

A European Safe Asset? Not Without the Investors*

Giovanni Bonfanti
Columbia University

Juri Marcucci
Bank of Italy

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Abstract

We study bonds issued by the European Union (EU) as joint liabilities of its member countries and show that they pay higher interest rates than comparably safe sovereign issuers. The spread reflects their greater sensitivity to adverse market shocks, which is particularly pronounced during periods of monetary tightening. Using novel data, we document that EU bonds have a small investor base because they are excluded from major fixed-income indices due to their lack of formal sovereign status. This exclusion lowers expected prices during crises, making EU bonds unattractive to investors with liquidity needs, such as mutual funds and foreign central banks. Banks and insurance corporations in core countries replace expensive safe government bonds with cheap but illiquid EU bonds. A demand-based asset pricing framework suggests that the spread would be negligible if the EU were recognized as a fully sovereign issuer, and this would not come at the cost of existing safe asset issuers due to strong foreign demand.

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1 Introduction

The European Union (EU) has been issuing debt jointly guaranteed by its member countries for several decades. Through various institutions and legal frameworks, more than €1.6 trillion of AAA-rated bonds have been issued as of 2025. Although this figure represents only 10% of European GDP, it is comparable in size to the sovereign debt of major member states such as Germany and France. The issuance of these bonds surged in response to the COVID-19 crisis, and recent political momentum has reinvigorated efforts to develop a safe asset for the entire Union, aimed at financing common priorities.

Despite such ambitious plans, EU bonds trade at significant spreads relative to comparable sovereign issuers, around 50 basis points, with little evidence of compression even as their outstanding volume has doubled. Their prices are more sensitive to bad news and react more strongly to shifts in monetary policy expectations. These characteristics indicate that EU bonds do not function as a safe asset, yet explanations from the literature, such as perceived credit risk, are inconsistent with the empirical evidence.

We show that EU bonds pay a large premium not because of their economic fundamentals, but because of their legal status. They are excluded from sovereign bond indices because they are “supranationals”: securities backed by tax revenues but not legally issued by a government. Consequently, many institutional investors cannot participate in this market because their investment universes are defined by index inclusion. This exclusion matters because it shrinks the investor base, and a smaller base means prices fall more during crises, which makes the bonds unattractive to investors who might need to liquidate assets.

We begin by ruling out other explanations and use credit default swaps to show that the spread is up to 10 times larger than default risk alone could justify. Crucially, this finding extends to all supranationals, regardless of their activity or credit backing. Even bonds issued by KfW, a policy bank fully controlled and solely guaranteed by Germany, trade at the same spread both in levels and changes. The spread cannot be accounted for by issuer size, secondary market liquidity, or preferential regulatory treatment for government bonds.

In line with a classical approach to asset pricing, we document that the unconditional spread on EU bonds reflects their inferior stochastic properties, with prices falling more during periods of market stress. The higher sensitivity to adverse shocks does not reflect expectations of worsening fundamentals, as is the case for risky governments like Spain and Italy, since it is common to all supranationals. Instead, a higher probability of a crisis has a larger impact on EU bonds because they are expected to fall by more in price during a period of severe market disruption due to their smaller investor base.

To explain why supranational bonds have worse stochastic properties, we construct a novel measure that quantifies the size of the potential investor base for different issuers. We find that bonds issued by the EU and other supranationals have a benchmarked investor base only about 20% as large as that of comparable sovereign bonds, a dramatic difference that cannot be explained by characteristics such as credit quality, maturity, or issue size.

Our measure is constructed by collecting the weights assigned to thousands of individual bonds across a wide range of European fixed-income indices and combining these with data on the total assets under management (AUM) that track each index from mutual funds and ETFs. For each bond, we calculate the fraction of its outstanding amount that would be held by benchmarked investors if they replicated their indices exactly. This measure accounts for both active and passive investors, following a large literature showing that even active funds tend to minimize deviations from their benchmarks. Using the terminology in the index-inclusion literature, we refer to this measure as inelastic demand, and show that securities with smaller investor bases face significantly higher borrowing costs.

In Section 3, we confirm the link between low inelastic demand and worse conditional properties that drive relative pricing by comparing the actual investor base of supranational and sovereign bonds. In particular, we show that it is investors with a potential need for cash that avoid buying EU bonds even if they are in their investment universe. We present evidence of investor sorting across bonds that are equally safe but have different stochastic properties both within and across classes of financial intermediaries. Within mutual funds and ETFs, we measure the flightiness of the investor base during Covid for different funds, and show that it is only those that expect to suffer large outflows during a crisis that pay a large premium to hold sovereigns relative to equally safe supranationals.

We also use confidential holdings data to establish that insurance companies and commercial banks almost entirely avoid government debt and are instead enthusiastic buyers of EU bonds, which offer AAA safety at a sizeable discount. They are the natural buyers for this type of debt since the long-dated or stable nature of their liabilities means they do not need to liquidate assets and realize losses during crisis episodes. By contrast, mutual funds and foreign investors pay a large premium to hold government debt since they have a higher willingness to pay for safe assets that do not depreciate in bad times. Mutual funds, with their short-dated liabilities, experience large outflows during periods of market disruption; as a result, they need to hold assets they can liquidate at a high price. Foreign holdings are dominated by central banks, which use European bonds as hard-currency reserves to draw on in times of need.

Banks and insurance companies thus naturally take advantage of this pricing differential,

but cannot eliminate it. Foreign investors and mutual funds, who together hold nearly 80% of all AAA-rated European bonds, are simply too large relative to domestic intermediaries. The spread persists because the marginal investors are those with the greatest liquidity needs. In equilibrium, slow-moving institutions such as banks and insurers act as stabilizing arbitrageurs, while flight-prone mutual funds and foreign investors pay a stiff price to hold assets that retain value during episodes of market stress.

Among banks and insurers, it is the intermediaries located in core countries who take advantage of this trade, selling their expensive government bonds while holding cheap EU bonds. German and Dutch banks stand out in particular, with the former holding their own sovereign bonds less than 20% as compared to the market portfolio, while buying EU bonds more than 3 times as much. The spread is not large enough for intermediaries in Spain and Italy, who continue to hold their sovereign bonds because they offer a higher yield.

We thus provide an explanation for the failure of EU bonds as safe assets that disproves claims that financial markets require an “EU premium” arising from the political fragmentation of its institutions. We also rationalize the failure of policies aimed at reducing the spread paid by EU bonds because they did not address the issue of inelastic demand. Instead, we show that the legal status of the issuing entities is ill-suited for the market coordination on proper sovereign issuers and that monetary tightening widens the gap.

Finally, in Section 4 we estimate a demand-based asset pricing framework to understand which policies have the potential to reduce the spread paid by EU bonds. We show that incremental increases in outstanding quantities, potentially replacing part of each country’s national debt, yield only modest gains in terms of reduced interest cost for EU bonds. Instead, the recognition of the European Commission as a fully sovereign entity, holding constant default risk and market size, would substantially reduce its borrowing costs. This ability to issue safe assets would come at the cost of only slightly higher yields for national governments, thanks to large additional demand by foreign investors in need of a store of value.

Our findings have substantial implications for the understanding of the ultimate source of the specialness of government debt and for the international role of the euro. We describe a setting where a large stock of debt issued by a safe institution cannot compete with government debt, even with full regulatory support. Instead, the recognition of an asset as a store of value accessible to a large investor base is the key source of convenience yields. Because reserve currency status requires assets that can attract broad demand, our findings suggest that the euro has limited prospects for challenging the dominance of the dollar.

Related literature. This paper first relates to the literature on European fiscal integration, where countries of differing credit quality consider joint debt issuance. Among the most

influential contributions, Brunnermeier et al. (2017) analyze the institutional design of European Safe Bonds (ESBies), proposing a tranching mechanism to create AAA-rated securities from a diversified portfolio of sovereign debt. Similar proposals (e.g. Favero and Missale (2012), Beetsma and Mavromatis (2014)) have explored alternative structures for common issuance. While these designs have received considerable policy attention, they were never implemented, and our findings suggest that they would have failed to create a safe asset because financial markets would not have treated such instruments as sovereign debt.

The paper also contributes to the literature on the determinants of safe-asset status. Following Brunnermeier et al. (2024), a truly safe asset must be not only free of default risk but also highly liquid during periods of stress, thereby earning a convenience yield. Geromichalos et al. (2023) show that the link between safety and liquidity is strong but not universal and this paper provides a salient example: despite their AAA rating, EU bonds are not treated as liquid stores of value. We thus speak to the ultimate source of the convenience yield on government debt as measured by Krishnamurthy and Vissing-Jorgensen (2012) and Du et al. (2018a) for the US and by Jiang et al. (2026) for euro-area sovereigns, and connect more broadly to Habib et al. (2020), who systematically identify the fundamentals underlying safe-asset status at a cross-country level. In particular, we show that institutional design can impede market coordination on a given issuer as a provider of safe assets, a mechanism modeled theoretically by He et al. (2019), and consistent with Beber et al. (2009), who find that investors in the euro area value liquidity properties associated with market size more than default risk.

A third strand concerns the index inclusion effect, originally identified by Harris and Gurel (1986) and Shleifer (1986), who show that the inclusion of a stock in an index induces abnormal returns because of the inelastic demand of benchmarked investors. The broader framework for thinking about inelastic demand as a first-order equilibrium property of asset prices is provided by Gabaix and Koijen (2021), whose inelastic-markets hypothesis generalizes these early findings beyond equity index inclusion. Our work differs from this literature in two key respects. First, we focus on fixed-income markets, where the importance of the index inclusion effect has only recently been discussed (see e.g. Calomiris et al. (2022), Dathan and Davydenko (2026) for corporates and Pandolfi and Williams (2019) for sovereigns). Second, whereas most studies employ an event-study approach for temporary price impacts, we identify a persistent consequence of index exclusion that is never arbitrated away. We build on Pavlova and Sikorskaya (2023) by computing a measure of benchmarking intensity and examining its implications for asset pricing and the investor composition.

A fourth, more recent strand of the literature studies how investor clienteles shape the

pricing of safe assets, and it is largely euro-area focused and based on granular holdings data. Using the same data as this paper, Breckenfelder et al. (2024) show that supranational bonds issued by the European Commission are primarily held by mutual funds and banks and are not viewed as substitutes for national sovereign debt, reflecting strong home bias and segmentation across asset classes. In parallel, Holm-Hadulla et al. (2024) decompose sovereign yields into liquidity, collateral, and regulatory components, showing that these convenience services account for a substantial share of governments’ borrowing advantage. Our findings bridge these perspectives by showing that EU bonds fail to command similar premia not because of inferior fundamentals, but because institutional design limits their ability to deliver these services to key investor groups.

The rest of the paper is structured as follows. Section 2 shows that EU bonds pay a spread due to their exclusion from indices. Section 3 describes their investor base. Section 4 estimates a demand-based asset pricing framework for policy counterfactuals. Section 5 concludes.

2 EU bonds failed because they are not sovereign debt

Common EU debt has not lived up to expectations of providing a new safe asset. EU bonds consistently trade at a large premium relative to sovereign bonds, a difference that cannot be explained by default risk, market size, or regulatory treatment. They also lack the key property of safe assets, high prices in bad times, and therefore must offer higher yields than equally safe sovereign issuers. We argue that investors demand this premium because EU bonds are not sovereign debt: the EU is not a government, and its securities are excluded from the sovereign bond indices that underpin inelastic demand in fixed-income markets.

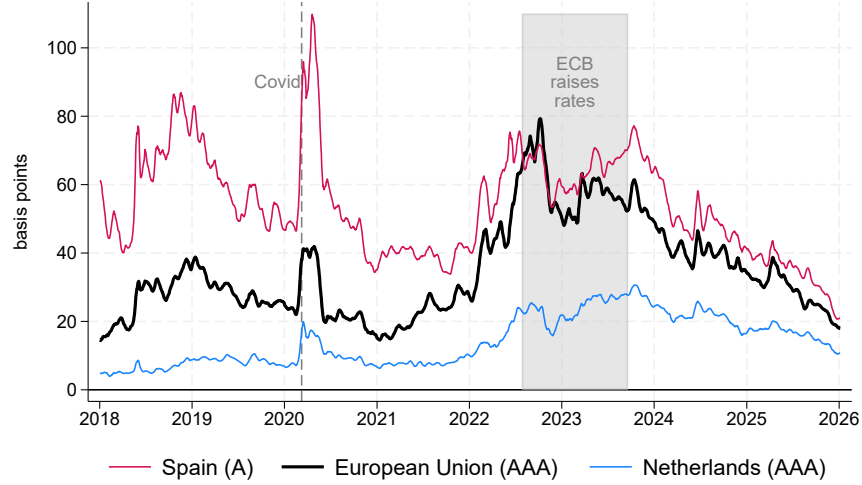
2.1 Not issuing as a formal government has a large cost

We show that the European Union and other supranational institutions pay a large premium relative to equally safe and large governments due to their legal status, which does not qualify them as formal sovereigns. In particular, we show that the spread paid by EU bonds is exactly the same as that of a very heterogeneous group of issuers and that factors such as default risk and market size do not seem to have any effect on their cost of borrowing.

We document the large spread that AAA-rated EU bonds pay relative to AAA-rated governments as an empirical puzzle. Figure 2.1 shows the 5-year yield spread with AAA-rated German government bonds for selected issuers to show that the EU pays a very large

premium relative to Germany (in the range of 20 to 80 basis points) and also relative to another smaller AAA-rated sovereign issuer such as the Netherlands. The EU spread at times exceeded the spread paid by Spain, a country with a significantly lower rating and that was part of a bailout program in the early 2010s.

Figure 2.1: 5-year yield spread with German government bonds



The figure shows the difference between the 5-year point of the yield curve for a given issuer and the 5-year point of the yield curve for Germany, computed for Spain (in red), the European Union (in black), and the Netherlands (in blue). The yield for the European Union is computed as the average yield for the 4 EU institutions listed in Table 2.1. The vertical line marks the start of turmoil in financial markets due to the Covid epidemic (9 March 2020), while the shaded gray area is the period during which the ECB raised interest rates (from 27 July 2022 to 20 September 2023). Data comes from Bloomberg.

We rule out that the spread is explained by credit risk considerations by employing a market-based measure of default risk: credit default swaps (CDS). These are financial contracts in which the seller insures the buyer against the default of a specific issuer over a period of time. We compute the so-called bond basis, following Bai and Collin-Dufresne (2019), for an issuer i as the difference between the 5-year spread (shown in Figure 2.1) and the 5-year CDS premium differential, or

$$bb_t^i = \left(y_t^i - y_t^{\text{Germany}} \right) - \left(CDS_t^i - CDS_t^{\text{Germany}} \right), \quad (1)$$

where y_t^i is the yield for issuer i at time t and CDS_t^i is the corresponding CDS premium. Figure A.1 in the Appendix shows that the bond basis is positive and large - up to 70 basis points - for EU bonds, meaning that the required compensation for credit risk is much smaller than the observed spread over German bonds.¹

¹The CDS premium on AAA-rated issuers of medium size is the price of an illiquid contract that is traded

We then use a heterogeneous group of supranational institutions to further show that the spread paid by EU bonds is not due to commonly cited factors such as market size or regulatory treatment. The context is the sovereign debt market in euros, where all issuers are comparably large but belong to two groups according to their legal status and hence the size of potential investors: they are either national governments or supranational institutions. For both groups, we focus on the issuance in euros and ignore the smaller amounts issued in dollars or other currencies.

For national governments, we consider the central administrations of the five largest economies of the euro area since this grouping exhibits heterogeneity in both market size and credit risk. Table 2.1 reports the credit rating and outstanding debt in euros at the end of 2024, and both dimensions of heterogeneity are apparent. First, the credit rating ranges from the very safest (Germany and the Netherlands) to a merely safe BBB (Italy). Secondly, the size of markets varies to a large extent, with the outstanding debt for France being about double the Spanish debt, which in turn is about 3 times as large as the Dutch debt.

For supranationals, we consider 5 entities with very different roles and the legal status as the only common characteristic. Four are institutions linked to the European Union and the fifth is a German policy bank and they are all AAA-rated entities with established debt markets. Table 2.1 lists their names and outstanding debt but we show below that this heterogeneity is irrelevant for market pricing and that they all pay the same interest rates. The only significant difference with national governments is that the securities issued by these institutions are not formally classified as sovereign debt.

The 4 institutions linked to the European Union are tasked with very different roles but have always been AAA-rated² thanks to the understanding that their bonds are a joint and several liability of the member countries.³ The European Investment Bank (EIB) is a multilateral development bank established in 1959 and with operations in a wide range of countries. The European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM) provided concessionary loans to governments during the Euro crisis of the early 2010s. The European Commission (EC) is the political body at the head of the Union and whose funding comes from a multiannual budget financed by the member countries; Figure 2.2 shows how the EC rapidly increased its share of debt after a big recovery package

by a small subset of financial intermediaries and it likely includes some amount of counterparty risk and market power. As a result, IHS Markit only reports prices for the EIB (with several days without data), KfW (starting in 2021), and the European Commission (starting in 2025).

²In some periods, issuers other than the EIB have had an AA rating assigned by some of the agencies.

³The legal status of these liabilities is the result of political negotiations at different points in time, giving rise to a variety of *ad-hoc* arrangements of unclear classification, see Estrella Blaya (2022). However, the evidence presented in this Section shows that the exact legal status of the securities is not a pricing factor.

Table 2.1: Selected national governments and supranational institutions issuing debt in euros

The table shows characteristics of the central governments for the five largest countries in the euro area by GDP and the five largest supranational issuers in euros, whose role and legal status are described in the body of the text. For each issuer, the table reports the corresponding default rating (median across rating agencies) and the total amount of tradable debt in euros outstanding as of December 31, 2024. We define the category of “EU bonds” as the combined issuance of the 4 institutions linked to the European Union.

Issuer (national governments)	Rating	Debt (EUR Bn)
Germany	AAA	2,300
Netherlands	AAA	500
France	A	2,900
Spain	A	1,500
Italy	BBB	2,700
Issuer (supranational institutions)	Rating	Debt (EUR Bn)
European Commission (EC)	AAA	900
European Investment Bank (EIB)	AAA	400
European Financial Stability Facility (EFSF)	AAA	200
European Stability Mechanism (ESM)	AAA	100
Total “EU bonds” (EC, EIB, EFSF, and ESM)	AAA	1,600
Kreditanstalt für Wiederaufbau (KfW)	AAA	500

was agreed during Covid and now accounts for the bulk of the outstanding amounts.

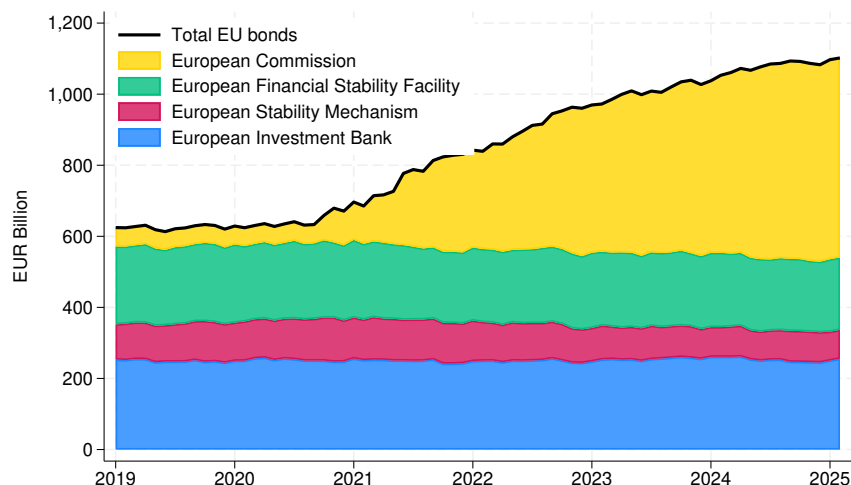
The last supranational borrower is a German policy bank whose credit standing is fully backed by the German government and whose securities can thus be regarded as having the exact same credit risk as those of the national government. The full name is Kreditanstalt für Wiederaufbau (KfW) and while being formally a private entity, the institution operates within a political mandate and the federal government has an explicit and binding legal obligation to guarantee all its liabilities. A long literature in finance has thus treated securities issued by KfW as having the same credit risk as German government bonds, and interpreted the higher yield of its securities as a measure of “illiquidity”.⁴

We now document that the different legal status of supranational institutions translates into significantly higher borrowing costs for reasons unrelated to default risk. Figure 2.3 plots the yield to maturity of the 5 supranational institutions together with Germany, where all issuers are large, AAA-rated, and have preferential treatment in regulatory terms. In particular, the left panel shows how all supranationals pay a very similar interest rate for all the maturities shown⁵, regardless of the nature of their activity or their ultimate financial

⁴See, among others, Du and Schreger (2016), Du et al. (2018b), Schwarz (2019), Du et al. (2023).

⁵Figure A.2 shows that rates seem to diverge for very long maturities like 20 and 30 years, where our mechanism might apply to a smaller extent and other pricing factors might be more important. Since the

Figure 2.2: Outstanding EU bonds denominated in euros by issuing institution



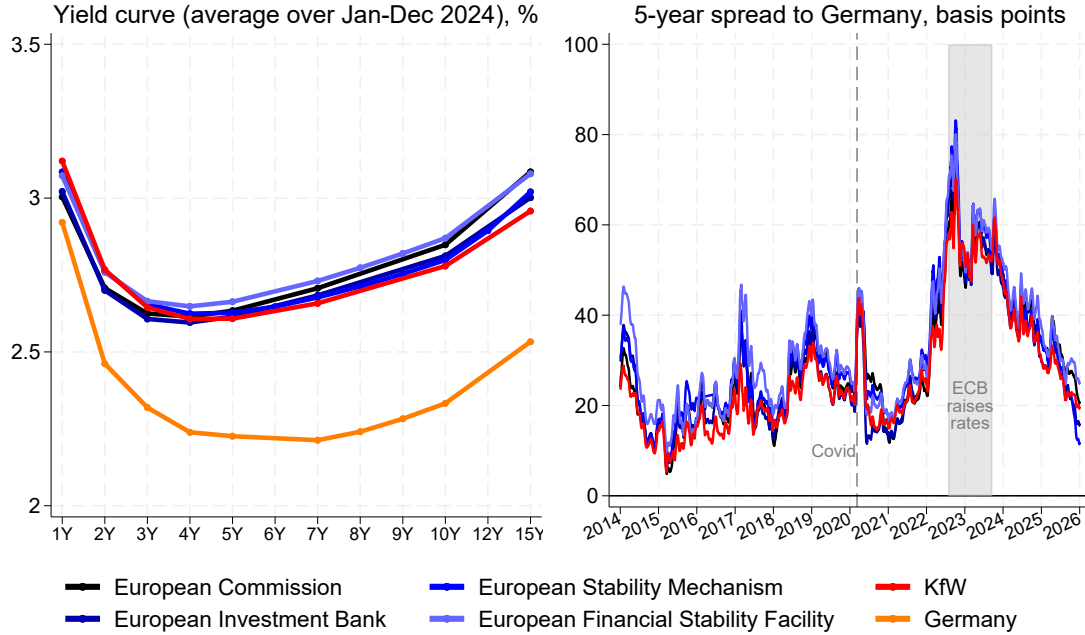
The figure shows total outstanding tradable debt in euros issued by the 4 supranational institutions of the European Union, whose legal status is described in the body of the text. In the rest of the paper we refer to the total amount of bonds issued by the four institutions as “EU bonds”. Data comes from the ECB’s Centralised Securities Database (CSDB) and is shown at a monthly frequency.

backing. Most importantly, all these institutions must pay a very large premium relative to bonds issued by the German central government. The right panel shows that this phenomenon is not specific to the period in question, with the 5-year yields of the institutions moving in tandem for the past decade and maintaining a large gap to the rate paid by Germany.

The spread of supranationals relative to Germany cannot be explained by different default risk because KfW has long been considered as safe as Germany in the literature and yet its borrowing costs are exactly the same as all EU institutions. This also rules out related explanations such as redenomination risk (since KfW bonds would be redenominated in the same currency as German bonds) or the complexity of enforcing the claim on the many different governments backing EU bonds (only the German government guarantees KfW).

We can also rule out other explanations that have been shown to drive relative pricing in other settings such as market size or liquidity. As regards the former, the Netherlands is an issuer whose market size is comparable to that of the EU institutions and yet pays a much lower premium (see Figure A.2) since it is a national government issuing sovereign debt. For liquidity, Figure A.3 in the Appendix shows that bid-ask spreads of EU bonds are comparable to those of the Netherlands and at least one order of magnitude smaller than interest rate differentials; if anything, supranationals pay the same interest rates on securities with very different bid-ask spreads. The rate paid by EU bonds is also not an average of the vast majority of debt is within the 1-15 maturity we leave this issue aside.

Figure 2.3: Yield to maturity in secondary market for selected AAA-rated issuers



The figure shows yield to maturity data in the secondary market for selected AAA-rated issuers in Europe. The left panel shows the average yield curve for each issuer over the 2024 calendar year for maturities from 1 to 15 years. The right panel shows the evolution of the 5-year spread to Germany for each issuer from 2015 to the end of December 2025, computed as the 17-day centered moving average. Data comes from yield curves as computed by Bloomberg.

yield of member countries computed using some weighting scheme such as GDP or the share of contributions to the EU budget: Figure A.4 shows that such averages fail to match both the cross-section and the time series of the yield paid by EU bonds.

A final set of explanations related to the regulatory treatment of different issuers can also be rejected, as supranational bonds receive the same regulatory treatment as sovereign bonds.⁶ For example, commercial banks and insurers use a 0% weight for credit risk purposes for both categories and the ECB conducts open market operations by allocating a share of purchases towards EU bonds that is broadly equivalent to their share of the outstanding.

The next Section shows that the unconditional spread paid by supranationals is due to their higher sensitivity to bad news and in this sense their lower price is consistent with their stochastic properties. Since we established that all institutions related to the EU are treated as identical by market participants, in the following we consider all their bonds jointly and refer to the combined outstanding as debt of the “European Union”. Daily yields are a simple average of the very similar rates paid by the different institutions, and all the results shown for the aggregate also apply to the issuers when considered individually as well as for KfW.

⁶Section 4.2 discusses attempts to reduce the spread by improving the regulatory status of EU bonds.

2.2 EU bonds spread is due to higher sensitivity to bad news

The price of EU bonds reacts adversely to bad news compared to equally safe bonds issued by national governments and this explains the spread. Figure A.6 shows examples of EU bonds depreciating relative to German bonds over periods of heightened uncertainty like the start of Covid or political upheaval in France. To show this formally, we define the realized excess holding-period return for an n -year bond issued by i relative to Germany as

$$rx_{n,t}^i = ns_{n,t-\Delta t}^i - (n - \Delta t)s_{n-\Delta t,t}^i, \quad (2)$$

where $s_{n,t-\Delta t}^i$ is the spread of a n -year bond issued by i relative to Germany at time $t - \Delta t$. Since Germany pays the lowest interest rate among European governments (see e.g. Figure 2.1), $rx_{n,t}^i$ is on average positive for any other issuer i , but it turns negative when bonds issued by Germany appreciate relative to bonds issued by i .

Table 2.2: Estimated sensitivity to VIX for major issuers in the euro area

The table shows estimation results for Equation 3, where we regress the realized excess return relative to Germany for each issuer on the contemporaneous log change in VIX. We use monthly data for the period 2019m1-2025m12 for a total of 80 observations for each issuer. We use Newey-West standard errors with 24 lags and 90% confidence intervals. Yield data comes from Bloomberg and EURO STOXX 50 Volatility (VSTOXX) data from STOXX. Significance stars are as follows: * $p < .05$, ** $p < .01$, *** $p < .001$.

	Netherlands	France	EU	Spain	Italy
$\Delta \ln VIX_t$	-0.15*** [-.23, -.08]	-0.33*** [-.47, -.18]	-0.41*** [-.59, -.23]	-0.70*** [-.80, -.60]	-0.92*** [-1.48, -.35]
Constant	0.01 [-.01, .03]	0.02 [-.00, .05]	0.05* [.00, .09]	0.09*** [.04, .13]	0.20** [.07, .34]

We compute a measure of the covariance between risk-off movements and the widening in spreads in line with the literature (e.g. Du and Schreger (2016)) by running a contemporaneous regression of the excess return on the percent change in VIX.⁷ Formally, we obtain estimates of parameters for each issuer i in

$$rx_{5,t}^i = \alpha_i + \beta_i \cdot \Delta \ln VIX_t + \varepsilon_{t,i}. \quad (3)$$

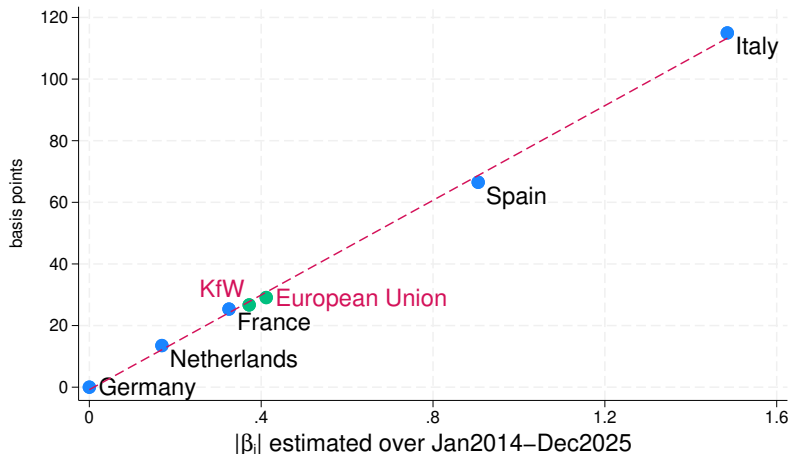
Table 2.2 shows that the spread of EU bonds to German bonds reacts to bad news by widening more than for comparably safe governments. All estimated beta parameters are

⁷Here VIX is the implied volatility computed from options on the EURO STOXX 50.

negative, meaning that all spreads widen during risk-off movements, but the spread of EU bonds widens by more than both the Netherlands and France.⁸ The estimated coefficient for the EU is so large that it is not statistically different from Spain and Italy.

The estimated sensitivity to adverse shocks explains the cross-section of unconditional yields over the past decade very well so the spread paid by EU bonds reflects their high conditional volatility. This is shown in Figure 2.4, where there is a very strong correlation between the estimated β and the unconditional spread over the sample. Figure A.15 shows that, contrary to expectations, the volatility of EU bonds has not improved as outstanding amounts have increased.

Figure 2.4: Average 5-year spread to Germany over Jan2014-Dec2025



The figure shows the average 5-year spread to Germany over Jan2014-Dec2025 (on the vertical axis) and the volatility to VIX estimated over the same period (on the horizontal axis), computed as in Equation 3 and reported in absolute value. Yield data comes from Bloomberg and EURO STOXX 50 Volatility (VSTOXX) data from STOXX.

The higher sensitivity to bad news of EU bonds cannot be due to credit risk, as is the case for Spain and Italy, because German-guaranteed KfW also has the same stochastic properties. Figure A.10 shows that the estimated β_i for KfW and the European Union are not statistically different from each other, while being larger than equally safe Germany and the Netherlands.

Having shown that the spread of supranational bonds is due to their worse conditional properties, the Section documents how this is due to their exclusion from sovereign bond indices.

⁸Figure A.9 shows estimated parameters using the swap rate to compute excess returns and Germany is the only issuer with a positive β , consistent with market coordination on German bonds as safe assets.

2.3 Supranational bonds are arbitrarily excluded from indices

We show that EU bonds are excluded from European government bond indices due to the legal classification of EU institutions as not formally sovereign and that this translates into a smaller investor base compared to equally safe governments. This smaller investor base is associated with higher borrowing costs and institutional investors explicitly identify this as the main hurdle preventing EU bonds from commanding a higher price.

Large financial institutions that compile fixed-income indices explicitly exclude EU bonds from their sovereign indices and investors list this exclusion as the main reason for the failure of EU bonds as safe assets. For example, the prospectus of one of the largest states that “*The J.P. Morgan EMU Government Bond Investment Grade Index aims to track the performance of eligible fixed-rate, euro-denominated domestic government debt issued by Eurozone countries.*” Since supranational institutions are not formally countries, they are automatically excluded from such indices, regardless of their safety or liquidity.

In a recent survey of institutional investors, respondents noted that “*Inclusion of EU-Bonds in sovereign indices is the single-most important remaining step in order for EU-Bonds to trade and price similarly to European government bonds.*”⁹ The European Commission has tried to have its bonds recognized as sovereign securities but all major index providers declined to change its status as a supranational even after formal consideration.¹⁰ This highlights the equilibrium nature of the supranational status, since it is not in the interest of an individual provider to include bonds with worse conditional volatility properties until all other providers do the same.¹¹

Since each index provider offers tens of different benchmarks for European bond markets, the institutional investors that benchmark their returns against such indices could in principle use other, broader indices that do include EU bonds but we show in the rest of this Section that this is not the case. In particular, we develop a new measure to show that while supranational bonds are included in other euro-denominated indices, the size of investors ultimately tracking their bonds is much lower than for central governments.

We develop a measure of inelastic demand due to the inclusion in fixed-income indices and show that bonds issued by supranational institutions are characterized by a smaller investor

⁹“EU Inaugural Investor Survey: Overview of results”, European Commission, 29 September 2023.

¹⁰For example, after rejecting the inclusion of EC bonds in its sovereign indices, ICE stated that (our emphasis) “There were many views for and against this proposal, but nothing close to a *consensus*”. Described in “EU’s sovereign ambition in capital markets suffers setback... for now”, OMFIF, 9 August 2024.

¹¹The second reason is that the inclusion of a large issuer like the EC would have to come at the expense of existing sovereign issuers, which would experience reduced inelastic demand for their securities. Section 4.4 provides an estimate of the increase in the funding cost for different countries if the EC was recognized as a sovereign issuer.

base than sovereign bonds. Our approach is a concrete application to fixed-income markets of the inelastic-markets hypothesis of Gabaix and Koijen (2021), which establishes inelastic demand as a first-order equilibrium property of asset prices. Intermediaries such as mutual funds, money market mutual funds, and exchange-traded funds (ETFs) declare an index and benchmark their return against that of the index. Passive funds aim at tracking closely the composition of an index, but a large literature has shown that even active funds tend to follow the investment universe defined by their respective benchmark, both for theoretical reasons related to underperformance aversion (Basak and Pavlova (2013), Buffa et al. (2022)) and empirically (see e.g. Raddatz et al. (2017)), so we use data for both categories.

The measure is conceptually similar to others used in the literature (e.g. Pavlova and Sikorskaya (2023)) but we are the first in the literature to employ data on the actual composition of a large number of fixed-income indices. To compute the measure we assume that every fund invests in each bond exactly in proportion to the weight assigned to it by the respective index and then we compute what fraction of the outstanding amounts would be held by this class of investors.

The notation is as follows: every fund f has size $\mu_{f,t}$ and it declares a “benchmark” (or index) x ; for every index, bond b has a specific weight $\omega_{b,t}^x$ at each date t and $\sum_b \omega_{b,t}^x = 1 \forall x, t$. Therefore, each index x is tracked by a total amount equal to the sum of assets under management (AUM) of these funds, $M^x = \sum_{\text{index}(f)=x} \mu_{f,t}$. If all funds invest according to the weights of their respective index, then funds tracking index x buy a total amount of bond b equal to

$$\Omega_{b,t}^x = M_t^x \cdot \omega_{b,t}^x. \quad (4)$$

For each bond b , we can then compute how much is bought by the funds tracking all the indices,

$$\Phi_{b,t} = \sum_x \Omega_{b,t}^x. \quad (5)$$

We normalize this by the total outstanding amount for each bond, $T_{b,t}$, to obtain

$$\phi_{b,t} = \Phi_{b,t} / T_{b,t}. \quad (6)$$

Finally, we compute the size-weighted mean inelastic demand for issuer i as

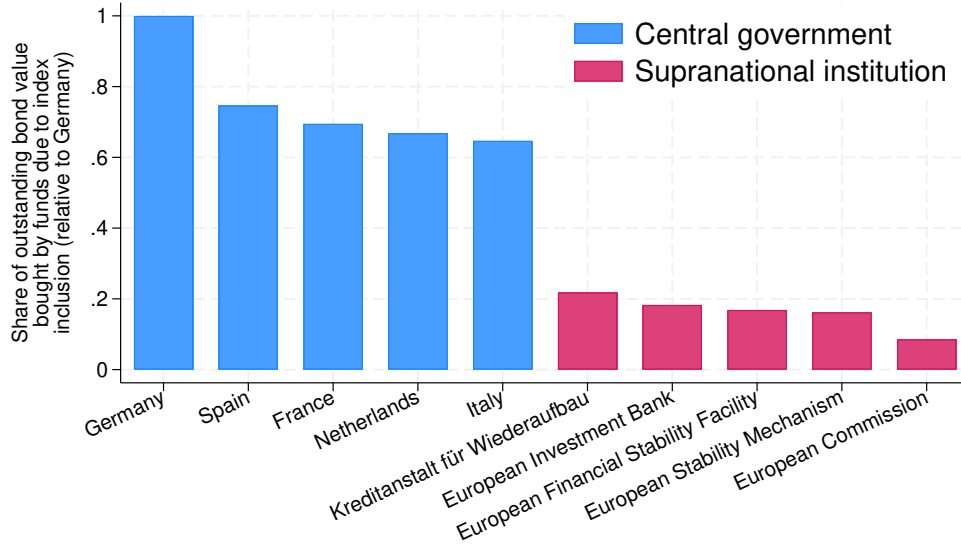
$$\phi_t^i = \sum_b \frac{\phi_{b,t} T_{b,t}}{\sum_b T_{b,t}}. \quad (7)$$

We use data from Morningstar Direct to identify the universe of active funds and obtain

a time series of their total assets that we match to the declared benchmark. We identify all mutual funds, MMMFs, and ETFs located in major jurisdictions and define our total potential investor universe as funds denominated in euros or classified as investing in European fixed income. The total amount of AUM is above €10 Tn as of May 2025 and only 13% is composed of explicitly passive funds.

For the composition of fixed-income indices in euros we instead rely on Bloomberg and collect daily data on all available benchmarks, a significant improvement over the existing literature that tends to focus on the composition of a single index. Figure A.5 in the Appendix shows the largest indices by the sum of tracking AUM and we are able to obtain data for most of the indices provided by Bloomberg and ICE, the two main providers, for a total of about 50% of AUM in the European fixed income asset class (about €500 Bn).

Figure 2.5: Mean inelastic demand ϕ_t^i by bond issuer



The figure shows the mean inelastic demand, $\phi_{b,t}$, for the issuers listed in Table 2.1 expressed as a percentage of the corresponding value for Germany. The measure is computed from daily bond-level data averaged over the period 2019-2024 and weighted by bond outstanding amount. For each European fixed-income index we obtain data about bond inclusion and weights from Bloomberg, we match fund size and declared benchmark from Morningstar Direct, and use bond characteristics from the ECB CSDB.

Computing the measure described in the previous section, we find that bonds issued by supranational institutions can count on a much smaller inelastic demand compared to central governments. Figure 2.5 shows how all governments exhibit similar levels of ϕ_t^j regardless of their rating and the size of their debt markets, while supranational institutions have inelastic demand that is around 80% lower. In order to discard the hypothesis that these lower values are driven by a different composition of bond characteristics in the outstanding securities of

the two groups we regress the bond-level inelastic demand on a supranational issuer dummy and time-varying bond characteristics,

$$\phi_{b,t} = f(\sigma_b + \alpha_t + \mathbf{z}_{b,t}'\boldsymbol{\zeta}) + \varepsilon_{b,t}, \quad (8)$$

where f is the logit function in a generalized linear model to account for the fact that $\phi_{b,t}$ is a small number between 0 and 1.

Table 2.3: Regression of inelastic demand $\phi_{b,t}$ on bond characteristics

The table shows estimation results from Equation 8, where we regress inelastic demand, $\phi_{b,t}$, on a dummy for supranational issuer, σ_b , and bond characteristics, $\mathbf{z}_{b,t}$. Since $\phi_{b,t}$ is a number between 0 and 1, we use a generalized linear model with logit function and report exponentiated point estimates. We use monthly data between 2019m1 and 2024m12 with $\phi_{b,t}$ computed as described in Section 2.3 and bond characteristics from the ECB's CSDB. Bond characteristics are controlled in a nonparametric way as follows: issuer rating is the median rating across Moody's, Standard & Poor's, Fitch, Scope and DBRS (a dummy for each level); coupon type is a dummy for fixed interest rate and a dummy for floating (so the base is zero-coupon bonds); bond size is a dummy for each decile of the amount outstanding distribution; bond duration is seven dummies for conventional cutoffs. Standard errors are clustered at the bond-month level and significance stars are as follows: * $p < .05$, ** $p < .01$, *** $p < .001$.

	(1)	(2)	(3)	(4)	(5)
Supranational issuer	0.25*** (-25)	0.20*** (-21)	0.20*** (-21)	0.23*** (-17)	0.19*** (-27)
Time FE	Yes	Yes	Yes	Yes	Yes
Issuer Rating	No	Yes	Yes	Yes	Yes
Coupon Type	No	No	Yes	Yes	Yes
Bond Size	No	No	No	Yes	Yes
Bond Duration	No	No	No	No	Yes
Observations	164,050	164,050	164,050	164,050	164,050
Pseudo- R^2	0.008	0.013	0.014	0.017	0.063
LRT for σ_b (p -value)	0.000	0.000	0.000	0.000	0.000

Table 2.3 shows that supranationals are excluded from fixed-income indices for reasons other than the characteristics of the bonds. In particular, the exponentiated coefficient for the dummy always being smaller than 1 indicates that supranational bonds are included to a lower extent than bonds issued by central governments. Without controlling for any bond characteristics (first column), the average bond issued by a supranational is included in fixed-income indices only 25% as much as a bond by a sovereign government. Progressively adding controls for bond characteristics does not change the conclusion, with the last column showing that a bond issued by a supranational is included only 19% as much as a sovereign bond having the same coupon type, outstanding amount, duration, and rating.

We also verify that a higher measure of index inclusion is associated with lower borrowing costs, consistent with the views expressed by investors. To do so, we regress the yield to maturity of a bond b issued by i , $y_{b,t}^i$, on the index inclusion measure relative to Germany, $\phi_t^i/\phi_t^{\text{Germany}}$, a time fixed effect, and bond characteristics, or

$$y_{b,t}^i = \alpha_t + \beta \frac{\phi_t^i}{\phi_t^{\text{Germany}}} + \mathbf{z}_{b,t}' \boldsymbol{\zeta} + \varepsilon_{b,t}^i. \quad (9)$$

Table A.2 in the Appendix shows that a higher inelastic demand is indeed associated with lower yields even when controlling for all bond characteristics. The estimated coefficient for the measure of inelastic demand is large and statistically significant in all specifications, even with standard errors clustered at the bond-month level. The magnitude suggests that if EU bonds were to be included in indices to the same extent as German government bonds, the gap in yields would disappear.

We conclude that the large spread paid by EU bonds is fully consistent with their worse conditional properties, which are due to their exclusion from sovereign indices. The next Section explores the relation between these stochastic properties and the investor base in supranational as opposed to sovereign bonds.

3 Investors with liquidity needs avoid EU bonds

We show that investor classes that value the low conditional volatility properties of safe assets avoid EU bonds and instead tilt their portfolios towards expensive sovereign bonds. We show that mutual funds hold AAA-rated sovereigns as opposed to EU bonds only if they anticipate suffering large outflows from retail investors during a crisis. Across investor classes, mutual funds and foreign investors with conditional liquidity needs tilt their allocation towards AAA-rated sovereigns while banks and insurance corporations are enthusiastic buyers of EU bonds.

3.1 Only mutual funds with flighty investors avoid EU bonds

Using holdings data from mutual funds we show that the funds that avoid holding EU bonds are those that anticipate experiencing larger outflows during crises. We measure this heterogeneity in the conditional need for liquidity using outflows during the Covid pandemic.

The market selloff during March 2020 was a liquidity crisis that forced intermediaries to sell assets in order to meet redemptions from investors. A large literature has documented how investor outflows generated a “dash for cash” unrelated to the safety of securities but

purely driven by the need for liquidity and constrained intermediaries (see e.g. He et al. (2022) and Haddad et al. (2021)). Mutual funds played a major role in the market rout due to the nature of their liabilities that allowed large withdrawals from investors within a few days (Ma et al. (2022), Falato et al. (2021)). We thus focus on the universe of mutual funds and ETFs denominated in euros or with European fixed Income as investment class as reported by Morningstar. We obtain complete holdings data for 6,240 individual funds with a combined AUM of €3.5 Tn in June 2023, of which about 90% is accounted for by mutual funds.

We obtain a measure of the “flightiness” of the investor base for each fund by computing the ratio between net flows into the fund for the worst week of market distress during Covid and its AUM at the beginning of the month. We show in Figure A.13 that March 2020 is a large outlier with €71 billion of combined net outflows from funds, over 3 standard deviations below the mean of €10 billion of net inflows, with the week of March 16-20 registering net outflows of about €20 billion daily. Figure A.14 shows flows as a fraction of assets and not all funds experienced outflows to the same extent, with a tenth of funds losing at least 6% of AUMs and a tenth registering inflows of at least 1%. We can thus use this heterogeneity to sort funds by their conditional need for liquidity.

Since the intensity of outflows depended on the characteristics of the investor base in each fund and those are slow-moving factors, we assume that outflows share during a crisis is a constant property of each fund and define the time-invariant property of fund j , χ_j , as the fraction of outflows experienced by j during March 16-20. We implicitly assume that this scales proportionally with the overall level of liquidity needs and that fund managers know their value of χ_j after its realization in March 2020.

We show that funds with larger liquidity needs tilt their holdings of highly rated bonds in euros toward expensive sovereign bonds rather than EU bonds. We compute $\omega_{b,j}$ as the value of holdings of bond b for fund j as a share of all holdings of AAA-rated bonds in euros (either EU bonds or German and Dutch bonds). We regress $\omega_{b,j}$ on a dummy for EU bonds, EU_b , our measure of investor flightiness, χ_j , their interaction, and bond-level characteristics. Formally:

$$\omega_{b,j} = \gamma \cdot EU_b + \psi \cdot \chi_j + \beta \cdot EU_b \cdot \chi_j + \mathbf{z}_b' \boldsymbol{\zeta} + \varepsilon_{b,j}. \quad (10)$$

Table 3.1 shows that progressively adding bond controls removes the unconditional bias against EU bonds while preserving the effect of the heterogeneous conditional need for liquidity. The interaction coefficient is negative, meaning that funds that suffer larger outflows avoid holding EU bonds relative to other AAA-rated bonds. An increase in χ_j of one stan-

Table 3.1: Regression of portfolio weight $\omega_{b,j}$ on bond and fund characteristics

The table shows the estimation results of Equation 10, where we regress the portfolio share of fund j in bond b among AAA-rated bonds in euros on a dummy for EU bonds and bond characteristics. Data for June 2023 with 1,418 funds with at least one holding of AAA-rated bonds in euros. χ_j is the fraction of outflows experienced by fund j during March 16-20 (as a percentage of AUM at the end of February 2020). Holding and fund flows data comes from Morningstar while bond characteristics come from the ECB's CSDB.

	(1)	(2)	(3)	(4)
EU _{b}	-3.35*** (-16.12)	-1.65*** (-5.47)	-0.12 (-0.41)	-0.06 (-0.19)
EU _{b} $\times$ χ_j	-17.25*** (-3.84)	-18.59*** (-4.20)	-21.06*** (-4.82)	-17.37*** (-4.05)
Bond Size	No	Yes	Yes	Yes
Coupon Type	No	No	Yes	Yes
Bond Duration	No	No	No	Yes
N	15,386	15,386	15,386	15,386

dard deviation reduces holdings of EU bonds by about 1.5 percentage points in a sample where the average holding is 10% of the portfolio in AAA-rated bonds.

Table A.3 shows that a similar pattern, if less pronounced, exists for holdings at the end of 2019, suggesting that fund managers had some prior knowledge about the flightiness of their investor base. This also addresses concerns about reverse causality, since it implies that funds holding a larger share of EU bonds suffered smaller outflows.

Next, we show that this same pattern of investor sorting is detectable in the holdings of different classes of financial intermediaries. In particular, the investors with a potential need for liquidity avoid EU bonds and buy governments.

3.2 Investors with liquidity needs buy sovereigns, not EU bonds

We show that investors with liquidity needs hold disproportionately highly-rated sovereigns even if they are expensive. Mutual funds and foreign investors avoid EU bonds, while banks and insurance corporations do the opposite and earn the premium.

We employ the confidential Securities Holdings Statistics by Sector (SHSS) as collected by the Eurosystem. This dataset has already been used in the academic literature but it

remains a vastly underutilized resource.¹² SHSS reaches the full span of all securities issued by entities based in the euro area or denominated in euros, including fixed income, equities and all other financial instruments. The holdings are reported at the single ISIN level and the frequency of observations is quarterly, with the first available data point for 2013Q4.

Data is obtained via depository institutions and holdings of individual investors are aggregated at the country and sector level (e.g., French banks, German insurers). We further aggregate holdings of domestic institutions (located inside of the euro area) into four broad categories of investors: mutual funds (including ETFs and hedge funds), commercial banks, insurance corporations, and households (including government institutions and social security funds)¹³. We remove the amounts held by the Eurosystem and compute the holdings of foreign investors as the difference between the total outstanding amounts and holdings by domestic investors.

In order to establish clear empirical facts, we define a measure of portfolio “tilt” for investor j and issuer i in quarter t as

$$TILT_{i,j,t} = \frac{\omega_{j,i,t}}{m_{i,t}} \in [0; \infty). \quad (11)$$

where $\omega_{j,i,t}$ is the share of country j ’s portfolio invested in securities of issuer i , and $m_{i,t}$ is the market weight of securities issued by i . Values above 1 mean that investor j is overweight issuer i relative to the market portfolio, while values smaller than 1 imply the opposite. We compare the tilt towards EU bonds and the tilt towards AAA-rated sovereign bonds (issued by Germany or the Netherlands) because the two groups have the same default risk but different stochastic properties.

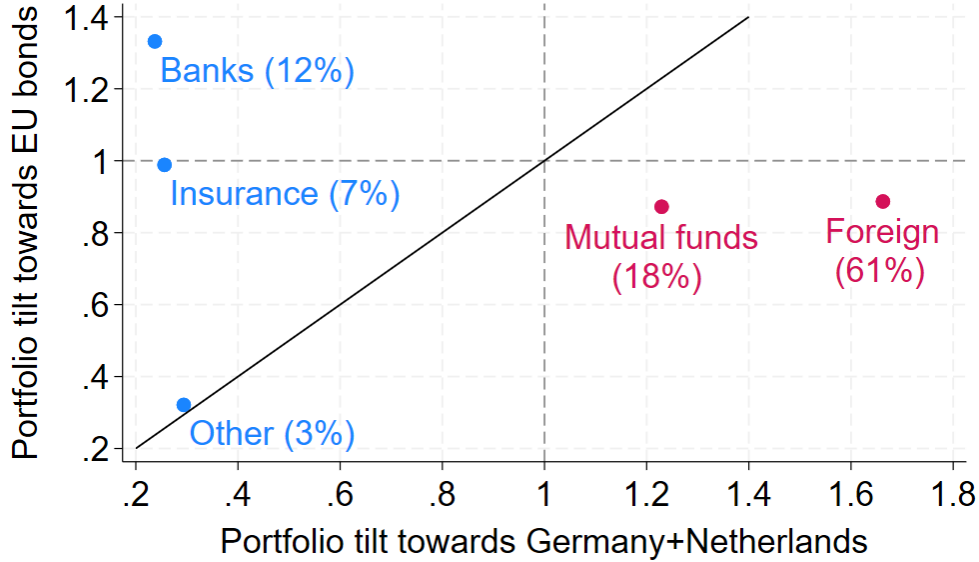
Figure 3.1 shows that different classes of investors differ widely in their holding patterns of EU bonds and equally safe sovereigns. Commercial banks and insurance companies hold very little of the expensive bonds issued by Germany and the Netherlands (only about 20% as their market share), while they are comparatively large buyers of the cheap EU bonds. Vice versa, mutual funds and especially foreign investors are significantly overweight sovereign bonds while avoiding EU bonds, and since they account for almost four-fifths of the total market, their buying behavior drives a gap between sovereign and supranational bonds.

This investor sorting reflects the interplay between the stochastic properties of bonds and the differential aversion to volatility. In particular, insurance companies have very long-dated

¹²See Boermans (2026) for a detailed description of the data and a literature review.

¹³We drop holdings by the German central government of its own debt as they reflect the activities of the debt management office (Finanzagentur) that operates a large repo facility such that issued securities appear on its balance sheet while being effectively used to borrow from investors.

Figure 3.1: Portfolio tilt for different investor sectors in 2025Q2



The figure shows the portfolio tilt, computed as described in Equation 11, towards AAA-rated sovereign bonds and towards EU bonds for different investor sectors. In parentheses is shown the total share of holdings of AAA-rated sovereign or supranational bonds for each investor class (excluding the ECB). Data comes from the ECB's Securities Holdings Statistics by Sector.

liabilities and thus have relatively less need to hold securities that remain liquid during times of stress, consistent with the evidence in Jansen (2025) that long-term investors' demand shapes sovereign yields; the same is true for commercial banks, which, while having a portion of their liabilities with potentially very low maturity, tend to experience inflows during crises.¹⁴ Vice versa, mutual funds tend to suffer outflows in periods of market turbulence¹⁵ and thus have a higher willingness to pay for securities with lower price risk. Finally, foreign investors are dominated by reserve managers¹⁶ that hold assets in euros to use specifically during crises and hence are the class that is most willing to pay a premium to hold liquid sovereigns rather than EU bonds that will lose some of their value when it matters most. Jiang et al. (2021) document this foreign safe-asset demand as a first-order driver of sovereign bond prices in the US context.

Within the sectors of commercial banks and insurance companies, it is institutions based in countries where the local sovereign bond is more expensive that are the largest holders of

¹⁴In a market crisis households typically liquidate their holdings of securities and hold larger precautionary balances in checking accounts and hence the liquidity at the disposal of depository institutions actually increases. During the first months of Covid, for example, American and European banks saw their deposit base increase at a fast pace (e.g. Castro et al. (2022)).

¹⁵For recent documentation of this pattern, see e.g. Ma et al. (2022).

¹⁶In 2025Q1 foreigners held €2.1 trillion of bonds issued by EU institutions, Germany, or the Netherlands, while total reserves denominated in euros by foreign central banks were €2.3 trillion (from the IMF COFER).

EU bonds. Figure A.11 shows that investors based in Germany and the Netherlands hold very little of their own sovereign bonds and are instead significantly overweight EU bonds, while investors from Italy and Spain do the opposite. German banks are the most extreme case, holding their own sovereign bonds at less than 20% of market weight while holding EU bonds at more than three times market weight. It thus seems that the spread between EU bonds and highly-rated sovereigns is large enough to flip the direction of the home bias typically documented in euro-area portfolio allocations by Beck et al. (2024).

The next section shows that this pattern holds even at the bond level and that investors sort across sovereign issuers according to their need for liquid securities.

3.3 Investor sorting reflects the stochastic properties of bonds

We show that the investor base in government bonds reflects their conditional properties, with highly-rated bonds mostly held by investors with liquidity needs. The investor base of EU bonds is more similar to that of a lower-rated government, whose bonds tend to depreciate during a crisis.

We consider two aggregate classes of investors: financial intermediaries with short-dated liabilities (called *Flighty*) and with long-dated liabilities (called *Stable*). We identify the two groups according to the holding patterns in Figure 3.1: *Stable* are insurance corporations, commercial banks, and households while *Flighty* are mutual funds and foreign investors.

We show that there is a sorting of investors with potential liquidity needs (*Flighty*) into markets with more potential buyers during a crisis. Such sorting is apparent in Figure A.12, where the market share of *Stable* (ρ^i in the model) unambiguously correlates with the average interest rates shown in Figure 2.4. The issuer with the lowest interest rate, Germany, is characterized by the largest market share of *Flighty* investors, with the Netherlands and France earning comparably lower convenience yields and having a marginally smaller market share held by *Flighty*. The investor base in bonds issued by the European Union is instead markedly skewed toward investors that are less averse to volatility and is thus more similar along this dimension to that of Spain and Italy.

We check that this aggregate pattern survives controlling for bond characteristics that might bias our conclusion. For example, if the European Union disproportionately issues the long-term bonds that are favored by *Stable* investors, we would observe this sorting pattern irrespective of the presence of our mechanism through investment mandates. We thus use bond-level data and regress the share of outstanding amounts of bond b held by *Flighty* investors at time t , defined as $1 - \rho_{b,t}$, on an issuer fixed effect μ_b and the rich set of time-

Table 3.2: Issuer fixed effect in a regression of $1 - \rho_{b,t}$ on bond characteristics

The table shows the estimated issuer fixed effect from Equation 12, where we regressed the market share held by Flighty, $1 - \rho_{b,t}$, on an issuer fixed effect, μ_b , and bond characteristics, $\mathbf{z}_{b,t}$. Since $\rho_{b,t}$ is a number between 0 and 1, we use a generalized linear model with logit function and report exponentiated point estimates. Issuer fixed effects are computed relative to bonds issued by Germany and bond characteristics are the same as in Table 2.3. Holdings data comes from the ECB’s Securities Holdings Statistics by Sector and bond characteristics from the ECB’s CSDB.

	Netherlands	France	European Union	Spain	Italy
Issuer FE	0.71***	0.67**	0.19***	0.41***	0.23***
	(-3.56)	(-3.17)	(-12.53)	(-5.05)	(-7.26)

varying bond characteristics already used in Table 2.3. Since $\rho_{b,t}$ is between 0 and 1, we use a generalized linear model with logit as the link function and set Germany as the base level for the fixed effect. Formally, we estimate the following

$$1 - \rho_{b,t} = f(\mu_b + \mathbf{z}'_{b,t}\boldsymbol{\zeta}) + \varepsilon_{b,t}. \quad (12)$$

Table 3.2 shows that, even after controlling for bond characteristics, the investor base for EU bonds is much more skewed toward Stable investors than comparably safe issuers and in this respect it is more similar to that of a risky country like Italy.

4 The road towards a safe asset: possible scenarios

In this section, we consider alternative scenarios in which EU bonds assume the properties of safe assets and show what would happen to their price and investor base. To do so, we estimate a demand system for European sovereign bonds and compute counterfactual scenarios about investors’ preferences for EU bonds and increases in the amount of common debt. We thus inform the policy debate about the desirability of this instrument, its optimal size, and the potential benefits for European taxpayers.

4.1 Estimation of a demand system for European sovereign bonds

We start by estimating a demand system for bonds issued by sovereign countries and large supranational institutions in Europe in a setup similar to Koijen and Yogo (2019). We use observed prices and portfolios to infer investor preferences over a set of securities characteristics. We then compute the counterfactual prices and portfolio allocations that would clear markets if asset characteristics or investor idiosyncratic preferences were to change.

We obtain holdings data from the SHSS database already described in Section 3.2 and use them for an estimation exercise that expands on Koijen et al. (2021). We define investor classes at the country-sector level (for a total of 46 portfolios) and consider their holdings of bonds issued by the 6 largest European national governments¹⁷ or the four supranational institutions listed in Table 2.1.¹⁸ We use holdings at the issuer level to avoid taking a stance on the substitutability of specific bonds and use the 5-year point of the yield curve as the inverse of the bond price. We use quarterly data for the period 2019Q4:2025Q1 and exclude holdings by the Eurosystem from outstanding amounts as such securities are removed from the effective supply. In total, we observe holdings of European sovereign bonds of almost €10 Tn for investors with combined portfolios worth over €53 Tn.¹⁹

We thus observe the portfolios of m classes of investors across N issuers of securities for a total of T quarters and define the market value of holdings of investor j for issuer i at time t as $B_{j,t}^i$ and the value of the holdings in outside assets as $B_{j,t}^0$. In order to aggregate the holdings of bonds with different maturities and coupon rates, we define the market value as the product between the face value of holdings, $FV_{j,t}^i$, and the price of a zero-coupon bond with 5-year maturity and yield corresponding to the 5-year point of the issuer yield curve, $P(y_t^i)$. With this, we can express portfolio shares as

$$w_{j,t}^i = \frac{B_{j,t}^i}{B_{j,t}^0 + \sum_{n=1}^N B_{j,t}^n} = \frac{\delta_{j,t}^i}{1 + \sum_{n=1}^N \delta_{j,t}^n}, \quad (13)$$

where we defined the portfolio share relative to the outside asset as $\delta_{j,t}^i = w_{j,t}^i / w_{j,t}^0$.

The contribution of Koijen and Yogo (2019) is to show that under assumptions that are standard in asset pricing, the optimal portfolio gives a demand function that depends on the observed characteristics of each asset. The necessary assumptions are weak and common in the literature: investors have preferences such that the optimal portfolio is a mean-variance portfolio, returns have a factor structure and expected returns and factor loadings depend only on an asset's own prices and characteristics. As a result, we can write relative portfolio

¹⁷These are France, Italy, Germany, Spain, Belgium, and the Netherlands.

¹⁸Supranational institutions are 4 instead of the original 5 because we consider the European Financial Stability Facility together with the European Stability Mechanism as they have the same management and board and an identical investor base.

¹⁹Note that for domestic investors we observe the complete portfolio of securities including fixed-income, equity, and mutual funds even if invested abroad, while for foreign investors we only observe holdings that fall within the reporting scope of SHSS, i.e. assets held in Europe or denominated in euros.

weights as a function of the yield to maturity, y_t^i , and other characteristics of the asset, ζ_t^i ,

$$\delta_{j,t}^i = \exp(\alpha_{j,t} + \beta_j y_t^i + \mathbf{z}_j' \zeta_t^i) \cdot \varepsilon_{j,t}^i, \quad (14)$$

where $\varepsilon_{j,t}^i$ is commonly referred to as latent demand, which captures the time-varying demand of investor j for additional characteristics of issuer i . By normalizing the mean of $\varepsilon_{j,t}^i$ to 1, we can interpret $\alpha_{j,t}$ as the parameter for the attractiveness of European sovereign bonds relative to the outside asset for investor j in quarter t . In practice, parameter estimation requires dealing with the endogeneity concerns of correlated demand shocks that have aggregate price impact. With a valid instrument for the yield, we can use the standard moment condition to retrieve parameter values for each investor:

$$\mathbb{E}[\varepsilon_{j,t}^i | \hat{y}_t^i, \zeta_t^i] = 1. \quad (15)$$

We instrument the yield using a source of exogenous variation that is novel in this context and refers to the index inclusion of different issuers. In particular, we use the measure of index inclusion computed in Section 2.3 at the issuer level, ϕ_t^j , to measure the extent of inelastic demand for bonds issued by different entities. The vector of additional characteristics ζ_t^i includes a dummy for home bias, the 5-year default probability (computed from ratings), the outstanding amount (at face value), and its square root. As a result, ϕ_t^j captures the index inclusion practices of different issuers for reasons other than perceived default or market size and is thus particularly relevant for the context of supranational issuers, whose bonds are excluded from indices for reasons that are not related to the fundamentals of the securities themselves (see Table 2.3).

Index inclusion is a very strong instrument for all investors and the relevant statistics are above conventional thresholds. We run the first-stage regression for each investor with time fixed effects and cluster standard errors at the time-issuer level, with parameter estimates shown in A.4. Table 4.1 shows how the absolute t-statistic for the excluded instrument (index inclusion) is above the threshold of 4.05 from Stock and Yogo (2005) for all investors.

Using this instrument, we rely on the moment condition in 15 to estimate model parameters for each investor. The flexibility of GMM estimation allows us to impose restrictions on the sign of some coefficients and we impose a positivity constraint for the yield (meaning a downward demand schedule). Table A.5 shows the large amount of dispersion of estimated parameters across investors while Figure A.16 plots the average estimate by investor sector. For all regressors we observe a ranking across sectors that is consistent with the literature,

Table 4.1: Statistics for excluded instrument (index inclusion) from first-stage regressions

The table shows statistics for the first stage of Equation 14, where for each investor j we regress the 5-year yield of issuer i on a time fixed effect and a set of issuer characteristics: a dummy for home bias, the 5-year default probability (computed as the median across rating agencies) and the log of outstanding amounts. We cluster standard errors at the issuer-quarter level and report the distribution of t-statistics, F-statistics, and partial R2 across regressions for each investor.

	min	p25	p50	p75	max
t statistic	-8.24	-6.57	-6.57	-6.05	-5.02
F statistic	25.24	36.58	43.14	43.14	67.91
Partial R2	0.11	0.15	0.17	0.17	0.24

for example with households displaying the strongest home bias and foreign investors the most negative loading on default probability.

In order to compute counterfactual scenarios, we notice that market clearing together with the estimated loadings on characteristics implicitly pin down prices and portfolio allocations as a function of asset characteristics. To see this, consider that each investor has a total portfolio worth $A_{j,t}$ and that each issuer has a total face value outstanding of $S_t^i = \sum_j FV_{j,t}^i$. For each issuer, the bond market clears at observed prices and portfolio allocations:

$$S_t^i P(y_t^i) = \sum_{j=1}^m B_{j,t}^i = \sum_{j=1}^m A_{j,t} \omega_{j,t}^i \quad \forall i, t. \quad (16)$$

Taking the size of investors and asset supply as exogenous, the estimated parameters of Equation 14 provide an expression for portfolio weights as a function of yields and asset characteristics:

$$\omega_{j,t}^i = f(y_t^i, \zeta_t^i | \alpha_{j,t}, \beta_j, \gamma_j, \varepsilon_{j,t}^i). \quad (17)$$

By combining 16 and 17 we obtain a system in $m \times N$ equations for each period such that for each collection of counterfactual characteristics $\{\tilde{\zeta}_t^i\}_{i=1}^N$ there is a vector of counterfactual prices, $\tilde{P}_t$, that solves the system. Koijen and Yogo (2019) show that such a solution is unique as long as demand curves are downward sloping, a condition that we imposed in the GMM estimation as shown in Table A.5.

The next Sections compute price and quantities corresponding to different distributions of outstanding amounts across issuers, $\{S_t^i\}_{i=1}^N$, or different investor preferences for other characteristics through changes in latent demand, $\{\{\varepsilon_{j,t}^i\}_{i=1}^N\}_{j=1}^m$, for the latest available period. Similar exercises have been carried out in the literature in a different context (see e.g. Koijen and Yogo (2020) and Bretscher et al. (2026)).

Some limitations of this approach are inevitable and hence we limit ourselves to scenarios where the total face value of outstanding assets is unchanged. We do this because our counterfactual exercises only clear the markets for which we observe the full investor composition, i.e. European sovereign debt, and do not consider the pricing of any outside asset. Furthermore, the model allows unlimited substitution between the outside asset and European sovereign bonds and hence does not explicitly capture rigidities in allocations to specific asset classes. Finally, since for foreign investors we do not observe holdings outside the European market, we are unable to observe scenarios with radical changes, such as a shift of international reserves from the dollar to the euro as a result of improvements in the properties of EU bonds. Before showing counterfactuals, we briefly discuss policies that have already been tried but failed to bring about a change in the status of EU bonds.

4.2 The failure of policies to change the status of EU bonds

After the realization that common debt was more expensive than originally thought²⁰, policymakers in the European Union announced a range of policies to close the gap between the rates paid by their institutions and those of national governments.

We consider 4 policies implemented by the European Commission (EC) and the ECB with the aim of increasing the liquidity of debt issued by the EC; other EU institutions and KfW were unaffected by these changes. First, the EC announced in December 2022 that it would start issuing single-branded “EU-Bonds” for all its spending programs rather than bonds tied to a specific spending program as it had done in the past. Second, the ECB announced that in its collateral framework it would apply to the EC the same haircut that it uses for national governments starting from June 2023, while previously the EC was assigned a worse category together with the other EU institutions. Third, in October 2024 the EC started operating a repo facility for its debt to increase the market liquidity, in line with the established practice of large sovereign issuers like Germany. Fourth, the EC partnered with the largest European derivatives exchange to start a market for futures on its securities that became operational in September 2025.

These policies did not close the spread between interest rates paid by the EC and national governments and this is apparent in Figures A.7 and A.8, where no differential pattern in interest rates within EU institutions is discernible in any of the periods mentioned above. While sensible in their own merit, these measures did not address the fact that debt issued by the EC remains outside the investment universe of a large class of investors. In particular,

²⁰For example, the large spread to Germany was described in Bonfanti and Garicano (2022).

Kaldorf and Poinelli (2023) show that the haircut change by the ECB resulted in a reduction in EC repo rates relative to Germany, and yet the gap in secondary market yields remains substantial. More importantly, market yields for the EC have remained close to those of the other supranationals, suggesting that all these reforms failed to change the market view of the Commission as just another supranational. The next subsections will thus evaluate other potential roads to change the nature of EC bonds, either via an increase in outstanding amounts or via policies that change investors’ idiosyncratic demand.

4.3 If common debt partly replaced national bonds

We compute model equilibria in which the distribution of outstanding amounts across issuers is different from the one observed. We think of a counterfactual supply, $\tilde{S}_t^i$, and hence asset characteristics, $\tilde{\zeta}_t^i$, and compute the prices that would clear markets in 16. A larger supply of securities of a given issuer has to be matched by an increase in aggregate demand that comes from the changed characteristics themselves (the outstanding amount is included in ζ_t^i) or from an increase in the yield. Depending on the amount of the increase and the estimated elasticities, a supply increase can either lower or raise the interest rate for a given issuer.

In particular, we think of two scenarios in which there is an increase in the amount of EU bonds while holding constant the total face value of outstanding bonds. The first scenario considers an institutional arrangement such that all the large issuers related to the EU²¹ establish a single Debt Management Office (DMO) that issues debt on behalf of the individual entities through the European Commission in order to create a single asset market. The second scenario analyzes the case of a debt mutualization exercise in which €500 Bn of national debt is replaced by bonds of the Commission, with different countries benefiting in proportion to their ECB capital key (shown in Table A.1). This exercise abstracts from the effects of this mutualization on default rates and we assume that each country pays a fraction of the interest bill on common debt that is equal to the ECB capital key.

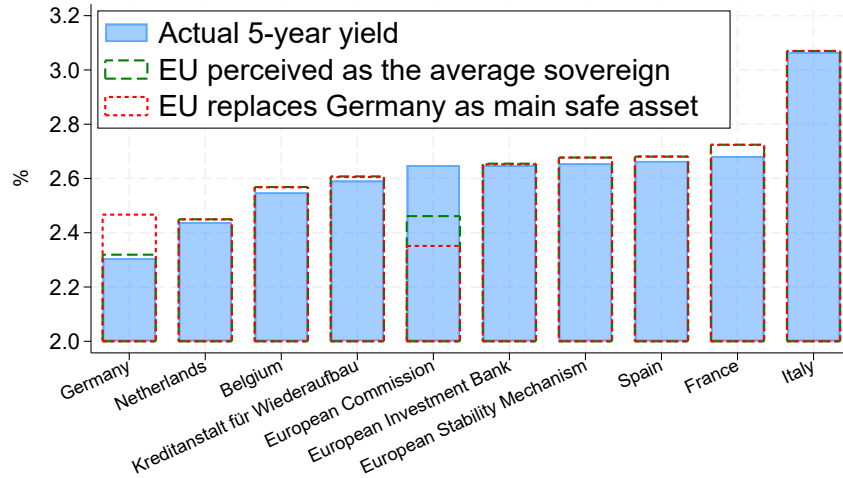
We show in Figure A.17 that in both scenarios the interest rate paid by EU bonds (European Commission in the figure) decreases by less than 10 basis points, while all other issuers are virtually unaffected other than a marginal reduction for the largest issuers. These exercises explain why proposals of debt mutualization have faced such stiff resistance, given the limited aggregate gains and the large implicit fiscal transfers that they would entail. Implicit redistribution would happen even if the total debt level is held constant and riskier countries never defaulted. In particular, countries such as Germany and the Netherlands could end up

²¹These are the 4 EU institutions listed in Table 2.1.

paying a higher average interest rate, even if all rates were to decrease, while countries like Italy and France would benefit from paying lower rates on their individual debt, as well as access to cheaper common debt.

We conclude that reasonably large increases in outstanding quantities are, by themselves, unlikely to bring about a significant change in the nature of EU bonds, while also being politically costly to achieve. We thus caution against the idea that a gradual increase in common debt will transform EU bonds into a safe asset able to rival national debt. The next section shows instead that a change in the idiosyncratic preferences of investors offers more hope even without additional issuance of common debt.

Figure 4.1: 5-year yield and counterfactuals under different scenarios, by issuer



The figure shows the 5-year yield to maturity for different issuers at the end of 2025Q1 (in light blue) and counterfactual values obtained from the computation of the price vector that would clear the system in 16 given the estimated elasticities for each investor. In the first counterfactual scenario (dashed green line) we set the latent demand for EC bonds for each investor equal to the average latent demand for bonds issued by Germany, the Netherlands, or Belgium (see Equation 18) and then rescale all latent demand values such that the mean and standard deviation are unchanged. In the second counterfactual scenario (dotted red line) we set the latent demand for EC bonds for each investor equal to the latent demand for Germany, which in turn is replaced by the average latent demand for bonds issued the Netherlands, or Belgium (see Equation 19) and then rescale all latent demand values such that the mean and standard deviation are unchanged.

4.4 If the EU was recognized as a proper sovereign issuer

We compute counterfactual scenarios in which we hold fixed the characteristics of the issuers but change the demand of investors for features other than those in the specification. In practical terms, we focus on the last available quarter and compute the model equilibrium for variations in the term for latent demand, $\varepsilon_{j,t}^i$. In general, an increase in latent demand for issuer i will lead to a decrease in its yield even holding constant observable asset characteristics

like default probability and outstanding amounts.

We consider two scenarios in which we change the vector of latent demand for EC bonds in order to match the unobservable characteristics of sovereign issuers. In the first alternative, for each investor j we set the latent demand for EC bonds equal to the average latent demand for the 6 sovereign issuers, or

$$\tilde{\varepsilon}_j^{\text{EC}} = \sum_i \varepsilon_j^i / 6 \quad \forall j. \quad (18)$$

In the second scenario, the European Commission replaces Germany as the supplier of the securities that are broadly recognized as the main safe asset in euros, while Germany becomes like the average government. Formally, we set

$$\tilde{\varepsilon}_j^{\text{EC}} = \varepsilon_j^{\text{Germany}}, \quad \tilde{\varepsilon}_j^{\text{Germany}} = \sum_i \varepsilon_j^i / 6 \quad \forall j. \quad (19)$$

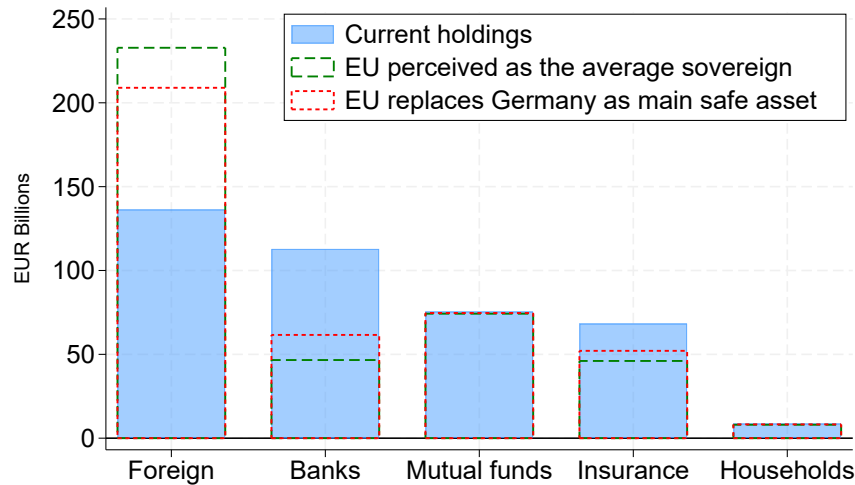
In both cases, we change all values of latent demand such that the mean and standard deviation at the investor level are unaffected. This ensures that increases in demand for EC bonds come at the expense of other issuers, rather than coming from funds previously allocated to the unspecified outside asset.

Figure 4.1 shows that in both scenarios the yield on EC bonds would decrease significantly, by about 20 basis points if it were perceived as a fully sovereign issuer and by more than 30 basis points if it replaced Germany as the prime safe asset provider. This shows that the characteristics of common debt in terms of size and rating are such that it could potentially become a safe asset if it were perceived as having the same intrinsic properties of sovereign debt. Contrary to a widely held belief, the lack of a captive investor base (expressed here by the absence of investors for which the home-bias dummy assumes a value of 1) does not prevent EC bonds from earning a large convenience yield.

If recognized as a sovereign issuer, the EC could issue more than €2,500 billion of new debt and end up paying an interest rate no higher than it currently does. This is shown in Figure A.18, where we compute the counterfactual yield of EC bonds corresponding to different values of latent demand and outstanding amounts (where increases in EC bonds are accompanied by decreases in national debt in proportion to the ECB's capital key).

In these scenarios, where we explicitly ruled out paradigm shifts like a move away from the dollar by international investors, improvements in the interest rate paid by common debt would necessarily come at the expense of other issuers. This is particularly true for Germany, which currently earns a convenience yield in the order of 10 basis points and whose role as the prime provider of safe assets would be diminished by an increase in the attractiveness of

Figure 4.2: Holdings of EC bonds and counterfactuals, by investor sector



The figure shows holdings of bonds issued by the European Commission in 2025Q1 by different classes of investors (in light blue) and counterfactual holdings under the alternative scenarios described in Figure 4.1. Data comes from the ECB's Securities Holdings Statistics by Sector.

EC bonds. All other countries would instead benefit from such a change, as the convenience yield rents would be shared among all countries through the budget of the Commission.

Figure 4.2 shows that if EC bonds were to become more similar to a true safe asset, their investor base would change dramatically. In particular, foreign investors would almost double their holdings of EC bonds and end up holding almost half of the entire supply. Commercial banks and insurance companies would drastically scale back their holdings due to the significantly reduced yield on EC bonds, and as a result, they would hold little of them, just as they currently do for Germany (see Figure A.11).

We conclude that incremental increases in supply are unlikely to bring common EU debt closer to a safe asset, since a change in investor preferences is required to reduce its yield by a significant amount. Foreign investors, in particular, would have to drastically increase their holdings of an asset that is currently walled off due to investment mandates or perceived as too volatile to compete with sovereign issuers. We also highlighted political considerations, as gains for common EU debt would likely come at the expense of Germany, which is currently able to earn a large convenience yield on its sovereign debt.

5 Conclusion

We show that bonds jointly issued by the European Union, despite their AAA rating and joint-and-several guarantees, do not function as a safe asset. The key factor is the issuer's legal status, which limits the investor base through exclusion from fixed-income indices. Because EU bonds are not legally classified as sovereign debt, investment mandates prevent or discourage many institutional investors from holding them, shrinking the investor base and causing larger price declines during crises. Because investors value securities that retain value during crises, they demand a premium for holding EU bonds.

Our contribution is to demonstrate that the special properties of government debt cannot be replicated through preferential regulatory treatment alone, as they emerge from market coordination around sovereign legal status. A large stock of low-risk debt can serve as a superior store of value only if it is accessible to the broadest possible investor base, as sovereign bonds are. Safety alone is insufficient for investors who may face crisis-induced fire sales, when the ability to find a buyer is most valuable.

These findings reshape our understanding of safe asset creation and carry important implications for the future of Europe and the international role of the euro. By constructing a novel measure of the investor base, we demonstrate that the spread relative to national governments will not close through incremental liquidity gains alone. Even substantial increases in issuance are unlikely to make EU bonds function as a true safe asset, implying that the euro will struggle to challenge the dollar's dominance as a global reserve currency. Lasting progress will require reforming the legal foundations to align EU debt with the market's coordination on sovereign debt.

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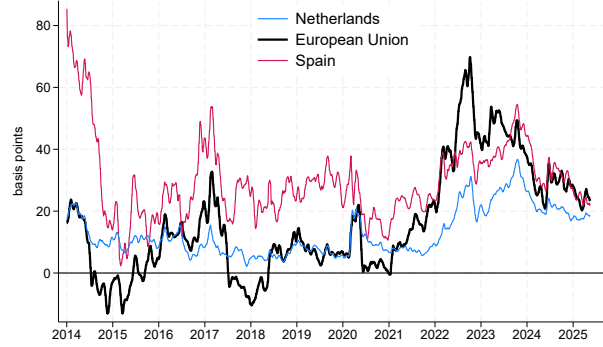
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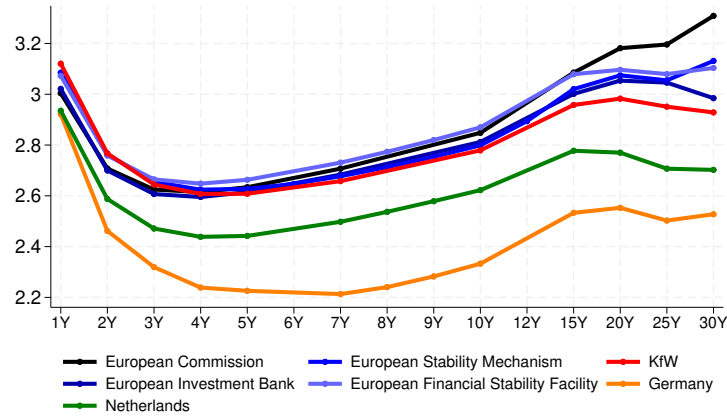
Appendix A Additional figures

Figure A.1: 5-year yield spread with German government bonds net of CDS premia



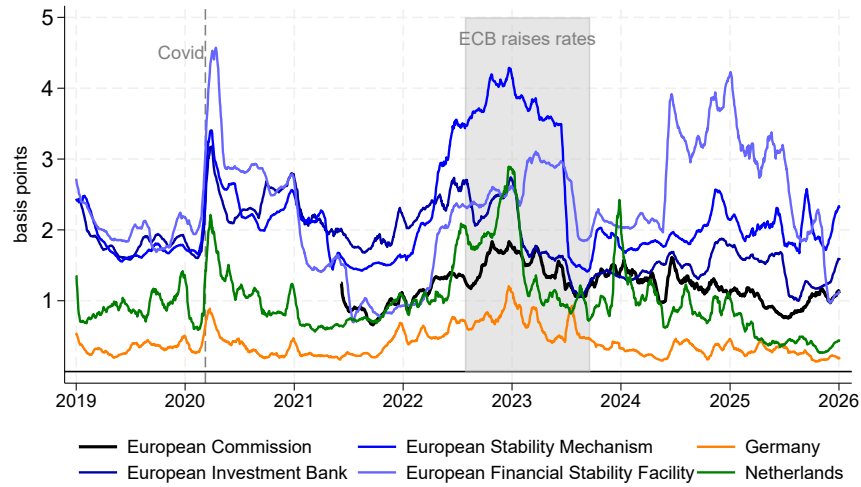
The figure shows the bond basis for the Netherlands (in blue), the European Union (black), and Spain (red). We compute the bond basis as $bb_t^i = (y_t^i - y_t^{\text{Germany}}) - (CDS_t^i - CDS_t^{\text{Germany}})$, where y_t^i is the 5-year yield for issuer i at time t and CDS_t^i is the corresponding 5-year CDS premium. The yield for EU bonds is computed as the arithmetic average of the yield for the European Commission, the European Investment Bank, the European Stability Mechanism, and the European Financial Stability Facility. We use the CDS contract for European Investment Bank for the European Union. Yield data comes from Bloomberg and CDS premia come from IHS Markit.

Figure A.2: Yield curve (average over Jan-Dec 2024)



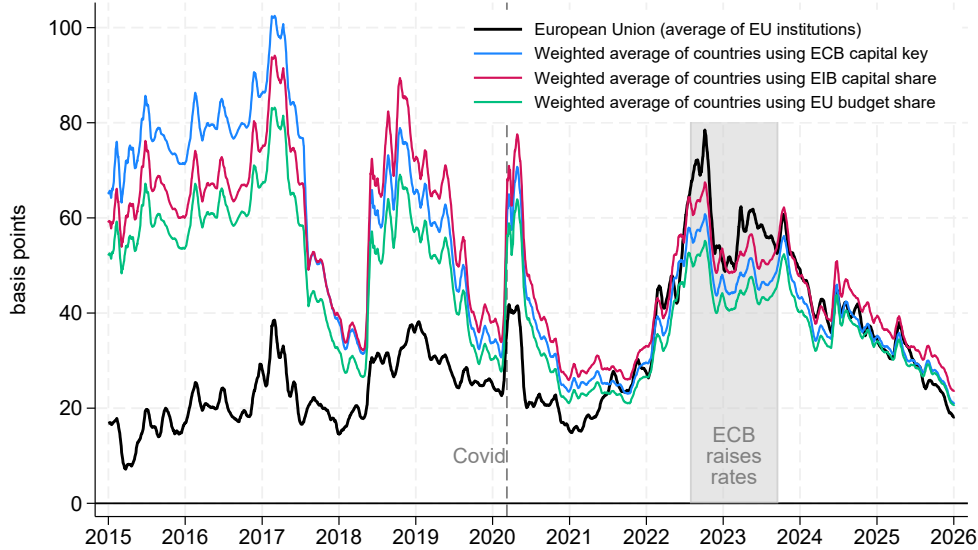
The figure shows the average yield curve for each issuer over the 2024 calendar year for maturities from 1 to 30 years. Data comes from yield curves as computed by Bloomberg.

Figure A.3: Bid-ask spread for 5-year benchmark



The figure shows the bid-ask spread for the 5-year benchmark bond for selected issuers. Data comes from Bloomberg.

Figure A.4: 5-year yield spread with German government bonds



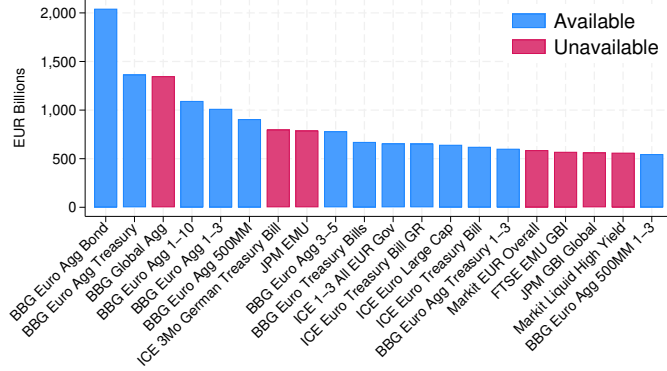
The figure shows the 5-year spread to Germany for EU bonds (in black) and for an average of euro area member countries using three different weighting schemes. The yield for EU bonds is computed as the arithmetic average of the yield for the European Commission, the European Investment Bank, the European Stability Mechanism and the European Financial Stability Facility. The red line is the average of countries' yields using the ECB capital key, the green line is the average using the capital share in the European Investment Bank and the yellow line is the average using the country share of the EU budget. Yield data comes from Bloomberg, capital key data from ECB, capital share from the EIB, and the EU budget from the European Commission. Country shares for all weighting schemes are shown in Table A.1. For all three averages we only include countries that are members of the euro area.

Table A.1: Country shares in different EU institutions

The table shows the shares corresponding to each country in three institutions related to the European Union. The capital key in the European Central Bank reflects an equal weighting of GDP and population at the time of the last update and data comes from the ECB. The capital share in the European Investment Bank and the share of contributions to the budget of the European Union are the result of complex political negotiations but are broadly representative of the share of GDP, with data coming from the EIB and the European Commission, respectively.

Country	ECB capital key	EIB capital share	EU budget share
Austria	2.9%	2.6%	2.4%
Belgium	3.6%	5.2%	3.5%
Bulgaria	0.0%	0.2%	0.6%
Cyprus	0.2%	0.1%	0.2%
Czech Republic	0.0%	0.9%	1.9%
Germany	26.1%	18.8%	23.4%
Denmark	0.0%	2.6%	2.1%
Spain	11.8%	11.3%	8.7%
Estonia	0.3%	0.1%	0.2%
Finland	1.8%	1.5%	1.7%
France	20.3%	18.8%	18.7%
Greece	2.5%	1.4%	1.3%
Croatia	0.8%	0.4%	0.5%
Hungary	0.0%	0.8%	1.4%
Ireland	1.7%	0.7%	2.5%
Italy	16.9%	18.8%	12.8%
Lithuania	0.6%	0.2%	0.5%
Luxembourg	0.3%	0.1%	0.5%
Latvia	0.4%	0.1%	0.3%
Malta	0.1%	0.0%	0.1%
Netherlands	5.8%	5.2%	4.6%
Poland	0.0%	4.6%	4.5%
Portugal	2.3%	0.9%	1.7%
Romania	0.0%	0.7%	2.0%
Slovakia	1.1%	0.3%	0.7%
Slovenia	0.5%	0.3%	0.4%
Sweden	0.0%	3.5%	2.6%

Figure A.5: Sum of tracking AUMs (sum over 2019m1-2025m2) by index and data availability



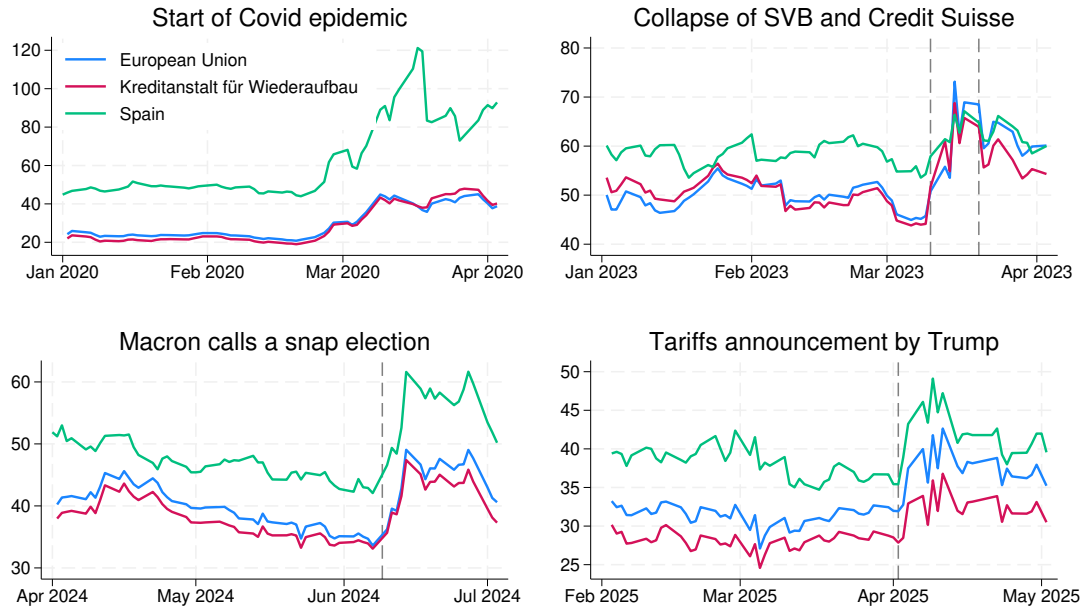
The figure shows the sum of assets under management over the period 2019m1-2025m2 tracking each index. In blue are the indices for which we have composition data and in red are those for which we do not. Data on the size of each fund and the respective index comes from Morningstar Direct and index composition comes from Bloomberg.

Table A.2: Regression of yield on inelastic demand and bond characteristics

The table shows estimation results from Equation 9, where we regress the yield to maturity of bond b issued by i , $y_{b,t}^i$, on ϕ_t^i , a time fixed effect, and bond characteristics, $\mathbf{z}_{b,t}$. We use monthly data between 2019m1 and 2024m12 with ϕ_t^i computed as described in Section 2.3 and bond characteristics from the ECB's CSDB. Bond characteristics are controlled in a nonparametric way as follows: issuer rating is the median rating across Moody's, Standard & Poor's, Fitch, Scope and DBRS (a dummy for each level); coupon type is a dummy for fixed interest rate and a dummy for floating (so the base is zero-coupon bonds); bond size is a dummy for each decile of the amount outstanding distribution; bond duration is seven dummies for conventional cutoffs. Standard errors are clustered at the bond-month level and significance stars are as follows: * $p < .05$, ** $p < .01$, *** $p < .001$.

	(1)	(2)	(3)	(4)	(5)
Indexed demand	-0.51***	-0.51***	-0.47***	-0.41***	-0.47***
(relative to Germany)	(-9)	(-17)	(-15)	(-10)	(-14)
Time FE	Yes	Yes	Yes	Yes	Yes
Issuer Rating	No	Yes	Yes	Yes	Yes
Coupon Type	No	No	Yes	Yes	Yes
Bond Size	No	No	No	Yes	Yes
Bond Duration	No	No	No	No	Yes
Observations	71,027	71,027	71,027	71,027	71,027
R^2	0.62	0.71	0.75	0.75	0.81
Partial R^2 for ϕ_t^i/ϕ_t^G	0.05	0.05	0.05	0.03	0.05

Figure A.6: 5-year yield spread with German government bonds, basis points



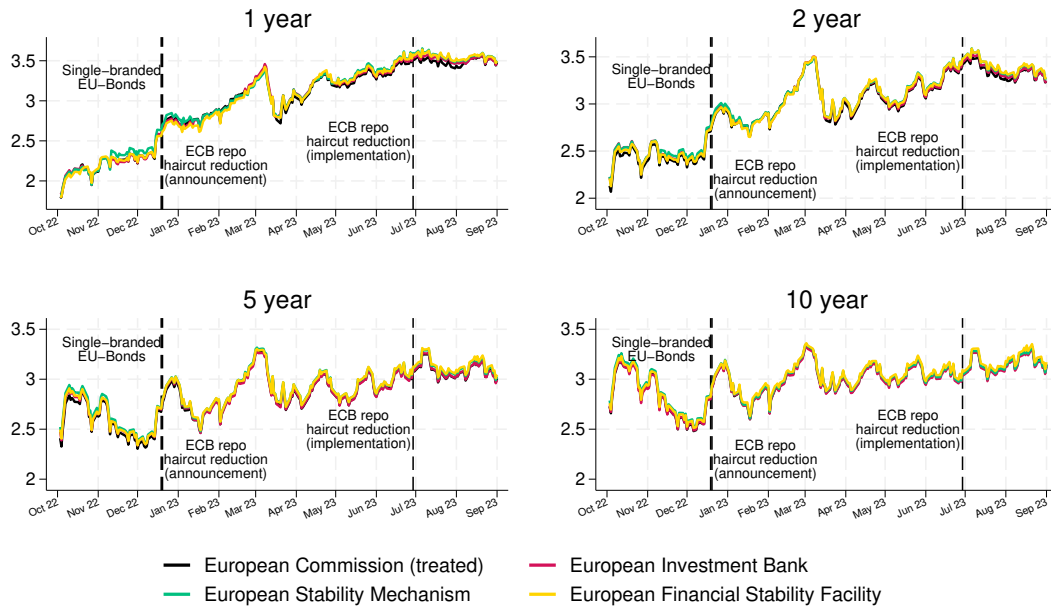
The figure shows the 5-year yield spread with German government bonds for the European Union (in blue), Kreditanstalt für Wiederaufbau (in red) and Spain (in green). Yields are shown are 4 periods of heightened volatility in financial markets: the start of the Covid epidemic (1 January - 1 April 2020), the collapse of SVB and Credit Suisse (1 January - 1 April 2023), Macron calling a snap election following disappointing results in elections for the European Parliament (1 April - 1 July 2024), and the announcement of tariffs by Trump (1 February - 1 May 2025). Yield data comes from Bloomberg.

Table A.3: Regression of portfolio weight $\omega_{b,j}$ on bond and fund characteristics

The table shows the estimation results of Equation 10, where we regress the portfolio share of fund j in bond b among AAA-rated bonds in euros on a dummy for EU bonds and bond characteristics. Data for December 2019 with 676 funds with at least one holding of AAA-rated bonds in euros. χ_j is the fraction of outflows experienced by fund j during March 16-20 (as a percentage of AUM at the end of February 2020). Holding and fund flows data comes from Morningstar while bond characteristics come from the ECB's CSDB.

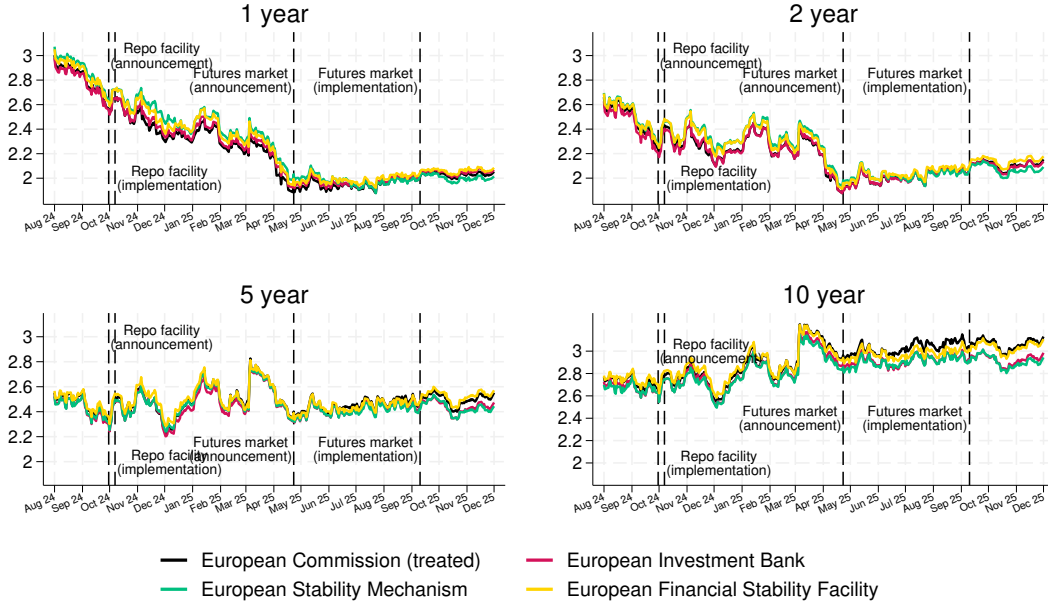
	(1)	(2)	(3)	(4)
EU_i	-4.33* (-2.58)	-13.77* (-2.58)	1.26 (0.27)	-9.38 (-1.62)
$EU_i \times \chi_j$	-100.60 (-1.07)	-96.39 (-1.11)	-125.89 (-1.45)	-120.86* (-2.13)
Bond Size	No	Yes	Yes	Yes
Coupon Type	No	No	Yes	Yes
Bond Duration	No	No	No	Yes
N	5,843	5,843	5,843	5,843

Figure A.7: Yield to maturity for 1-, 2-, 5-, 10-year bonds, %



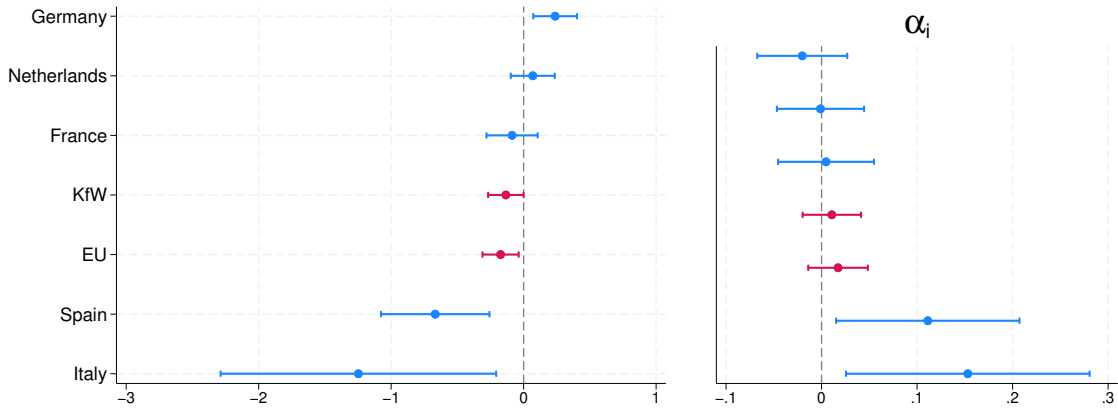
The figure shows the yield to maturity for 1-, 2-, 5-, and 10-year bonds for the 4 issuers linked to the European Union between October 1, 2022 and September 1, 2023. The vertical dashed lines show dates for the announcement of the single funding strategy (19 December 2022), the announcement of the haircut reduction (20 December 2022) and its implementation (29 June 2023).

Figure A.8: Yield to maturity for 1-, 2-, 5-, 10-year bonds, %



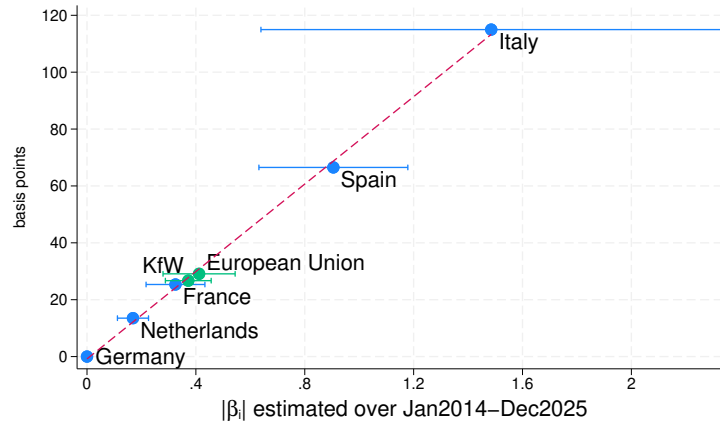
The figure shows the yield to maturity for 1-, 2-, 5-, and 10-year bonds for the 4 issuers linked to the European Union between August 1, 2024 and December 1, 2025. The vertical dashed lines show dates for the announcement of the EC repo facility (30 September 2024), its implementation (7 October 2024), the announcement of the establishment of a futures market by Eurex (23 April 2025), and its implementation (10 September 2025).

Figure A.9: Estimated parameters for major issuers in the euro area



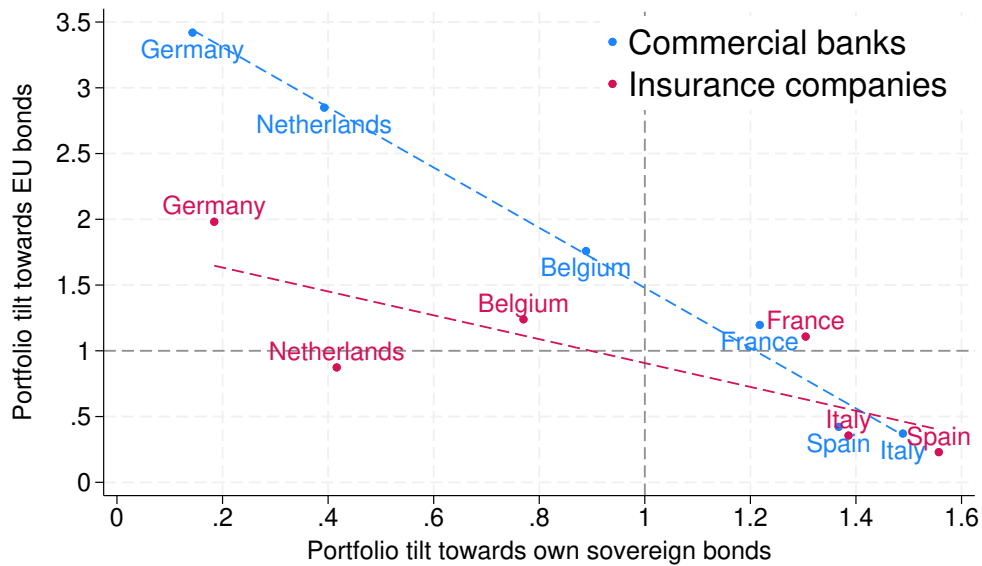
The figure shows estimation results for Equation 3 but the difference relative to Table 2.2 is that here we regress the realized excess return relative to the risk free rate as measured using the 5-year swap-implied rate on the contemporaneous log change in VIX. We use monthly data for the period 2014m1-2025m12 for a total of 137 observations for each issuer. We use Newey-West standard errors with 24 lags and 95% confidence intervals. Yield and swap data comes from Bloomberg and EURO STOXX 50 Volatility (VSTOXX) data from STOXX.

Figure A.10: Average 5-year spread to Germany over Jan2014-Dec2025



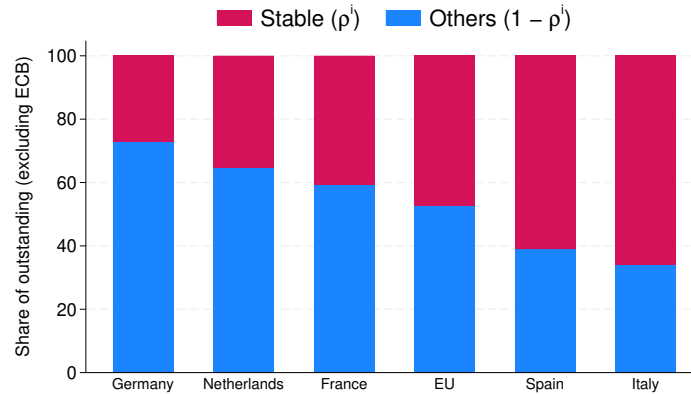
The figure shows the average 5-year spread to Germany over Jan2014-Dec2025 (on the vertical axis) and the volatility to VIX estimated over the same period (on the horizontal axis), computed as in Equation 3 and reported in absolute value. 90% confidence intervals using Newey-West standard errors with 24 lags. Yield data comes from Bloomberg and EURO STOXX 50 Volatility (VSTOXX) data from STOXX.

Figure A.11: Portfolio tilt for different investor sectors and countries in 2025Q1



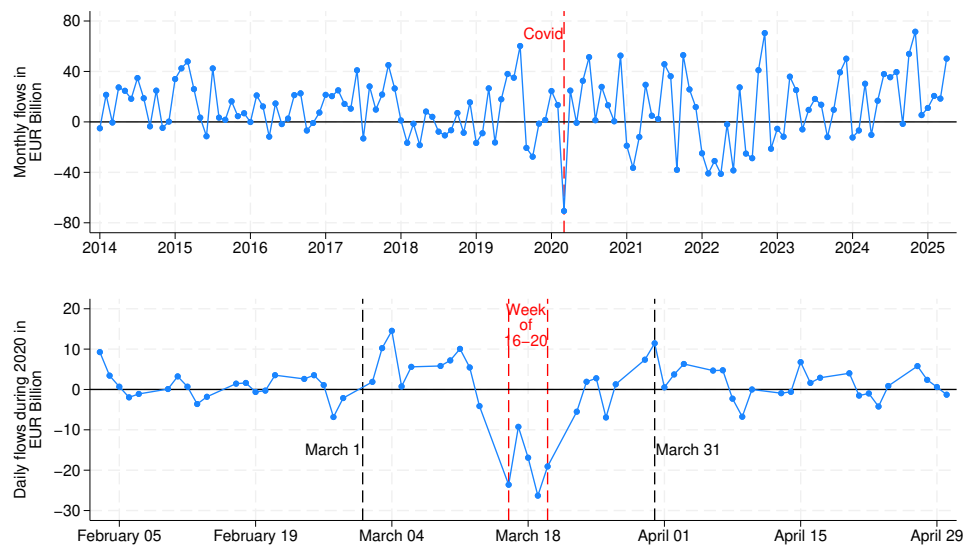
The figure shows the portfolio tilt (as defined in 11) for commercial banks (in blue) and insurance corporations (in red) located in different countries towards EU bonds (vertical axis) and bonds issued by their own national government (horizontal axis). We use data for 2025Q1 and consider portfolio and market shares out of total holdings and outstanding amounts of European sovereign bonds denominated in euros. Data comes from the ECB Securities Holdings Statistics by Sector.

Figure A.12: Investor composition for sovereign issuers in euro (excluding the ECB)



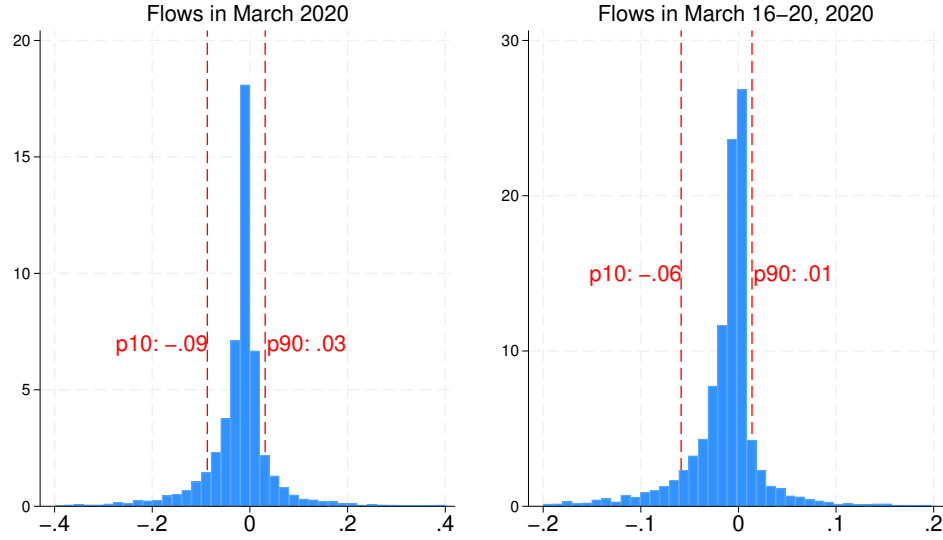
The figure shows the investor composition (excluding the ECB) for selected issuers, where we divide all investor sectors into 2 categories. Stable is commercial banks, insurance corporations, households, and government while Others refers to all other categories, mostly to mutual funds, MMMFs, ETFs and foreign investors. We use data for 2025Q1 and consider outstanding amounts of European sovereign bonds denominated in euros. Data comes from the ECB Securities Holdings Statistics by Sector.

Figure A.13: Monthly and daily total net flows into selected universe of funds



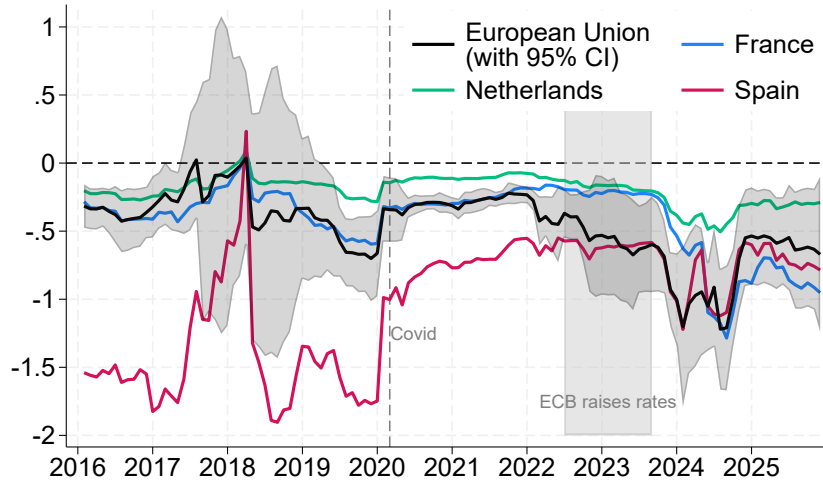
The figure shows total net flows into the selected universe of funds at the monthly frequency (top panel) and daily frequency (bottom panel). We include all available funds denominated in euros or with European Fixed Income as investment category. Data comes from Morningstar Direct.

Figure A.14: Distribution of net outflows as a share of AUM in February 2020



The figure shows the distribution of fund outflows during March 2020 (left panel) and during the week of March 16-20 (right panel). We include all available funds denominated in euros or with European Fixed Income as investment category. Data comes from Morningstar Direct.

Figure A.15: Rolling estimation of β_i over preceding 24 months



The figure shows the beta parameter for Equation 3 estimated over a rolling window of the preceding 24 months for the four issuers. The shaded area is the 95% confidence interval for the estimated beta parameter for the European Union, computed using Newey-West standard errors with 23 lags. Yield data comes from Bloomberg and EURO STOXX 50 Volatility (VSTOXX) data from STOXX.

Table A.4: First-stage regression of yield y_t^i on index inclusion and included regressors

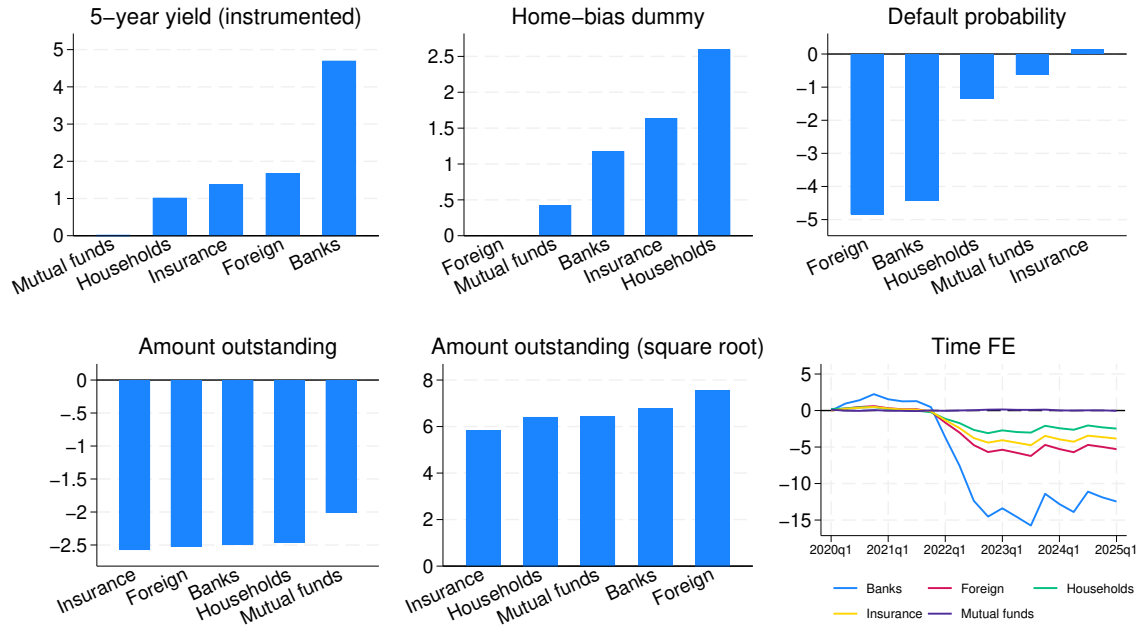
The table shows the results of the first-stage regression of the GMM condition 15, where we run a linear regression of y_t^i on the index inclusion measure and included regressors. We report interquartile statistics for all regressors including the time fixed effects and the constant. Statistics for the excluded regressors are shown in Table 4.1.

	min	p25	p50	p75	max
Index inclusion	-15.74	-14.76	-14.38	-14.32	-12.74
Home-bias dummy	-0.29	-0.04	0.00	0.05	0.30
Default probability	1.44	1.51	1.51	1.51	1.97
Amount outstanding	-0.30	0.04	0.04	0.06	0.14
Amount outstanding (sqrt)	-0.34	-0.19	-0.15	-0.12	0.23
2020Q1	0.04	0.04	0.04	0.04	0.04
2020Q2	-0.18	-0.18	-0.18	-0.18	-0.17
2020Q3	-0.29	-0.29	-0.29	-0.29	-0.28
2020Q4	-0.39	-0.39	-0.39	-0.39	-0.39
2021Q1	-0.25	-0.25	-0.25	-0.25	-0.25
2021Q2	-0.18	-0.18	-0.18	-0.18	-0.17
2021Q3	-0.18	-0.18	-0.18	-0.18	-0.18
2021Q4	-0.01	-0.01	-0.01	-0.01	-0.01
2022Q1	0.89	0.89	0.89	0.89	0.89
2022Q2	1.73	1.73	1.73	1.74	1.74
2022Q3	2.73	2.73	2.73	2.73	2.74
2022Q4	3.21	3.21	3.22	3.22	3.22
2023Q1	2.99	2.99	2.99	2.99	3.00
2023Q2	3.24	3.24	3.24	3.24	3.26
2023Q3	3.49	3.49	3.49	3.49	3.50
2023Q4	2.57	2.57	2.57	2.57	2.59
2024Q1	2.87	2.87	2.87	2.87	2.89
2024Q2	3.11	3.11	3.11	3.11	3.13
2024Q3	2.53	2.54	2.54	2.54	2.56
2024Q4	2.70	2.70	2.70	2.70	2.72
2025Q1	2.86	2.86	2.86	2.86	2.89
Constant	-0.23	-0.12	-0.11	-0.10	-0.05

Table A.5: First-stage regression of yield y_t^i on index inclusion and included regressors
The table shows the results of the GMM estimation from condition 15. We report interquartile statistics for all regressors.

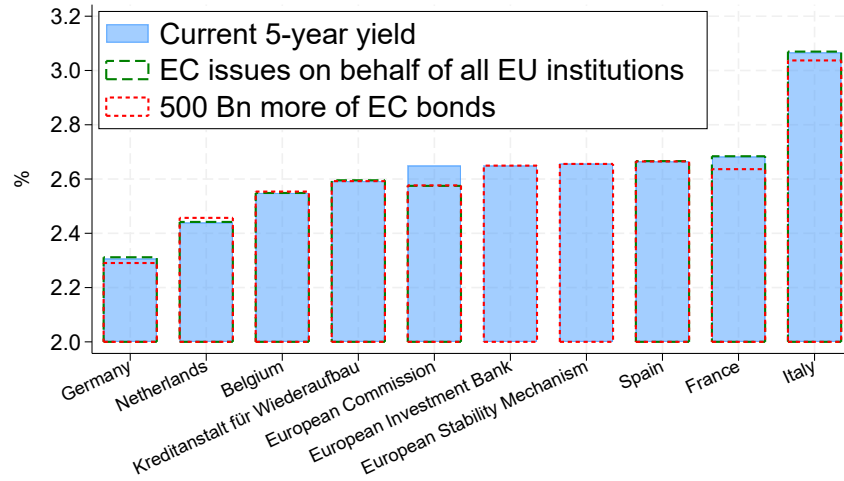
	min	p25	p50	p75	max
5-year yield (instrumented)	0.00	0.00	0.00	2.69	10.53
Home-bias dummy	-2.66	0.00	0.00	2.09	5.61
Default probability	-9.44	-3.85	-1.19	1.02	10.01
Amount outstanding	-9.38	-3.55	-2.30	-1.36	0.22
Amount outstanding (square root)	1.45	4.52	6.61	8.95	21.56

Figure A.16: Distribution of estimated parameters from GMM across investors



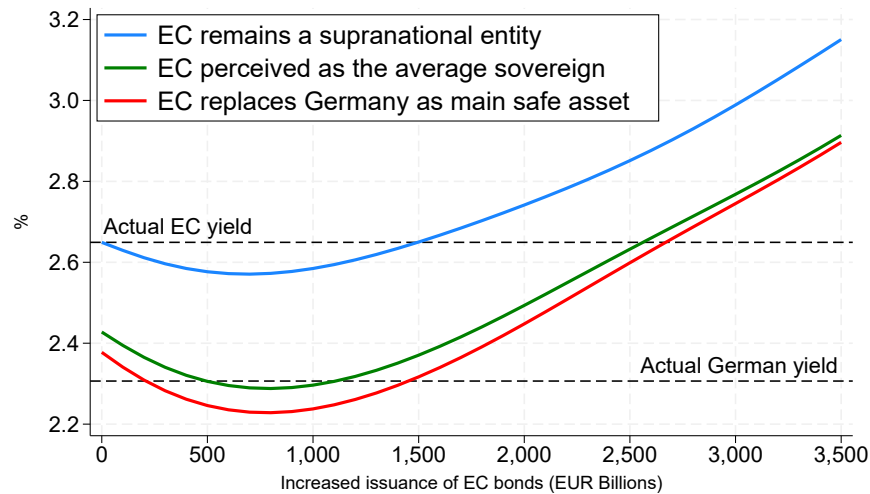
The figure shows the distribution of the GMM estimation from condition 15. For each regressor, we report the mean (weighted by asset size) coefficient for different investor sectors.

Figure A.17: 5-year yield and counterfactuals under different scenarios, by issuer



The figure shows the 5-year yield to maturity for different issuers at the end of 2025Q1 (in light blue) and counterfactual values obtained from the computation of the price vector that would clear the system in 16 given the estimated elasticities for each investor. In the first counterfactual scenario (dashed red line) we set the amount outstanding for the European Investment Bank and the European Stability Mechanism to zero and increase the amount for the European Commission by the corresponding number. In the second counterfactual scenario we increase the amount outstanding of the European Commission by €500 Bn and decrease the amount of national governments by the same total amount, with each country benefiting in proportion to the ECB's capital key shown in Table A.1.

Figure A.18: 5-year yield for EC bonds in counterfactuals of increased issuance, by scenario



The figure shows the 5-year yield to maturity for EC bonds at the end of 2025Q1 for counterfactuals of increased issuance under different assumptions about the parameters of latent demand. For each scenario we increase the amount outstanding of the European Commission and decrease the amount of national governments by the same total amount, with each country benefiting in proportion to the ECB's capital key shown in Table A.1. The blue line uses the latent demand parameters as estimated from 15, while the green and red line replace the latent demand parameters for the EC as described in 18 and 19.