These results suggest that new investments triggered by the shock do not qualify as investment spikes leading to an increase in the scale of production.

However, a crucial question arises regarding whether the adjustment occurs at the extensive rather than at the intensive margin. Indeed, firms' reaction are not perfectly synchronized under stochastic adjustment costs, since firm adjusts their assets after a shock in their cost of funding depending on how it compares to the stochastic cost of adjustment. Firms therefore react with some probability to the non-fundamental funding shock, which leads to inaction in firm-level investment followed by bursts. In other words, a reaction of investment that is not staggered over time is hardly consistent with substantial adjustment costs.

We employ the same regression model considered for the size of investment, but using as a dependent variable a dummy variable indicating whether a firm had some positive expenditures in either gross investment or maintenance investment. Results show that the funding shock raises the probability of investing in maintenance over several years, but has no effect on the probability of investing overall. We run a battery of robustness checks, including placebo analysis which supports the parallel trend assumption. The main findings also hold when we use a propensity score weighting estimator.

Taken together, these results show that an easier access to the bond market supports only routine investment and does not lead to spikes in total investment. This highlights that the cost of capital has only a limited impact on investment. This corroborates Disney et al. (2020), who points at aggregate demand and uncertainty as being major drivers of investment spikes. We advance previous works by relating explicitly investment to firm-level earning prospects. Our results are obtained with changes in external funding costs that materialize absence of any change in firm fundamentals.

Several studies investigate how non-convex adjustment costs affect firm investment. Non-convex costs of adjustments can be implemented as fixed adjustments costs (Cooper et al., 1999; Caballero and Engel, 1999; Cooper and Haltiwanger, 2006; Miao and Wang, 2014).

These fixed costs can be random to allow for an inaction range to vary over time. The fixed cost measures the need for plant restructuring, installation costs, costs associated with disruption, worker retraining and organizational restructuring. The fixed costs can also be due to financial frictions. Investment may require external funding which entails larger transaction costs than internal funding. Debt funding, for instance, is costly because it requires to find a lender, bargain with them, pay underwriting fees on new debt and ensure that both parties fulfill the contract. The presence of such frictions create adjustment costs implying that plant level productivity is lower during spikes of investment (Power, 1998; Sakellaris, 2004). To the best of our knowledge, we are the first paper to show empirically that a firm can invest in different types of equipment, each one yielding a different cost to adjust capital.

Our work relates to the impact of external funding conditions on corporate investment. The standard view is that the sensitivity of investment to internal funds should increase with the wedge between the costs of internal and external funds (Fazzari et al., 1988). A higher sensitivity of investment to cash-flow is however not an evidence of financial constraints (Kaplan and Zingales, 1997). Almeida and Campello (2007) show that financing frictions can lead to a sensitivity of investment to cash-flows. Firms' access to debt market is a point in case (Harford and Uysal, 2014). A contraction of loan supply, whether bank loans or market loans, weigh on corporate investment (Beck et al., 2020; Chava and Purnanandam, 2011; Duchin et al., 2010) and employment (Popov and Rocholl, 2018). Different from these papers, we contribute by focusing on an easing shock in the cost of external funding that is specific to market debt and does not overlap with a shock on other external funding.

We also add to the literature on unconventional monetary policy. Their effect on firms' policies, including corporate investment, vary depending on the characteristics of the interventions (Acharya et al., 2019, 2020; Berger and Roman, 2017; Bergman et al., 2020; Chakraborty et al., 2020; Chava and Purnanandam, 2011; Ferrando et al., 2019; Luck and Zimmermann, 2020; von Rüden et al., 2023). By increasing bond demand, large scale asset purchases by central banks reduce yields (Kryshnamurthy and Vissing-Jorgensen, 2011;

Koijen et al., 2021). The effect of corporate bond purchases through CSPP on bond issuances and yields are studied in Abidi and Ixart (2018); Zaghini (2019); Todorov (2020); De Santis and Zaghini (2021). Our study is grounded in this ample literature showing that CSPP induced an easing in bond funding. 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 directly benefit from the corporate purchase program (Grosse-Rueschkamp et al., 2019; Arce et al., 2020; Ertan et al., 2020). While this suggests that the bank-lending channel was also active at that time, this plays against our results since it closes the gap between the treated group and the control group. Grosse-Rueschkamp et al. (2019) and De Santis and Zaghini (2021) show that eligible firms use the additional funds raised through new market debt to invest in non-capital expenditures (purchases of securities, repurchase of stocks, cash holding and other short term financial investments). This is consistent with our results, highlighting the overall lack of response of investment for projects other than replacement of equipment.

The paper is organized as follows. Section 2 discusses the hypotheses development and the institutional framework of the CSPP. We detail the datasets we use and how we build our measurement of exposure to the bond easing 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 Testable Hypotheses and Institutional Background

2.1 Testable Hypotheses

We formulate a set of testable hypotheses grounded in the q-theory of investment adjusted for non-convex costs of capital adjustments. In the standard Q model, where costs of adjusting firms' capital stock are strictly convex, the investment rate in each period is linearly increasing in the expected discounted marginal value of an additional unit of investment.

Hence, the investment rate depends on the marginal q.

Non-convex costs of capital adjustments imply a non-linear relationship between the investment rates and the expected discounted marginal value of an additional unit of investment. In this framework, shocks on the cost of investment do not necessarily lead to an instantaneous and linear response for investment. Caballero and Engel (1999) show that in the presence of fixed adjustment costs, investment becomes a non-decreasing function of marginal q. More specifically, there is a region for the stochastic fixed adjustment cost in which investment is zero and unrelated to marginal q. It is only outside of this region that investment increases with marginal q. Miao and Wang (2014) show that an exogenous drop in the cost of investment, introduced through a tax shock, leads to an attenuated response of investment relative to a standard Q model. Indeed, if the cost of funding per unit of capital decreases without a change in firms fundamentals, firms whose marginal benefit from investment is below the non-convex cost of adjusting capital do not increase their investment. Alternatively, only firms whose marginal benefit from investment is above the cost of adjusting capital increase their investment and ultimately their capital. Maintenance investment typically involves lower costs of capital adjustments, since it involves allocating resources to activities aimed at preserving, repairing, or upgrading existing assets to ensure they continue to operate effectively over time. While this can involve upgrades or replacements of entire systems or components to enhance performance, adjustment costs are nonetheless limited compared to costs implied by the set-up of a brand new process.

We derive from this theory the testable hypotheses:

H1 If the cost of funding per unit of capital decreases without a change in firms' fundamentals, the marginal benefit from investment becomes positive first for capital goods with the lowest adjustment costs. Firms hence invest more in capital goods with the lowest adjustment costs, namely in maintenance investment.

In a framework with convex costs, firms adjust their capital structure after a shock. There is hence only an intensive margin effect on investment, in the sense that the shock affects

by how much a firm invests but does not affect how likely is a firm to invest. The existence of a stochastic fixed adjustment cost leads to a probability that a firm adjusts it's assets after a shock, depending on how the shock compares to the stochastic cost of adjustment. Hence, it introduces also capital adjustment at the extensive margin, since firms' reactions are not perfectly synchronized.

H2 If the cost of funding per unit of capital decreases without a change in firms' fundamentals, the probability that a firms adjust its capital increases. This increase is more important for equipments with the lowest adjustment costs.

2.2 Institutional background : the Corporate Sector Purchase Program

To test our hypotheses, we use the European Central Bank (ECB)'s Corporate Sector Purchase Program (CSPP) as a quasi-natural experiment. 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 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 and whose actual purchases started on June 8, 2016.

The CSPP consists of purchases by the Eurosystem of investment-grade euro-denominated bonds issued by non-bank corporations.[2] The purchases were conducted in the primary and secondary markets.[3] To ensure a diversified allocation of purchases across issuers and avoid

[2]The purchases are carried out by six Eurosystem national central banks: Nationale Bank van Belgie/Banque Nationale de Belgique, Deutsche Bundesbank, Banco de Espana, Banque de France, Banca d'Italia and Suomen Pankki/ Finlands Bank.

[3]It was decided by the ECB that no primary market purchases will involve debt instruments issued by entities that qualify as public undertakings.

distortion in bond liquidity, purchases comply with rules.[4] 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-best 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 investment grade bonds. 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, expectations on their future earnings 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

Firms' assets structure 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 sub-sample 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.

[4]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

More specifically, consolidated statements are mandatory for groups exceeding two of the following thresholds : more than EUR 15 million of total assets, more than EUR 30 million of net income and more than 250 workers before 2016. From 2016 onward, the first two thresholds were raised to EUR 24 million and EUR 48 million 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 our two main outcome variables. The first one is maintenance capital expenditures. These are expenses by the company to replace its defective or obsolete equipment. This type of investment is not related to a growth in firms' scale. The second one is the investment rate. We compute the gross investment rate as net capital expenditure in fixed assets (acquisition minus sales).

In addition, balance sheet data also reports information we use to build control variables, including the amounts of securities held in portfolio, current assets, sales, leverage (defined as the ratio of debt over equity), total assets and total assets squared. Securities held in portfolio, current assets and sales are normalized by the firm's total assets. All control variables are used as of 2015 throughout the specification, to avoid endogeneity concerns with the CSPP.

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 billion instead of EUR 220 million for accounts following French rules) and more employees (30.000 employees instead of 1.000).

3.2 Analyst Forecasts on Firms Future Earnings

We use analyst forecasts of firms future earnings provided by Refinitiv Datastream. The data are compiled by I/B/E/S, which collect for publicly traded firms estimates by market analysts of the future earnings at various time horizons. We use both the expected earnings per share at a 2 years horizon and the expected growth in operating income at the 3-5 years horizon. In both cases, we consider the median analysts forecasts, which we aggregate over each year by averaging.

3.3 Bond eligibility

Firm exposure to the bond funding shock 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 & 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 avoid endogeneity concerns as regards shift between the treatment and the control group

over the lifetime of the CSPP, we hold both groups has fixed once the CSPP started. More specifically, we consider that a firm that is eligible at some point after the beginning of the programme is eligible over the whole lifetime of the program. This plays against our results, since we treat as fully eligible firms that were actually eligible only over a restricted time period.

Note that we construct the exposure variable based on the eligibility to CSPP purchases. This may differ from the actual purchases, which are used for the identification in Abidi and Ixart (2018). Since one expects the actual purchases to have a stronger impact on funding cost than eligibility, this plays against our results.

3.4 Data cleaning

Firm-balance sheet data and rating data do not share a common identifier that would allow for an exact matching. The closest to it are firm names. 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.[5]

The sample of firms is restricted to companies that have public debt. This allows to focus on firms whose debt funding cost has been directly affected by the CSPP. We exclude real estate companies. We also winsorize at the 1% level dependent variables and control variables. Finally, we consider firms with observations on at least 3 consecutive years.

We end up with a sample of approximately 3,000 observations, covering about 858 firms headquartered in France. Table 1 presents the summary statistics of the sampled companies. Treated firms have public debt eligible to CSPP purchases. The control group is made of firms in France with public debt that is not eligible. Market debt appears more

[5]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.

important for the funding of eligible firms, has it represents 20% of their total assets instead of 12% 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 over-represented 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 co-founding 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 the CSPP induced easing in funding conditions.

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 an outcome variable among treated and control firms and across industries, between the pre- and the post-CSPP periods. Identification hence combines two sources of heterogeneity : a first one due to firm eligibility to an easing in bond funding shock, and a second one due to different trends in the growth of capital across industries. We estimate the following model at the firm-year level:

$$Y_{i,t} = \beta \text{Eligible}_{i,t,2016} * \text{Post}_t + \gamma_1 Z_{i,t} * \text{Post}_t + \gamma_2 X_{i,t}^{IBES} + \gamma_3 X_{i,2015} + \delta_i + \delta_{j,t} + \epsilon_{i,t}, \quad (1)$$

where i denotes a company, t a year, and $Y_{i,t}$ an outcome variable, such as maintenance investment expenditures normalized by total assets. The main coefficient of interest is β, which traces the impact of the CSPP on the outcome variable of interest. When $\beta > 0$, firms experiencing an easing in their bond funding conditions exploit it to replace obsolete and deprecated equipment. $\text{Eligible}_{i,t,2016}$ is a dummy variable that indicates if firm i is eligible to CSPP purchases. To avoid endogeneity concerns as regards shift between the

treatment and the control group over the lifetime of the CSPP, we hold both groups has fixed once the CSPP started in 2016. 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 β 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.

$X_{i,t}^{IBES}$ and $X_{i,2015}$ controls for firms characteristics affecting its investment according a standard Tobin's Q model of capital budgeting. $X_{i,t}^{IBES}$ includes a measurement for expected earnings per share at a 2 years time horizon, as well as measurement for the long-term grwoth in the earnings per share. Both variables are obtained from I/B/E/S at t.[6] $X_{i,2015}$ proxies for the access to external funding (current assets normalized by total assets and sales normalized by total assets), firm credit risk (leverage, total assets and its' square) and a measurement for firm i security portfolio (normalized by total assets). Control variables in $X_{i,2015}$ are fixed at their 2015 values throughout the specification. We control for firm security portfolio since the sample comprises of firms whose assets are to some extent invested in securities. Indeed, bond purchases 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 co-founding factor using the ratio of investment securities over total assets. Omitting this control would inflate β if firms used capital gains over their security portfolio, instead of bond issuances, to fund new assets.

Equation (1) includes company fixed effects δ_i, that control for firm-level time-invariant characteristics such as the firm's business model and location. The baseline model also comprises the industry-year fixed effects $\delta_{j,t}$. They absorb trends in capital structure across industries. Due to innovation, new equipment are regularly available, which ultimately affect the stock of capital from one industry to another. Furthermore, to the extent that

[6] Considering these variables at $t-1$ does not affect the results while it substantially lowers the number of observations. Results are available upon request.

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 funding shock is identified by contrasting changes in investment 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

This section examines the impact of an easing in bond funding on firm investment. First, we consider the effects of cheaper bond funding on expenses over different types of investment. Second, we present our results on firm size and productive capabilities. Finally, we present our findings on the effects of the shock on the probability that firm invests.

5.1 Main result: the effect of a bond funding shock on firm investment expenditures

We begin by testing hypothesis H1. In this section, we document that maintenance investment increase following an easing in bond funding, while total investment remains muted. To do so, we estimate Equation (1) in which the dependent variable is a measurement for either gross investment expenditures or maintenance investment expenditures, normalized by total assets.

The results are presented in Table 2, with standard errors clustered at the firm-level. Columns (1)-(3) pertain to different specifications with investment as the dependent variable, that we progressively saturate with controls for firm fundamentals. Across all specifications, the estimated coefficient of interest, i.e., the interaction term between firm's current eligibility status and the post-CSPP dummy is statistically insignificant. Columns

(4)-(6) consider the same specification, this time with maintenance investment as the dependent variable. The estimated β is statistically significant in all columns, because of both larger point estimates and more accurate estimates. Note also that our results are immune to wealth effect induced by capital gains over firm security portfolio. This is important since not taking into account this confounding factor would lead to a larger reaction by investment, as shown in column (3).

Results in Table 2 suggest that investment in capital expenditures or intangible goods took place, but only so as to replace existing assets. Hence, we confirm a positive and statistically significant impact of easing in bond financing on maintenance investment with an effect size of around 0.57 percentage point (Table 2, column 6).[7] This overall supports H1.

5.2 Do induced investments allow firm to grow?

In this section, we bring Equation (1) to the data to assess the effect of the bond funding relief shock on fixed assets and total assets. As before, the main variable of interest is the interaction term between firm's eligibility status and CSPP time dummy. Results are reported in Table 4. The dependent variable varies, with percentage changes in total assets in columns (1)-(2) and percentage changes in fixed assets in columns (3)-(4). Table 4 show the estimates for the most saturated specifications used in the previous section.

We find muted response of fixed assets and total assets, indicating that firm size basically did not react to the easing in funding conditions. This is consistent with the results above on maintenance investments. Instead of investing in new equipment to grow in scale, companies essentially conveyed routine investment.

[7] To calculate the elaticity of eligible firms during the corporate purchase program at the mean, we use the following formula: $\frac{coefficientvalue \times meanoftreatmentdummy}{meanofmaintenanceinvestment.}$, equivalent to 0.19%

5.3 Do firm invest more often?

Under stochastic adjustment costs, firms do not necessarily react to a non-fundamental shock. Instead, they react with some probability that depends on the realization of the adjustment cost. We hence now test for hypothesis H2, to check whether firms invest more often following an easing in bond funding. While the estimates so far focused on the magnitude of investment expenditures, so on the intensive margin, we now study the proportion of firms that invest, so the effect on the extensive margin. To this end, we create two dummy variables indicating whether a firm had strictly positive expenditures in investment or maintenance investment, respectively.

Table 5 presents the estimation results. We find that a non-fundamental easing in bond funding does not impact the frequency of investment overall (columns (1)-(3)) but only the probability of maintenance investment (columns (4)-(6)). These indicate that the shock affects primarily the segment of investment with the smallest adjustment costs. Furthermore, it leads to a time profile for the response of maintenance investment consistent with stochastic adjustment costs. Table 5 thus supports hypothesis H2.

5.4 Do firm move up plans to replace assets?

If firms do not face adjustment costs, firms managers are incentivized to expand their bond funding right after the beginning of the shock. Indeed, firms are rationale when they accommodate to such a shock and establish a lower hurdle rate for new investments, taking into account the drop in the cost of funding. Such behavior of "timing the market" should arise when managers either maximize their firm's stock price in the short run or are financially constrained (Stein, 1996).

On the opposite, the presence of capital adjustment costs lead to a reaction for investment more stable over time. Indeed, the shift in the price of bond relative to other funding will only affect investment for firms with the most limited adjustment costs. In other words,

only a fraction of firms reacts already at the beginning of the shock. As the stochastic fixed costs are reset over firms, other firms will exploit this funding opportunity in turn (Miao and Wang, 2014).

To test for a time profile in investment reaction, we perform a parametric test where we interact the treatment variable with an indicator for each year. The specification is as follows:

$$Y_{i,t} = \beta \text{Eligible}_{i,t,2016} * \text{D}_t + \theta \text{D}_t + \gamma_1 Z_{i,t} * \text{Post}_t + \gamma_2 X_{i,t}^{IBES} + \gamma_3 X_{i,2015} + \delta_i + \delta_{j,t} + \epsilon_{i,t}, \quad (2)$$

where D_t is a vector of dummy variables for each $t \in \{2013, ..., 2018\}$. The firm-level controls and fixed-effects remain the same as before.

Figure 1 reports the estimated coefficients of the interaction between time dummies and eligibility status when considering maintenance investment as a dependent variable. Two comments stand out. First, Figure 1 supports the parallel trend assumption with statistically insignificant coefficients for the interaction between time dummies and eligibility status prior to the introduction of CSPP. It is only after the shock that the coefficients become statistically significant and the maintenance investment increases for eligible firms relative to ineligible firms. Second, the effect of the funding shock on investment expenditures is very stable over time, suggesting that firms did not move up investment plans.

We perform the same analysis using as a dependent variable the dummy indicating strictly positive maintenance investment expenditures. The results, plotted on Figure 2, highlight also that reactions at the extensive margins are staggered over time.

These results suggest a causal interpretation regarding firms' investment decisions. There is no evidence that managers respond to CSPP by moving up plans to replace assets, as would be optimal for financially constrained firms without adjustment costs. On the opposite, the reaction of firms investment is staggered, as implied by stochastic adjustments costs.

5.5 Robustness: Placebo test and Propensity Score Weighting estimator

Our baseline specification contrasts the level of dependent variables before and after the beginning of the CSPP. A potential concern could be that our results are driven by the ECB's purchase programme of sovereign bonds introduced in 2015.

We test whether the effects firms' maintenance investment appear already in 2015. Table 5 shows the results of a regression where we add to the Post CSPP dummy another dummy equal to 1 in 2015, hence prior to the CSPP, and 0 otherwise.

There is no evidence of an association between an investment grade rating and maintenance investment before the CSPP. This relationship between firms eligibility and the rise in expenditure to replace obsolete assets is not altered before the introduction of CSPP. We can therefore reject the hypothesis that some shift in maintenance investment based on unobservable factors, such as other ECB measures in 2015, may drive our main results.

When using difference-in-differences style regressions, treated and control units may differ significantly in terms of observable covariates. In such cases, including these covariates may not be enough to correct potential biases in the estimated coefficient of interest. To address this potential concern, we use a propensity score weighting (PSW) procedure to enhance the overlap in covariates across the treated and control groups. More specifically, we compute the propensity score for each observation, i.e., the probability of being assigned to the treatment group, given the firms' characteristics. We then re-estimate the main model using WLS regressions and weight each observation by the inverse of the propensity score for those assigned to the treated group, or the inverse of one minus the score for those in the control group. This procedure reduces the impact on the coefficient estimate of observations where "counterfactuals" are nearly absent in the data, namely those in the treated group with a high probability of being treated and those in the control group with a low probability of being treated. Conversely, this procedure overweights observations for which we may find enough counterfactuals in the sample, namely those in the treated

group with a low probability of being treated and those in the control group with a high probability of being treated. Results of the PSW regressions are in the columns (2) to (4) in Table 5. We re-confirm the effect of bond funding shock on maintenance investment. The point estimates are furthermore in the confidence intervals surrounding the baseline estimates.

6 Conclusion

In this paper, we characterize how an exogenous easing in security funding affects firms' investment, by distinguishing total investment from routine investment. 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.

We find evidence that an easing in bond funding, that occurs without a change in the expected firm's future fundamentals and in the industry-level business cycle, does not trigger overall higher capital expenses. This is because only maintenance investment, which is a component of total investment expenditures, appears to benefit from the easing in bond funding conditions. Hence firms do not appear to use the drop in the cost of funding to increase their scale, but used them instead to replace existing assets. Similarly, the bond funding shock affects the probability for maintenance investment expenditures to take place, but has no effect on the probability of investing overall. These effects are robust, as highlighted by a Placebo test and Propensity Score Weighted estimates. Our finding are consistent with the existence of significant costs for adjusting capital.

These findings have implications for policies aimed at firm investment. They support the view that firms facing frictions in adjusting their capital, for instance because of costs for plant restructuring. While transaction costs in external funding can also lead to costs for adjusting capital, note that this bond funding shock provides us with an ideal setting

to study firms that can raise cash to fund investment without facing either large entry costs over the financial market or a substantial increase in their marginal funding cost. So our empirical set-up is closely related to the existence of fixed capital adjustments costs. We show that firms do not smoothly adjust investment following a shock in the cost of capital. Marginal changes in the cost of capital hence only have a limited ability to trigger investment spikes, sugggesting an important role for aggregate demand and uncertainty in investment spikes. As such, policies supporting firms future profits, for instance through a higher demand, appear to have more potential to support aggregate investment.

This paper also contributes to informing the monetary policy debate on the implications of asset purchases programs. Our results point at limited real effects for corporate asset purchases, when conveyed out of episodes of financial stress, on firm investment. It follows that a reduction in corporate bond portfolio, for instance in a context of quantitative tightening, is likely to also have a reduced impact on investment once the effect on the business cycle is taken into account. It also suggests that quantitative tightening could have different effects on investment if it turns out to have a strong impact on the business cycle. We leave these questions for future research.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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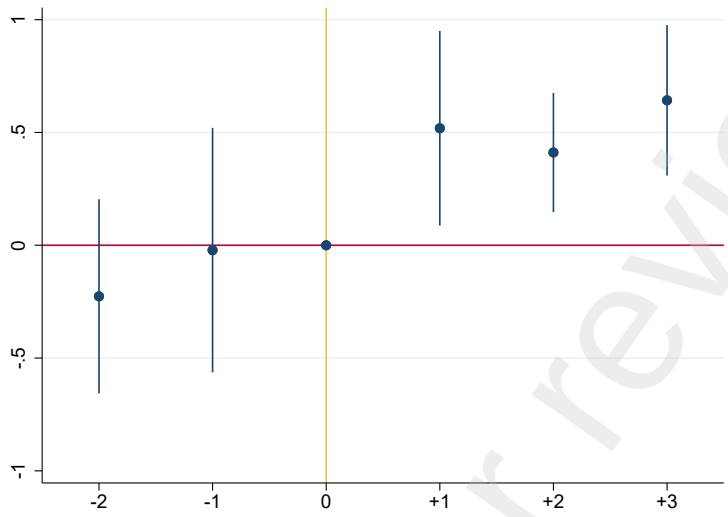
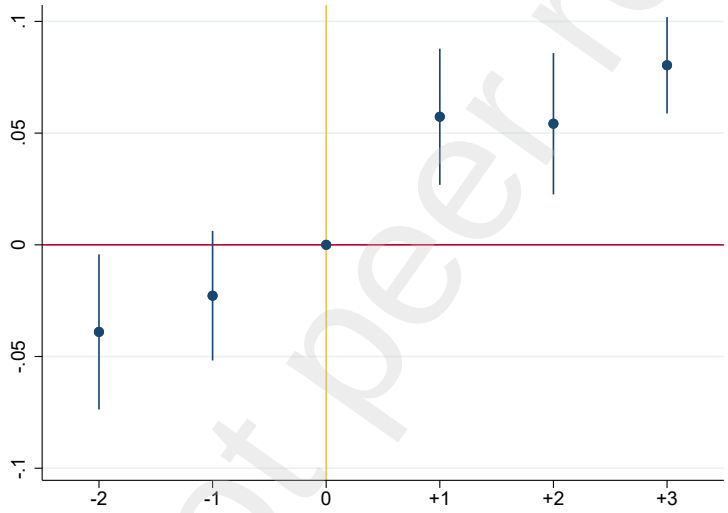
Figures

Figure 1: Parallel trend assumption



Notes: The figure plots the impact of CSPP on maintenance investment for our sample of firms. The dashed lines represent 95% confidence intervals. Treated observations are identified with a dummy variable that takes the value one for firms whose rating is investment grade at t, satisfying eligibility criteria to CSPP purchases. The dummy variable is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016.

Figure 2: Time profile of the occurence of maintenance investment



Notes: The figure plots the impact of CSPP on maintenance investment for our sample of firms. The dashed lines represent 95% confidence intervals. Treated observations are identified with a dummy variable that takes the value one for firms whose rating is investment grade at t, satisfying eligibility criteria to CSPP purchases. The dummy variable is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016.

Tables

Table 1: Summary Statistics

	Obs	Mean	Std.D.	p10	Median	p90
Treatment Group						
Maintenance Investment$_t$, (/Assets$_t$ %)	129	3.0	1.8	1.0	2.8	5.7
Investment$_t$ (/Assets$_t$, %)	129	5.3	3.8	1.5	4.7	9.1
Δ log Total Assets$_{t-1t}$, (%)	129	5.3	16.4	-2.5	3.5	14.3
Δ log Fixed Assets$_{t-1t}$, (%)	127	2.8	70.1	-45.5	-2.9	66.6
Expected Earnings per Share$_t^{2Y}$	129	-17.5	41.7	-100.0	1.9	5.8
Expected Growth in Earnings$_t^{LT}$	129	-11.1	46.5	-100.0	8.6	14.4
Security portfolio$_{t,2015}$	115	3.7	5.9	0.0	0.3	12.5
Current Assets$_{t,2015}$	115	36.6	17.9	15.7	33.5	58.0
Leverage$_{t,2015}$	105	0.4	0.1	0.3	0.4	0.6
Sales$_{t,2015}$ (in million)	115	16.5	14.0	2.9	10.2	40.2
Total Assets$_{t,2015}$	115	26.7	21.3	6.2	16.2	69.7
Control Group						
Maintainance Investment$_t$, (/Assets$_t$ %)	2,827	2.3	2.3	0.1	1.7	5.2
Investment$_t$ (/Assets$_t$, %)	2,827	5.7	5.8	1.0	4.0	12.0
Δ log Total Assets$_{t-1t}$, (%)	2,827	5.1	15.3	-8.3	3.2	20.6
Δ log Fixed Assets$_{t-1t}$, (%)	2,720	0.6	77.6	-50.3	0.1	55.5
Expected Earnings per Share$_t^{2Y}$	2,827	-98.8	10.9	-100.0	-100.0	-100.0
Expected Growth in Earnings$_t^{LT}$	2,827	-98.7	12.8	-100.0	-100.0	-100.0
Security portfolio$_{t,2015}$	2,555	1.9	4.3	0.0	0.0	6.2
Current Assets$_{t,2015}$	2,555	48.8	20.2	20.8	50.2	75.0
Leverage$_{t,2015}$	2,466	0.6	0.2	0.3	0.6	0.8
Sales$_{t,2015}$ (in million)	2,555	1.7	5.8	0.3	0.1	2.9
Total Assets$_{t,2015}$	2,555	2.7	10.0	0.0	0.1	4.3

Summary statistics recorded for our sample of treated and control firms prior to the implementation of CSPP, i.e., in 2015 for all French non-financial firms. Treated group is defined as firms whose bonds were above investment grade by atleast one rating agency, and control group comprises of non investment grade rated firms with public debt. Summary statistics for control variables including security portfolio, current assets, leverage and sales is recorded for the year 2015.

Table 2: Investment and Maintenance Investment

	(1) Investment$_t$ (/Assets$_t$ %)	(2) Investment$_t$ (/Assets$_t$ %)	(3) Investment$_t$ (/Assets$_t$ %)	(4) Maintenance Investment$_t$ (/Assets$_t$ %)	(5) Maintenance Investment$_t$ (/Assets$_t$ %)	(6) Maintenance Investment$_t$ (/Assets$_t$ %)
Post CSPP$_t$ x IG rating$_{t,2016}$	0.62*	0.62*	0.44	0.67***	0.66***	0.57***
	(0.32)	(0.32)	(0.34)	(0.15)	(0.15)	(0.15)
IG rating$_{t,2016}$	-1.13	-0.92	-1.21	-0.48	-1.12*	-1.20*
	(1.49)	(1.07)	(1.14)	(0.46)	(0.66)	(0.63)
Security portfolio$_{t,2015}$			0.14*			0.02
			(0.07)			(0.02)
Expected Earnings per Share$_t^{2Y}$		0.01	0.01		0.02*	0.02**
		(0.02)	(0.02)		(0.01)	(0.01)
Expected Growth in Earnings$_t^{LT}$		-0.02**	-0.01		-0.01	-0.01
		(0.01)	(0.01)		(0.01)	(0.01)
Observations	3,294	3,294	3,294	3,294	3,294	3,294
R-squared	0.466	0.466	0.477	0.674	0.674	0.681
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level Default Risk Controls	No	No	Yes	No	No	Yes

The dependent variable in columns (1)-(3) is the ratio of gross investment to total assets. The dependent variable in columns (4)-(6) is the ratio of maintenance investment to total 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 purchases. $IGrating_t$ is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016. $PostCSPP$ equals one after the announcement of CSPP, i.e., 2016, otherwise zero. Our sample period id from 2013-2018. The firm-level controls include ratio of current assets to total assets, leverage, sales, total assets and its square. These variables are set at their value as of 2015 throughout the sample. It also comprises firm fixed effects to control for the heterogeneity in firm characteristics. 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: Firm productive capability

	(1) Δ log Total Assets$_{t-1t}$ (%)	(2) Δ log Total Assets$_{t-1t}$ (%)	(3) Δ log Fixed Assets$_{t-1t}$ (%)	(4) Δ log Fixed Assets$_{t-1t}$ (%)
Post CSPP$_t$ x IG rating$_{t,2016}$	3.39	3.28	8.16	8.13
	(2.79)	(2.71)	(12.52)	(12.34)
IG rating$_{t,2016}$	-0.71	-2.05	23.22	24.19
	(4.16)	(4.05)	(57.10)	(56.89)
Security portfolio$_{t,2015}$		0.21		0.88
		(0.21)		(1.30)
Expected Earnings per Share$_t^{2Y}$	0.08	-0.02	0.53	0.62
	(0.11)	(0.14)	(1.09)	(1.08)
Expected Growth in Earnings$_t^{LT}$	-0.06	0.03	-0.14	-0.23
	(0.10)	(0.13)	(0.20)	(0.22)
Observations	3,182	3,182	3,043	3,043
R-squared	0.36	0.37	0.21	0.21
Firm Fixed Effects	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes
Firm-level Default Risk Controls	No	Yes	No	Yes

The dependent variable in columns (1)-(2) is the growth in total assets, while it is in columns (3)-(4) the growth in fixed assets. $IGrating_{t,2016}$ is a dummy that takes the value one for firms whose rating is investment grade at t, satisfying eligibility criteria to CSPP purchases. $IGrating_{t,2016}$ is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016. $PostCSPP$ equals one after the announcement of CSPP, i.e., 2016, otherwise zero. Our sample period id from 2013-2018. The firm-level controls include ratio of current assets to total assets, leverage, sales, total assets and its square. These variables are set at their value as of 2015 throughout the sample. 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: Probability of investing

	(1) Investment$_t$ Dummy (/Assets$_t$ %)	(2) Investment$_t$ Dummy (/Assets$_t$ %)	(3) Investment$_t$ Dummy (/Assets$_t$ %)	(4) Maintenance Invest.$_t$ Dummy (/Assets$_t$ %)	(5) Maintenance Invest.$_t$ Dummy (/Assets$_t$ %)	(6) Maintenance Invest.$_t$ Dummy (/Assets$_t$ %)
Post CSPP$_t$ x IG rating$_{t,2016}$	0.01	0.01	0.01	0.08***	0.08***	0.08***
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
IG rating$_{t,2016}$	-0.10	-0.03	-0.03	0.01	-0.00	-0.01
	(0.09)	(0.04)	(0.04)	(0.01)	(0.01)	(0.01)
Security portfolio$_{t,2015}$			0.00			-0.00
			(0.00)			(0.00)
Expected Earnings per Share$_t^{2Y}$		-0.00	-0.00		0.00	0.00
		(0.00)	(0.00)		(0.00)	(0.00)
Expected Growth in Earnings$_t^{LT}$		-0.00	-0.00		-0.00	0.00
		(0.00)	(0.00)		(0.00)	(0.00)
Observations	3,294	3,294	3,294	3,294	3,294	3,294
R-squared	0.36	0.36	0.36	0.48	0.48	0.48
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-level Default Risk Controls	No	No	Yes	No	No	Yes

The dependent variable in columns (1)-(3) is the ratio of gross investment to total assets. The dependent variable in columns (4)-(6) is the ratio of maintenance investment to total 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 purchases. $IGrating_t$ is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016. $PostCSPP$ equals one after the announcement of CSPP, i.e., 2016, otherwise zero. Our sample period id from 2013-2018. The firm-level controls include ratio of current assets to total assets, leverage, sales, total assets and its square. These variables are set at their value as of 2015 throughout the sample. 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: Placebo and Propensity Score Weighting

	Maintenance Investment$_t$ (/Assets$_t$ %)			
	(1)	(2)	(3)	(4)
	Placebo	Propensity score Weighting		
Post CSPP$_t$ x IG rating$_{t,2016}$	0.66***	0.66***	0.66***	0.57***
	(0.21)	(0.17)	(0.17)	(0.16)
Year 2015 x IG rating$_{t,2016}$	0.22			
	(0.19)			
IG rating$_{t,2016}$	-1.28*	-0.55	-1.39*	-1.45*
	(0.65)	(0.61)	(0.77)	(0.74)
Security portfolio$_{t,2015}$	0.02			0.02
	(0.02)			(0.02)
Expected Earnings per Share$_t^{2Y}$	0.02**		0.03***	0.03***
	(0.01)		(0.01)	(0.01)
Expected Growth in Earnings$_t^{LT}$	-0.01		-0.01***	-0.01***
	(0.01)		(0.00)	(0.00)
Observations	3,294	3,085	3,085	3,085
R-squared	0.68	0.70	0.71	0.71
Firm Fixed Effects	Yes	Yes	Yes	Yes
Industry x Year FE	Yes	Yes	Yes	Yes
Firm-level Default Risk Controls	Yes	No	No	Yes

The dependent variable is the ratio of maintenance investment to total 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 purchases. $IGrating_t$ is equal to zero for non investment grade rated firms with public debt. This dummy remains constant once the CSPP started in 2016. As regards the placebo analysis, $Year2015$ equals one if year = 2015, i.e., prior to the commencement of CSPP; 0 otherwise. In columns (2)-(4), propensity score weighting is used. $PostCSPP$ equals one after the announcement of CSPP, i.e., 2016, otherwise zero. Our sample period id from 2013-2018. The regressions include firm-level controls including ratio of current assets to total assets, leverage, sales, total assets and its square and firm fixed effects to control for the heterogeneity in firm characteristics. 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.