The Liquidity Promise of QE*

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Abstract

This paper uses confidential portfolio holdings data to show that corporate quantitative easing (QE) operates primarily through a liquidity demand channel. By acting as a standing buyer, the central bank enhances the liquidity and reduce the liquidity risk of eligible bonds, raising demand from liquidity-sensitive investors. The impact on prices crucially depends on investor heterogeneity. Mutual funds rebalance toward eligible bonds, while banks and foreign investors are net sellers. As a result, mutual funds amplify the transmission of QE to bond prices. QE mainly compresses the CDS-bond basis with limited effect on default premia. Even during balance sheet unwinding, the implicit liquidity backstop persists, muting quantitative tightening (QT) effects.

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One of the leading explanations for why quantitative easing (QE) raises asset prices is that it reduces the supply of assets that investors have to hold. The underlying mechanism is well-captured by models in the spirit of Vayanos and Vila (2021). In this class of models, preferred habitat investors—who have limited ability to rebalance their portfolios—cannot respond effectively to this central bank buying pressure. Meanwhile, risk-averse arbitrageurs reduce their exposure to risk by selling bonds to the central bank. As the total supply of risk that arbitrageurs need to hold falls, so does the risk premium. Thus, the combination of inelastic preferred habitat investors and risk-averse arbitrageurs explains why QE might have a large impact on asset prices.[1]

In this paper, we show that this supply-side explanation alone cannot account for both the price impact and the heterogeneous portfolio rebalancing responses to the ECB's corporate QE. We argue that corporate QE also operates through a liquidity demand channel and document how investor heterogeneity shapes the transmission of this policy. The ECB's commitment to act as a large standing buyer—both in normal times and, especially, during periods of market stress (Haddad et al., 2025)—enhances the liquidity of bonds eligible for ECB purchase and reduce their liquidity risk (Pástor and Stambaugh, 2003; Acharya and Pedersen, 2005). Investors who value liquidity increase their demand for these bonds. As a result, QE affects asset prices not only by reducing the supply of duration and credit risk—which induces movements *along* investors' existing demand curves—but also by shifting investors' demand curves outward. Because investors differ in how much they value liquidity, their demand responses to the policy vary. This heterogeneity determines how strongly aggregate demand for eligible bonds increases, and therefore how much their yields compress in response to QE. Because corporate bonds are illiquid relative to sovereign bonds, liquidity enhancement plays a central role in the transmission of corporate QE, which explains the differences between our results and those of other studies focusing on sovereign bond QE (Koijen et al., 2021; Breckenfelder and De Falco, 2024).

We leverage confidential granular data on portfolio holdings in the euro area, along with a large cross-section of corporate bond prices, to study the complete life cycle of corporate QE—from the 2016 Corporate Sector Purchase Programme (CSPP) announcement, via the expansion of the Pandemic Emergency Purchase Programme (PEPP) in response to the COVID-19 crisis, to the subsequent Quantitative Tightening (QT) when the ECB started unwinding its balance sheet. Studying all three phases is critical: it allows us to trace the liquidity demand channel across varying market conditions, as well as for expansionary and contractionary central bank policy measures.

[1]Policymakers often refer to this narrative. See, e.g., the speech by Philip R. Lane, Member of the ECB's Executive Board: "*By buying sovereign bonds and other assets, the ECB reduced the overall amount of duration [and credit] risk that had to be borne by private investors, reducing the compensation for risk.*"

We document four main findings that, as we will show, are consistent with the liquidity demand channel: (i) At the initial announcement, mutual funds rebalanced toward eligible bonds rather than selling them to the ECB, increasing their holdings by 10% relative to their pre-announcement portfolio weights, whereas insurance companies and pension funds decreased their portfolio weights on eligible bonds; (ii) For bonds with higher mutual fund holdings, ECB purchases had a stronger impact on spreads. A 10 percentage point higher mutual fund ownership share prior to the announcement corresponds to an approximately 3 basis points larger announcement effect on credit spreads; (iii) The QE announcement had a large and persistent impact on corporate bond spreads, but a modest impact on the default premium, as measured by CDS spreads. As a result, the non-default premium (the CDS-bond basis[2]) of eligible versus ineligible bonds increased by 11 basis points, accounting for roughly 55% of the overall spread decline; (iv) During the QT phase, while the supply of eligible bonds absorbed by the ECB has been reverting toward its pre-QE level, the spread differential between eligible and ineligible bonds has not shown signs of returning to its pre-QE level.

These findings may initially appear counterintuitive for several reasons. Mutual funds are typically viewed as highly elastic investors[3] and would therefore be expected to sell eligible bonds to the ECB, as the announcement made these more expensive. Moreover, according to the existing literature, the presence of elastic investors should dampen the impact of QE on spreads, whereas inelastic investors should amplify it (Koijen et al., 2021; Breckenfelder and De Falco, 2024). Additionally, if the transmission of corporate QE operated primarily through a reduction in the supply of credit risk—and thus a reduction in the aggregate price of credit risk—both bond prices and CDS spreads should have moved similarly, leaving limited scope for changes in the CDS-bond basis. Finally, under a standard supply-side mechanism, when the ECB reduces bond holdings during QT, the effects should be *symmetric*, as investors must re-absorb the risk that the ECB had previously taken onto its balance sheet.

We rationalize the empirical results through our liquidity demand channel rather than through the supply channel of QE.[4] The ECB's presence as a standing buyer improves investors' ability to liquidate their positions. This improvement in liquidity induces heterogeneous demand responses across intermediaries, reflecting differences in liquidity valuation. The resulting increase in aggregate demand for QE-eligible securities raises their prices, even

[2]The CDS-bond basis is defined as the yield spread between AAA sovereign bonds and duration-matched CDS-hedged corporate bonds. The CDS-bond basis has been associated with, among other things, the liquidity premium (Longstaff et al., 2005).

[3]See, e.g., Koijen et al. (2021); Bretscher et al. (2025); Jansen (2024).

[4]Throughout the paper, we use the term *QE* to refer to *corporate quantitative easing*, unless stated otherwise.

if the effect on default risk is limited, hence the large impact on the CDS-bond basis. Finally, even during QT—when the ECB unwinds its balance sheet by discontinuing the purchase of eligible bonds—investors nonetheless expect the central bank to stand ready to reactivate the programme if needed. This expectation prevents bond prices and portfolio allocations from returning to their pre-QE equilibrium. We organize these ideas in a simple model in Appendix A.

We document several other findings consistent with this liquidity demand channel. Mutual funds are subject to redemption risk (e.g., Coppola (2025)) and therefore place a premium on the ability to liquidate positions quickly and at low cost. Using granular mutual fund holdings data, we show that funds with more volatile capital flows are precisely those that rebalance more strongly toward eligible bonds following the QE announcement. Mutual funds' excess demand is accommodated by banks and foreign investors rebalancing away from eligible bonds. By revealed preference, this implies that the now relatively more expensive eligible bonds are particularly valuable to mutual funds. We argue this is the case because these are the investors who benefit the most from enhanced liquidity and reduced liquidation costs. In the robustness section, we rule out alternative explanations, such as mutual funds front-running the central bank. We therefore interpret these results as strong evidence for the liquidity promise mechanism we propose.

At the core of our mechanism is the idea that the ECB corporate QE improves the liquidity of eligible bonds. Following Pástor and Stambaugh (2003), we recognize that liquidity encompasses not only transaction costs, but also exposure to liquidity risk—how easily a bond can be sold during periods of market distress. This dual nature makes measuring liquidity inherently challenging. Despite these challenges, we provide multiple measures that directly capture the liquidity enhancement of eligible corporate bonds.

We begin the analysis by examining traditional liquidity measures: bid-ask spreads and turnover.[5] Consistent with Todorov (2020), our results indicate that the CSPP announcement reduced bid-ask spreads and increased secondary market turnover for eligible bonds. We show that these liquidity improvements are persistent, lasting at least two quarters after the announcement. However, the conventional measures overlook a critical aspect of liquidity: the fire-sale discount investors face when unwinding portfolios during crises, which relates more closely to exposure to liquidity risk factors. Because QE entails an implicit promise that investors can sell bonds to the central bank during periods of market stress, it fundamentally alters eligible bonds' loading on systematic liquidity risk. This mechanism is consistent with the contingent nature of QE, as proposed by Haddad et al. (2024, 2025).

[5]Unlike the US market, we lack transaction data, precluding calculation of other liquidity measures such as round-trip costs.

We provide new evidence for the relevance of this liquidity promise channel during the COVID-19 outbreak. We show that, *before* the ECB announced the PEPP, credit spreads of ineligible bonds increased substantially more than those of eligible bonds. Investment-grade ineligible bonds experienced a 9.1% fall in prices, significantly larger than the 6.1% registered for eligible bonds. These effects are driven almost entirely by the CDS-bond basis widening more for ineligible bonds. Investors likely anticipated these differences in fire sale costs, which materialized during the first days of the COVID crisis. As a result, holding eligible bonds helped to mitigate losses for mutual funds precisely when outflows forced them to sell assets. Our evidence on the evolution of bond spreads and the CDS-bond basis complements the findings of Breckenfelder and Hoerova (2023), who study fund flows and show that funds with higher ex ante shares of eligible bonds experienced relatively lower outflows during the COVID crisis.

We continue by examining the PEPP announcement. We find that the effects of PEPP—aside from the short-term movements immediately before and in a narrow window around the announcement—were substantially weaker than those observed during the initial CSPP.[6] In particular, when we consider broader windows, we find that PEPP did not have any material effect on the spread between eligible and ineligible bonds. This indicates that it was the initial CSPP announcement that reshaped investors' perceptions of liquidity. By the time PEPP was announced, investors had already anticipated the intervention and prices reflected the expected purchases. This evidence is consistent with findings from government bond QE announcements by other central banks (Hesse et al., 2018; Bernanke, 2020; Haddad et al., 2025).

Finally, consistent with the notion that expected future intervention is already incorporated into prices, we provide novel evidence that QT has asymmetric effects on asset prices and portfolio rebalancing compared to the initial CSPP announcement. Following the ECB's announcement of its intention to discontinue the purchase of eligible securities, one might expect the spreads of eligible bonds to widen more than those of ineligible bonds, effectively starting to reverse the initial announcement effects. We do not find this to be the case. In 2022, as the ECB began to tighten monetary policy and announced it would start reducing its QE actions, credit spreads widened. Surprisingly, eligible bonds experienced smaller losses than ineligible bonds—that is, their credit spreads and basis widened by less—despite being the bonds most directly impacted by QT. Moreover, mutual funds largely retained their holdings of eligible bonds. These findings are consistent with the idea that once the central bank has intervened, markets anticipate future interventions in times

[6]Short-term effects are consistent with the Federal Reserve's corporate bond purchase announcements during the COVID-19 crisis (Haddad et al., 2021; Gilchrist et al., 2024; Darmouni and Siani, 2022; O'Hara and Zhou, 2021; Kargar et al., 2021; Falato et al., 2021; Ma et al., 2022).

of stress, thereby persistently enhancing the perceived liquidity of eligible bonds relative to ineligible ones. These results indicate that the effects of QE were not symmetric and provide new insights into how QT influences financial markets.

All our empirical analyses rely on a difference-in-differences approach that exploits the institutional design of the policy. At the time of the CSPP announcement, the ECB stated that it would purchase only a subset of bonds, which provides a natural setting to compare eligible and ineligible securities. By contrasting the prices and holdings of eligible bonds with those of ineligible ones, this empirical design enables us to isolate the effects of the policy announcement from potential confounding influences. To implement this approach, we combine confidential sector-level portfolio holdings from the ECB's Securities Holdings Statistics (SHSS) with granular mutual fund data from Morningstar. We then match these holdings with monthly corporate bond prices and bond characteristics from the ECB's Centralised Securities Database (CSDB), complemented by high-frequency daily data from Markit iBoxx.

Our results have important implications for understanding the transmission of unconventional monetary policy. The immediate response of bond spreads to the QE announcement indicates that expectations of a central bank liquidity backstop reshape investor behavior. Rather than operating only through immediate supply effects, QE also works by altering how investors perceive and price the liquidity of eligible bonds. This effect is particularly powerful for corporate bonds, which are intrinsically less liquid than sovereign bonds, making the liquidity promise a central component of the transmission of corporate QE.

Central banks can harness these insights to design more effective interventions by considering three factors: First, recognize that the liquidity channel is stronger when central banks target more illiquid assets. Second, communicate the commitment to intervene strategically, acknowledging that liquidity needs are state-contingent. Third, account for the fact that investors differ in how they value liquidity, so the composition of the investor base matters for transmission strength.

These findings contribute to the ongoing debate about central bank communication and balance sheet policy. Credible commitments may matter as much as—or more than—the actual scale of purchases. Looking ahead, the liquidity channel may become even more important as mutual funds increase their market share in the corporate bond market, even as markets become overall more elastic.

Related Literature Our paper contributes to three strands of literature. First, we contribute to the assessment of how QE affects asset prices. Haddad et al. (2024, 2025) show that the initial announcement of government bond QE had large effects on asset prices because markets revised their expectations of state-contingent support—so-called "policy puts." Whereas Haddad et al. (2024, 2025) identify these effects from the pricing of Trea-

suries and corporate bond options, we take a different, complementary approach by jointly studying the heterogeneous rebalancing behavior of investors and a large cross-section of corporate bonds. This joint perspective is essential for identifying and quantifying the liquidity-demand channel that we document. Our key contribution is to show that the transmission of QE depends on investors' valuation of this additional liquidity, which varies across investor types. We provide direct evidence of this liquidity demand channel by examining portfolio rebalancing patterns and demonstrating how investor heterogeneity shapes the transmission of corporate QE.

The fact that mutual funds are subject to redemption risk—and that their presence therefore shapes the transmission of shocks to asset prices—has been documented by Coppola (2025). We connect this behavior to the QE context. The central bank's liquidity promise not only enhances the liquidity of QE-eligible bonds in general, but also mitigates their exposure to fire-sale risk. Because mutual funds place particular value on liquidity, they increased their demand for eligible bonds following the 2016 corporate QE announcement. This increase in demand amplifies the effects of corporate QE announcements on asset prices. The expectation that eligible bonds would be less vulnerable to price pressures in the event of a recession is borne out during the COVID crisis. We show that eligible bonds exhibited significantly greater price resilience than ineligible bonds. This is connected to the role of mutual funds in amplifying the transmission of monetary policy to corporate bond yields and thus relates to Fang (2023) who instead focus on the fund-flows channel.

Our work connects more broadly to papers that document the effects of QE announcements on bond yields. Todorov (2020) and Zaghini (2020) document ECB announcement effects on corporate bond yields. In particular, Todorov (2020) shows significant liquidity effects. Faia et al. (2025) document the effects of the ECB's QE on the euro–dollar yields difference of corporate bonds. D'Amico and Kaminska (2019) study UK central banks' corporate bond purchases.[7] Pelizzon et al. (2025) studies the effect of sovereign QE on the arbitrage between European sovereign bonds and their futures contracts. Differently from our results, they show that sovereign QE reduced sovereign bond market liquidity. Several papers examine Fed announcements during the pandemic crisis, discussing how announcements provided liquidity to mutual funds during fire sales (Vissing-Jorgensen, 2021; Haddad et al., 2021; Gilchrist et al., 2024; Darmouni and Siani, 2022; O'Hara and Zhou, 2021; Kargar et al., 2021; Falato et al., 2021; Ma et al., 2022; Darmouni et al., Forthcoming). Our empirical contribution lies in tracing the liquidity demand channel across the full corporate QE cycle in the euro area—from the initial CSPP announcement under calm market conditions,

[7]Other studies include Abidi and Miquel-Flores (2018); De Santis et al. (2018); De Santis and Zaghini (2021), Fabo et al. (2021).

through the PEPP intervention during the COVID-19 crisis, to the subsequent quantitative tightening period. By documenting the effects of ECB corporate QE on the CDS-bond basis, we contribute to the literature studying the CDS-bond basis in the euro area (Fontana and Scheicher, 2016; Jiang et al., 2025; Corell et al., 2025).

The second main strand of literature we contribute to relates to QT. Du et al. (2024) provide a cross-country empirical analysis of quantitative tightening in developed economies. D'Amico and Seida (2024) find that Treasury yield sensitivities to QT-related supply surprises are, on average, *larger* than sensitivities to QE surprises. These findings are also consistent with the model predictions in Jiang and Sun (2024). On investor heterogeneity, Kaminska et al. (2025) analyze the asymmetry between QE and QT effects on bond yields in the UK, but focus on the behavior of insurance companies and pension funds.[8] Our results for corporate QT contrast with the evidence for US Treasuries. We find that eligible bonds did not exhibit an increase in spreads relative to ineligible bonds, and thus the spread differential between eligible and ineligible bonds did show signs of reverting back to its pre-QE level. Furthermore, mutual funds did not sell the eligible bonds accumulated during the QE phase. Our findings can be rationalized through the lens of our liquidity demand channel. Investors expect the central bank to reactivate the programme if needed and such expectations prevent bond prices and portfolio allocations from returning to their pre-QE equilibrium.

Third, we contribute to the demand-based asset pricing literature that studies how investor heterogeneity shapes asset prices (Koijen and Yogo, 2019). A low investor demand elasticity can rationalize the sizable QE effects documented using high-frequency identification.[9] Corporate bond investors differ markedly in price elasticities: insurance companies exhibit low elasticity, whereas mutual funds are substantially more elastic (Koijen et al., 2021; Bretscher et al., 2025; Breckenfelder and De Falco, 2024; Jansen, 2024). These findings predict that elastic investors should sell bonds to the central bank, implying that bonds heavily held by mutual funds experience smaller yield declines during QE. The study most closely related to ours is Breckenfelder and De Falco (2024), who show that this mechanism is crucial for explaining the effects of QE on government bonds purchased by the ECB during the implementation phase. Likewise, Koijen et al. (2021) document that more elastic investors—such as the rest of the world and mutual funds—sold a larger share of sovereign bonds to the ECB.[10]

[8] Acharya et al. (2023); Blickle et al. (2025) also discuss asymmetric QE vs. QT effects, focusing on U.S. banks and showing how banks' balance sheets expanded during QE but did not contract during QT.

[9] Gagnon et al. (2011); Krishnamurthy and Vissing-Jorgensen (2011) study Fed QE announcements. Altavilla et al. (2021) and Krishnamurthy et al. (2017) examine ECB government bond purchases.

[10] Fang and Xiao (2025) study the role of heterogeneous investors in the transmission of conventional monetary policy and government bond QE in the United States.

Our results show that the role of heterogeneity in shaping the effects of corporate QE is more nuanced than previously understood. QE affects portfolio choices not only through prices, but also by *fundamentally altering the characteristics* of the bonds eligible for purchase. As a result, price effects are driven not solely by investors' elasticities, but also by how different investors value the central bank's liquidity promise. Our evidence indicates that this liquidity demand channel outweighs elasticities in explaining the impact of euro area corporate QE. Mutual funds place a high value on liquidity and therefore rebalance toward eligible bonds, thereby amplifying—rather than dampening—the effects of corporate QE. These findings highlight how investor heterogeneity has markedly different implications for corporate QE compared to existing evidence on sovereign bond QE.

I. Institutional Background

A. Corporate Quantitative Easing

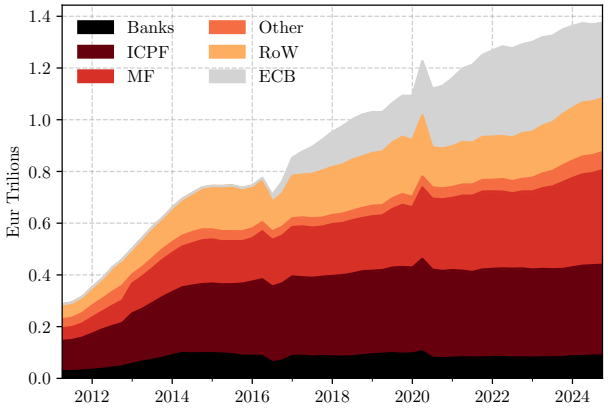
The ECB launched its Asset Purchase Programme (APP) in 2014 to counter persistently low inflation in the euro area, initially focusing on covered bonds and asset-backed securities. In January 2015, the ECB announced a major expansion through the Public Sector Purchase Programme (PSPP), involving large-scale purchases of government bonds, with purchases starting in March 2015. As part of the APP, the ECB announced its first corporate QE programme, the Corporate Sector Purchase Programme (CSPP), on March 10, 2016. On the announcement date, the ECB increased total monthly APP purchases from €60 billion to €80 billion and expanded the eligible asset universe to include corporate bonds. The announcement took place in a relatively calm market environment and was primarily intended to broaden the ECB's purchase capacity. Actual corporate bond purchases under the CSPP began in July 2016.

Under the CSPP, the ECB restricted its purchases to investment-grade corporate bonds issued by non-bank corporations incorporated in the euro area, hereafter referred to as eligible bonds. A bond is considered eligible if the following conditions are met: (a) the issuer is not a credit institution and does not have a parent undertaking that qualifies as such; (b) the bond is rated by accepted external credit assessment institutions or third-party rating tools and has a minimum rating of BBB−; (c) the bond has an initial maturity of at least 367 days, with a remaining maturity between six months and 30 years and 364 days; (d) the bond is euro-denominated; (e) it is issued in the euro area; (f) the issuer is established in the euro area and the place of settlement is also located in the euro area and (g) the yield is above the ECB deposit facility rate (DFR).[11] Whether a security is considered eligible is publicly available information, as announced by the ECB. Within eligible bonds, the ECB

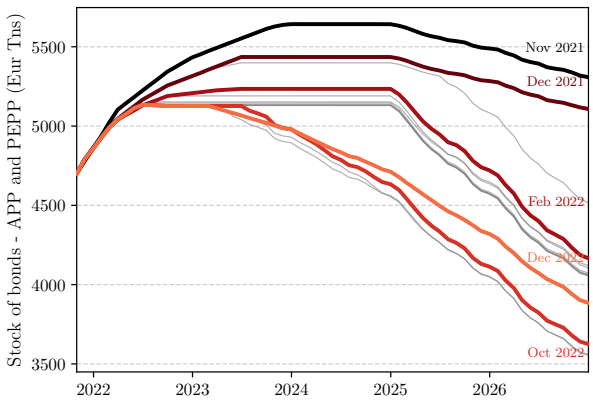
[11] This minimum yield requirement was removed in September 2019.

Figure 1. **ECB Holdings of Corporate Bonds and SMA Expected Path of Holdings**
Panel (a) plots the holdings in € trillions by different sectors for eligible bonds. Panel (b) shows market expectations on the path of purchases under the combined APP and PEPP programme. Market surveys take place each month. Each line in the plot corresponds to a different time when the expectations were elicited. The dark grey lines are months where there were not major changes in market expectations.

(a) Holdings of Corporate Bonds



(b) Path of Stock Bonds under APP and PEPP



implements its corporate purchases using a market-neutral approach, whereby purchases are guided by a benchmark that mirrors the outstanding stock of eligible securities.[12]

In 2020, in response to the challenges posed by the COVID-19 pandemic, the ECB introduced a substantial policy package that included increased purchases of corporate bonds. First, at its Governing Council meeting on March 12, 2020, the ECB announced that it would increase purchases under the existing APP and add a temporary envelope of additional net asset purchases of €120 billion until the end of the year, with a strong contribution from private sector purchase programmes. However, bond markets fell sharply, as financial markets viewed the ECB's response as insufficient given the scale of the unfolding shocks.[13] Six days later, on March 18, 2020, the ECB took further action outside its regular schedule. In this unscheduled announcement, the ECB unveiled the Pandemic Emergency Purchase Programme (PEPP), committing to a substantial expansion of its asset purchases. The programme was launched with an initial envelope of €750 billion, signaling a significant intensification of the ECB's policy response to the escalating crisis.

The set of bonds eligible under the PEPP coincides with that of the CSPP, except that eligibility was expanded to include securities with a remaining maturity of at least 28 days.[14]

Since launching its first corporate purchase programme in 2016, the ECB has become a

[12]The original market-neutral approach was adjusted in July 2022, when the Eurosystem announced its intention to tilt purchases toward issuers with stronger climate performance.

[13]The reaction was also exacerbated by President Lagarde's remark that "we are not here to close spreads," which was widely seen as undermining support for sovereign debt markets.

[14]Following the PEPP announcement, these securities could be purchased under both the PEPP and the CSPP, which were operating in parallel.

dominant player in the corporate bond market. Figure 1a shows the evolution of holdings across investor sectors. Since the ECB started purchasing bonds in 2016, it rapidly accumulated over €300 billion, holding 22% of eligible investment-grade bonds by 2019—a share that spiked to 27% during the COVID-19 crisis before peaking at approximately €400 billion in 2023. This scale makes the ECB comparable to the largest private-sector investors: mutual funds, which grew from under €50 billion in 2011 to €360 billion in 2024, and insurers and pension funds, which expanded from €120 billion to over €350 billion. By contrast, banks remained smaller at under €100 billion, while foreign investors held a relatively stable €150–200 billion throughout the period. Foreign holdings, referred to as the Rest of the World (RoW), are computed as the difference between total outstanding amounts and euro area holdings.

B. Corporate Quantitative Tightening

At the end of 2021 and the beginning of 2022, the ECB gradually shifted its communication regarding the future of its QE programmes. Unlike the CSPP and PEPP announcements, which were communicated to markets on clearly defined dates, the transition toward QT did not occur through a single announcement. Instead, it unfolded progressively through a series of policy communications.

The first indication came during the press conference of 16 December 2021, when the ECB stated: "In the first quarter of 2022, we expect to conduct net asset purchases under the PEPP at a lower pace than in the previous quarter. We will discontinue net asset purchases under the PEPP at the end of March 2022." (ECB Press Conference). The same communication also signaled a gradual reduction in purchases under the APP.[15] In subsequent meetings, the ECB continued to signal its intention to end APP purchases in the third quarter of 2022, while emphasizing a data-dependent approach. Finally, at the meeting of 9 June 2022, the ECB formally announced that net asset purchases under the APP would end as of 1 July 2022. At the same meeting, the ECB also announced its intention to raise policy rates at the July 2022 meeting, which indeed materialized. In July 2022, the ECB increased the short-term policy rate (the MRO) from 0% to 0.5% and continued to raise interest rates until September 2023, when the MRO reached 4.5%.

It is worth emphasizing that by QT we refer to the period in which the ECB communicated to markets its intention to slow or halt bond purchases. In practice, the actual run-off of the ECB's balance sheet began only in 2023, when the ECB stopped reinvesting the principal of maturing bonds.

The main rationale for focusing on announcement effects in the literature is that asset

[15]Press release from the December 2021 meeting: "The Governing Council decided on a monthly net purchase pace of €40 billion in the second quarter and €30 billion in the third quarter under the APP."

prices respond primarily to changes in market expectations. Consequently, most studies identify policy shocks as changes in asset prices observed around major announcements. Owing to the more gradual communication, this approach is less straightforward for QT. We therefore identify QT-related "treatment dates" based on major adjustments in market expectations. In particular, we use the ECB's *Survey of Monetary Analysts (SMA)*, which provides information on market expectations regarding the future path of the stock of bonds held under the APP and PEPP programmes.

The evolution of these expectations is illustrated in Figure 1b. Each line in the plot corresponds to a different survey round, with the dark gray lines indicating the months when expectations remained broadly unchanged. To make the numbers comparable across survey rounds, we focus on expectations regarding the stock of bonds held by the ECB in December 2026, the longest common horizon across survey rounds. Consistent with the policy timeline, the first notable shift in expectations occurred in December 2021, when market participants began to anticipate a smaller stock of bonds—about €5.1 trillion compared with €5.3 trillion expected in November 2021. A second major revision took place in early 2022, with expectations declining to around €4.2 trillion by February 2022, and a further adjustment later in the year, reaching about €3.6 trillion by October 2022. Interestingly, following this trough, expectations partially reversed, with market participants anticipating a higher stock of roughly €3.9 trillion by December 2026. These shifts mark the main episodes of changing market perceptions about the pace and extent of QT.

Against this background, we study the ECB's corporate QE announcements in Sections 4–6 and analyze the QT announcement in Section 7. Our analysis is based on a large set of data combining information from several sources on asset prices and portfolio holdings. We describe these data in detail in the next section.

II. Data

A. Asset Prices

We use monthly bond-level data from the ECB's Centralised Securities Database (CSDB). We restrict our sample to senior unsecured corporate bonds with fixed or zero coupon that are denominated in euro and issued by euro area entities. Moreover, we only include bonds with a residual maturity of at least one year and an outstanding amount of at least €10 million. For each bond, we collect credit ratings from four major agencies—Fitch Ratings, Moody's, Standard & Poor's (S&P), and DBRS—as well as information on the outstanding amount and the issuer's ESA 2010 sector classification. To capture liquidity conditions, we augment the dataset with monthly turnover from the TraX dataset, sourced from MarketAxess. Finally,

we collect each bond's coupon schedule to compute its modified duration.

We augment the corporate bond data with Markit iBoxx, applying similar filters as for the CSDB dataset. Although the coverage is narrower than that of the CSDB, iBoxx offers daily frequency, which allows for a more granular analysis of price dynamics. Available variables include bid and ask prices, accrued interest, yield to maturity, option-adjusted spreads (OAS), modified duration, and credit ratings. We use data from the periods surrounding the CSPP announcement, the PEPP announcement, and the QT phase.

For CDS, we use daily single-name CDS composite data from Markit and ICE Data Services (formerly CMA). Corporate bonds are matched to CDS contracts based on issuer and seniority. For each issuer-seniority pair, we interpolate the CDS curve to obtain a spread at the exact maturity of the bond. To remove outliers, we discard all observations with a CDS-bond basis below the 1^{st} and above the 99^{th} percentile within each month.

The *CDS-bond basis* is defined as the difference between the maturity-matched CDS spread and the bond's credit spread. This basis captures the non-default component of corporate bond yields. Specifically, the CDS-bond basis reflects the yield spread between a default-free sovereign bond and a CDS-hedged corporate bond. Because both bonds have roughly the same cash flows, the yield spread should theoretically be zero. However, the CDS-bond basis is on average negative, implying that corporate bonds are cheap relative to sovereigns. The CDS-bond basis reflects, among other things, liquidity differences between corporate and sovereign bonds.[16] Importantly, there is also large cross-sectional variation in the basis among corporate bonds. Therefore, bonds with a high (less negative) CDS-bond basis are expensive relative to bonds with a lower (more negative) basis, after controlling for their implied duration and credit risk.

We distinguish between eligible and ineligible bonds for QE purchases. The group of QE-ineligible bonds largely consists of bank bonds (94% of ineligible observations in our sample) and high-yield non-bank bonds (2%). The remaining 4% of ineligible bonds either have too long residual maturities or are issued in unconventional legal forms or traded in unregulated markets that the ECB does not consider acceptable.

Table I reports summary statistics for the corporate bond samples used in the analysis, distinguishing between subperiods around the CSPP, PEPP, and QT events. Across all samples, eligible bonds have larger issuance sizes, longer maturities, and lower credit spreads than ineligible bonds. For the CDS-bond basis, eligible bonds exhibit more negative values (implying larger discounts relative to sovereigns) than ineligible bonds in the CSPP sample, but this pattern reverses in the PEPP and QT samples, where eligible bonds have less

[16]For more details about the drivers of the CDS-bond basis in the euro area, we refer the reader to Corell et al. (2025).

Table I. **Bond Prices Summary Statistics** This table reports summary statistics for the corporate bond samples used in the analysis. Columns (1) to (8) present statistics based on the CSDB database, while columns (9) to (16) present statistics based on the iBoxx database. Panel (a) reports data for the period preceding the CSPP (January 2015); Panel (b) reports the period preceding the PEPP (January 2020); and Panel (c) reports the period preceding the QT (November 2021). Within each sample, we further report statistics separately for bonds that are eligible and ineligible under the respective purchase programs.

Panel (a): CSPP

	CSDB Price Data								**iBoxx Price Data**							
	Eligible				Ineligible				Eligible				Ineligible			
	Mean	Median	Std	*N*	Mean	Median	Std	*N*	Mean	Median	Std	*N*	Mean	Median	Std	*N*
Outstanding (bln)	0.67	0.60	0.48	465	0.24	0.03	0.62	2750	0.78	0.75	0.31	281	0.98	0.85	0.53	201
Maturity	6.67	5.13	5.08	465	4.60	3.29	4.59	2750	5.69	4.90	3.45	281	4.57	3.95	3.40	201
Duration	5.72	4.71	3.76	465	4.12	3.13	3.36	2750	5.10	4.50	2.72	281	4.12	3.68	2.24	201
Yield-to-Maturity (%)	0.75	0.63	0.51	465	0.73	0.54	0.77	2750	1.12	1.02	0.67	281	1.20	1.03	0.95	201
Credit Spread (%)	0.73	0.66	0.37	465	0.82	0.63	0.73	2750	1.07	1.01	0.41	281	1.29	1.05	0.80	201
CDS-Bond basis (%)	-0.14	-0.16	0.33	465	-0.07	-0.02	0.67	2750	-0.34	-0.33	0.22	190	-0.27	-0.29	0.42	153
Turnover (%)	2.44	1.31	4.05	370	2.96	1.34	4.77	399								
Bid-Ask (bps)									0.49	0.44	0.24	281	0.40	0.33	0.27	201
Panel (b): PEPP																
Outstanding (bln)	0.62	0.60	0.42	752	0.27	0.04	0.62	2482	0.77	0.70	0.33	488	0.92	0.90	0.39	265
Maturity	7.26	6.13	5.09	752	6.38	4.98	5.34	2482	6.92	6.21	4.04	488	4.83	4.29	2.93	265
Duration	6.61	5.78	4.27	752	5.89	4.83	4.43	2482	6.34	5.77	3.41	488	4.48	4.05	2.19	265
Yield-to-Maturity (%)	0.29	0.18	0.48	752	0.45	0.34	0.61	2482	0.48	0.40	0.43	488	0.72	0.46	1.00	265
Credit Spread (%)	0.84	0.73	0.40	752	1.02	0.93	0.57	2482	0.84	0.76	0.31	488	1.20	0.92	0.94	265
CDS-Bond basis (%)	-0.20	-0.26	0.43	752	-0.51	-0.50	0.42	2482	-0.27	-0.27	0.18	340	-0.52	-0.46	0.27	236
Turnover (%)	4.35	1.84	7.21	592	6.15	2.80	9.66	459								
Bid-Ask (bps)									0.45	0.41	0.19	488	0.39	0.31	0.27	265
Panel (c): QT																
Outstanding (bln)	0.67	0.60	0.40	865	0.24	0.03	0.64	2657	0.76	0.70	0.31	681	0.85	0.75	0.32	308
Maturity	6.77	5.59	4.88	865	7.32	5.72	6.35	2657	6.35	5.44	4.34	681	4.50	4.13	2.89	308
Duration	6.17	5.24	4.17	865	6.75	5.48	5.30	2657	5.85	5.07	3.76	681	4.18	3.88	2.29	308
Yield-to-Maturity (%)	0.49	0.37	0.62	865	0.56	0.45	0.73	2657	0.51	0.39	0.59	681	0.97	0.58	1.17	308
Credit Spread (%)	1.07	0.95	0.55	865	1.13	1.02	0.68	2657	0.93	0.80	0.52	681	1.48	1.02	1.11	308
CDS-Bond basis (%)	-0.44	-0.44	0.29	865	-0.53	-0.49	0.36	2657	-0.32	-0.32	0.22	537	-0.56	-0.49	0.27	281
Turnover (%)	2.84	1.69	3.98	722	3.53	2.30	4.34	393								
Bid-Ask (bps)									0.44	0.39	0.25	681	0.43	0.34	0.27	308

negative basis values. Despite these price advantages, eligible bonds have larger bid-ask spreads and lower turnover on average.

B. Holdings

We use confidential data from the ECB's Securities Holdings Statistics by Sector (SHSS) to calculate the share of each bond held by different types of financial intermediaries. SHSS provides portfolio holdings at the security (ISIN) level for all euro area investors at a quarterly frequency. Holdings are categorized by investor sector and country of domicile. We aggregate across all euro area countries and focus on three main investor sectors: mutual funds, insurance companies and pension funds (ICPF), and banks. The sector "Other" includes all remaining euro area sectors, while RoW refers to holdings by non-euro-area investors and

Table II. **Summary statistics of sectoral shares by programme and eligibility** This table reports summary statistics for sectoral portfolio holdings. Columns (1)–(8) present statistics for portfolio weights within each sector–country pair, whereas columns (9)–(16) report statistics for the shares of total outstanding amounts held by each sector. The median share of outstanding amounts is computed conditional on a sector holding the bond. We report summary statistics for the quarter preceding each programme. Panel (a) presents statistics for the CSPP (2015Q4), Panel (b) for the PEPP (2019Q4), and Panel (c) for the QT (2021Q4). Within each sample, we further distinguish between bonds that are eligible and ineligible under the respective purchase programmes.

Panel (a): CSPP

	Portfolio Weight (basis point)								**Share of Amount Outstanding**							
	Eligible				Ineligible				Eligible				Ineligible			
Sector	Mean	Median	Std	*N*	Mean	Median	Std	*N*	Mean	Median	Std	*N*	Mean	Median	Std	*N*
Banks	5.60	1.83	9.00	3008	5.09	1.45	8.82	5984	0.08	0.06	0.10	439	0.43	0.66	0.43	2152
MF	7.07	4.44	8.06	6668	7.00	3.76	8.93	7271	0.23	0.24	0.16	439	0.07	0.12	0.18	2152
ICPF	8.31	4.82	9.52	7370	6.29	2.41	9.10	6923	0.50	0.47	0.27	439	0.13	0.16	0.29	2152
Other	4.24	1.54	7.29	5554	4.93	1.51	8.61	9248	0.06	0.04	0.08	439	0.28	0.50	0.39	2152
RoW	2.87	1.86	4.30	902	1.54	0.06	4.01	3140	0.14	0.13	0.12	439	0.08	0.05	0.17	2152
Panel (b): PEPP																
Banks	6.00	2.06	9.61	5022	5.53	1.66	9.19	5088	0.11	0.06	0.19	785	0.50	0.93	0.45	1969
MF	4.66	2.57	6.43	12068	6.25	3.69	7.91	8126	0.19	0.19	0.15	785	0.08	0.18	0.17	1969
ICPF	6.18	3.26	8.03	13356	5.52	2.56	7.95	8325	0.38	0.34	0.28	785	0.18	0.33	0.33	1969
Other	4.04	1.54	6.91	8003	5.53	1.86	9.34	7318	0.04	0.03	0.06	785	0.17	0.10	0.33	1969
RoW	2.84	1.49	4.92	1692	1.35	0.27	2.43	2373	0.14	0.11	0.15	785	0.07	0.07	0.15	1969
Panel (c): QT																
Banks	5.45	1.69	9.11	6982	5.50	1.55	9.27	5891	0.07	0.05	0.11	834	0.53	0.98	0.46	2140
MF	3.97	2.16	5.73	16038	5.51	3.07	7.35	8693	0.20	0.19	0.13	834	0.07	0.21	0.17	2140
ICPF	5.43	2.67	7.69	17151	5.11	2.33	7.58	8654	0.33	0.27	0.24	834	0.16	0.31	0.32	2140
Other	3.75	1.31	6.73	10531	4.79	1.76	8.14	7373	0.04	0.02	0.07	834	0.17	0.10	0.34	2140
RoW	2.59	1.32	5.01	2172	1.27	0.37	2.17	2471	0.12	0.10	0.11	834	0.06	0.08	0.15	2140

is computed as a residual. The dataset also includes information on securities held by the ECB. Regarding the bonds, we apply the same filters as for the CSDB data described above.

Table II reports the summary statistics. We consider two measures of sectoral holdings: (i) portfolio weights within each sector–country pair and (ii) the share of the total outstanding amount held by each sector. We report these two measures for the quarter preceding the CSPP announcement, the PEPP announcement, and the QT announcement. The table shows that, prior to the CSPP announcement, the dominant holders of eligible bonds were ICPFs, which accounted for roughly 50% of the outstanding amount, followed by mutual funds with about 23% (Panel (a), column 9). By the onset of QT, the ICPF share had declined to approximately 33%, while the mutual fund share remained relatively stable at around 20%. Banks consistently held a comparatively small fraction of eligible bonds (about 8%). As the ECB expanded its holdings, the combined share held by private investors declined accordingly.

We add granular information on individual mutual funds' holdings from Morningstar. We use monthly information on euro area mutual fund holdings, asset under management (AUM), and flows. We include only euro area open-end funds and exclude closed-end, variable annuity funds, and index funds from our analysis. We merge this dataset with the CSDB data and exclude observations for which the market value is zero or where the ratio of the market value of holdings to the total market value exceeds one. We also exclude funds holding less than €1 million (market value) in corporate bonds or where the portfolio weight in corporate bond positions is greater than one. For monthly holdings data, we only keep funds that report in all 3 months of each quarter and in at least 6 months throughout the event window. To ensure data quality, we exclude holdings for which the amount held by the fund exceeds their total outstanding amount and truncate the share of total outstanding at the 97th percentile. We provide a full description of the Morningstar data and a complete set of summary statistics in Appendix C.

III. Hypotheses Development

In this section, we develop four testable hypotheses related to the liquidity demand channel that we propose to explain the effects of corporate QE on prices and portfolio allocations. The hypotheses are based on a simple model presented in Appendix A.

The model features a set of heterogeneous investors who allocate their portfolios across a set of assets. Assets may differ not only in their risk characteristics but also in the services investors derive from holding them. We allow for an arbitrary set of such services and, in the context of this paper, focus on liquidity as one of them (other examples include collateral value or regulatory benefits). Investors may differ in their risk aversion and in how they value these services. As a result, heterogeneous investors hold different portfolios and rebalance differently as the provision of these services changes. Equilibrium expected returns are determined through market clearing. Absent asset services, two assets with the same risk—measured by their covariance with the market portfolio—would have identical equilibrium expected returns. Once services are introduced, assets with identical risk may earn different expected returns due to differences in the services they provide and in how investors value them. While stylized, the model delivers the key insights needed to structure the discussion and guide our empirical analysis. Details of the model, as well as the propositions and their proofs, are provided in Appendix A. A more in-depth discussion of the framework can be found in Corell et al. (2025).

Our first hypothesis focuses on the effect of corporate QE on asset prices. Recall that credit spreads can be decomposed into the CDS (capturing default risk) and the CDS-bond basis (capturing non-default factors, including liquidity). If QE primarily reduces default

risk, it should affect corporate bond prices mainly through the CDS component. Conversely, if QE operates through the liquidity demand channel we propose—enhancing the liquidity of eligible bonds and thereby increasing investor demand—it should affect prices primarily through the CDS-bond basis. This motivates our first prediction.

Prediction 1 (QE effect on the CDS-bond basis)**.** *If a QE programme increases the liquidity of assets eligible for purchase, the CDS-bond basis of these assets should rise.*

Our second prediction relates to portfolio rebalancing. Investors differ in their preference for liquidity and exposure to liquidity risk. Those who need to rebalance their portfolio frequently place a high premium on liquidity. Mutual funds, for instance, especially those subject to volatile inflows and outflows, particularly value holding liquid assets. Moreover, mutual funds as a sector are exposed to pronounced liquidity risk: during periods of market stress, large outflows often force them to sell assets at fire-sale prices. In contrast, long-term investors such as insurance companies and pension funds value liquidity less, given their stable liabilities and limited exposure to forced sales. When the liquidity of an asset rises, mutual funds will be willing to buy more of this asset and long-term investors will be willing to sell. These considerations motivate our second prediction.

Prediction 2 (Heterogeneous rebalancing response to QE)**.** *Investors who value liquidity more should rebalance their portfolios toward eligible bonds, while those who value liquidity less should accommodate this demand by selling eligible bonds.*

Third, we explore how QE announcements affect the cross-section of corporate bonds. Our logic is that, in a segmented market, the effects on corporate bonds depend on their investor composition. As long as there are frictions preventing bonds from easily changing hands across sectors, bonds held by investors who value liquidity are more exposed to QE shocks, compared to bonds held by investors who do not. We therefore exploit the granularity and cross-sectional variation in our data to test this mechanism. If the portfolio rebalancing channel strengthens policy transmission through a positive demand shift by mutual funds, then bonds held predominantly by mutual funds should respond most strongly to QE announcements. This leads to our third prediction.

Prediction 3 (Effect of investor composition)**.** *Bonds that are mostly held by mutual funds respond most strongly to QE announcements.*

Fourth, we examine whether QT mirrors the effects of QE. While QE and QT appear symmetric, their transmission through the liquidity channel may differ substantially. The key asymmetry lies in the implicit backstop: during QT, markets understand that the ECB retains the capacity and willingness to intervene with QE if liquidity conditions deteriorate significantly. This implicit promise acts as a liquidity insurance mechanism, dampening the

impact of QT on the liquidity premium and reducing investors' incentive to rebalance away from eligible bonds. Additionally, the passive nature of QT—allowing bonds to mature rather than actively selling—means the liquidity withdrawal is gradual and predictable, further limiting portfolio adjustments. This asymmetry motivates our fourth prediction.

Prediction 4 (Asymmetric effects of QT)**.** *QT has limited impact on the CDS-bond basis and generates smaller portfolio rebalancing effects compared to QE announcements.*

We acknowledge that QE also entails standard supply effects. Our results can therefore be interpreted as the net impact of supply changes and liquidity provision promise effects. If the policy operated purely as a supply shock, investors would sell to the central bank, with the price impact determined by their demand elasticity. More elastic investors would reduce their holdings more sharply, requiring smaller price adjustments. Mutual funds, often regarded as relatively elastic, would thus be expected to act as prominent sellers when the ECB purchases bonds. Moreover, in segmented markets, bonds with higher mutual fund ownership should display more muted price reactions, as their supply is absorbed more elastically. The fact that we observe mutual funds buying, rather than selling, in response to QE underscores the central role of liquidity in shaping policy transmission. Because our estimates are net of the standard supply channel, the portfolio rebalancing effects reported in Section 5 should be interpreted as conservative.

IV. The Impact of ECB Corporate QE on Bond Prices

To test Prediction 1, we study the effects of the ECB's corporate bond purchase programs on bond prices. In Section 4.1, we document the evolution of bond yields around the two key ECB corporate QE announcements. In Section 4.2, we implement a difference-in-differences approach to isolate the effects of these announcements on eligible versus ineligible bonds.

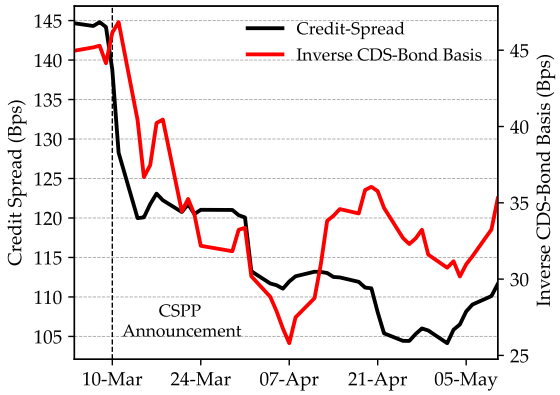
A. Bond Spreads around the QE Announcement

We begin by adopting a standard high-frequency approach to examine daily changes in credit spreads and the CDS-bond basis around the announcement dates. Specifically, we compute value-weighted average credit spreads for bonds eligible under the ECB's purchase programmes, along with the corresponding value-weighted average CDS-bond basis. In Appendix B.1, we extend the analysis using monthly data covering the broader sample.

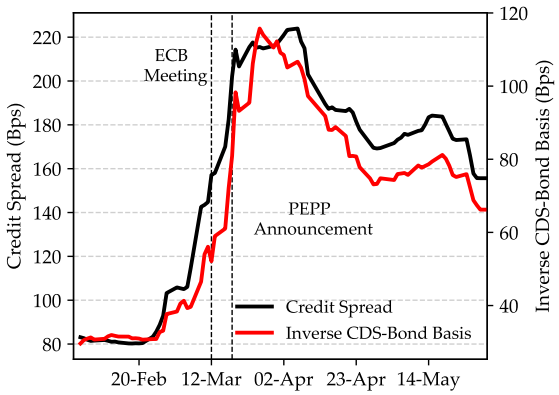
The March 2016 announcement of the CSPP led to a sharp decline in corporate bond spreads, driven primarily by an increase in the CDS-bond basis. As shown in Figure 2a, credit spreads fell rapidly following the ECB's announcement: within one month, the value-weighted average bond spread declined by about 30 basis points, which is large relative to the 145 bps average credit spreads pre-announcement. The figure also reports, on the right

Figure 2. **Credit Spread and CDS-Bond Basis around ECB Announcements** Figure 2a displays the evolution of credit spreads (left-hand axis) and the inverse CDS-bond basis (right-hand axis) of the subset of eligible corporate bonds. The inverse CDS-bond basis is defined as minus the CDS-bond basis. We plot the series around the announcement of the CSPP. Similarly, Figure 2b illustrates the behavior of credit spreads and the inverse CDS-bond basis around the PEPP announcement.

(a) CSPP Announcement



(b) PEPP Announcement



axis, the inverse CDS–bond basis, defined as the bond credit spread minus the CDS spread. This measure increased by roughly 20 basis points, indicating that most of the reduction in credit spreads was driven by an increase in the CDS–bond basis.

Figure 2b shows the evolution around the PEPP announcement. As discussed in Section 1, the PEPP announcement on March 18 occurred shortly after the ECB Governing Council meeting on March 12. Figure 2b marks these two key dates with vertical lines. The figure shows a sharp increase in credit spreads that began at the end of February 2020 and intensified after the March 12 Governing Council meeting, as markets viewed the initial policy package announced by the ECB as insufficient. The announcement of the PEPP one week later reversed this pattern, triggering a decline in corporate bond spreads.

As with the CSPP, the surge and subsequent decline in credit spreads closely mirrored the evolution of the CDS-bond basis. On average, credit spreads increased by approximately 140 basis points before falling by around 60 basis points in the month following the announcement. Over the same period, the basis fell by 80 basis points and then rose by roughly 40 basis points. In this case, CDS spreads also contributed to the initial widening, resulting in a larger overall increase in credit spreads relative to the CDS-bond basis. Nonetheless, the PEPP episode further underscores the impact of QE on the CDS-bond basis.

B. QE Announcement Effects on Bond Spreads

The patterns discussed above indicate that the ECB's interventions had sizable impacts on bond spreads. Nonetheless, part of the observed spread movements could also stem from broader macroeconomic shocks. To strengthen causal identification, we exploit the

institutional design of the ECB's purchase programs and the rich cross-section of corporate bonds in our sample. Specifically, we implement a difference-in-differences (DiD) strategy that leverages the exogenous timing of the CSPP announcement. This framework allows us to assess the effects of the corporate QE on credit spreads and their components— CDS spreads and the CDS-bond basis—by comparing eligible and ineligible bonds. We extend our analyses to also study the yield reactions around the PEPP announcement.

Our main difference-in-differences specification is:

$$y_t(n) = \theta \; Elig(n) \times Post_t + \gamma \; Elig(n) + \text{Fixed Effects} + u_t(n). \tag{1}$$

For each bond n and month t, the dependent variable $y_t(n)$ corresponds to one of the following outcomes: credit spread, CDS spread, or the CDS-bond basis. The indicator variable $Elig(n)$ equals 1 if bond n is eligible for purchase under the CSPP (or PEPP), and 0 otherwise. The variable $Post_t$ is a time dummy equal to 1 for periods after the announcement of the respective purchase program, and 0 otherwise.

The identifying assumption is that, absent the CSPP announcement, corporate bond yields, credit spreads, CDS spreads, and the CDS-bond basis for the treatment and control groups would have evolved in parallel. In Appendix B.2, we provide evidence supporting the validity of this parallel trends assumption. The parallel-trend assumption would be violated if the ECB announcement coincided with shocks that affect the two groups differently. For instance, because such announcements often respond to deteriorating macroeconomic conditions—and eligible bonds may simply be of higher credit quality—they may exhibit lower sensitivity to macroeconomic risk. To address this concern, our baseline specification includes rating-by-maturity-by-time fixed effects.[17] The estimated coefficients are therefore identified within the same maturity–rating bucket. Moreover, changes in default risk are captured by CDS spreads, which are directly linked to default probabilities. The CDS-bond basis, which measures the difference between bond yields and the yields implied by CDS spreads and duration premia, isolates variation in bond yields beyond the traditional sources of corporate bond risk: duration and default. By focusing on the CDS-bond basis, we mitigate concerns that our results are driven by shocks to duration or credit risk that coincided with the QE announcements.[18]

As discussed, the CSPP and PEPP announcements occurred under markedly different market conditions. At the time of the CSPP announcement, markets were relatively calm and the intervention was unexpected. In contrast, markets likely anticipated the subsequent introduction of the PEPP. In particular, as liquidity dried up at the onset of the COVID crisis,

[17]Specifically, we define twelve rating–maturity buckets by combining three rating categories (AAA–A, BBB, and high-yield) with four residual maturity groups (1–3 years, 3–5 years, 5–10 years, and 10–30 years).

[18]Non-default factors—such as counterparty risk in the CDS market—would need to differ systematically between treated and control bonds to bias our estimates, which we view as unlikely.

the liquidity channel predicts that eligible bonds should have become more valuable relative to ineligible bonds in anticipation of ECB intervention. These differences are important because the parallel-trend assumption between eligible and ineligible bonds is unlikely to hold for the PEPP. Consistent with this, spreads between eligible and ineligible bonds moved before the announcement of the PEPP, when market turmoil started, as we discussed in Section 8. Still, studying the effect of PEPP is interesting, as it allows us to assess how much of the intervention was already priced in and whether the results are consistent with the contingent liquidity demand channel we highlight

Panel (a) of Table III examines the impact of the CSPP announcement in March 2016. Columns 1–3, which include time and rating-by-maturity fixed effects, show that credit spreads of eligible bonds declined by about 20 basis points relative to ineligible ones. Of this decline, roughly 11 basis points—about 55%—are explained by a widening of the CDS-bond basis, while the remaining 9 basis points reflect a reduction in CDS spreads. These estimated effects are economically large: the 20-basis-point decline corresponds to roughly 27% of the average credit spread, while the 11-basis-point increase in the CDS–bond basis represents about 70% of its pre-announcement level. Overall, the results suggest that the CSPP announcement had a substantial impact on both the CDS-bond basis and, ultimately, the credit spreads of eligible bonds.

Our baseline estimates align closely with the high-frequency evidence shown in Figure 2a. This shows that the effects of the QE announcement are long-lasting, persisting for at least 2 quarters after the announcement. In Appendix B.2, we further document that the spread between eligible and ineligible bonds widened at the announcement and remained stable thereafter. Taken together, these results strengthen the interpretation that announcement effects accounted for the bulk of the policy's impact on asset prices.[19]

In Panel (b), we turn to the PEPP, announced in March 2020. As discussed earlier, if investors had already priced in the effects of QE on corporate bonds, we would expect weaker announcement effects for eligible relative to ineligible bonds. This hypothesis is borne out in the data. Around the PEPP announcement, the CDS spreads of eligible bonds increased by about 12 basis points relative to ineligible bonds, indicating a larger deterioration in default risk or default risk premium. However, eligible firms did not experience a corresponding rise in credit spreads, as their CDS–bond basis also increased relative to ineligible bonds, offsetting part of this effect. We estimate a statistically significant increase of 9 basis points in the basis. The net effect on credit spreads—the sum of these two components—is not statistically different from zero and corresponds to an estimated increase of 3 basis points.

[19]These findings are consistent with evidence for government bonds documented by D'Amico and King (2013) and De Santis and Holm-Hadulla (2020).

Table III. **The Effect of Corporate QE on Corporate Bond Yields** This table reports estimates from equation (1) using different measures of bond yields as dependent variables. The first row in each panel presents difference-in-differences estimates capturing the price effect of the respective corporate QE program. All regression include rating-by-maturity-by-time fixed effects. Standard errors are double-clustered at the time and issuer level.

(a) CSPP: September 2015 – September 2016

	(1) Credit Spread	(2) CDS	(3) Basis
Post × Eligible	-0.198***	-0.089***	0.109*
	(0.034)	(0.006)	(0.055)
Eligible	-0.054	-0.240***	-0.186***
	(0.069)	(0.060)	(0.052)
Rating x Maturity x Time FE	✓	✓	✓
R^2	0.39	0.47	0.12
Observations	37,994	37,994	37,994

(b) PEPP: September 2019 – September 2020

	(1) Credit Spread	(2) CDS	(3) Basis
Post × Eligible	0.030	0.116*	0.086*
	(0.042)	(0.057)	(0.042)
Eligible	-0.288***	0.002	0.290***
	(0.054)	(0.063)	(0.079)
Rating x Maturity x Time FE	✓	✓	✓
R^2	0.50	0.42	0.24
Observations	42,373	42,373	42,373

Overall, these findings are consistent with Prediction 1: the QE announcement primarily affected the CDS-bond basis rather than the CDS component of credit spreads. As we document below, the impact on the basis is likely due to the liquidity enhancement of eligible bonds. Overall, the evidence indicates that the initial CSPP announcement generated a substantial shift in bond yields for eligible relative to ineligible bonds, whereas subsequent announcements—such as the PEPP—had more muted effects, consistent with markets having anticipated them. These results also address an important open question in the empirical QE literature regarding the persistence of announcement effects. By combining high-frequency identification with medium-term cross-sectional analysis, we show that the impact on the CDS-bond basis is not only immediate but also persistent and stable over time.

V. The Impact of ECB Corporate QE on Portfolio Rebalancing

Our next step is to examine *why* QE eligibility raises the CDS-bond basis of eligible bonds. Prediction 2 states that, after the QE announcement, investors who place higher value on the enhanced liquidity of eligible assets shift their portfolios more strongly toward them.

We start by examining aggregate portfolio rebalancing around the CSPP and the PEPP. Panel (a) of Table IV reports changes in aggregate holdings from the quarter preceding the CSPP announcement (2015Q4) to one and three quarters afterward (2016Q2 and 2016Q4).

The ECB initiated corporate bond purchases in June 2016, acquiring approximately €6 billion in the second quarter and a total of €46 billion by the end of the year. During the second quarter of 2016, mutual funds sharply increased their holdings of eligible corporate bonds, purchasing €21 billion. In contrast, they acquired only €4 billion of ineligible corporate bonds while selling €39 billion of sovereign bonds. This reallocation raised the share of eligible bonds in their overall bond portfolios (which include both corporate and sovereign securities) by 2.63 percentage points.

The shift persisted through the end of 2016. Mutual funds maintained elevated holdings of eligible bonds, further reduced their exposure to sovereign bonds, and reallocated part of their portfolios toward ineligible corporate bonds. Overall, the portfolio share of eligible bonds increased by 2.74 percentage points over the year (see Table D2 in Appendix D). These patterns suggest that the policy made eligible bonds particularly attractive to mutual funds. This pattern suggests that QE had a wider market impact on corporate bonds, making the entire asset class more attractive to mutual funds.

Insurers and pension funds also increased their holdings of eligible bonds, although to a smaller extent. By the end of 2016, they had purchased €24 billion of eligible bonds. The corresponding increase in the share of eligible bonds within their overall bond portfolios was limited to 0.7 percentage points, as they simultaneously accumulated substantial amounts of ineligible corporate bonds and sovereign bonds. This pattern indicates that these investors expanded their bond portfolios broadly, without a pronounced tilt toward eligible securities. By contrast, banks and foreign investors (the Rest of the World) were the main sellers to the ECB.

The overall pattern of portfolio rebalancing is broadly consistent with the evidence for *sovereign* QE in Koijen et al. (2021), except for the behavior of mutual funds. In particular, following sovereign QE announcements, mutual funds sold sovereign bonds to the ECB, whereas under the corporate bond programme they purchased bonds alongside the ECB.

Panel (b) reports portfolio rebalancing around the PEPP. In this case, the role of mutual funds as buyers of eligible bonds is even more pronounced. They purchased €49 billion of eligible bonds while simultaneously reducing their holdings of both ineligible corporate bonds and sovereign bonds. Similar to the CSPP episode, this increase in eligible bond holdings remained stable both in the short run (within one quarter) and in the longer run (within one year). By contrast, insurance companies and pension funds increased their holdings of eligible bonds by only €22 billion during the same period.

Table IV. **Portfolio rebalancing around the two corporate QE programs.** The table reports changes in nominal corporate bond holdings (EUR billions) during the ECB's CSPP and PEPP. For each program, portfolio rebalancing is shown over two horizons: a short-run window (from the quarter before the announcement to one quarter after) and a longer-run window (to three quarters after the announcement). Results are reported separately for eligible and ineligible corporate bonds as well as sovereign bonds. We also report net issuance. The final column reports holdings in 2015Q4.

(a) CSPP

	2015Q4–2016Q2			2015Q4–2016Q4			2015Q4
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign	Holdings
Banks	-2	4	-10	-20	5	-95	1215
ICPF	20	6	39	24	9	37	1535
MF	21	4	-43	21	9	-56	950
Other	-3	-14	-33	-4	-26	-55	566
ECB	6	0	211	46	0	402	682
RoW	-1	17	-94	-37	33	-121	2195
Net issuance	-41	-16	-70	-30	-30	-112	

(b) PEPP

	2019Q4–2020Q2			2019Q4–2020Q4			2019Q4
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign	Holdings
Banks	26	29	120	21	40	33	1185
ICPF	19	5	-33	22	8	-68	1839
MF	36	-4	-14	49	-0	-33	1039
Other	0	-7	102	4	-12	84	490
ECB	59	5	245	117	3	527	1658
RoW	45	-16	94	45	7	-34	2457
Net issuance	-185	-12	-513	-257	-46	-509	

A. QE Announcement Effects on Portfolio Rebalancing

The preceding evidence indicates that portfolio rebalancing differed markedly across sectors. In particular, mutual funds shifted substantially toward eligible bonds. To formally assess the causal impact of QE on investor behavior, we now turn to micro-level holdings data. Prediction 2 states that investors who derive greater benefits from liquidity should increase the share of eligible bonds in their overall bond portfolios.

We adopt an empirical strategy similar to that in Section 4 to estimate how the ECB's policy announcements affected investor portfolio rebalancing. Our unit of observation is the portfolio weight of bond n by investor type j in country c for a given quarter—for example, the portfolio weight of Italian mutual funds in a specific quarter. For each investor type-country pair, we compute the portfolio weight of each bond n within that sector-country's corporate bond portfolio, expressing these weights in basis points since the holding of a single bond is small relative to the total holdings. We focus on the intensive margin by excluding cases where the portfolio weight is zero, as rebalancing typically occurs by adjusting the size of existing positions.[20]

We then estimate, separately for each investor type, the following DiD specification:

[20]To limit the influence of extreme values, we drop observations above the 97th percentile of portfolio shares across all investors.

$$x_{j,c,t}(n) = \theta_j \, Elig(n) \times Post_t + \gamma_j \, Elig(n) + \text{Fixed Effects} + u_{j,c,t}(n), \tag{2}$$

where $x_{j,c,t}(n)$ denotes the portfolio weight of bond n held by investor type j in country c at time t, $Elig(n)$ is an indicator equal to one if the bond is eligible for the CSPP (or PEPP), and $Post_t$ is an indicator equal to one in the quarters following the CSPP (or PEPP) announcement. The interaction coefficient θ_j captures the differential change in portfolio weights of eligible bonds after the start of the programme for investor type j.

All regressions include holder-country-by-time fixed effects and rating-by-maturity-by-time fixed effects. The holder-country-by-time fixed effects absorb time-varying shocks at the investor-country level, such as changes in returns on country-specific government bonds, which may serve as a proxy for the outside asset. The rating-by-maturity-by-time fixed effects, in turn, control for changes over time in the relative attractiveness of bonds with different credit quality and maturity profiles. Before the CSPP, the median portfolio share in eligible bond was 1.87 bps for banks, 4.42 bps for mutual funds, and 4.81 bps for insurance companies and pension funds (ICPF) (see Panel (a) of Table II). Not surprisingly, these medians are small, indicating that portfolios are, on average, diversified, and most single-bond positions represent only a small fraction of the relevant portfolio. These medians provide a natural benchmark against which to scale the estimated effects of the program.

Focusing first on mutual funds, column (2) of Table V shows that the estimated post-announcement effect is 0.3 bps and is statistically different from zero. Relative to the pre-CSPP median portfolio share of 4.42 bps, this corresponds to an increase of roughly 6.8% in the typical holding of an eligible bond. This is an economically meaningful rebalancing, given the small size of the median position.

For insurance companies and pension funds, the estimated effect is 0.081 bps and is not statistically different from zero. Relative to their pre-CSPP median portfolio share of 4.81 bps, this corresponds to a negligible change of approximately 1.7%. By contrast, banks exhibit a decline of -0.485 bps, which is also statistically insignificant. Relative to their median overall bond portfolio share of 1.87 bps, this translates into a reduction of about 26%. Other domestic investors display a statistically significant decrease of -0.314 bps, or roughly 21% relative to their median portfolio share of 1.48 bps. Finally, the rest of the world also reduced their holdings of eligible bonds in a statistically significant way.

Overall, the CSPP appears to have led to a meaningful rebalancing toward eligible bonds among mutual funds, while banks, other domestic sectors and foreign investors reduced their relative exposure and insurers showed no statistically significant change.[21]

We also report results for the PEPP in Panel (b) of Table V. For the PEPP, we find a

[21] We also consider a slightly longer sample, reported in Appendix Table D3. The results remain broadly consistent with the baseline.

pattern similar to that observed for the CSPP, but the effects are weaker, as we consistently find throughout the paper. Mutual funds again display a statistically significant increase in their holdings of eligible bonds, with an estimated effect of 0.11 bps. This effect is smaller than for the CSPP and is statistically significant only at the 10% confidence level. Relative to their pre-PEPP median portfolio share of 4.23 bps (Table II), this corresponds to an increase of about 2.6%.

Insurance companies and pension funds, by contrast, rebalance out of eligible bonds, with a statistically significant coefficient of -0.21 bps. Relative to their pre-PEPP median share of 4.75 bps, this implies a reduction of roughly 4.4%. Banks again appear to be net sellers of eligible bonds, while the Rest of the World and other domestic investors exhibit positive but statistically insignificant changes.

Consistent with Prediction 2, the evidence in Table IV and Table V point to heterogeneous portfolio rebalancing across investor sectors. In particular, we find that mutual funds, an investor class that value liquidity the most, significantly reallocate toward eligible bonds. This pattern is inconsistent with a purely supply-driven transmission channel. Under such a mechanism, mutual funds—typically viewed as relatively elastic investors—would be expected to act as the main sellers of corporate bonds, as documented for government bond QE. Instead, in the case of corporate QE, mutual funds increased their holdings of eligible bonds despite rising prices. These findings indicate that mutual funds respond to features of the programme that go beyond standard supply effects.

We instead interpret the main transmission channel as an improvement in the liquidity of eligible bonds due to central bank purchases. Mutual funds rebalance their portfolios frequently and are often forced to sell bonds when they experience large outflows, which tend to intensify during recessions, precisely when bond prices are falling. The central bank's commitment to purchase bonds on a daily basis and, in particular, in adverse states of the world is therefore especially valuable for mutual funds relative to other investors, and helps rationalize the observed portfolio rebalancing. Other investors who do not value this enhanced liquidity as much, react by accommodating this demand.

B. Granular Mutual Funds Portfolio Rebalancing

Our results so far indicate that, after the QE announcement, mutual funds rebalance their portfolios toward eligible bonds rather than selling them. We argue that this behavior reflects the value mutual funds place on liquidity: they can sell these bonds to the ECB if they face outflows and need to liquidate assets. To validate this hypothesis, we test whether, within the mutual fund sector, funds with greater volatility in net flows—which should value liquidity the most—rebalance more strongly toward eligible bonds.

Table V. **The effect of corporate QE on portfolio share.** This table displays the results of estimating equation (2) separately for five holdings sectors: Banks, mutual funds, insurance companies & pension funds, other, and rest of the world (Row). Standard errors are double-clustered at the time and issuer level.

(a) CSPP: 2015q3 – 2016q3

	(1) Banks	(2) MF	(3) ICPF	(4) Other	(5) RoW
Post=1 × CSPP eligible=1	-0.485**	0.293**	0.081	-0.314**	-0.442**
	(0.15)	(0.08)	(0.08)	(0.08)	(0.15)
CSPP eligible=1	-1.537**	-0.769*	0.420	-0.947**	1.873**
	(0.48)	(0.33)	(0.35)	(0.28)	(0.45)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.25	0.19	0.22	0.15	0.04
Observations	45,088	70,878	74,195	73,539	20,258

(b) PEPP: 2019q3 – 2020q3

	(1) Banks	(2) MF	(3) ICPF	(4) Other	(5) RoW
Post=1 × PEPP eligible=1	-0.265	0.109*	-0.214***	0.156**	0.138
	(0.15)	(0.04)	(0.05)	(0.04)	(0.16)
PEPP eligible=1	-0.438	-1.310***	-0.072	-1.021***	1.936***
	(0.41)	(0.20)	(0.22)	(0.21)	(0.40)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.32	0.17	0.20	0.14	0.08
Observations	53,419	104,684	113,044	79,343	20,819

We use granular information on the holdings and net flows $F_{i,t}$ (in euros) of each fund i from Morningstar. We start by constructing a fund-level measure of capital flightiness, using the volatility of fund flows as a proxy. We define $CapitalFlightiness_i$ as the volatility of $F_{i,t}$ over the two years leading up to the QE announcements (CSPP and PEPP) for each fund. Our measure is normalized by the average AUM to control for fund size.[22] In summary, in our empirical specification, we measure $CapitalFlightiness_i$ separately for the CSPP and the PEPP:

$$CapitalFlightiness_i = \frac{\sigma(F_{i,t-2yr\to t})_i}{mean(AUM_{i,t-2yr\to t})_i}. \tag{3}$$

Building on the difference-in-difference specification (2), we implement a triple difference specification. For each fund i in country c at month t, the dependent variable, the portfolio weight x, is defined as the ratio of the market value of fund i's holdings in bond n to the market value of the fund's total corporate bond holdings. Specifically, we run the regression.

$$\begin{aligned} x_{ict}(n) = \psi_1 Elig(n) \times Post_t \times CapitalFlightiness_i + \psi_2 Elig(n) \times Post_t + \\ \psi_3 CapitalFlightiness_i \times Post_t + \text{Fixed Effects} + \text{Controls} + \varepsilon_{ict}(n) \end{aligned} \tag{4}$$

[22] To maintain consistency across monthly observations, we include only fund/month observations for which $\frac{F_{i,t}}{AUM_{i,t-1}}$ is within the range -0.5 to 0.5. Additionally, we only include funds with valid AUM data for at least 6 months over the two years preceding the QE announcements (CSPP and PEPP). The sample covers, on average, 2,515 funds in the monthly sample.

Table VI. **The effect of corporate QE on mutual funds holdings.** This table displays the results of estimating equation (4) for mutual funds in the euro area. Columns (1) - (3) report the estimates for CSPP (September 2015 – September 2016), columns (4) - (6) report the estimates for PEPP (September 2019 – September 2020). The dependent variable is the portfolio weight x of fund i in bond n, defined as the share (in %) of the market value of fund i's holdings in bond n to the the total market value of the fund's holdings across all corporate bonds. The key independent variable *CapitalFlightiness* is computed from equation (3). *HighCapF* is a dummy indicator reflecting whether the fund's *CapitalFlightiness* falls within the top 75th percentile. Standard errors are double-clustered at the time and issuer level.

	CSPP			PEPP		
	(1)	(2)	(3)	(4)	(5)	(6)
Elig=1 x Post=1 x CapitalFlightiness		1.277**			0.733***	
		(0.512)			(0.194)	
Elig=1 x Post=1 x HighCapF=1			0.066*			0.049***
			(0.033)			(0.014)
Elig=1 x Post=1	0.046***	−0.012	0.028***	−0.033***	−0.064***	−0.046***
	(0.003)	(0.012)	(0.006)	(0.003)	(0.008)	(0.005)
Post=1 x CapitalFlightiness		−2.319***			−1.367***	
		(0.436)			(0.264)	
Post=1 x HighCapF=1			−0.122***			−0.090***
			(0.026)			(0.020)
Elig=1 x CapitalFlightiness		0.151			0.157	
		(0.651)			(0.226)	
Elig=1 x HighCapF=1			−0.017			−0.009
			(0.042)			(0.016)
Elig=1	−0.292***	−0.298***	−0.287***	−0.050	−0.056	−0.047
	(0.056)	(0.068)	(0.058)	(0.033)	(0.037)	(0.034)
Holder Country x Time FE	✓	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓
Fund FE	✓	✓	✓	✓	✓	✓
R^2	0.705	0.705	0.705	0.700	0.700	0.700
Observations	683,647	683,647	683,647	1,252,539	1,252,539	1,252,539

To match our previous specification, we include holder country-time fixed effects to absorb time-varying country-specific demand, rating × maturity × time fixed effects to capture duration and credit risk fund. We add fund fixed effects to absorb time-invariant fund fundamentals. The results are reported in Table VI.[23]

Column (1) reports the results of a single diff. Using fund-level data, we confirm the findings of Table V: mutual funds respond to the QE announcement by purchasing more eligible securities after CSPP. Columns (2)–(3) show that the effect is more substantial for funds with higher capital flightiness. In particular, the estimates in column (2) imply that a one-standard deviation increase in asset flightiness raises a fund's portfolio weight in eligible bonds by 4 bps (= 0.031 × 1.277). Relative to the median portfolio weight at the ISIN level (1.3%), this corresponds to a 3% increase. In Column (3), we include the dummy *HighCapF*, which indicates whether a fund's *CapitalFlightiness* lies in the top 75th percentile. The results further confirm this pattern: high-flightiness funds purchase roughly 6 bps more eligible bonds than other funds, corresponding to a 5% increase relative to the

[23]The sample is monthly, and we only keep funds that report holdings at monthly frequency, which is around 95% of the sample. As before, we truncate the portfolio weights at 97% to address potential data errors in portfolio holdings, and we winsorize *CapitalFlightiness* at 1% and 99% to remove outliers.

median portfolio weight. We view this as corroborating evidence that the perceived extra liquidity of ECB-eligible bonds is key to explaining why the corporate QE announcement had such a substantial impact on prices.

Table VII. **Mutual Funds Money Rebalancing.** This table displays the results of estimating equation (5) for mutual funds in the euro area. Panel A reports estimations excluding the fund asset flightiness metric and panel B reports estimations considering the fund asset flightiness. Portfolio weights are represented in percentage points. $x_{i,other}$ includes fund positions in derivatives, real estats, private equity, commodities, etc. $Log(AUM)_{i,pre}$ and $x_{i,pre}^{corpbond}$ refer to the fund's assets under management and corporate bond share at the onset of the events (September 2015 for CSPP and September 2019 for PEPP). *HighCapF* is a dummy indicator reflecting whether the fund's *CapitalFlightiness* falls within the top 75th percentile. Data is monthly.

(a) CSPP: September 2015 – September 2016

	Δx^{inelig}	Δx^{cash}	Δx^{sov}	Δx^{equity}	Δx^{other}
	(1)	(2)	(3)	(4)	(5)
Δx^{elig}	−0.085	−0.245***	−0.420***	−0.060*	−0.229**
	(0.063)	(0.094)	(0.087)	(0.033)	(0.108)
log(AUM)	−0.114	−0.031	0.239	0.020	−0.114
	(0.114)	(0.169)	(0.158)	(0.060)	(0.196)
$x_{pre}^{corpbond}$	−0.102***	0.013	0.066***	0.003	0.028
	(0.011)	(0.016)	(0.015)	(0.006)	(0.019)
Holder Country FE	✓	✓	✓	✓	✓
R^2	0.169	0.032	0.062	0.027	0.050
Observations	966	966	966	966	966

(b) PEPP: September 2019 – September 2020

	Δx^{inelig}	Δx^{cash}	Δx^{sov}	Δx^{equity}	Δx^{other}
	(1)	(2)	(3)	(4)	(5)
Δx^{elig}	−0.080*	−0.258***	−0.368***	−0.027	−0.267***
	(0.043)	(0.074)	(0.073)	(0.029)	(0.089)
log(AUM)	0.187**	−0.184	−0.0002	0.028	0.045
	(0.088)	(0.153)	(0.152)	(0.059)	(0.184)
$x_{pre}^{corpbond}$	−0.027***	0.034**	0.020	0.005	−0.017
	(0.008)	(0.014)	(0.014)	(0.006)	(0.017)
Holder Country FE	✓	✓	✓	✓	✓
R^2	0.053	0.094	0.075	0.026	0.064
Observations	1,229	1,229	1,229	1,229	1,229

For the PEPP, we find that although the average mutual fund in the Morningstar sample does not respond to the announcement by buying more eligible bonds—as indicated by the negative coefficient on $Elig = 1 \times Post = 1$ in column (4)—high-flightiness funds still value eligible bonds more than others. Column (5) shows that a one-standard deviation increase in asset flightiness increases the portfolio weight in eligible bonds by 3 bps ($= 0.036 \times 0.733$). These results indicate that most of the portfolio rebalancing occurred during the first announcement, while adjustments under the PEPP were more muted. This is consistent with the more muted pricing effects documented in the previous section.

We then investigate the ways mutual funds reallocate their resources between QE-eligible corporate bonds and other asset classes in their portfolio. We begin by constructing asset

class portfolio weights $x_{i,m,t}$, defined as the market value of fund i's holdings in asset class m, normalized by the fund's total asset under management (AUM) in month t. The change in portfolio weight around the QE announcement for fund i in asset class m is defined as the difference in portfolio weight for that asset class between the first and last periods of the CSPP and PEPP event window, respectively.[24] We run the following regression on all fund $\times$ asset class pairs:

$$\Delta x_{im} = \alpha + \beta \Delta x_{i,elig} + \gamma_1 log(AUM)_{i,pre} + \gamma_2 x_{i,pre}^{corpbond} + \alpha_c + \epsilon_{im} \tag{5}$$

We control for the fund's pre-period AUM and corporate bond share to account for differences in fund size and exposure to assets most affected by QE. We include holder country fixed effects to absorb time-invariant country-specific demand. We report results in Table VII.

Table VII Panel (a) shows that for each 1% increase in portfolio weight in eligible bonds, mutual funds reduce their holdings of sovereign bonds by 0.42%, cash by 0.25%, and other assets—including derivatives, real estate, commodities, and similar categories—by 0.23%. The effects on ineligible bonds and equity are very small. We interpret this as evidence that mutual funds view eligible bonds as partial substitutes for safe liquid assets such as sovereign bonds. These results are consistent with what we found in Table IV, which is constructed using SHSS data. The results for the PEPP are similar, as shown in Panel (b).

In summary, the results in this section provide further evidence for the liquidity demand channel. Mutual funds with greater flow volatility rebalance more aggressively toward eligible bonds following the QE announcement, funding this shift by reducing their most liquid holdings, particularly sovereign bonds.

VI. Heterogeneous Transmission of QE

In Section 4 we showed that announcements of corporate bond purchases had significant effects on credit spreads and the CDS-bond basis. In Section 5 we documented that investors who value the enhanced liquidity and hedging properties of eligible corporate bonds—most notably mutual funds—rebalanced strongly toward these assets. In this section we show that this increase in demand by mutual funds amplified the transmission of Corporate QE, by narrowing the CDS-bond basis and reducing credit spreads.

Prediction 3 posits that a higher share of investors who value liquidity (i.e., mutual funds) should strengthen the transmission of corporate QE to asset valuations. A direct empirical test of how investor heterogeneity affects the transmission of QE is challenging. Existing studies have primarily addressed this question either theoretically or using calibrated demand systems Koijen et al. (2021); Breckenfelder and De Falco (2024); Fang and Xiao (2025). Our

[24] We trim the distribution of Δx_{im} by keeping observations within the interval [-100, 100], and winsorize at the 1st and 99th percentiles to remove outliers.

empirical design, combined with a large cross-section of corporate bonds, allows us to make progress on this question by directly linking cross-sectional variation in mutual fund holdings to the price response of eligible bonds around corporate QE announcements.[25]

We begin by providing reduced-form evidence of heterogeneity in the effects of QE across bonds. Figure 3a shows that bonds with higher mutual fund ownership experience larger reductions in credit spreads around the CSPP announcement. The reduction in credit spreads ranges from about 5 basis points for bonds with roughly 20% mutual fund ownership to about 70 basis points for bonds with around 50% ownership. The difference in yield responses between bonds with low and high mutual fund ownership is substantial, given that the average effect across all bonds is approximately 30 basis points. Appendix Figure D2 shows similar results for the CDS–bond basis, where the pattern is nearly identical.[26]

By linking our asset price data to granular holdings information, we uncover a clear pattern: eligible bonds with higher mutual fund ownership experienced larger declines in yields following the CSPP announcement. At the same time, this evidence raises some potential concerns. Specifically, one may worry that the patterns observed in the raw data reflect (i) differences in the types of bonds held by mutual funds relative to other investors (e.g., insurance companies and pension funds), (ii) temporary effects that fade quickly after the announcement, or (iii) movements in bond yields unrelated to the announcement. In the next section, we address each of these concerns.

A. Heterogeneous QE Announcement Effects on Spreads

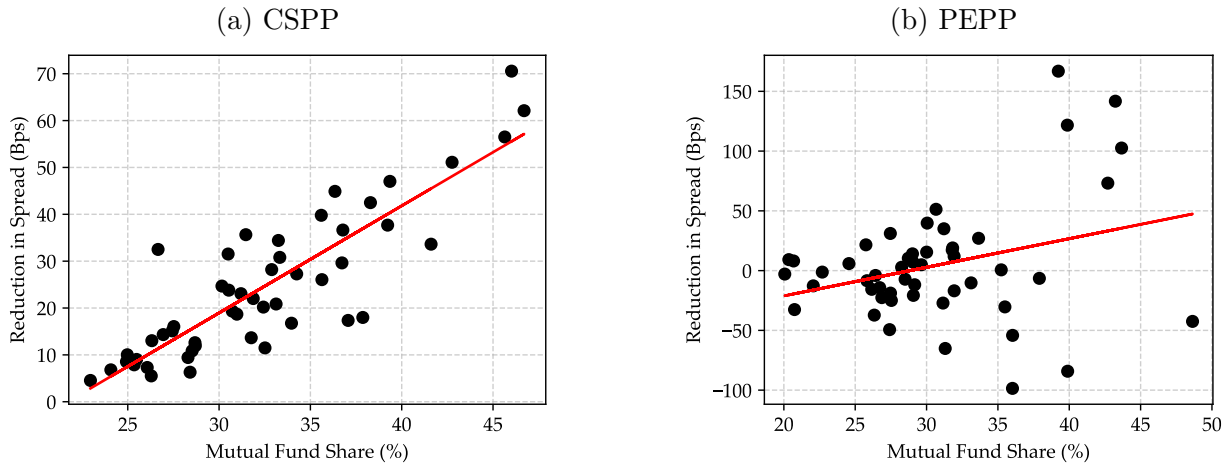
We extend the baseline DiD framework in equation (1) to a triple-differences specification. Specifically, we interact bond eligibility and the post-announcement indicator with the pre-intervention share of a bond's outstanding amount held by mutual funds (MFs). While mutual funds are the primary focus of the paper, we also extend the analysis to insurance companies and pension funds (ICPFs) to compare the two main investor types in corporate bond markets. Moreover, because ICPFs are typically considered relatively inelastic, one might expect them to amplify the effects of corporate QE on bond yields. Formally, we estimate the following specification:

$$y_t(n) = \gamma_j \; Post_t \times Elig(n) + \theta_j \; Post_t \times Elig(n) \times \tilde{x}_j(n) + \text{Fixed Effects} + u_t(n), \qquad (6)$$

[25]Other studies use a similar empirical design to examine how mutual fund holdings affect fire-sale dynamics (Coppola, 2025) or the transmission of conventional monetary policy (Fang, 2023).

[26]We also report the results for the PEPP announcement in Panel 3b. Consistent with the findings in the previous sections, the pattern for this announcement is less clear. Yield movements around the announcement are considerably noisier, with estimated changes ranging from about −100 to 150 basis points, making it more difficult to identify a clear relationship.

Figure 3. **Mutual Funds Holdings and Credit Spread Response** The figure shows the relationship between the reduction in spreads (y-axis) around ECB announcements and the corresponding mutual fund holdings (x-axis). Bonds are ranked according to the magnitude of their spread reactions and sorted into 50 groups. For each group, we compute the average mutual fund share. Panel (a) presents the results for the CSPP announcement, while Panel (b) reports the results for the PEPP announcement.



where $\tilde{x}_j(n)$ is the share of the bond's outstanding amount held by investor j prior to the intervention.[27] We consider mutual funds ($j = \text{MF}$) and insurance companies and pension funds ($j = \text{ICPF}$). We restrict the sample to bonds in which both mutual funds and insurance companies and pension funds hold a positive share.[28]

Because mutual funds and ICPFs systematically hold different sets of bonds, we include ISIN fixed effects to control for time-invariant bond-level characteristics—such as credit quality, sector, or issuance features—that may be correlated with both investor composition and price changes. This specification ensures that identification comes from within-bond variation over time, net of any persistent differences across securities. In addition, we include maturity-rating-time fixed effects to capture time-varying shocks that may differentially affect bonds with similar risk and duration profiles.

We define "share" $\tilde{x}_j(n)$ as the fraction of a bond's outstanding amount held by a given investor type. Summary statistics for these variables are reported in Table II (columns (9)–(16)). Prior to the CSPP, mutual funds hold approximately 24% of a bond's outstanding amount, with a standard deviation of approximately 18 percentage points, indicating substantial cross-sectional variation. Insurance companies and pension funds hold approximately 48% of a bond's outstanding amount.

The central assumption motivating Prediction 3 and the regression specification in equation (6) is that investors rebalance their portfolios primarily by trading bonds they already

[27]Portfolio holdings are highly persistent, so the exact timing of the measurement has little impact on the results.

[28]We winsorize the holdings at the investor level by trimming the top 1%.

Table VIII. **Intermediary Effects, Difference-in-Differences Approach** The table reports the estimates of Equation 6. The triple interaction coefficients θ_{MF} and θ_{ICPF} capture the additional effects of the policies for bonds that, ex-ante, had a higher share held by mutual funds or by insurance corporations and pension funds, respectively. We use rating-by-maturity-by-time fixed effects and ISIN FE. Standard errors are double-clustered at the time and issuer level.

(a) CSPP: September 2015 – September 2016

	MF			ICPF			MF & ICPF		
	(1) CS	(2) CDS	(3) Basis	(4) CS	(5) CDS	(6) Basis	(7) CS	(8) CDS	(9) Basis
Post × Eligible × MF Share	-0.237*	0.108	0.345**				-0.288*	0.150	0.438**
	(0.125)	(0.102)	(0.131)				(0.156)	(0.104)	(0.173)
Post × Eligible × ICPF Share				0.126	0.007	-0.118	0.014	0.046	0.031
				(0.082)	(0.045)	(0.089)	(0.076)	(0.056)	(0.090)
Post × Eligible	-0.077*	-0.121**	-0.043	-0.179**	-0.104**	0.075	-0.059	-0.148**	-0.088
	(0.043)	(0.041)	(0.050)	(0.069)	(0.037)	(0.073)	(0.068)	(0.053)	(0.082)
ISIN FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.93	0.92	0.82	0.91	0.93	0.79	0.91	0.93	0.80
Observations	12,557	12,557	12,557	15,211	15,211	15,211	17,379	17,379	17,379

(b) PEPP: September 2019 – September 2020

	MF			ICPF			MF & ICPF		
	(1) CS	(2) CDS	(3) Basis	(4) CS	(5) CDS	(6) Basis	(7) CS	(8) CDS	(9) Basis
Post × Eligible × MF Share	-0.124	-0.131	-0.006				0.087	-0.157	-0.244
	(0.153)	(0.113)	(0.120)				(0.137)	(0.166)	(0.165)
Post × Eligible × ICPF Share				0.121	0.274	0.153	0.157	0.150	-0.007
				(0.139)	(0.185)	(0.113)	(0.138)	(0.214)	(0.168)
Post × Eligible	0.051	0.069	0.019	-0.034	-0.063	-0.029	-0.071	0.039	0.109
	(0.063)	(0.068)	(0.062)	(0.069)	(0.056)	(0.070)	(0.059)	(0.098)	(0.118)
ISIN FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.90	0.89	0.81	0.90	0.89	0.80	0.89	0.89	0.80
Observations	16,374	16,374	16,374	18,709	18,709	18,709	21,053	21,053	21,053

hold.[29] Under this assumption, the model implies that, conditional on similar observable characteristics, the impact of the CSPP on yields should depend on the ex-ante investor base. The coefficients θ_j on the triple interaction terms therefore capture whether the CSPP effect was amplified or dampened for bonds more heavily held by a given investor type.

Table VIII presents the estimation results. Columns (1)–(6) report separate regressions for mutual funds and ICPF. Columns (7)–(9) include both mutual funds and ICPF in the same regression, allowing their effects to be estimated jointly. For mutual funds, the coefficient in column (1) is negative and statistically different from zero, indicating that credit spreads decline more for bonds predominantly held by mutual funds. The magnitude implies that a 10 percentage point increase in mutual fund holdings amplifies the CSPP effect on credit spreads by about 2.4 basis points. Given the standard deviation of mutual fund holdings (18 percentage points), a one-standard-deviation increase in mutual fund share implies an additional compression of roughly 4.2 basis points. Column (3) shows that this

[29]Such frictions have been documented in several contexts, including mutual fund flows (Coval and Stafford, 2007; Coppola, 2025; Fang, 2023), insurance company fire sales (Ellul et al., 2011), and the demand-based asset pricing literature (Koijen and Yogo, 2019; Bretscher et al., 2025).

effect is mirrored in the CDS-bond basis, which increases by about 3.5 basis points for a 10 percentage point increase in mutual fund holdings, or about 6.2 basis points for a one-standard-deviation change. This pattern is consistent with the CSPP effect operating primarily through the CDS-bond basis—reducing yields without a commensurate change in CDS spreads, as shown in column (2). In contrast, the interaction terms for ICPF holdings are small and statistically insignificant across all specifications, suggesting that insurance companies and pension funds did not drive the observed CSPP price effects. Columns (7) and (9) show that the effects associated with mutual fund ownership are larger when we estimate the specification jointly including mutual funds and insurance companies and pension funds (ICPFs). A one–standard-deviation increase in mutual fund ownership reduces credit spreads by 5.2 basis points and increases the CDS–bond basis by 7.9 basis points. These magnitudes correspond to 26% and 72% of the average CSPP announcement effects on credit spreads and the CDS–bond basis, respectively (see Table III).[30]

Consistent with our previous findings, the effects for the PEPP policy—reported in Panel (b) of Table VIII—are not statistically distinguishable from zero.

The results in this section link our first set of findings on the effects of the CSPP announcement on yields (Section 4) with our results on mutual funds' portfolio rebalancing (Section 5). Taken together, these results show that investor heterogeneity is a key determinant of the transmission of corporate QE through the liquidity demand channel proposed in this paper.

VII. Quantitative Tightening

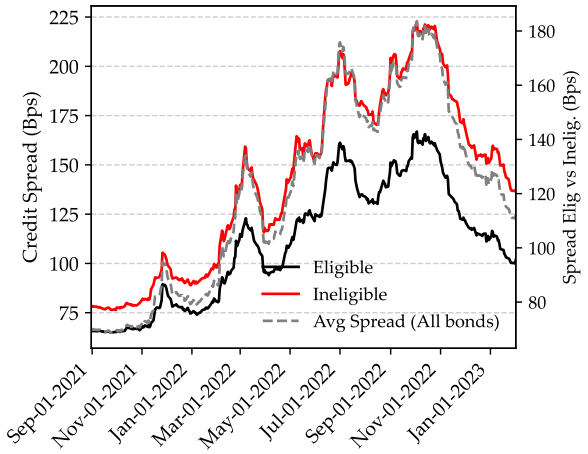
In this section, we build on the timeline of QT announcements and the associated revisions in market expectations to examine how QT affected bond yields and portfolio rebalancing dynamics. In Section 1.2, we detail the sequence of QT announcements and track the evolution of market expectations using the Survey of Market Participants (SMA). The ECB's monetary policy tightening and the transition to QT in 2021–2022 were accompanied by a pronounced widening of credit spreads and of the CDS-bond basis. In this section, we examine the differential effects on eligible versus ineligible bonds during this phase.

This analysis provides insight into how investors perceived the QT policy and helps us rationalize the dynamics documented at the time of the initial corporate QE announcement. Specifically, this section tests Prediction 4. The key idea is that if investors anticipate that the ECB will intervene again in the future, asset prices should not revert to their pre-QE

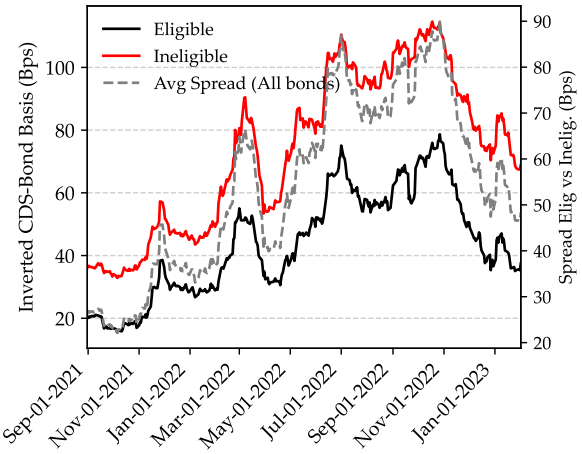
[30] We assess the robustness of our results by extending the event window, as reported in Table D1. Under this specification, the interaction coefficient for mutual fund ownership becomes even larger. For credit spreads, a one–standard-deviation increase in mutual fund holdings amplifies the CSPP effect by about 6.7 basis points, and increases the CDS–bond basis by about 8.4 basis points.

Figure 4. **Credit Spread and Basis of Eligible vs Ineligible bonds during Quantitative Tightening** The figure shows the evolution of credit spreads and the CDS–bond basis for eligible and ineligible bonds around the ECB QT. All variables are residualized with respect to rating and duration.

(a) Credit Spread



(b) CDS-Bond Basis



announcement equilibrium even after QT. Likewise, mutual funds—which place a high value on liquidity—should not divest from previously purchased bonds, given the expectation that the ECB would *reactivate* its purchase programme in the event of market stress.

A. QT Effects on Bond Spreads

We begin by examining the evolution of bond yields during the QT period. We first use daily data to capture the gradual adjustment of market expectations and then extend our DiD approach to analyze the QT phase.

We use daily data from iBoxx and distinguish between eligible and ineligible bonds. We control for differences in duration and credit quality by residualizing credit spreads and CDS-bond basis with respect to the rating–maturity-time fixed effects. This procedure yields time series of spreads and bases for eligible and ineligible bonds that are directly comparable, as they net out differences in rating and duration composition across days. After residualizing the two series, we add back the daily market-wide average spread and basis so that the figure also reflects the overall trend in the market.

Figure 4 plots the residualized credit spreads and CDS-bond basis for eligible (black) and ineligible (red) bonds. Following the December 2021 meeting, we observe a gradual increase in credit spreads (see Figure 4a) for both groups of bonds. This upward trend becomes more pronounced over the course of 2022, with a sharp acceleration in June 2022, when the ECB explicitly announced its intention to conclude the APP as of July 2022. It is evident from the figure that the rise in credit spreads (and the corresponding decline in the bond basis) was substantially more pronounced for ineligible bonds than for eligible ones. To the

Table IX. **The Effect of QT on Corporate Bond Yields** This table reports estimates from equation (1) using different measures of bond yields as dependent variables. The first row in each panel presents difference-in-differences estimates capturing the price effect of the QT program. Standard errors are double-clustered at the time and issuer level.

(a) QT: January 2021 – December 2023

	(1) CS	(2) CDS	(3) Basis	(4) CS	(5) CDS	(6) Basis	(7) CS	(8) CDS	(9) Basis
Post Dec 2021 × Eligible	-0.139**	-0.094	0.045						
	(0.052)	(0.083)	(0.100)						
Post Feb 2022 × Eligible				-0.153***	-0.071	0.082			
				(0.054)	(0.079)	(0.092)			
Post Oct 2022 × Eligible							-0.245***	-0.094*	0.151**
							(0.043)	(0.051)	(0.072)
Eligible	-0.211***	0.081	0.293***	-0.211***	0.062	0.273***	-0.209***	0.055	0.264***
	(0.042)	(0.089)	(0.099)	(0.041)	(0.082)	(0.091)	(0.046)	(0.067)	(0.068)
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.51	0.54	0.27	0.51	0.54	0.28	0.51	0.54	0.28
Observations	131,944	131,944	131,944	131,944	131,944	131,944	131,944	131,944	131,944

best of our knowledge, this is the first evidence documenting such a differential response. The gray dashed line in the figure plots the spread between ineligible and eligible bonds, which began to widen in December 2021 and continued to increase throughout the following year. Overall, the credit spreads of ineligible bonds rose by a peak of 146 basis points in October 2022, compared with an increase of 102 basis points for eligible bonds over the same period—resulting in a substantial gap of about 48 basis points.

Similarly, Figure 4b plots the inverse CDS-bond basis. We observe a decline in the basis that is significantly more pronounced for ineligible bonds than for eligible ones. The CDS-bond basis of ineligible bonds fell by 82 basis points through October 2022, compared with a decline of 63 basis points for eligible bonds over the same period.

We then estimate the effect of QT on eligible versus ineligible bonds using the DiD specification in Equation 1. Because there is no single, well-defined announcement date, we rely on the three months in which the SMA survey indicates a substantial shift in investor expectations: December 2021, February 2022, and October 2022. For each of these dates, we run a separate DiD regression. Consistent with our baseline specification, all regressions include rating-by-maturity-by-time fixed effects. Given the exact timing of the tightening is unclear, we use a longer sample covering 2021 through 2023 for our analyses.

Table IX reports the results for credit spreads, CDS spreads, and the CDS-bond basis. Across all three dates, eligible bonds exhibit a more muted increase in credit spreads following QT. The estimated coefficients are negative and statistically significant, ranging from -0.14 (December 2021) to -0.25 (October 2022). This pattern indicates that, even as credit spreads widened overall, eligible bonds outperformed ineligible bonds.

The coefficient on the CDS-bond basis is positive, ranging from 0.05 (December 2021)

to 0.15 (October 2022). For October 2022, the estimate is statistically significant, whereas the coefficients for the other two earlier dates are not. These results indicate that, during the corporate bond turmoil over this period, eligible bonds experienced a smaller widening of the basis than ineligible bonds. Overall, the findings reinforce the patterns documented in Figure 4.

These results are crucial for understanding the transmission of corporate QE. One might expect that, once the ECB began to unwind its portfolio, the corporate bond market would revert to its pre-CSPP equilibrium, with eligible bonds catching up by experiencing larger increases in spreads and a decline in the basis. However, our results reject this hypothesis. Eligible bonds experienced a significantly smaller rise in spreads. This suggests that the ECB's label of eligibility fundamentally altered the market's perception of these securities. Investors continued to view eligible bonds as more liquid assets, as they expect the ECB to intervene again and repurchase these bonds in the event of adverse market conditions

B. QT Effects on Portfolio Rebalancing

Table X presents the rebalancing behavior of different investor types. We report the portfolio adjustments starting in 2021Q3—prior to the widening of spreads—and trace their evolution over subsequent quarters. The table highlights the dynamics during the tightening phase.

During QT, mutual funds continued accumulating eligible bonds rather than selling them, purchasing approximately €46 billion over two years (and €114 billion of sovereign bonds) while divesting ineligible securities. This persistent demand indicates that the liquidity advantages of eligible bonds outlast active central bank purchases.

It is worth noting that mutual funds also increased their purchases of sovereign bonds. This pattern is consistent with the standard view that mutual funds act as elastic investors, absorbing the larger net supply as the ECB reduced and ultimately ceased its purchases. The dynamics in the sovereign bond market align closely with the evidence reported by Koijen et al. (2021). By contrast, in the corporate bond market we observe an asymmetric response: mutual funds purchased when the ECB first announced CSPP, but did not sell proportionally during QT. These results suggest that the transmission mechanism of corporate bond purchases operates through channels that differ substantially from those affecting sovereign bonds. The table also shows that investors from the rest of the world increased their bond purchases alongside mutual funds. This behavior is consistent with the standard demand elasticity mechanism, whereby foreign investors tend to sell when prices are high and purchase when prices are low.

To further corroborate our findings, we apply our DiD design and estimate equation (2) for the QT period. We use the sample from 2021Q1 to 2023Q4 and consider different dates

Table X. **Portfolio rebalancing around QT Announcement.** The table reports changes in nominal corporate bond holdings (EUR billions) during the period when the ECB started QT. For each program, portfolio rebalancing is shown over different horizons. Results are reported separately for eligible and ineligible corporate bonds as well as sovereign bonds. We also report net issuance.

	2021Q3–2022Q2			2021Q3–2022Q4		
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign
Banks	-5	1	15	-7	12	-79
ICPF	16	1	-36	17	3	-67
MF	3	-17	-1	7	-13	33
Other	5	11	1	8	27	47
ECB	57	-1	160	57	-2	121
RoW	13	7	-124	27	18	-88
Net issuance	-89	-3	-15	-109	-46	33
	2021Q3–2023Q2			2021Q3–2023Q4		
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign
Banks	6	17	-8	8	3	24
ICPF	20	13	-29	22	17	-4
MF	22	-9	92	46	-7	114
Other	17	48	73	29	56	118
ECB	59	-2	71	48	-2	48
RoW	40	26	152	43	14	267
Net issuance	-165	-94	-351	-196	-81	-567

at which we consider the transition to QT as having taken place. Table XI reports the results using 2022Q2 as the start of the "post-treatment" period. In addition, we present the results for each quarter from 2021Q4 through 2022Q4 in the Appendix Table D4. As before, we include both holder-country-by-time and rating-by-maturity fixed effects.

We find that mutual funds slightly reduced their portfolio weight in eligible bonds. The coefficient for mutual funds is -0.04 and is not statistically different from zero. The magnitude is approximately one tenth of the net positive rebalancing observed during the CSPP period (see Table V). This pattern confirms that, while these funds increased their holdings during the CSPP and PEPP phases, as discussed earlier in the paper, they did not reduce their exposure to eligible bonds proportionally once the QT phase began.

The results in this section highlight the importance of QE announcements. Once a bond is designated as eligible, it exhibits markedly different price dynamics compared to ineligible securities. Investors are aware of this distinction and tend not to sell eligible bonds even after the central bank announces the end of its purchase programme. In this sense, QE and QT announcements are inherently asymmetric—the expectation that the central bank would intervene again in case of market stress makes these bonds more attractive to flight-sensitive investors, even when the central bank is no longer actively purchasing such securities.

Market expectations were later confirmed by ECB communication. In July 2022, the ECB complemented its rate lift-off with the introduction of the new Transmission Protec-

Table XI. **The effect of corporate QT on portfolio share.** This table reports the results from estimating equation (2) for the QT period. We use athe sample window 2021Q1–2023Q4. The regression is estimated separately for five investor sectors: banks, mutual funds, insurance companies and pension funds, other domestic investors, and the rest of the world. Standard errors are double-clustered at the time and issuer level.

QT: 2021q1 - 2023q4 (Post Dummy: 2022q2)

Post 2022q2 × Eligible	-0.129***	-0.040	-0.048**	0.196***	0.026
	(0.04)	(0.03)	(0.02)	(0.05)	(0.06)
Eligible	-0.511	-1.318***	-0.430*	-0.515**	1.744***
	(0.37)	(0.20)	(0.20)	(0.17)	(0.38)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140

tion Instrument (TPI), primarily focused on sovereign bonds but not excluding private-sector securities: "TPI purchases would be focused on public sector securities [...] Purchases of private sector securities could be considered, if appropriate."[31] Corporate bonds were therefore explicitly mentioned as potential targets for ECB purchases under the new programme.

Furthermore, the ECB reaffirmed this stance in its latest monetary policy strategy assessment, concluded in June 2025: "... The primary monetary policy instrument is the set of ECB policy rates. The Governing Council may also employ other instruments, as appropriate, to steer the monetary policy stance when the policy rates are close to the lower bound or to preserve the smooth functioning of monetary policy transmission. Such instruments include longer-term refinancing operations, asset purchases, negative interest rates, and forward guidance." This communication thus reiterated that—if deemed appropriate—the ECB stands ready to purchase both sovereign and corporate bonds.

Overall, the reactions of both markets and financial intermediaries align with the importance of ECB's communication and underscore the need of interpreting QE within a dynamic, state-contingent framework (Haddad et al., 2025, 2024). Three key patterns emerge: the large effects of the initial CSPP announcement, the muted response to subsequent interventions like PEPP, and the asymmetric impact of QT. These findings reveal that QE effectiveness depends critically on state and history—early interventions shape market expectations about the scale of support central banks can deploy during future stress episodes, amplifying policy credibility.

VIII. Liquidity and Fire Sales

We have shown that the announcement of the ECB's CSPP led to a significant reduction in credit spreads, primarily driven by the CDS-bond basis component. The effects are amplified

[31] The full text of the communication is available at `https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220721~973e6e7273.en.html`.

in the presence of mutual funds. The effect is not reversed even in the presence of QT. We interpret these results as evidence that the ECB QE increased the perceived liquidity of eligible bonds. We now present direct evidence that the ECB announcement improved indicators of corporate bond market liquidity and mitigated fire sales during periods of market stress.

We employ two standard indicators of bond market liquidity: the bid-ask spread and turnover. Data on turnover are sourced from *TraX*, while bid-ask spreads are obtained from iBoxx. The bid-ask spread is defined as the difference between the bid and ask quotes, divided by the bid price. We compute the monthly bid-ask spread by averaging the available observations within each month. Turnover is measured as the monthly trading volume of each bond divided by its outstanding amount. Using granular data on ECB holdings, we also construct a measure of turnover net of ECB purchases. We apply this adjustment because the increase in trading activity from the pre- to post-CSPP period partly reflects the mechanical effect of ECB buying flows.[32]

We then estimate our baseline regression model, as defined in Equation 1, using each of the two liquidity measures as the dependent variable. Both variables are expressed in percentage points.[33] The results are presented in Table XII. All specifications include rating-by-maturity-by-time fixed effects. Column (1) reports the results for the bid-ask spread. The CSPP announcement reduced bid-ask spreads for eligible bonds by approximately 0.038 basis points. For comparison, the median pre-announcement bid-ask spread was 0.44 basis points (see Table I). The effect is both statistically and economically meaningful, representing roughly 8.5% of the pre-announcement median. Note that the bid-ask spread regression is estimated on the sample of bonds covered by iBoxx. Taken together, these results indicate that the CSPP announcement materially improved corporate bond market liquidity through a reduction in bid-ask spreads.

Columns (2) and (3) of Table XII look at turnover as dependent variable, as an additional proxy for bond liquidity. Column (2) uses the turnover measure directly from *TraX*, while Column (3) relies on turnover net of ECB purchases. We find a baseline estimate of 44 basis points in the first specification and a slightly lower value of 32 basis points in the second. The median trading volume amounts to 1.3% for eligible bonds (see Table I). Overall, the results for this second measure are also statistically and economically significant, reinforcing the conclusion that the CSPP enhanced bond market liquidity.

Taken together, these results indicate that bond market liquidity improved following the CSPP announcement. The bid-ask spread and turnover reflect the ease of trading under

[32]ECB holdings are available at quarterly frequency; we assume that purchases occur uniformly across the months within each quarter.

[33]We trim observations in the bottom 1 and top 1 percentiles of each liquidity measure.

Table XII. **The Effect of Corporate QE on Corporate Bond Liquidity** This table reports estimates from equation (1) using different measures of bond liquidity as dependent variables. The first row in each panel presents difference-in-differences estimates capturing the price effect of the respective corporate QE program. Columns 1 to 3 show the results for Bid-Ask under different set of fixed effects. Column 4 to 6 show the results for turnover under different set of fixed effects. Standard errors are double-clustered at the time and issuer level.

(a) CSPP: September 2015 – September 2016

	(1) Bid-ask	(2) Turnover	(3) Turnover (Net of ECB)
Post × Eligible	-0.038***	0.441***	0.323**
	(0.012)	(0.141)	(0.140)
Eligible	0.087***	-0.575**	-0.537**
	(0.020)	(0.200)	(0.193)
Rating x Maturity x Time FE	✓	✓	✓
R^2	0.67	0.06	0.06
Observations	6,342	9,128	9,128

normal market conditions. However, liquidity encompasses more than just trading costs and immediacy. QE policies also mitigate fire-sale dynamics during periods of market stress by providing a credible backstop for distressed sellers. The COVID-19 crisis provides a natural laboratory to study this mechanism, as it was characterized by a sharp deterioration in market liquidity and a widening of credit spreads. We exploit the unfolding of the COVID crisis—and the sequence of ECB interventions that followed—to examine fire-sale dynamics and assess how investors interpreted the ECB's implicit promise of market support.

We examine the behavior of eligible and ineligible bonds at a daily frequency during the COVID-19 crisis. To construct comparable measures of credit spreads and the CDS-bond basis across the two groups, we control for observable bond characteristics such as rating and duration using the same procedure described in Section 7.

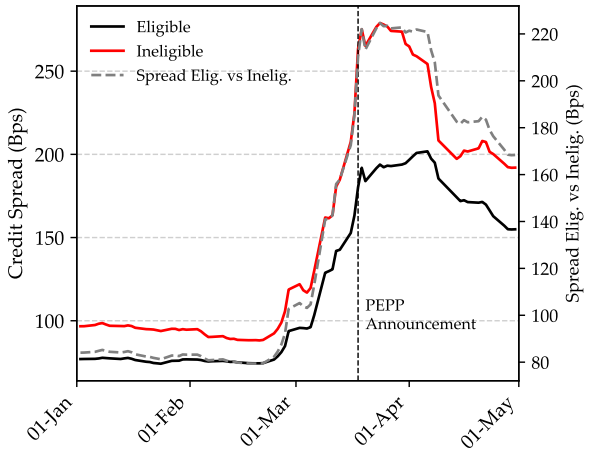
The results are presented in Figure 5. Figure 5a depicts the evolution of credit spreads in the period surrounding the PEPP announcement for eligible (in black) and ineligible (in red) bonds. It is evident that the credit spreads of ineligible bonds increased substantially more than those of eligible bonds, *before* the announcement. The spread between eligible and ineligible bonds (gray dashed line) began to widen at the end of February, roughly three weeks before the announcement of the PEPP.

The increase in credit spreads for ineligible bonds amounted to 191 basis points, compared with 128 basis points for eligible bonds, implying a sizable gap of 63 basis points—approximately 50% of the total increase observed for eligible bonds. Importantly, this difference arises after controlling for rating and duration fixed effects.

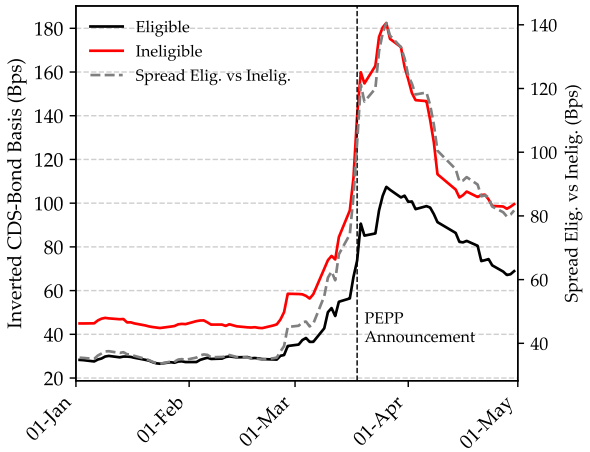
Given a median duration of approximately five years, we find that, for bonds with comparable duration and credit rating, ineligible bonds experienced additional losses of roughly 3% relative to eligible bonds, compared with total losses of 6.1% for eligible bonds. This represents a material difference in performance during the crisis period. The significant dif-

Figure 5. **Credit Spread and CDS-Bond Basis during COVID Crisis** The figure shows the evolution of credit spreads and the CDS-bond basis for eligible and ineligible bonds around the PEPP announcement. All variables are residualized with respect to rating and duration.

(a) Credit Spread



(b) CDS-Bond Basis



ference in losses indicates that eligible bonds exhibit substantially lower downside risk than ineligible bonds, conditional on observable characteristics.

Figure 5b plots the inverse CDS-bond basis for eligible and ineligible bonds (the average basis is negative), so that an upward movement in the figure corresponds to a reduction in the basis. The bond basis is residualized using the same set of fixed effects as for the credit spread analysis. As with credit spreads, there is a pronounced gap in the evolution of the basis during the COVID-19 crisis. For ineligible bonds, the basis decreased by 140 basis points, compared with a smaller decline of 81 basis points for eligible bonds. These results suggest that market conditions for eligible bonds deteriorated less than for ineligible bonds, *even before the announcement*, consistent with the interpretation that eligible securities were less affected by fire-sale dynamics during the crisis.

The results presented in this section show that the ECB's corporate bond purchases improved market liquidity and mitigated fire-sale dynamics in corporate bond markets. These effects are particularly valuable for mutual funds, which trade more frequently and may be forced to liquidate assets when facing outflows. As Coppola (2025) document, such outflows tend to intensify during recessions, leading mutual funds to sell corporate bonds at depressed prices—unlike insurance companies, whose funding is more stable. This mechanism helps explain why mutual funds rebalanced toward eligible bonds (Section 5). The improvement in liquidity and the reduction in fire-sale risk are therefore priced into bond valuations. As shown in Section 4, the price effects operate primarily through the CDS-bond basis. This measure captures liquidity conditions and typically declines during recessions, when corporate bond spreads widen more than CDS spreads, leading to larger losses on corporate

bonds.

IX. Alternative Channels

We propose a liquidity channel as the primary mechanism driving mutual funds' portfolio rebalancing. While several alternative explanations could, in principle, account for the observed patterns, we find these alternatives unconvincing. In what follows, we discuss each potential channel in turn and explain why both our empirical evidence and existing findings in the literature suggest that they are unlikely to play a dominant role.

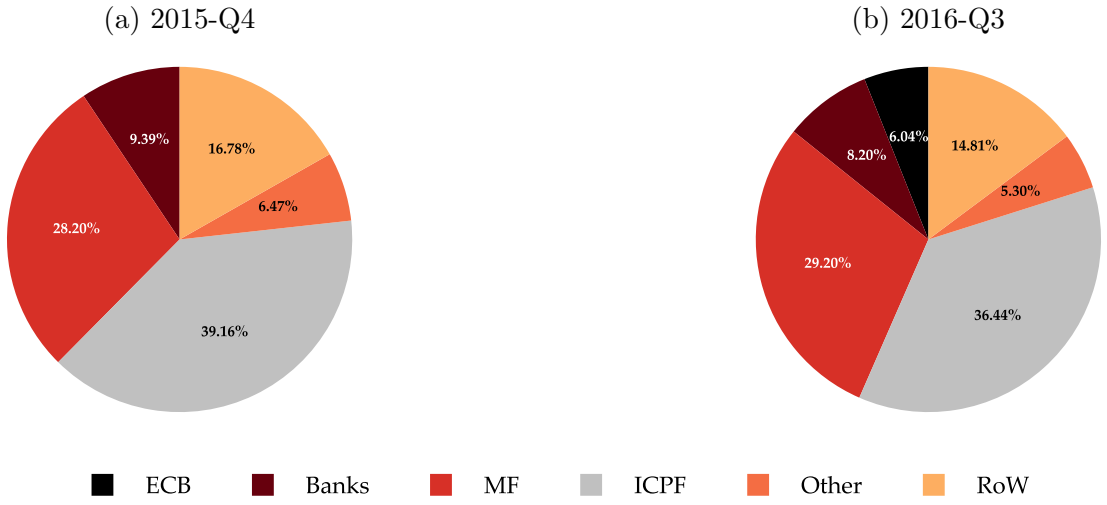
One potential mechanism is that mutual funds purchased bonds in anticipation of selling them to the ECB once prices increased following the start of purchases. First, although we find that mutual funds increased their purchases of eligible bonds after the announcement, there is no evidence that they subsequently sold these bonds once the ECB began its purchases. Figure 6 displays the investor composition of the corporate bonds included in the ECB's portfolio at the end of 2016Q3 (i.e., after one quarter of purchases). The pie charts show that almost every sector reduced its share of these bonds to accommodate the roughly 6% of the amount outstanding purchased by the ECB by that time. The mutual fund sector is the only exception, increasing its share by about one percentage point. This pattern alleviates concerns that mutual funds may have attempted to "front-run" the ECB by purchasing large quantities of eligible bonds before the programme officially began, only to sell them back shortly thereafter. In such a scenario, we would have observed mutual funds reducing their holdings of eligible bonds after purchases commenced.

Furthermore, we find that mutual funds with more volatile capital flows were those most actively purchasing eligible bonds. If the primary motive was simply to front-run the ECB, it is not clear why investors facing higher redemption risk would be the ones accumulating these positions.

Another potential transmission channel operates through mutual fund flows, as documented by Fang (2023); Fang and Xiao (2025). Such flows may account for part of the observed effects via price pressure. However, in our portfolio rebalancing analysis, we find that mutual funds increased their holdings of eligible bonds relative to ineligible bonds. This represents a *within*-fund rebalancing, which cannot be explained solely by fund-level inflows or outflows. Instead, mutual funds appear to have reallocated toward eligible bonds, likely reflecting their improved liquidity following the CSPP announcement.

Another possible explanation relates to bond supply. If firms whose bonds are typically held by mutual funds were more likely to issue new debt, and mutual funds simply purchased these new issues, this could mechanically increase their ownership of eligible bonds. However, this explanation is unlikely. Our rebalancing effects emerge within one quarter after the

Figure 6. **Holder composition of ECB-purchased corporate bonds.** These pie charts illustrate which investor sectors held ECB-purchased bonds before the CSPP announcement (i.e., in 2015q4) and after (2016q3) purchases had started. The sample consists only of ISINs that the ECB had purchased under the CSPP by the end of 2016q3, i.e., after one quarter of purchases. Holding shares are obtained by dividing the nominal value held by the total outstanding amount.



announcement, whereas De Santis and Zaghini (2021) document that it took at least six months for the increase in bond issuance by eligible firms to materialize.

Taken together, the evidence suggests that, although alternative mechanisms may have contributed to the observed patterns, the liquidity channel provides the most coherent explanation across all empirical findings.

X. Conclusion

This paper examines the transmission of the ECB's corporate bond purchase programs, highlighting the central role of liquidity demand channels shaping investor behavior and bond market outcomes.

Our analysis shows that announcement effects were both immediate and persistent. Credit spreads of eligible bonds declined sharply following the CSPP and PEPP announcements, with the bulk of the adjustment explained by movements in the CDS-bond basis. The results confirm that policy announcements themselves—rather than the gradual implementation of purchases—were the key driver of transmission.

Portfolio rebalancing further underscores the role of heterogeneous investors. Mutual funds, which are especially vulnerable to funding outflows in downturns, valued the liquidity insurance component of QE the most. They not only increased their holdings of eligible bonds but did so by reallocating away from sovereign and liquid assets, demonstrating that they viewed eligible corporate bonds as close substitutes for safe assets. Bonds with higher

mutual fund ownership experienced disproportionately larger spread declines, confirming that intermediary composition is a critical determinant of policy effectiveness.

Taken together, these results highlight three broad lessons. First, corporate QE should be understood not merely as a supply shock, but as a policy that changes the perceived characteristics of assets by providing state-contingent insurance. Second, heterogeneity in investor bases amplifies these effects, with fragile intermediaries playing a pivotal role. Finally, the effectiveness of future interventions will depend less on the size of announced purchases and more on the extent to which they exceed investor expectations and alter asset characteristics.

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A. Appendix: Model

In this section, we present an asset pricing model similar to that in Corell et al. (2025), in which investors value financial assets not only for their cash flows but also for the service flows they provide. We generalize their approach to accommodate market segmentation. The model is in reduced form and does not directly model liquidity needs. Many models in the literature generate similar predictions, so ours serves as a simple framework to structure our ideas. Our goal is to characterize optimal portfolio allocation and equilibrium convenience yields, and to study shocks to asset-specific service flows, which we map to QE shocks in the empirical section.

The key insight is that liquidity is one of the primary drivers of the relative convenience yields between Treasuries and corporate bonds. In the model, the CDS-bond basis maps to this relative convenience, making it our price instrument for understanding how the ECB affects the liquidity of eligible versus ineligible bonds.

A.1 Setup

Consider a market with N risky assets indexed by $n \in \{1, \dots, N\}$ and a continuum of heterogeneous investors i. Investors differ in their risk tolerance and in how strongly they value service benefits from holding assets.

Investor i chooses portfolio weights $x_{it} \in \mathbb{R}^N$, defined as risky holdings relative to total wealth. The investor's problem is:

$$\max_{x_{it}} \left(\boldsymbol{\mu}_t + Z_t \boldsymbol{\lambda}_{it}\right)^\top \boldsymbol{x}_{it} - \frac{a_{it}}{2} \boldsymbol{x}_{it}^\top \Sigma_t \boldsymbol{x}_{it},$$

where $a_{it} > 0$ is the mean–variance risk aversion, $\boldsymbol{\mu}_t$ is the $N \times 1$ vector of expected excess returns, and Σ_t is the $N \times N$ positive definite covariance matrix. We represent asset-specific characteristics associated with service flows by Z_t, an $N \times K$ matrix that stores the quantity of each of the K services that may provide investors with utility beyond expected returns. Investors value these services differently, with loadings $\boldsymbol{\lambda}_{it}$, a $K \times 1$ vector. Throughout, we refer to Z_t as *services*, and $\boldsymbol{\lambda}_{it}$ investor i's preference for them.

A.2 Optimal Portfolio Allocation and Expected Returns

The first–order condition on investor portfolio optimization implies

$$\boldsymbol{x}_{it} = \frac{1}{a_{it}} \Sigma_t^{-1} \big(\boldsymbol{\mu}_t + Z_t \boldsymbol{\lambda}_{it}\big). \tag{7}$$

Let w_{it} be investor i's wealth, $w_t = \int_0^1 w_{it}\, di$ total wealth, and $\tilde{w}_{it} = w_{it}/w_t$ the wealth share. Define the wealth-weighted average risk tolerance and the corresponding average

service taste

$$\bar{a}^{-1} := \int_0^1 \frac{1}{a_{it}} \tilde{w}_{it}\, di, \qquad \bar{\boldsymbol{\lambda}}_t := \frac{\int_0^1 \frac{1}{a_{it}} \tilde{w}_{it} \boldsymbol{\lambda}_{it}\, di}{\bar{a}^{-1}}. \tag{8}$$

Let $\boldsymbol{x}_{mt}$ be the market portfolio of risky assets. Market cleaning ensures that

$$\boldsymbol{x}_{mt} = \int_0^1 \tilde{w}_{it} \boldsymbol{x}_{it}\, di$$

Aggregating (7) yields

$$\boldsymbol{x}_{mt} = \bar{a}^{-1} \Sigma_t^{-1} \big(\boldsymbol{\mu}_t + Z_t \bar{\boldsymbol{\lambda}}_t \big) \tag{9}$$

We can then solve for the equilibrium implied expected return, expressed as a function of current prices:

$$\boldsymbol{\mu}_t = \bar{a}\, \Sigma_t \boldsymbol{x}_{mt} - \boldsymbol{cy}_t, \tag{10}$$

where $\boldsymbol{cy}_t = Z_t \bar{\boldsymbol{\lambda}}_t$ is the *convenience yield*. The first term on the right-hand side is the standard equilibrium expected excess return in an economy where investors do not derive utility from services. The second term, the convenience yield, reflects characteristics such as liquidity, hedging value, or collateral use, whose utility may vary across investors.

Substituting (10) into (7), we obtain the holdings of an individual investor i:

$$\boldsymbol{x}_{it} = \frac{\bar{a}}{a_{it}}\, \boldsymbol{x}_{mt} \;+\; \frac{1}{a_{it}} \Sigma_t^{-1} Z_t \, (\boldsymbol{\lambda}_{it} - \bar{\boldsymbol{\lambda}} v_t). \tag{11}$$

The first term represents a proportional holding of the market portfolio. In the absence of services, the standard two-fund separation holds, and investors differ only in how much of the market portfolio they hold, with the proportion determined by their risk aversion. The second term is an investor-specific tilt that captures whether an investor values services more or less than the average investor.

A.3 Predictions

Based on the setup, we state a set of propositions that guide the empirical analysis. Proofs for all propositions are provided in Appendix A.6. In the propositions, we use the term *policy* to denote an exogenous change to the system—such as one induced by central bank actions—to draw a direct link to the empirical results. The results, however, apply to any exogenous change.

Let $\boldsymbol{z}^k$ be the k-th column of matrix Z_t, and $z^k(n)$ be the n-th element of this vector.

Proposition 1 (Service shock and equilibrium returns)**.** *If a policy increases the service flow k of asset n (raising $z^k(n)$), the convenience yield on that asset unambiguously rises. The effect on its expected excess return $\mu(n)$ is ambiguous in equilibrium, since it depends*

on how the aggregate market portfolio $\boldsymbol{x}_{mt}$ adjusts in response.

Proposition 2 (Rebalancing toward valued services)**.** *Suppose all investors have the same risk-aversion coefficient. If the service k of asset n increases, then investors with above-average λ_{it}^k tilt their portfolios toward n, while those with below-average λ_{it}^k tilt away.*

A.4 Market Segmentation

We now introduce market segmentation. We assume investors can only invest in a pre-specified subset of assets. This can be interpreted as an investment mandate in Koijen and Yogo (2019). Suppose each investor i can only hold assets in a subset represented by the selection matrix S_i. Specifically, let M_i be the number of assets in investor i's universe, S_i is then an $N \times M_i$ matrix that selects the relevant covariance structure, and the weights on the other assets are zero. Investors' problem is given by

$$\max_{x \in \text{span}(S_i)} (\mu_t + Z_t \boldsymbol{\lambda}_{it})^\top \boldsymbol{x}_{it} - \frac{a_i}{2} \boldsymbol{x}_{it}^\top \Sigma_t \boldsymbol{x}_{it}.$$

The optimal portfolio choice is

$$\boldsymbol{x}_{it} = \frac{1}{a_i} (\Sigma_t^i)^{-1} \big(\boldsymbol{\mu}_t + Z_t \boldsymbol{\lambda}_{it} \big), \tag{12}$$

where Σ_t^i is the variance–covariance matrix that incorporates the restriction that allocations are limited to assets within the investment mandate.[34]

The market-clearing condition is

$$\boldsymbol{x}_{mt} = \underbrace{\int_i \tilde{w}_i \frac{1}{a_i} (\Sigma_t^i)^{-1}}_{\overline{\Sigma}_t} \boldsymbol{\mu}_t + \underbrace{\int_i \tilde{w}_i \frac{1}{a_i} (\Sigma_t^i)^{-1} Z_t \boldsymbol{\lambda}_{it}}_{\Pi_t}, \tag{13}$$

where $\tilde{w}_i$ denotes investor i's wealth share (as defined above).

Equilibrium expected returns can be expressed in the same form as in equation 10:

$$\boldsymbol{\mu}_t = (\overline{\Sigma}_t)^{-1} \boldsymbol{x}_{mt} - \boldsymbol{cy}_{\boldsymbol{y}}, \text{ where } \boldsymbol{cy}_t := (\overline{\Sigma}_t)^{-1} \Pi_t, \tag{14}$$

where $\overline{\Sigma}_t$ summarizes the aggregate risk-bearing capacity of investors, capturing how wealth shares and risk tolerances interact with investment mandates, and $\boldsymbol{cy}_t$ represents equilibrium convenience yield, which aggregates demand for services, weighted by both risk tolerance and portfolio restrictions.

In the following sections, we present empirical results guided by the model and its propo-

[34] Formally, $(\Sigma_t^i)^{-1} = S_i \, (S_i^\top \Sigma_t S_i)^{-1} S_i^\top$.

sitions. At the beginning of each section, we restate the propositions under study and explain how the model informs the interpretation of the findings. We proxy the convenience yield in Equation 11 with the CDS-bond basis, which captures the relative yield investors are willing to forego in order to hold a bond. Several factors contribute to the convenience yield, including collateral value, regulatory constraints, and liquidity. Our focus is on how central bank commitments affect the service value of corporate bonds. As emphasized in the literature, these commitments primarily influence bond safety and liquidity, which are the key non-pecuniary services shaped by policy.

Proposition 3 (Service shock under segmentation)**.** *If a policy increases the service flow k of asset n (raising $z^k(n)$), the convenience yield on that asset unambiguously increases. The strength of this increase depends on the composition of the investor segment: the effect is larger when a greater share of investors that are allowed to hold asset n place a higher value on service k.*

A.5 Additional Propositions

We now add a number of proposition relating the change in supply and the effect on asset prices.

Proposition 4 (Supply shock and inverse demand)**.** *A reduction in the supply of asset n increases its price and lowers its expected return. The effect is stronger when investors are more inelastic. More elastic investors reduce their holdings more strongly in response.*

Proposition 5 (Supply shock under segmentation)**.** *If the supply of asset n increases while services remain fixed, the expected return on n rises. The magnitude of this effect depends on how elastic the group of investors who can hold asset n is. If only a few or very risk-averse (inelastic) investors are allowed to hold it, the price impact is large.*

A.6 Proofs of All Propositions

Proof of Proposition 1. Let e_n denote the n-th unit vector. By definition of the convenience yield,

$$\boldsymbol{cy}_t \;=\; Z_t\,\bar{\boldsymbol{\lambda}}_t \qquad \Longrightarrow \qquad cy_t(n) \;=\; \sum_{j=1}^{K} z^j(n)\,\bar{\lambda}_t^j.$$

Hence, for a change in the k-th service of asset n,

$$\frac{\partial\, cy_t(n)}{\partial z^k(n)} \;=\; \bar{\lambda}_t^k.$$

Because service k is valued in the aggregate (i.e., $\bar{\lambda}_t^k > 0$), the convenience yield on asset n rises when $z^k(n)$ increases.

For expected excess returns, equilibrium implies

$$\boldsymbol{\mu}_t \;=\; \bar{a}\,\Sigma_t\,\boldsymbol{x}_{mt} \;-\; \boldsymbol{c}\boldsymbol{y}_t.$$

Differentiating the n-th component with respect to $z^k(n)$ yields

$$\frac{\partial\,\mu_t(n)}{\partial z^k(n)} \;=\; \bar{a}\,e_n^\top\Sigma_t\,\frac{\partial \boldsymbol{x}_{mt}}{\partial z^k(n)} \;-\; \frac{\partial\,cy_t(n)}{\partial z^k(n)} \;=\; \bar{a}\,e_n^\top\Sigma_t\,\frac{\partial \boldsymbol{x}_{mt}}{\partial z^k(n)} \;-\; \bar{\lambda}_t^k.$$

The second term is negative for a positive service shock, while the first term depends on the general-equilibrium rebalancing of the market portfolio $\boldsymbol{x}_{mt}$ induced by price changes. Its sign cannot be determined without additional assumptions on how the market portfolio adjusts. Therefore, the net effect on $\mu_t(n)$ is ambiguous. □

Proof of Proposition 2. Assume identical risk aversion $a_{it} \equiv a$, so $\bar{a} = a$. From (11),

$$\boldsymbol{x}_{it} = \boldsymbol{x}_{mt} + \frac{1}{a}\,\Sigma_t^{-1} Z_t\,\big(\boldsymbol{\lambda}_{it} - \bar{\boldsymbol{\lambda}}_t\big).$$

Define investor i's *tilt* relative to the market portfolio:

$$\boldsymbol{\tau}_{it} := \boldsymbol{x}_{it} - \boldsymbol{x}_{mt} = \frac{1}{a}\,\Sigma_t^{-1} Z_t\,\big(\boldsymbol{\lambda}_{it} - \bar{\boldsymbol{\lambda}}_t\big).$$

Let e_n be the n-th unit vector. A marginal increase in the k-th service of asset n changes only the (n,k) entry of Z_t, so

$$\frac{\partial\,\boldsymbol{\tau}_{it}}{\partial z^k(n)} = \frac{1}{a}\,\Sigma_t^{-1}\,(e_n e_k^\top)\,\big(\boldsymbol{\lambda}_{it} - \bar{\boldsymbol{\lambda}}_t\big) = \frac{1}{a}\,\big(\Sigma_t^{-1} e_n\big)\,\big(\lambda_{it}^k - \bar{\lambda}_t^k\big).$$

Taking the n-th component,

$$\frac{\partial\,\tau_{it}(n)}{\partial z^k(n)} = \frac{1}{a}\,e_n^\top\Sigma_t^{-1} e_n\,\big(\lambda_{it}^k - \bar{\lambda}_t^k\big) = \frac{1}{a}\,[\Sigma_t^{-1}]_{nn}\,\big(\lambda_{it}^k - \bar{\lambda}_t^k\big).$$

Because Σ_t is positive definite, $[\Sigma_t^{-1}]_{nn} > 0$ and $a > 0$. Hence the sign of the change in investor i's position in asset n equals the sign of $\lambda_{it}^k - \bar{\lambda}_t^k$: if $\lambda_{it}^k > \bar{\lambda}_t^k$, the tilt in n increases (tilt toward n); if $\lambda_{it}^k < \bar{\lambda}_t^k$, it decreases (tilt away from n). This proves the proposition. □

Proof of Proposition 3. From (13), define

$$\overline{\Sigma}_t \;:=\; \int_i \tilde{w}_i\,\frac{1}{a_i}(\Sigma_t^i)^{-1}, \qquad \Pi_t \;:=\; \int_i \tilde{w}_i\,\frac{1}{a_i}(\Sigma_t^i)^{-1} Z_t \boldsymbol{\lambda}_{it}.$$

Equilibrium expected returns are given by (14):

$$\boldsymbol{\mu}_t \;=\; (\overline{\Sigma}_t)^{-1}\boldsymbol{x}_{mt} - \boldsymbol{cy}_t, \qquad \boldsymbol{cy}_t \;:=\; (\overline{\Sigma}_t)^{-1}\Pi_t.$$

Note that $\overline{\Sigma}_t$ depends on (Σ_t^i) and not on Z_t, so it is *constant* with respect to a service shock.

Consider a marginal increase in the k-th service of asset n, i.e. in the (n,k) entry of Z_t. Since only that entry of Z_t changes, we have

$$\frac{\partial \Pi_t}{\partial z^k(n)} = \int_i \tilde{w}_i \,\frac{1}{a_i}\,(\Sigma_t^i)^{-1}\,(e_n e_k^\top)\,\boldsymbol{\lambda}_{it} = \int_i \tilde{w}_i \,\frac{1}{a_i}\,(\Sigma_t^i)^{-1} e_n\,\lambda_{it}^k.$$

Because $\overline{\Sigma}_t$ is fixed with respect to $z^k(n)$,

$$\frac{\partial \boldsymbol{cy}_t}{\partial z^k(n)} = (\overline{\Sigma}_t)^{-1}\,\frac{\partial \Pi_t}{\partial z^k(n)} = \sum_i \tilde{w}_i \,\frac{1}{a_i}\,(\overline{\Sigma}_t)^{-1}(\Sigma_t^i)^{-1} e_n\,\lambda_{it}^k.$$

Taking the n-th component and writing $[\cdot]_n$ for the n-th entry,

$$\frac{\partial\, cy_t(n)}{\partial z^k(n)} = \sum_i \tilde{w}_i \,\frac{1}{a_i}\,e_n^\top(\overline{\Sigma}_t)^{-1}(\Sigma_t^i)^{-1} e_n\;\lambda_{it}^k \;=\; \sum_i \omega_i^n\,\lambda_{it}^k,$$

where

$$\omega_i^n \;:=\; \tilde{w}_i\,\frac{1}{a_i}\,e_n^\top(\overline{\Sigma}_t)^{-1}(\Sigma_t^i)^{-1}e_n \;\geq 0.$$

Indeed, for investors who *cannot* hold asset n, $(\Sigma_t^i)^{-1}e_n = \mathbf{0}$ so $\omega_i^n = 0$; for those who can, write

$$\omega_i^n/(\tilde{w}_i/a_i) = \big((\Sigma_t^i)^{-1/2}e_n\big)^\top\Big((\Sigma_t^i)^{-1/2}(\overline{\Sigma}_t)^{-1}(\Sigma_t^i)^{-1/2}\Big)\big((\Sigma_t^i)^{-1/2}e_n\big) \geq 0,$$

since $(\overline{\Sigma}_t)^{-1}$ is positive definite.

Hence

$$\frac{\partial\, cy_t(n)}{\partial z^k(n)} \;=\; \sum_{i\in\mathcal{S}_n} \omega_i^n\,\lambda_{it}^k \;\geq\; 0,$$

with strict inequality whenever at least one investor in the segment that is allowed to hold asset n has $\lambda_{it}^k > 0$ and $\omega_i^n > 0$. Therefore, the convenience yield on asset n increases when $z^k(n)$ rises.

Moreover, the strength of this increase is

$$\text{(marginal effect)} \;=\; \sum_{i\in\mathcal{S}_n} \omega_i^n\,\lambda_{it}^k,$$

a wealth- and risk-tolerance–weighted aggregation over precisely those investors who *can*

hold n. It is monotone in each λ_{it}^k and in the segment weights $\tilde{w}_i/a_i$. Therefore, the effect is larger when a greater share of the investors authorized to hold asset n place a higher value on service k of asset n. □

Proof of Proposition 3. From (14),

$$\boldsymbol{cy}_t = (\overline{\Sigma}_t)^{-1}\Pi_t, \qquad \Pi_t = \int \tilde{w}_i \tfrac{1}{a_i} (\Sigma_t^i)^{-1} Z_t \boldsymbol{\lambda}_{it}\, di,$$

where $\lambda_{it}^{(k)}$ denotes the k-th component of the vector $\boldsymbol{\lambda}_{it}$.

Since $\overline{\Sigma}_t$ does not depend on Z_t, only Π_t responds to a service shock. For a marginal increase in $z^k(n)$,

$$\frac{\partial cy_t(n)}{\partial z^k(n)} = \int \tilde{w}_i \tfrac{1}{a_i}\, e_n^\top (\overline{\Sigma}_t)^{-1} (\Sigma_t^i)^{-1} e_n\, \lambda_{it}^{(k)}\, di.$$

Define the weight

$$\omega_i^n := \tilde{w}_i \tfrac{1}{a_i}\, e_n^\top (\overline{\Sigma}_t)^{-1} (\Sigma_t^i)^{-1} e_n.$$

Because both $(\overline{\Sigma}_t)^{-1}$ and $(\Sigma_t^i)^{-1}$ are positive definite, the quadratic form $e_n^\top (\overline{\Sigma}_t)^{-1}(\Sigma_t^i)^{-1} e_n$ is nonnegative, hence $\omega_i^n \geq 0$, with equality if i cannot hold n.

Therefore,

$$\frac{\partial cy_t(n)}{\partial z^k(n)} = \int_{\mathcal{S}_n} \omega_i^n\, \lambda_{it}^{(k)}\, di \;\geq 0,$$

strictly positive whenever some investor in $\mathcal{S}_n$ values service k. The magnitude of the effect is larger when a greater share of the investors that can hold asset n place a higher value on service k. □

Proof of Proposition 4. From (10), equilibrium expected returns are

$$\boldsymbol{\mu}_t = \bar{a}\, \Sigma_t \boldsymbol{x}_{mt} - \boldsymbol{cy}_t,$$

where $\boldsymbol{x}_{mt}$ is the market portfolio, fixed by asset supplies.

Consider a marginal reduction in the supply of asset n, i.e. a decrease in $x_{mt}(n)$. Because $\bar{a} > 0$ and $\Sigma_t \succ 0$, we have

$$\frac{\partial \mu_t(n)}{\partial x_{mt}(n)} = \bar{a}\, \Sigma_{nn} > 0.$$

Thus lowering $x_{mt}(n)$ reduces $\mu_t(n)$, i.e. it raises the price of asset n.

The magnitude of the effect is proportional to $\bar{a}$, the wealth-weighted average risk tolerance: if investors are more inelastic (smaller risk tolerance $1/a_{it}$), then $\bar{a}$ is larger and the response of expected returns to supply is stronger.

Finally, from (11), individual holdings adjust according to

$$x_{it}(n) = \tfrac{\bar{a}}{a_{it}}\, x_{mt}(n) + \cdots ,$$

so investors with higher elasticity ($1/a_{it}$ larger) reduce their holdings more strongly when supply falls. □

Proof of Proposition 5. From (14), equilibrium expected returns satisfy

$$\boldsymbol{\mu}_t = (\overline{\Sigma}_t)^{-1}\boldsymbol{x}_{mt} - \boldsymbol{cy}_t,$$

with $\overline{\Sigma}_t = \int \tilde{w}_i \frac{1}{a_i}(\Sigma_t^i)^{-1}\, di$ and $\boldsymbol{cy}_t = (\overline{\Sigma}_t)^{-1}\Pi_t$.

Since $\boldsymbol{cy}_t$ does not depend on supplies $\boldsymbol{x}_{mt}$, a change in supply affects expected returns through the first term. Differentiating with respect to $x_{mt}(n)$,

$$\frac{\partial \boldsymbol{\mu}_t}{\partial x_{mt}(n)} = (\overline{\Sigma}_t)^{-1}e_n, \qquad \frac{\partial \mu_t(n)}{\partial x_{mt}(n)} = e_n^\top(\overline{\Sigma}_t)^{-1}e_n \;>\; 0.$$

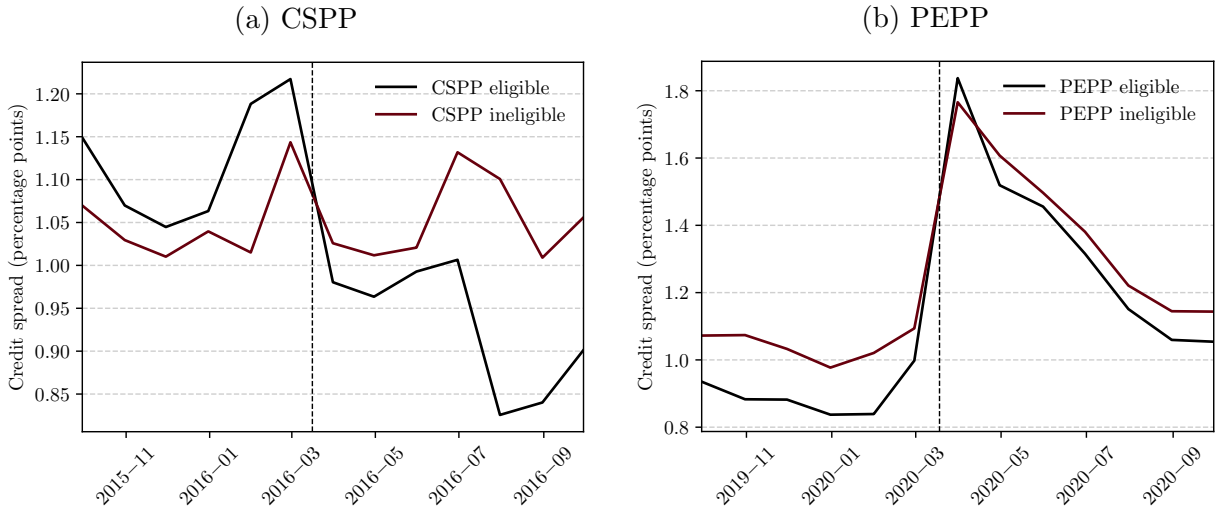
Thus, when the supply of asset n increases, $\mu_t(n)$ rises and its price falls. The slope of this inverse demand curve is $e_n^\top(\overline{\Sigma}_t)^{-1}e_n$, which depends on the aggregate risk-bearing capacity of those investors who can hold n. If only a few investors are in the segment for n, or if they have high risk aversion (low elasticity), then $\overline{\Sigma}_t$ places less weight on them and $(\overline{\Sigma}_t)^{-1}$ amplifies the effect. Hence the price impact is larger when the relevant segment is small or inelastic. □

B. Appendix: The Impact of ECB Corporate QE on Bond Prices

B.1 Descriptive time series evidence

Figure B1 shows the evolution of average credit spreads around the announcement of the CSPP and PEPP, separately for eligible and ineligible corporate bonds.

Figure B1. **Average credit spreads around CSPP and PEPP announcement dates.** This plot illustrates the average credit spreads of QE-eligible (blue) and QE-ineligible (pink) corporate bonds around the announcement dates of the CSPP (March 2016) and PEPP (March 2020).



The time period included in this plot is the same as in the baseline specification — six months before and six months after the announcement of the purchase program. From the time series plots, it becomes obvious that after the announcement of the CSPP the decrease in spreads was significantly larger for eligible bonds relative to ineligible bonds. In contrast, around the announcement of the PEPP the spread of eligible and ineligible bonds move in lockstep.

B.2 Parallel Trends

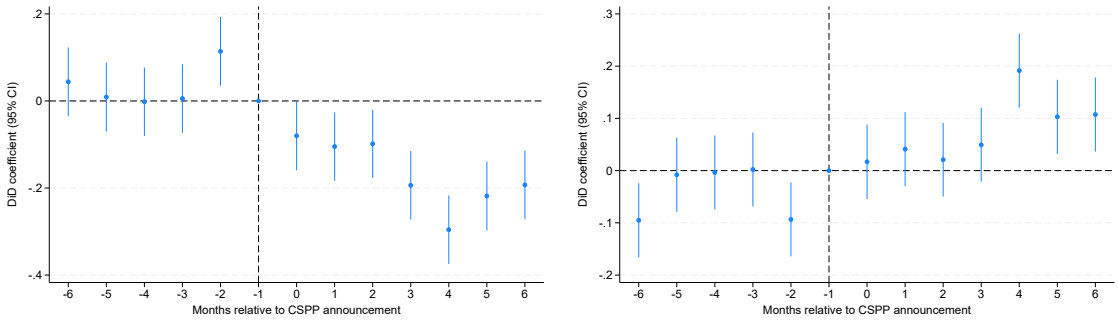
Next, to assess the validity of the parallel trends assumption and provide evidence of the dynamic impact of both ECB packages for different time periods, we set up a Granger causality test, as suggested in Angrist and Pischke (2009). The goal is to check whether causes happen before consequences and not the opposite. To do this, we split the *Post* dummy into monthly dummies and run the following specification:

$$y_t(n) = \sum_{\tau} \theta_{0,\tau} \times \mathbb{1}_{\tau=t} \times Eligible_t(n) + \alpha_{R\times M} + \alpha_t + \epsilon_t(n) \tag{15}$$

We chose the month before the program announcement as reference date. Figure B2 shows the dynamic DiD coefficient estimates with 95% confidence intervals for the two events (CSPP and PEPP) for the credit spread (left-hand side) and for the CDS-Bond basis (right-hand side).

The impact of the CSPP (Panel (a)) on the credit spread is clear. We observe that

(a) CSPP: September 2015 – September 2016



(b) PEPP: September 2019 – September 2020

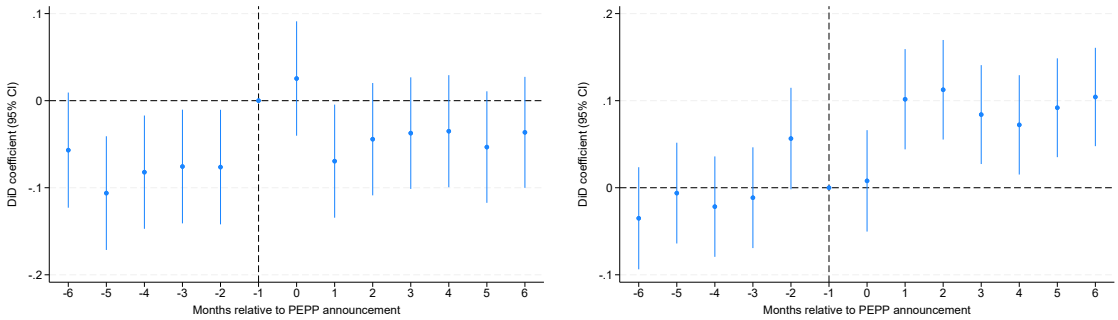


Figure B2. **DiD coefficients around the CSPP announcement.** This figure contains the monthly point estimates in equation (15) where the dependent variables are credit spreads (left-hand panel) and the CDS-bond basis (right-hand panel).

the coefficients are not statistically significant and close to zero until the month before the program announcement (with the exception of a single positive coefficient in January 2016, two months before the announcement), whereas they become negative and statistically significant in the months that follow. The fact that we do not observe any systematic significant differences in the pre-period is strong evidence that the parallel trends assumption holds.

Regarding the PEPP (illustrated in Panel (b)), we note that eligible bonds traded at lower spreads (i.e., higher prices) than ineligible ones before the PEPP announcement, but there is no significant difference (and generally more noise) between them afterwards. The plot is consistent with our interpretation discussed in Section 4 that the expectation of state-contingent central bank purchases was already priced in before the PEPP was announced.

Finally, note that the mechanism we propose works through a change in elible bonds' liquidity properties, not through a change in the relative supply of different assets. Therefore, an important question that naturally arises is whether the actual purchases of the ECB have an effect on top of the eligibility effect. In Figure B3, we present the average CDS-bond basis of CSPP-eligible bonds (blue) and that of bonds *actually* purchased by the ECB (pink). The

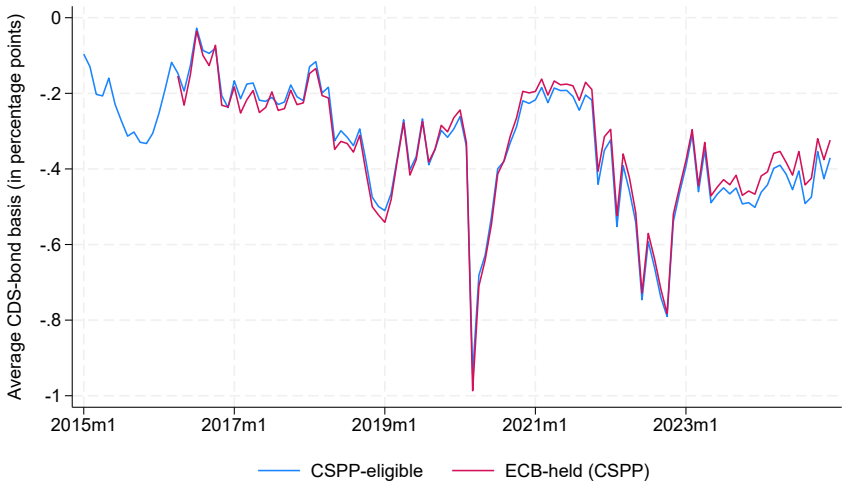


Figure B3. **Average CDS-bond basis for ECB-held bonds compared to the universe of CSPP-eligible bonds.** This figure plots the average CDS-bond basis separately for CSPP-eligible bonds (blue) and the bonds *actually purchased* by the ECB (pink).

two lines are almost identical for the entire period of interest, which suggests that there is no additional effect caused by the actual ECB purchase.

C. Appendix: Fund-Level Analysis

C.1 Data

We retrieve monthly euro area mutual fund holdings, asset under management (AUM), and flows from Morningstar. We include only open-end funds and exclude closed-end, variable annuity funds, and index funds from our analysis. To ensure data quality, we exclude holdings for which the amount held by the fund exceeds their total outstanding amount and truncate the share of total outstanding at the 99th percentile. We merge the holdings table with ECB corporate bond table (CSDB) and exclude observations for which the market value is zero or the ratio of the market value of holdings to the total market value amount exceeds one. The sample is further refined based on fund characteristics. Funds must have at least 1 million market value holdings in corporate bonds each month. We also drop funds where the portfolio weight in corporate bond positions is greater than one. To ensure consistent reporting behavior, for monthly holdings data, we only keep funds that report in all 3 months of each quarter and include only those with holdings data available for at least 6 months across the event window. For the quarterly table, we only include funds that report holdings for at least 2 quarters within the event window.

Table C1. **Descriptive statistics for mutual funds holdings.** This tables shows the descriptive statistics for key variables in regression(4). x is the portfolio weight of fund i in bond n, defined as the ratio of the market value of fund i's holdings in that bond to the fund's total market value holdings across all corporate bonds. The key independent variable *CapitalFlightiness* is computed from equation (3). *HighCapF* is a dummy indicator reflecting whether the fund's *CapitalFlightiness* falls within the top 75th percentile. βs are the loadings on the first two principal components obtained from a principal component analysis (PCA) of bond returns at the bond category level. The sample is monthly. We winsorize x, *CapitalFlightiness*, and βs at 1% and 99% to remove outliers.

(a) CSPP: September 2015 – September 2016

Statistic	N	Pctl(25)	Median	Pctl(75)	Mean	St. Dev.
Portfolio weight (%)	683,647	0.547	1.377	3.230	2.712	3.603
CapitalFlightiness	683,647	0.022	0.039	0.060	0.045	0.031
HighCapF=1	683,647	0	0	1	0.254	0.435
Elig=1	683,647	0	0	1	0.486	0.500
Post=1	683,647	0	1	1	0.553	0.497

(b) PEPP: September 2019 – September 2020

Statistic	N	Pctl(25)	Median	Pctl(75)	Mean	St. Dev.
Portfolio weight (%)	1,252,539	0.341	0.945	2.196	1.778	2.304
CapitalFlightiness	1,252,539	0.014	0.031	0.054	0.040	0.036
HighCapF=1	1,252,539	0	0	1	0.277	0.447
Elig=1	1,252,539	0	1	1	0.542	0.498
Post=1	1,252,539	0	1	1	0.572	0.495

Table C2. **Descriptive statistics for the change in mutual fund portfolio weights.** This table displays the descriptive statistics for key variables in regression (5). The fund AUM is the average fund AUM over the two years preceding the QE announcements (CSPP and PEPP) and is presented in millions. Portfolio weights are represented in percentage points. $x_{i,other}$ includes fund positions in derivatives, real estats, private equity, commodities, etc. $Log(AUM)_{i,pre}$ and $x_{i,pre}^{corpbond}$ refer to the fund's assets under management and corporate bond share at the onset of the events (September 2015 for CSPP and September 2019 for PEPP). Data is monthly. We winsorize all variables at the 1st and 99th percentiles to remove outliers.

(a) CSPP: September 2015 – September 2016

Statistic	Pctl(25)	Median	Pctl(75)	Mean	St. Dev.
wdelta_w_elig	−0.569	0.000	1.190	0.236	2.589
wdelta_w_inelig	−3.429	−0.503	2.075	−0.874	5.458
wdelta_w_cash	−3.954	−0.395	2.226	−0.816	7.500
wdelta_w_sov	−4.584	−0.278	1.653	−1.577	7.117
wdelta_w_equity	0.000	0.000	0.000	0.017	2.657
wdelta_w_other	−1.633	2.465	7.130	3.048	8.766
wshare	10.037	19.951	35.065	22.962	15.488
tna_mean	39.848	124.584	367.359	376.256	803.852

(b) PEPP: September 2019 – September 2020

Statistic	Pctl(25)	Median	Pctl(75)	Mean	St. Dev.
wdelta_w_elig	−0.224	0.625	2.694	1.252	2.875
wdelta_w_inelig	−1.624	0.210	2.185	0.220	4.325
wdelta_w_cash	−2.695	−0.041	2.225	−0.864	7.661
wdelta_w_sov	−3.119	0.000	1.873	−0.398	7.534
wdelta_w_equity	−0.328	0.000	0.000	−0.344	2.877
wdelta_w_other	−4.129	−0.167	3.841	0.316	9.076
wshare	9.809	19.425	34.089	22.499	15.539
tna_mean	49.420	135.045	379.540	435.543	1,152.632

D. Appendix: Additional Tables and Figures

Figure D1. **ECB Share of Outstanding Amount** igure D1 plots the shares of the outstanding amount of eligible bonds held by the ECB. The share was 0% at the beginning of 2016, prior to the start of the CSPP and peaked to 27% in 2023.

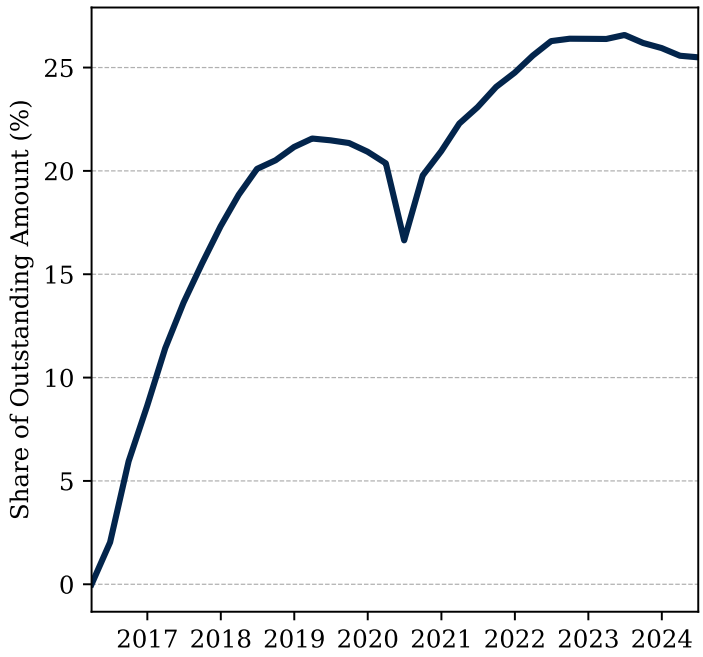


Table D1. **Intermediary Effects, Difference-in-Differences Approach** The table reports the estimates of Equation 6. The triple interaction coefficients θ_{MF} and θ_{ICPF} capture the additional effects of the policies for bonds that, ex-ante, had a higher share held by mutual funds or by insurance corporations and pension funds, respectively.

(a) CSPP: June 2015 – December 2016

	MF			ICPF			MF & ICPF		
	(1) CS	(2) CDS	(3) Basis	(4) CS	(5) CDS	(6) Basis	(7) CS	(8) CDS	(9) Basis
Post × Eligible × MF Share	-0.271**	0.077	0.347**				-0.372**	0.098	0.470**
	(0.112)	(0.087)	(0.131)				(0.147)	(0.093)	(0.178)
Post × Eligible × ICPF Share				0.096	-0.021	-0.117	-0.050	0.001	0.051
				(0.076)	(0.044)	(0.092)	(0.082)	(0.056)	(0.101)
Post × Eligible	-0.058	-0.096**	-0.039	-0.163**	-0.067	0.096	-0.007	-0.094	-0.087
	(0.044)	(0.042)	(0.054)	(0.066)	(0.039)	(0.080)	(0.075)	(0.056)	(0.094)
ISIN FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.92	0.91	0.79	0.89	0.91	0.75	0.90	0.91	0.75
Observations	18,185	18,185	18,185	21,991	21,991	21,991	25,129	25,129	25,129

(b) PEPP: June 2019 – December 2020

	MF			ICPF			MF & ICPF		
	(1) CS	(2) CDS	(3) Basis	(4) CS	(5) CDS	(6) Basis	(7) CS	(8) CDS	(9) Basis
Post × Eligible × MF Share	-0.083	-0.120	-0.037				0.071	-0.174	-0.246
	(0.130)	(0.111)	(0.117)				(0.117)	(0.178)	(0.177)
Post × Eligible × ICPF Share				0.093	0.221	0.128	0.133	0.095	-0.039
				(0.121)	(0.162)	(0.110)	(0.118)	(0.199)	(0.171)
Post × Eligible	0.061	0.086	0.025	-0.002	-0.027	-0.025	-0.041	0.077	0.118
	(0.048)	(0.062)	(0.062)	(0.052)	(0.057)	(0.062)	(0.046)	(0.109)	(0.122)
ISIN FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
R^2	0.90	0.88	0.81	0.89	0.89	0.80	0.89	0.89	0.80
Observations	23,453	23,453	23,453	26,879	26,879	26,879	30,190	30,190	30,190

Table D2. **Portfolio shares rebalancing around the two corporate QE programs.** This table displays the change in portfolio corporate bond holdings (in EUR billion) between the beginning and end of each event period (2015q1 – 2016q4 for CSPP; 2019q1 – 2020q4 for PEPP), separately for QE-eligible and -ineligible bonds, for the following investor sectors: Banks, mutual funds, insurance companies & pension funds, others (incl. households and non-financial corporations), and rest of the world (i.e., non-euro area holdings estimated as the residual). Net issuance is calculated as the sum of all sectors' rebalancing. The third column contains each sector's total holdings (ineligible and eligible) at the beginning of the event period. The final column shows the total change in holdings (ineligible and eligible) over the event period as a share of initial holdings.

(a) CSPP

	2015q4 – 2016q2			2015q4 – 2016q4			2015q4
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign	Holdings
Banks	-0.11	0.42	-0.31	-1.06	2.24	-1.18	1215
ICPF	0.51	-0.14	-0.37	0.70	-0.02	-0.69	1535
MF	2.63	0.75	-3.38	2.74	1.52	-4.26	950
Other	0.10	-0.36	0.26	0.33	-1.09	0.77	566
ECB	0.62	0.00	-0.62	4.09	0.01	-4.10	682
RoW	0.24	1.28	-1.52	-1.32	2.41	-1.09	2195
Net issuance	-3.99	-1.96	5.95	-5.49	-5.07	10.55	.

(b) PEPP

	2019q4 – 2020q2			2019q4 – 2020q2			2019q4
	Eligible	Ineligible	Sovereign	Eligible	Ineligible	Sovereign	Holdings
Banks	0.36	0.16	-0.52	0.73	2.00	-2.73	1185
ICPF	1.13	0.32	-1.46	1.62	0.68	-2.30	1839
MF	2.97	-0.74	-2.24	4.26	-0.33	-3.93	1039
Other	-1.65	-3.70	5.35	-0.79	-4.18	4.98	490
ECB	1.51	0.22	-1.73	2.41	0.07	-2.48	1658
RoW	1.06	-1.01	-0.05	1.73	0.22	-1.95	2457
Net issuance	-5.38	4.74	0.64	-9.95	1.54	8.41	.

Table D3. **The effect of corporate QE on portfolio share, Long Sample** This table displays the results of estimating equation (2) separately for five holdings sectors: Banks, mutual funds, insurance companies & pension funds, others (incl. households and non-financial corporations), and rest of the world (i.e., non-euro area holdings estimated as the residual).

(a) CSPP: 2015q2 – 2016q4

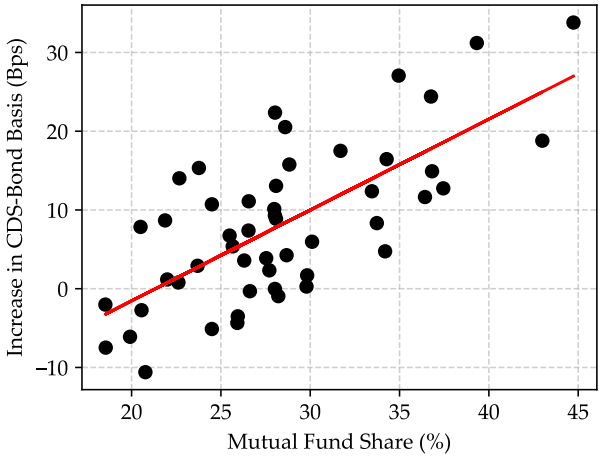
	(1) Banks	(2) MF	(3) ICPF	(4) Other	(5) RoW
Post=1 × CSPP eligible=1	-0.485***	0.167**	0.054	-0.530***	-0.549***
	(0.12)	(0.06)	(0.06)	(0.07)	(0.13)
CSPP eligible=1	-1.572**	-0.778*	0.449	-0.916**	1.933***
	(0.47)	(0.34)	(0.37)	(0.28)	(0.46)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.25	0.19	0.22	0.16	0.04
Observations	63,147	98,474	102,267	101,926	28,262

(b) PEPP: 2019q4 – 2020q4

	(1) Banks	(2) MF	(3) ICPF	(4) Other	(5) RoW
Post=1 × PEPP eligible=1	-0.501***	0.124***	-0.281***	0.231***	-0.055
	(0.12)	(0.03)	(0.04)	(0.04)	(0.16)
PEPP eligible=1	-0.419	-1.372***	-0.139	-1.179***	2.358***
	(0.50)	(0.23)	(0.25)	(0.23)	(0.56)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.20	0.20	0.15	0.08
Observations	75,421	146,325	158,523	111,895	29,666

Figure D2. **Mutual Funds Holdings and Basis Response** The figure depicts the relationship between the increase in CDS-Bond basis (y-axis) around ECB announcements and the corresponding mutual fund holdings (x-axis). Bonds are ranked according to the magnitude of their CDS-bond basis reactions and sorted into 50 groups with comparable responses. For each group, we compute the average mutual fund share. Panel (a) presents the results for the CSPP announcement, while Panel (b) reports the results for the PEPP announcement.

(a) CSPP



(b) PEPP

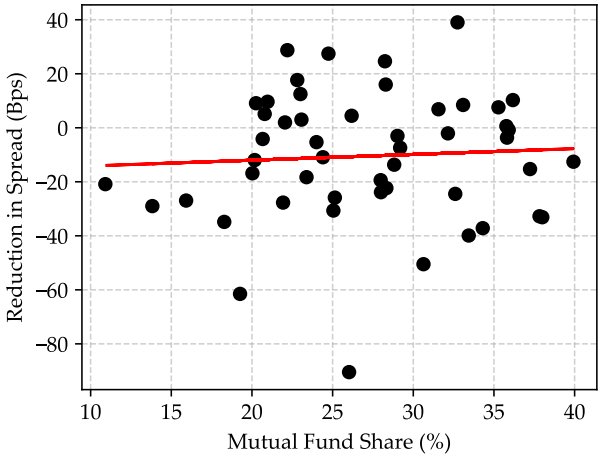


Table D4. **The effect of corporate QT on portfolio share.** This table reports the results from estimating equation (2) for the QT period. We use athe sample window 2021Q1–2023Q4. The regression is estimated separately for five investor sectors: banks, mutual funds, insurance companies and pension funds, other domestic investors and RoW.

QT: 2021q1 - 2023q4 (Post Dummy: 2021q4)

	(1) Banks	(2) MF	(3) ICPF	(4) Other	(5) RoW
Post 2021q4 × Eligible	-0.143**	-0.049	-0.089***	0.112**	-0.012
	(0.06)	(0.03)	(0.03)	(0.04)	(0.08)
Eligible	-0.480	-1.305***	-0.391*	-0.479**	1.769***
	(0.35)	(0.19)	(0.20)	(0.17)	(0.35)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140

QT: 2021q1 - 2023q4 (Post Dummy: 2022q1)

Post 2022q1 × Eligible	-0.099**	-0.051	-0.056**	0.162***	0.017
	(0.04)	(0.03)	(0.02)	(0.04)	(0.07)
Eligible	-0.521	-1.308***	-0.420*	-0.506**	1.748***
	(0.36)	(0.20)	(0.20)	(0.17)	(0.37)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140

QT: 2021q1 - 2023q4 (Post Dummy: 2022q2)

Post 2022q2 × Eligible	-0.129***	-0.040	-0.048**	0.196***	0.026
	(0.04)	(0.03)	(0.02)	(0.05)	(0.06)
Eligible	-0.511	-1.318***	-0.430*	-0.515**	1.744***
	(0.37)	(0.20)	(0.20)	(0.17)	(0.38)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140

QT: 2021q1 - 2023q4 (Post Dummy: 2022q3)

Post 2022q3 × Eligible	-0.132***	-0.062**	-0.041**	0.157***	0.031
	(0.03)	(0.02)	(0.02)	(0.03)	(0.05)
Eligible	-0.520	-1.310***	-0.437**	-0.479**	1.743***
	(0.37)	(0.20)	(0.20)	(0.18)	(0.39)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140

QT: 2021q1 - 2023q4 (Post Dummy: 2022q4)

Post 2022q4 × Eligible	-0.169***	-0.093***	-0.044**	0.133***	0.053
	(0.02)	(0.02)	(0.02)	(0.01)	(0.05)
Eligible	-0.515	-1.301***	-0.440**	-0.455**	1.736***
	(0.37)	(0.20)	(0.20)	(0.19)	(0.39)
Holder country x Time FE	✓	✓	✓	✓	✓
Rating x Maturity x Time FE	✓	✓	✓	✓	✓
R^2	0.31	0.17	0.21	0.12	0.11
Observations	153,127	302,466	315,957	234,022	65,140