External Finance Premium: Market Finance versus Bank Finance*

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*The views expressed in this paper are those of the authors and do not necessarily reflect the views of the ECB or the ESCB.

Research question

- Does firms' external finance premium depend on whether funds are sourced from financial markets or banks?
  - $\rightarrow$ Focus here on corporate bond spreads versus bank loan spreads

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  - → Focus here on corporate bond spreads versus bank loan spreads
- Does country heterogeneity in monetary unions matter for firms' external finance premium and for the transmission of the common monetary policy?
  - → Focus here on the role of country & state heterogeneity in EA and US for (i) monetary policy transmission to corporate bond spreads; (ii) the level of corporate bond spreads; (iii) the level of bank loan spreads
  - → How different is the EA from the US?

Research agenda

What we know:

- Euro area country heterogeneity matters for bank-based external finance premium (Altavilla, Gürkaynak & Quaedvlieg, 2024)
- Heterogeneity in firm fundamentals plays a role in the transmission of monetary policy (e.g. Ottonello & Winberry 2020; Anderson & Cesa-Bianchi 2021; Gürkaynak & al. (2022), Palazzo & Yamarthy (2022), Chițu & al. (2023), Cloyne & al. (2023), Adler & al. (2024))

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What we understand less:

- Limited micro-level literature for monetary policy transmission in the euro area, particularly for market-based finance
- Role of country heterogeneity in monetary unions for the external finance premium

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- Limited micro-level literature for monetary policy transmission in the euro area, particularly for market-based finance
- Role of country heterogeneity in monetary unions for the external finance premium

Our contribution:

- Contrast the market-based (corporate bond spreads) with the bank-based (bank loan spreads) external finance premium
- Focus on country/state heterogeneity within monetary unions $\Rightarrow$ compare EA and US

Why does it matter?

- Understand the corporate bond lending channel of monetary policy (Darmouni & al. 2021)
  - EA corporate bond markets' increased importance (ECB, 2021; Darmouni & Papoutsi, 2022)

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- Study simultaneously the market-based external finance premium and bank-based external finance premium $\Rightarrow$ First time in the empirical literature
- Timely & policy relevant
  - Current European policy initiative on Capital Markets Union

Mechanisms:

- **Transmission to market-based external finance premium**:
  - Corporate bond spreads can be decomposed into (i) expected default risk component & (ii) excess bond premium (Gilchrist & Zakrajsek, 2012).
  - Expected default risk channel: Monetary policy tightening surprise → tighter financing conditions → corporate debt service more challenging → firm's default probability higher → holding corporate bond riskier → wider corporate bond spread
  - Risk appetite channel: Monetary policy tightening surprise → increase in EBP → wider corporate bond spread (e.g. Anderson & Cesa-Bianchi, 2024; Chițu & et., 2023)

Mechanisms:

- **Role of country/state heterogeneity for transmission US vs EA**: Heterogeneous effects of monetary policy transmission to corporate bond spreads depending on the domicile of the bond issuer in the monetary union:
  (1) United States: Expect no role for state heterogeneity, i.e. the state of origin of the bond-issuing firm not to matter;
  (2) Euro area: Expect strong role for country heterogeneity, i.e. stronger corporate spread responses to monetary policy in lower-rated monetary union members:
  - Conventional perception that EA is not OCA as the US; heterogeneous EA sovereign ratings; sovereign ceiling; different tax regimes, legislations etc.
  - EA bank loan spreads are strongly determined at the country level (Altavilla & al. 2024):
    - Country-time effects capture 50% of the variation of bank loan spreads

Key Findings

- Monetary policy transmits **homogeneously** to bond spreads independently of the country/state of origin of the bond-issuing firm
- Corporate bond spreads determined primarily at the bond/firm level rather than at the country/state level $\rightarrow$ in contrast to bank loan spreads
- $\rightarrow$ Euro area corporate bond market is **as integrated** as that of the United States
- Primarily due to **properties of the corporate bond market** rather than to bond-issuing firms' specific characteristics
- **Bank finance premium** depends on country factors, **market finance premium** does not

Policy implications:

- Deepen euro area capital markets to facilitate bond issuance $\Rightarrow$ Implications for homogeneous monetary policy transmission to bond issuers & CMU analytical support

Data

- **Unique and comprehensive dataset**: Focus on non-financial corporates in the US and the EA (extension with financial corporates)
- Sample period: Jul-2006 to Sep-2023
- **Bond-level:** ICE Bank of America Merrill Lynch, Bloomberg, ECB-CSDB, ECB-SHSS, Moody's KMV Bonds characteristics
  - USD-denominated bonds for US; EUR-denominated bonds for EA
  - Option-adjusted spreads (OAS), maturity-matched spreads vs. OIS, maturity-matched spreads vs. Bund
  - Additional bond characteristics: size, age, coupon, seniority type, embedded options, ratings
  - **Type and nationality of bond holders** (EA only)

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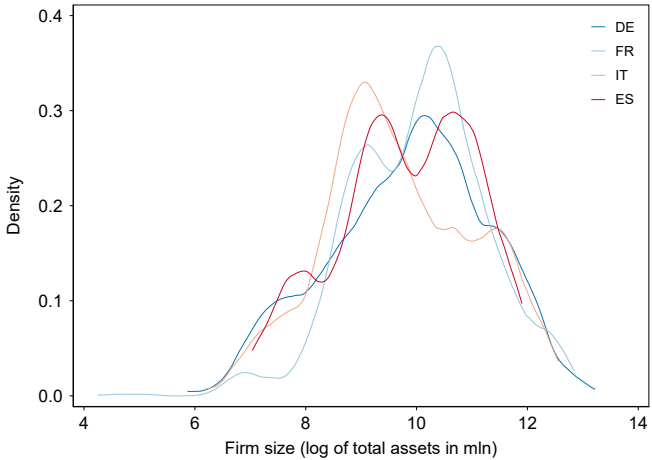
  - **Bank loan interest spread** - maturity matched vs. OIS (EA only) Loans characteristics
- **Filtered sample:** 1,986 US firms and 21,137 US bonds; 375 EA firms and 3,957 EA bonds

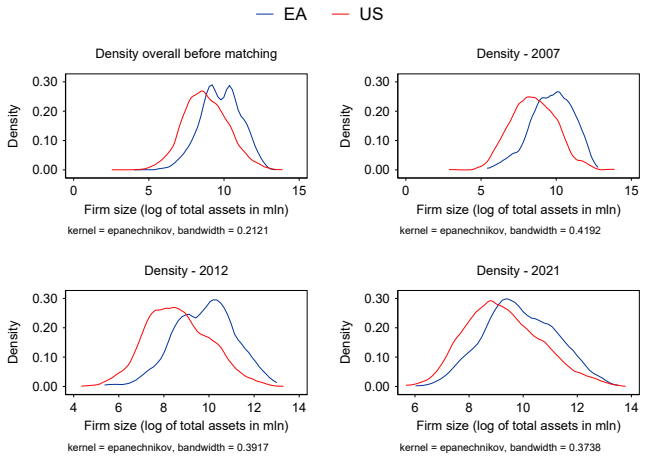
Similar size distributions of bond-issuing firms across major EA countries

Figure 1: Distributions of euro area firms by size



Convergence of EA bond-issuing firm size distributions towards US distribution

Figure 2: Distributions of US and EA firms by size



Empirical framework - Step 1: Estimate bond-level responses to monetary policy surprises

- **Research question 1**: Do spreads of bond issuers in low-rated countries/states react more to monetary policy surprises?
- Event study methodology: bond-level panel regressions for bond i of firm j in sector s and country or state c over one-week window, t, around FOMC/ECB announcements (Jul-2006 to Dec-2021):

$$\Delta y_{ijsc,t} = \beta_1 \epsilon_t + \beta_2 \epsilon_t \times \mathbb{1}_{ij}^{\text{low-rated sov.}} + \beta_3 \mathbb{1}_{ij}^{\text{low-rated sov.}} + \gamma \boldsymbol{Z_{ij,t}} + \alpha_i + \alpha_j + \alpha_s + e_{ijsc,t} \quad (1)$$

- $y_{ijsc,t}$: corporate bond spread (OAS; maturity-matched vs OIS; maturity-matched vs Bund)
- ϵ_t: monetary policy surprises from Jarocinski & Karadi (2020) and Altavilla & al. (2019)
- $\mathbb{1}_{ij}^{\text{low-rated sov}}$: dummy variable if bond-issuing firm domiciled in low-rated country/state; replaced with country fixed effects in robustness
- $Z_{ij,t}$: firm default risk; bond ratings
- $\alpha_i, \alpha_j, \alpha_s$: bond-, firm-, sector-level fixed effects

Step 1.1: Estimate bond-level responses to monetary policy surprises: US results

Table 1: US corporate bond spreads responses to Fed monetary policy

	(1) Average effect	(2) Lower rated US state	(3) Average effect with controls	(4) Lower rated US state with controls
Fed surprise	0.9099***	0.8618***	0.7042***	0.6735***
	(0.2473)	(0.2507)	(0.2569)	(0.2372)
Fed surprise x Lower rated_state		0.0808		0.0534
		(0.0783)		(0.0779)
N	398659	398659	335359	335359
R^2	0.0079	0.0079	0.0165	0.0166
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	110	110	110	110

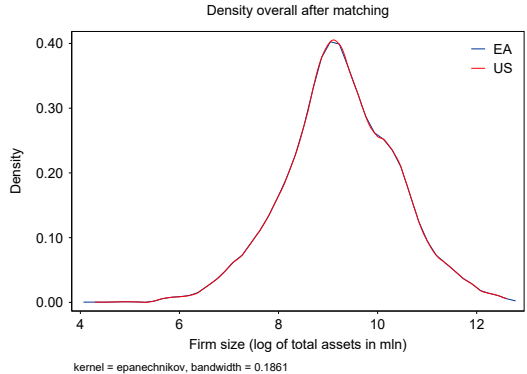
Step 1.2: Estimate bond-level responses to monetary policy surprises: EA results

Table 2: Euro area corporate bond spreads responses to ECB and Fed monetary policy

	(1) Average effect All ECB surprises	(2) Lower rated EA country All ECB surprises	(3) Average effect Largest ECB surprises	(4) Lower rated EA country Largest ECB surprises	(5) Average effect Fed spillovers	(6) Average effect Horse race ECB and Fed surprises	(7) Lower rated EA country Fed spillovers
ECB surprise	0.7336	0.7095	3.7397**	3.7113**		0.5876	
	(0.7670)	(0.6849)	(1.2558)	(1.1964)		(0.7188)	
ECB surprise x Lower rated_Country		0.1046		0.1457			
		(0.5017)		(0.8222)			
Fed surprise					0.4251**	0.3556**	0.4035**
					(0.1767)	(0.1779)	(0.1593)
Fed surprise x Lower rated_Country							0.1053
							(0.1793)
N	86899	86899	4467	4467	62501	163016	62501
R^2	0.0248	0.0249	0.2780	0.2778	0.0197	0.0113	0.0197
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	No	No	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of clusters	169	169	10	10	110	280	110

Step 1.2: Robustness: Estimate bond-level responses on matched firm size sample

Figure 3: Distributions of US and EA firms by size after applying a matching algorithm



Sources: ICE BofA Merrill Lynch, LSEG and authors calculations.
Notes: The chart shows the kernel density of firms by size measured as the log of total assets in EUR mln in the EA and the US after applying a matching algorithm using a caliper of 5 mln EUR in order to find the closest US match for an EA firm. Firm characteristics post-matching

Step 1.2: Robustness: Estimate bond-level responses on matched firm size sample: US

Table 3: Corporate bond spreads responses to monetary policy surprises on US matched sample

	(1) Overall	(2) Lower rated US State	(3) Overall, incl. FE and controls	(4) Lower rated US State, incl. FE
MP surprise	0.9182***	0.9827***	0.6396**	0.9703***
	(0.2587)	(0.2878)	(0.2455)	(0.2871)
MP surprise x Perif_State		-0.1077		-0.1049
		(0.1468)		(0.1508)
Observations	146,184	146,184	122,291	146,067
R^2	0.007	0.007	0.050	0.044
Adjusted R^2	0.0070	0.0070	0.0192	0.0156
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	No
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	110	110	110	110

Step 1.2: Robustness: Estimate bond-level responses on matched firm size sample: EA

Table 4: Corporate bond spreads responses to monetary policy surprises on EA matched sample

	(1)	(2)	(3)	(4)	(5)
	Overall	Lower rated EA country	Overall, incl. controls	Lower rated EA country incl. controls	Lower rated EA country incl. controls, largest surprises
ECB surprise	0.7981	0.6719	0.9628	0.8496	4.6203**
	(0.8300)	(0.7591)	(0.8997)	(0.8230)	(1.4999)
ECB surprise x Perif. country		0.5018		0.4352	-1.2477
		(0.5074)		(0.5290)	(0.9394)
N	58317	58317	49386	49386	2146
R^2 adjusted	0.0132	0.0135	0.0236	0.0239	0.2659
Fixed effects	Yes	Yes	Yes	Yes	Yes
Additional controls	No	No	Yes	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes	Yes
Number of clusters	170	170	169	169	10

Step 1.2: EA robustness: Estimate bond-level responses varying the fixed effects

Table 5: Corporate bond spreads responses to monetary policy in the EA using sector-time effects

	(1) Average effect All ECB surprises	(2) Lower rated EA country All ECB surprises	(3) Average effect Largest ECB surprises	(4) Lower rated EA country Largest ECB surprises	(5) Average effect Fed spillovers	(6) Average effect Horse race ECB and Fed surprises
ECB surprise x Perif_Country	0.2765	0.2837	3.9461	1.2553		
	(0.6281)	(0.7140)	(2.2276)	(1.0065)		
Fed surprise x Perif_Country					0.1996	0.4877
					(0.1787)	(0.3020)
N	100401	86706	4819	4454	162874	52212
R^2 adjusted	0.1640	0.1714	0.3174	0.4438	0.1751	0.1580
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	No	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes
Number of clusters	170	169	10	10	280	110

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises

Table 6: EA corporate bond spreads responses to Altavilla & al. timing surprises

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
Timing	-1.3630*	-1.3829**	-1.5564*	-1.5502**
	(0.7411)	(0.6565)	(0.8525)	(0.7660)
Timing x Perif_Country		0.0959		-0.0289
		(0.5283)		(0.5025)
N	99752	99752	86689	86689
R^2 adjusted	0.0181	0.0181	0.0257	0.0257
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	168	168	167	167

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises

Table 7: EA corporate bond spreads responses to Altavilla & al. target surprises

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
Target	0.3854	0.4290	0.3742	0.4086
	(0.7517)	(0.6194)	(0.7736)	(0.6349)
Target x Perif_Country		-0.2499		-0.1975
		(0.8912)		(0.9262)
N	100065	100065	86764	86764
R^2 adjusted	0.0133	0.0134	0.0201	0.0202
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	169	169	168	168

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises

Table 8: EA corporate bond spreads responses to Altavilla & al. forward guidance surprises

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
FG	-0.1374	-0.0555	-0.0910	0.0162
	(0.2792)	(0.2305)	(0.3795)	(0.3125)
FG x Perif_Country		-0.4541		-0.5899
		(0.4180)		(0.5464)
N	99752	99752	86689	86689
R^2 adjusted	0.0126	0.0129	0.0192	0.0195
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	168	168	167	167

Key Finding 1

- **Key Finding 1**: Monetary policy transmits homogeneously to bond issuers across US states and EA countries:
  - There are no differential responses to monetary policy surprises of bond spreads of firms located in lower rated US states/EA countries

Empirical framework - Step 2: Role of country fixed effects for corporate bond spreads **levels**

- **Research question 2:** Unconditionally, are corporate bond spreads determined at the issuer's country level or at the firm level?

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  - *Explore rather than absorb multidimensional fixed effects: sequentially extract fixed effects that aggregate information at country/state level first and then at the firm level*:

$$y_{i,j,c,t} = \mu_{c,t} + \varepsilon_{i,j,c,t} \tag{2}$$

where $y_{i,j,c,t}$ is the spread level at time t of bond i belonging to firm j in country c and $\mu_{c,t}$ are the country-time fixed effects.

$$\varepsilon_{i,j,c,t} = \mu_{j,t} + \epsilon_{i,j,c,t} \tag{3}$$

where $\varepsilon_{i,j,c,t}$ is the residual spread of Equation 2 and $\mu_{j,t}$ are the firm-time fixed effects

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Table 9: Relevance of country fixed effects for corporate bond spreads

	(1) US Spread	(2) US Spread	(3) US ε_i, j, c, t	(4) US Firm default risk	(5) EA Spread	(6) EA Spread	(7) EA ε_i, j, c, t	(8) EA Firm default risk
N	14,993,069	14,985,122	14,993,069	14,993,069	2,708,938	2,702,931	2,708,938	2,708,938
R^2 adjusted	0.04	0.08	0.44	0.02	0.03	0.08	0.41	0.02
Fixed effects	State	State-Time	Firm	State	Country	Country-Time	Firm	Country
Additional controls	No	No	No	No	No	No	No	No

- Country/country-time fixed effects explain only a tiny fraction of the variance of US and EA corporate bond spreads
- Firm fixed effects explain almost half of the variance of US and EA corporate bond spreads

Key Finding 2

- **Key Finding 2**: Corporate bonds spreads levels do not depend on country/state of the bond-issuing firm:
  - Country/country-time fixed effects explain only a tiny fraction of the variance of US and EA corporate bond spreads
  - This is polar opposite of bank loan spreads, which are very strongly determined at the country level (Altavilla & al. 2024)
- **EA corporate bond market is as integrated as the US one**

Robust results

- These results are very robust
- We cannot make them go away:
  - either conditionally or unconditionally
  - also when using a matched sample of EA and US firms

Empirical framework - Step 3: Corporate bond markets vs bond-issuing firms specific features?

Research question 3: Is it the bond issuing firms or the corporate bond market itself that is special?

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- We know that the **average** bank loan spread is strongly a function of country
- If **bank loan spreads** of the bond-issuing firms are determined at:
  - firm level (expect low R^2 for country-time FE) $\Rightarrow$ **Bond-issuing firms are special**
  - country level (expect high R^2 for country-time FE) $\Rightarrow$ **Corporate bond market is special**

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  - country level (expect high R^2 for country-time FE) $\Rightarrow$ **Corporate bond market is special**

Table 10: Role of country fixed effects for bank loan spreads in the euro area

	(1) Bank loan spread	(2) Bank loan spread
Fixed effects	Country-time	Country-time
Cluster	Country, time	Country, time
Controls	No	Yes
R^2 adjusted	0.6374	0.7074
N	61,957	48,872

Key Finding 3

- **Key Finding 3**: Bank finance premium depends on country factors, market finance premium does not
  - The corporate bond market is special not the bond-issuing firms:
  - The bank loan spreads of the bond issuing firms are similarly determined as those of other firms: at the country level

Robustness checks:

- Alternative definitions of corporate bond spread, country/state classification, sample periods
- Alternative samples: extended sample including also lower tranches of high-yield bonds; sub-sample only for HY bonds; sub-sample of EA and US firms matched by size
- Alternative data frequencies
- Role of country factors for bond spreads at bond issuance
- EA: Alternative monetary policy surprises (Altavilla & al. 2019)
- EA: Fixed or changing composition of EA
- EA: Country-by-country estimates
- EA: Alternative country assignment

Why is the corporate bond market special?

Figure 4: Sovereign effects on bank bonds

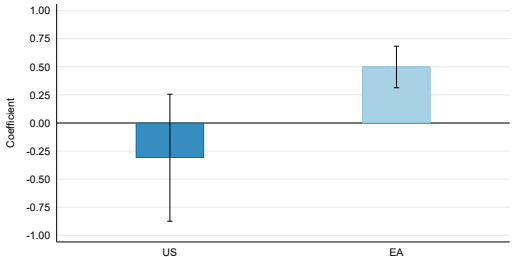
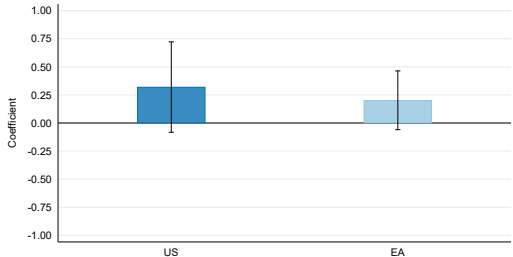


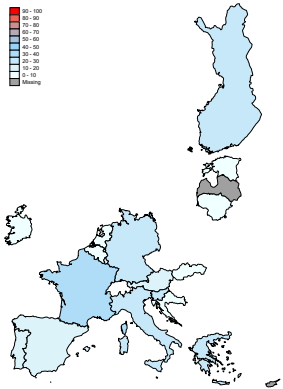
Figure 5: Sovereign effects on NFCs bonds



Sources: Anacredit, SHSS, CSDB, and authors' calculations.
Notes: The chart reports the correlations between bank bond spreads and sovereign spreads (Figure 4) and between NFC bond spreads and sovereign spreads (Figure 5), controlling for time fixed effects. For US, state-level 10-year municipal bonds are considered. For EA, country-level 10-year benchmark bonds are considered, and the euro area sovereign crisis (2012 - 2014) is excluded. Sovereign spreads are matched to the residual maturity of the bonds. All spreads are calculated versus the OIS curve. Spreads are measured in basis points. Standard errors are clustered two-way, at the firm and time level. Sample period: Aug 2006 - Sep 2023. Daily data.

Why is the corporate bond market special?

Figure 6: Share of NFC bonds held inside the country



Why is the corporate bond market special?

Figure 6: Share of NFC bonds held inside the country

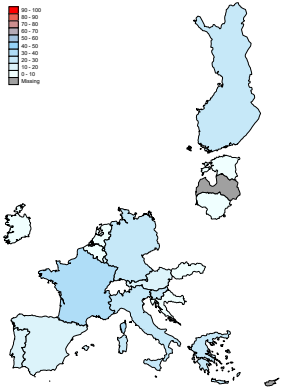
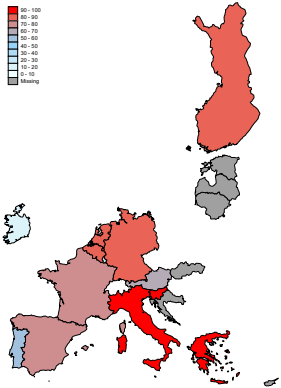


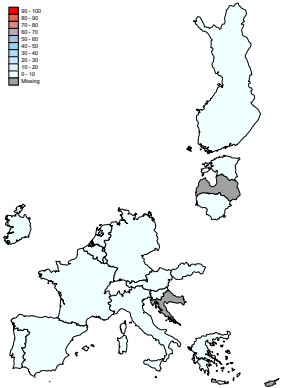
Figure 7: Share of loans to bond-issuing firms by local banks



Sources: Anacredit, SHSS, CSDB, and authors' calculations.
Notes: The map shows the share of NFCs bonds held by domestic investors (Figure 6) and the share of NFCs loans issued by domestic banks (Figure 7). Figure 6: The share is calculated as the market value holdings by all domestic sectors over the bond's outstanding amount at the end of each quarter. The share is trimmed at the 1st and 99th percentile of the yearly holdings distribution. The map shows the median share by country over the sample period. The definition of domestic holdings is based on the firm's country of risk. Sample period: 2009 Q1 - 2024 Q4. Figure 7: for each country, the share is calculated as the sum of the outstanding nominal amounts for loans issued by domestic banks over the sum of outstanding nominal amounts for loans issued by all banks over the sample period. Only loans at issuance are considered. The definition of domestic bank is based on firm's and bank's country of incorporation. Sample period: December 2019 - January 2024.

Why is the corporate bond market special?

Figure 8: Share of NFC bonds held by local banks



Why is the corporate bond market special?

Figure 8: Share of NFC bonds held by local banks

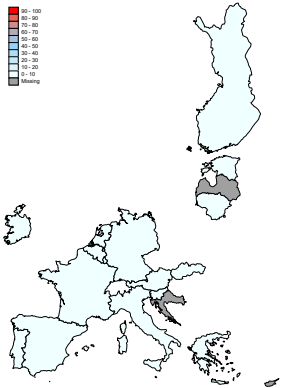
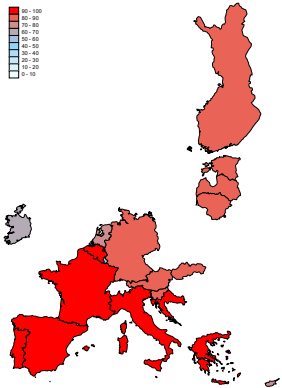


Figure 9: Share of loans to all firms by local banks



Sources: Anacredit, SHSS, CSDB, and authors' calculations.
Notes: The map shows the share of NFCs bonds held by domestic banks (Figure 8) and the share of NFCs loans issued by domestic banks (Figure 9).
Figure 8: the share is calculated as the market value holdings by domestic banks over the bond's outstanding amount at the end of each quarter. The share is trimmed at the 1st and 99th percentile of the yearly holdings distribution. The map shows the median share by country over the sample period. The definition of domestic holdings is based on the firm's country of risk. Sample period: 2009 Q1 - 2024 Q4.
Figure 9: For each country, the share is calculated as the sum of the outstanding nominal amounts for loans issued by domestic banks over the sum of outstanding nominal amounts for loans issued by all banks over the sample period. Only loans at issuance are considered. The definition of domestic bank is based on firm's and bank's country of incorporation. Sample period: December 2019 - January 2024.

Why is the corporate bond market special?

- Banking is local; for EA also intimately tied to the sovereign
- One bank extends the loan, the bank matters
- Market finance has many lenders; it is disperse across investors and pan-European
- It is the bond borrowing firm that matters

This paper:

- Investigates whether **firms' external finance premium** depend on whether funds are sourced from **financial markets** or **banks**
- Explores the role of **country/state heterogeneity in monetary unions** for (i) monetary policy transmission to corporate bond spreads; (ii) the level of corporate bond spreads; (iii) the level of bank loan spreads

Key Takeaways:

- Monetary policy transmits **homogeneously** to bond spreads not only in the US but also in the EA
  - Euro area corporate bond market is as **integrated** as that of the United States
- **Bank finance premium** depends on country factors, **market finance premium** does not

Policy implications:

- Deepen euro area capital markets to facilitate bond issuance $\Rightarrow$ Implications for homogeneous monetary policy transmission & CMU analytical support

Appendix

Option adjusted spreads

Figure 10: EA

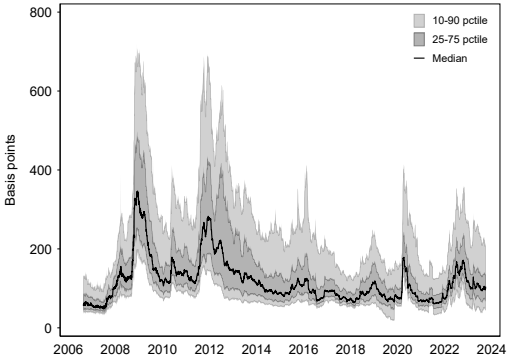
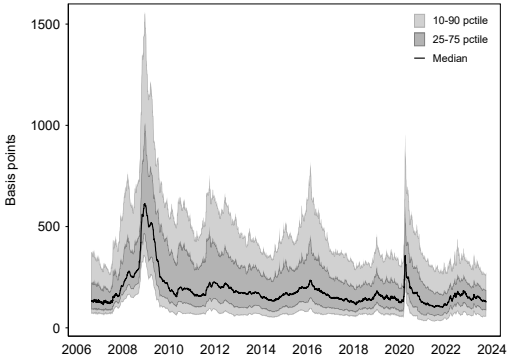


Figure 11: US



Sources: ICE BofA Merrill Lynch, Moody's CreditEdge, Bloomberg, LSEG and authors' calculations.
Notes: The figures plots the panel of daily corporate bonds spreads in basis points for the EA (Figure 10) and the US (Figure 11) over 2006 to 2023 and includes lower tranches of high-yield bonds.

Step 1.2: EA Robustness: Estimate bond-level responses on matched firm size sample using restricted sample

Table 11: Corporate bond spreads responses to monetary policy surprises on EA matched sample

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. FE and controls	(4) Lower rated EA country, incl. FE
MP surprise	1.3259	1.3174	1.3138	1.2768
	(1.1144)	(1.1683)	(1.1768)	(1.1357)
MP surprise x Perif_Country		0.0329		0.0696
		(0.4244)		(0.4081)
Observations	58,115	58,115	49,980	58,079
R^2	0.015	0.015	0.067	0.069
R^2 adjusted	0.0153	0.0153	0.0368	0.0412
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	No
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	156	156	156	156

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises - Restricted sample

Table 12: EA corporate bond spreads responses to Altavilla & al. timing surprises

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. FE and controls	(4) Lower rated EA country, incl. FE
Timing	-1.3235*	-1.2812*	-1.5251*	-1.4833*
	(0.7572)	(0.6784)	(0.8764)	(0.8092)
Timing x Perif_Country		-0.1943		-0.1930
		(0.4423)		(0.3398)
N	94,220	94,220	81,353	81,353
R^2	0.0061	0.0062	0.0551	0.0551
R^2 adjusted	0.0061	0.0061	0.0255	0.0255
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	154	154	154	154

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises - Restricted sample

Table 13: EA corporate bond spreads responses to Altavilla & al. target surprises

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. FE and controls	(4) Lower rated EA country, incl. FE
Target	1.7049	1.7837	1.7067	1.8032
	(1.7791)	(1.6355)	(1.8180)	(1.6655)
Target x Perif_Country		-0.3383		-0.4156
		(0.6610)		(0.6734)
N	94,438	94,438	81,425	81,425
R^2	0.0136	0.0138	0.0635	0.0637
R^2 adjusted	0.0136	0.0138	0.0343	0.0344
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	155	155	155	155

Step 1.2: EA robustness: Estimate bond-level responses to alternative monetary policy surprises - Restricted sample

Table 14: EA corporate bond spreads responses to Altavilla & al. forward guidance surprises

	(1)	(2)	(3)	(4)
	Overall	Lower rated EA country	Overall, incl. FE and controls	Lower rated EA country, incl. FE
FG	-0.3423	-0.3092	-0.3890	-0.3316
	(0.3493)	(0.2992)	(0.4660)	(0.4043)
FG x Perif_Country		-0.1592		-0.2740
		(0.3422)		(0.4050)
N	94,220	94,220	81,353	81,353
R^2	0.0008	0.0010	0.0478	0.0478
R^2 adjusted	0.0008	0.0009	0.0180	0.0180
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	154	154	154	154

Step 1.2: EA robustness: Estimate bond-level responses to alternative spread definition vs. OIS

Table 15: EA corporate bond spreads responses to monetary policy surprises

	(1) Average effect All ECB surprises	(2) Lower rated EA country All ECB surprises	(3) Average effect Largest ECB surprises	(4) Lower rated EA country Largest ECB surprises	(5) Average effect Fed spillovers	(6) Average effect Horse race ECB and Fed surprises	(7) Lower rated EA country Fed spillovers
ECB surprise	1.0119	0.9681	5.0354***	4.9825***		0.8247	
	(0.8266)	(0.7335)	(1.5378)	(1.4809)		(0.7803)	
ECB surprise x Perif_Country		0.1935		0.2733			
		(0.5950)		(0.8146)			
Fed surprise					0.2625	0.2173	0.2654
					(0.1949)	(0.1943)	(0.1865)
Fed surprise x Perif_Country							-0.0145
							(0.1842)
N	85206	85206	4521	4521	60298	160265	60298
R^2 adjusted	0.0120	0.0120	0.2754	0.2752	0.0507	0.0093	0.0506
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	Yes	Yes	Yes	No	No	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of clusters	169	169	10	10	110	280	110

Step 1.2: EA robustness: Estimate bond-level responses to alternative spread definition vs. Bund

Table 16: EA corporate bond spreads responses to monetary policy surprises

	(1) Average effect All ECB surprises	(2) Lower rated EA country All ECB surprises	(3) Average effect Largest ECB surprises	(4) Lower rated EA country Largest ECB surprises	(5) Average effect Fed spillovers	(6) Average effect Horse race ECB and Fed surprises	(7) Lower rated EA country Fed spillovers
ECB surprise	0.5865	0.5358	4.6013***	4.5906***		0.5836	
	(0.6739)	(0.6136)	(1.3524)	(1.3040)		(0.6693)	
ECB surprise x Perif_Country		0.2269		0.0549			
		(0.4977)		(0.7628)			
Fed surprise					0.1322	0.0868	0.1333
					(0.1890)	(0.1857)	(0.1810)
Fed surprise x Perif_Country							-0.0053
							(0.1856)
N	99063	99063	4497	4497	58937	158021	58937
^{2}	0.0024	0.0025	0.5396	0.5396	0.0678	0.0216	0.0678
^{2} adjusted	0.0024	0.0025	0.2639	0.2636	0.0337	0.0059	0.0337
Fixed effects	No	No	Yes	Yes	Yes	Yes	Yes
Additional controls	No	No	Yes	Yes	No	No	No
Double clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of clusters	170	170	10	10	109	279	109

Step 1.2: EA robustness: Estimate bond-level responses to alternative spread & surprises definitions

Table 17: EA corporate bond spreads vs OIS responses to Altavilla & al. target surprise

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
Target	0.7158	0.7267	0.7195	0.7174
	(0.8245)	(0.7030)	(0.8453)	(0.7169)
Target x Perif_Country		-0.0628		0.0119
		(0.9975)		(1.0399)
N	99515	99515	85071	85071
R^2	0.0316	0.0316	0.0345	0.0345
R^2 adjusted	0.0069	0.0069	0.0092	0.0092
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	169	169	168	168

Step 1.2: EA robustness: Estimate bond-level responses to alternative spread & surprises definitions

Table 18: EA corporate bond spreads vs OIS responses to Altavilla & al. timing surprise

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
Timing	-1.3234*	-1.3823*	-1.4300	-1.4674*
	(0.7944)	(0.7127)	(0.9301)	(0.8568)
Timing x Perif_Country		0.2873		0.1767
		(0.4953)		(0.4626)
N	99161	99161	84996	84996
R^2 adjusted	0.0078	0.0078	0.0099	0.0099
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	168	168	167	167

Table 19: EA corporate bond spreads vs OIS responses to Altavilla & al. FG surprise

	(1) Overall	(2) Lower rated EA country	(3) Overall, incl. controls	(4) Lower rated EA country, incl. controls
FG	-0.3489	-0.2829	-0.3127	-0.2408
	(0.2656)	(0.2348)	(0.3384)	(0.2916)
FG x Perif_Country		-0.3702		-0.4024
		(0.4240)		(0.5519)
N	99161	99161	84996	84996
R^2 adjusted	0.0060	0.0061	0.0080	0.0081
Fixed effects	No	No	Yes	Yes
Additional controls	No	No	Yes	Yes
Double clustering	Yes	Yes	Yes	Yes
Number of clusters	168	168	167	167

Step 2: Robustness: Role of country effects for corporate bond spreads using monthly frequency spread data

Table 20: Fixed effects analysis in monthly frequency

	(1) US Spread	(2) US Spread	(3) US ε_i, j, c, t	(4) US Firm default risk	(5) EA Spread	(6) EA Spread	(7) EA ε_i, j, c, t	(8) EA Firm default risk
N	804562	804142	804472	804567	131313	131163	131301	131317
R^2 adjusted	0.0428	0.0781	0.6787	0.0210	0.0523	0.1304	0.6304	0.0432
Fixed effects	State	State-Time	Bond, firm, sector	State	Country	Country-Time	Bond, firm, sector	Country
Additional controls	No	No	Yes	No	No	No	Yes	Yes

Step 2: Robustness: Fixed effects analysis in monthly frequency at bond issuance

Table 21: Fixed effects analysis in monthly frequency at bond issuance

	(1) US Spread	(2) US ε_i, j, c, t	(3) US Firm default risk	(4) EA Spread	(5) EA ε_i, j, c, t	(6) EA Firm default risk
N	8983	8703	8983	1647	1594	1647
R^2	0.090	0.648	0.037	0.108	0.508	0.091
R^2 adjusted	0.0862	0.6078	0.0323	0.1016	0.4394	0.0850
Fixed effects	State	Firm, sector	State	Country	Firm, sector	Country
Additional controls	No	Yes	No	No	Yes	Yes
Double clustering	Firm, time	Firm, time	Firm, time	Firm, time	Firm, time	Firm, time

Step 2: Robustness: Fixed effects analysis using alternative country of assignment for the firm

Table 22: Fixed effects analysis using country of incorporation

	(1) EA spread	(2) EA spread	(3) EA ε_i, j, c, t	(4) EA firm default risk
N	2,721,730	2,709,321	2,721,730	2722052
R^2 adjusted	0.0614	0.1208	0.4048	0.0417
Fixed effects	Country	Country-Time	Firm	Country
Additional controls	No	No	No	No

Step 3: EA robustness: Corporate bond markets vs bond-issuing firms specific features?

Table 23: Role of country fixed effects for bank loan spreads in the euro area

	(1)	(2)
	Bank loan spread	Bank loan spread
N	16431	16431
R^2	0.736	0.740
R^2 adjusted	0.7361	0.7403
Fixed effects	Bank country*Time	Firm country*Time
Cluster	Bank country, time	Firm country, time

Notes: Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country and time level. Sample period: January 2019 - October 2024. Monthly data.

Table 24: Role of country fixed effects for bank loan spreads in the euro area, for firms and banks located in different countries

	(1) Bank loan spread	(2) Bank loan spread
N	3899	3899
R^2	0.699	0.697
R^2 adjusted	0.6981	0.6959
Fixed effects	Bank country*Time	Firm country*Time
Cluster	Bank country, time	Firm country, time

Notes: The sample is restricted to firms and banks located in different countries. Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country and time level. Sample period: January 2019 - October 2024. Monthly data.

Bank loan spreads are correlated with banks own financing conditions:

Table 25: Relevance of creditor's spreads for bank loan spreads

	(1) Bank loan spread	(2) Bank loan spread
Bank bond spr. vs. OIS	0.1816***	0.1816***
	(0.0434)	(0.0433)
N	39,883,850	39,883,850
R^2 adj.	0.0274	0.7658
Fixed effects	Country bank	Country bank-time
Cluster	Country bank, time	Country bank, time

Notes: Each observation is weighted by the aggregated loan size at the country-time level. Standard errors clustered at country and time level. Sample period: January 2022 - October 2024. Monthly data.

Fixed effects for bank bond spreads

Table 26: Role of country fixed effects for bank bond spreads

	(1) US: Spread OAS	(2) US: Spread OAS	(3) EA: Spread vs OIS	(4) EA: Spread vs OIS
N	905,485	890,737	701,749	696,449
R^2 adjusted	0.0733	0.3508	0.2263	0.7339
Fixed effects	State	State-Time	Country	Country-Time
Additional controls	No	No	No	No
Double clustering	Bank, time	Bank, time	Bank, time	Bank, time

Dispersion of US state spreads and EA sovereign spreads

Figure 12: US

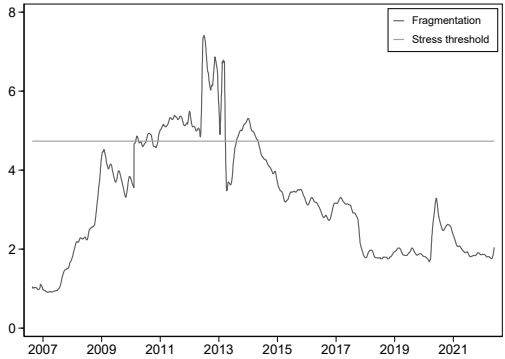
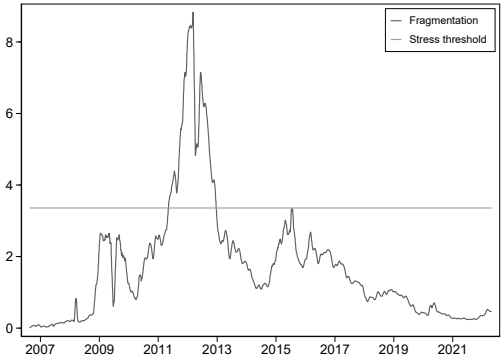


Figure 13: EA



Sources: Bloomberg, LSEG and authors' calculations.
Notes: Figure 12 shows a measure of US State stress proxied by the dispersion of changes in individual 10-year muni bond yields relative to the US 10-year Treasury yield. Figure 13 shows a measure of euro area sovereign stress proxied by the dispersion of changes in individual 10-year sovereign yields relative to the EA GDP-weighted yield. Severe stress is identified when the stress measure is 1 standard deviation above its long-term mean.

Bond characteristics

DE	Mean	SD	Min	Median	Max
No. of bonds per firm/day	13	10	1	10	41
Bond volume (mil)	781	401	25	750	3000
Maturity at issue (years)	8	4	2	7	30
Remaining maturity (years)	5	4	1	4	30
Bond Rating	BBB1	AA1	AA3	BBB1	CC2
OAS spread (bp)	138	151	5	100	3498
Coupon rate (pct)	3	2	0	2	12

ES	Mean	SD	Min	Median	Max
No. of bonds per firm/day	12	8	1	11	40
Bond volume (mil)	762	382	0	700	2250
Maturity at issue (years)	8	3	2	8	20
Remaining maturity (years)	5	3	1	5	20
Bond Rating	BBB2	AAA	AA3	BBB2	C2
OAS spread (bp)	186	262	5	109	3498
Coupon rate (pct)	3	2	0	3	10

FR	Mean	SD	Min	Median	Max
No. of bonds per firm/day	10	7	1	8	40
Bond volume (mil)	709	322	0	650	3650
Maturity at issue (years)	9	4	1	8	30
Remaining maturity (years)	6	4	1	5	30
Bond Rating	BBB1	AA1	AA1	BBB1	C2
OAS spread (bp)	133	141	5	96	3495
Coupon rate (pct)	4	2	0	4	11

IT	Mean	SD	Min	Median	Max
No. of bonds per firm/day	11	8	1	9	40
Bond volume (mil)	803	382	42	750	2750
Maturity at issue (years)	9	4	3	8	23
Remaining maturity (years)	5	4	1	5	23
Bond Rating	BBB2	AA1	A1	BBB2	C2
OAS spread (bp)	183	167	5	130	3470
Coupon rate (pct)	4	2	0	4	12

US	Mean	SD	Min	Median	Max
No. of bonds per firm/day	17	20	1	10	153
Bond volume (mil)	583	568	0	457	15000
Maturity at issue (years)	15	10	1	10	90
Remaining maturity (years)	9	8	1	6	30
Bond Rating	BBB2	AA2	AAA	BBB2	C2
OAS spread (bp)	239	265	5	164	3500
Coupon rate (pct)	6	2	0	6	15

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Firm characteristics

DE	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.59	3.45	0.01	0.09	50.00
EDF 5-Year (%)	0.74	1.71	0.01	0.39	50.00
EDF 10-Year (%)	0.88	1.20	0.01	0.62	50.00
Leverage ratio	0.30	0.14	0.01	0.27	1.32
Firm rating	Baa2	Aa1	Aa3	Baa2	C
Firm assets (EUR mln)	46.83	60.82	0.35	26.06	551.85

ES	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.45	1.54	0.01	0.05	23.31
EDF 5-Year (%)	0.76	1.44	0.03	0.30	14.84
EDF 10-Year (%)	0.93	1.08	0.03	0.58	10.10
Leverage ratio	0.45	0.16	0.13	0.45	1.83
Firm rating	Baa2	Aa1	Aa2	Baa2	C
Firm assets (EUR mln)	32.83	33.16	1.14	18.73	147.61

FR	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.40	1.70	0.01	0.06	48.67
EDF 5-Year (%)	0.59	1.02	0.01	0.29	25.70
EDF 10-Year (%)	0.76	0.78	0.01	0.53	17.03
Leverage ratio	0.32	0.13	0.00	0.30	0.77
Firm rating	Baa1	Aa1	Aaa	Baa1	C
Firm assets (EUR mln)	46.98	60.92	0.07	26.41	379.44

IT	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.69	3.35	0.01	0.06	50.00
EDF 5-Year (%)	0.80	1.75	0.01	0.32	23.28
EDF 10-Year (%)	0.88	1.15	0.01	0.58	13.97
Leverage ratio	0.38	0.15	0.00	0.38	1.34
Firm rating	Baa1	Aa1	Aa2	Baa2	C
Firm assets (EUR mln)	41.01	52.21	0.49	15.01	283.43

US	Mean	SD	Min	Median	Max
EDF 1-Year (%)	1.90	6.78	0.01	0.13	50.00
EDF 5-Year (%)	1.52	3.79	0.01	0.40	50.00
EDF 10-Year (%)	1.41	2.57	0.01	0.63	50.00
Leverage ratio	0.38	0.22	0.00	0.35	7.03
Firm rating	Baa3	Aa2	Aaa	Baa3	C
Firm assets (EUR mln)	21.42	46.17	0.01	6.73	1068.63

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Firm characteristics - post-matching

DE	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.4	1.4	0.0	0.1	35.0
EDF 5-Year (%)	0.7	0.9	0.0	0.4	17.5
EDF 10-Year (%)	0.9	0.8	0.0	0.7	11.2
Leverage ratio	0.3	0.1	0.0	0.3	1.3
Firm rating	Baa2	Aa1	Aa3	Baa2	C
Firm assets (EUR mln)	27.1	42.0	0.4	13.8	296.6

ES	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.6	1.8	0.0	0.1	23.3
EDF 5-Year (%)	0.9	1.7	0.0	0.3	14.8
EDF 10-Year (%)	1.1	1.2	0.0	0.6	10.1
Leverage ratio	0.5	0.2	0.1	0.4	1.8
Firm rating	Baa2	Aa1	Aa2	Baa2	C
Firm assets (EUR mln)	24.3	28.3	1.1	12.5	147.6

FR	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.5	1.9	0.0	0.1	48.7
EDF 5-Year (%)	0.7	1.2	0.0	0.3	25.7
EDF 10-Year (%)	0.9	0.9	0.0	0.6	17.0
Leverage ratio	0.3	0.1	0.0	0.3	0.8
Firm rating	Baa1	Aa1	Aaa	Baa2	C
Firm assets (EUR mln)	23.1	22.4	0.1	16.1	150.7

IT	Mean	SD	Min	Median	Max
EDF 1-Year (%)	0.8	3.9	0.0	0.1	50.0
EDF 5-Year (%)	0.8	2.0	0.0	0.3	23.3
EDF 10-Year (%)	0.9	1.3	0.0	0.6	14.0
Leverage ratio	0.4	0.2	0.0	0.4	1.3
Firm rating	Baa1	Aa1	Aa2	Baa2	C
Firm assets (EUR mln)	24.9	35.0	0.5	10.4	147.6

US	Mean	SD	Min	Median	Max
EDF 1-Year (%)	1.5	5.7	0.0	0.1	50.0
EDF 5-Year (%)	1.2	3.1	0.0	0.3	45.9
EDF 10-Year (%)	1.1	2.1	0.0	0.5	45.9
Leverage ratio	0.4	0.2	0.0	0.4	2.3
Firm rating	Baa3	Aa2	Aaa	Baa3	C
Firm assets (EUR mln)	19.2	29.6	0.1	10.3	296.6

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Loans characteristics

Table 27: Loans and bonds characteristics at the firm-month-year level, for firms with both bonds and loans

Bonds	N	Mean	Median	SD	Min	Max
Number of bonds	7853	7.18	4.00	10.36	1.00	153.00
Outstanding amount (mln EUR)	7853	4805.60	1926.71	7836.16	2.21	101014.55
Yield to maturity	5237	2.16	1.19	2.47	-0.31	18.01
Maturity at issuance (years)	7853	8.23	8.00	2.71	3.00	30.02
Loans	N	Mean	Median	SD	Min	Max
Number of loans	7853	19.84	7.00	45.12	1.00	1181.00
Outstanding amount (mln EUR)	7853	298.41	113.22	530.18	0.00	7065.59
Interest rate	6869	1.96	1.51	1.58	0.01	14.72
Maturity at issuance (years)	7832	4.88	4.81	4.05	0.00	126.86

Sources: Anacredit, ICE BofA, CreditEdge, CSDB.
Notes: Bonds and loans are aggregated at the firm level. For each firm, we calculate at the end of each month the number of bonds (loans), their total outstanding amount, their median yield to maturity (interest rate), their median maturity at issuance. Bonds' yield to maturity and loans' interest rate are trimmed at the 1st and 99th percentile before getting aggregated at the firm-level. Sample period: January 2019 - September 2023. Monthly data.

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Pan-European investor base and reduced home bias in the EA corporate bond market

Table 28: The investor base composition of euro area corporate bonds by country

	Bond holdings by domestic investors (in % of total EA holdings as reported in SHSS)	*of which:* Banks	MMFs	IFs	IC	PF	Other
Country							
AT	24.0	9.6	0.0	4.4	3.9	0.0	6.0
BE	9.6	0.8	0.0	0.8	5.3	0.1	2.7
DE	48.9	11.4	0.0	16.4	3.3	0.5	17.1
ES	16.5	2.9	0.0	3.9	5.4	2.5	1.8
FI	32.8	5.4	0.0	7.6	4.9	0.3	14.3
FR	49.4	5.7	0.2	7.2	33.8	0.0	2.5
GR	41.1	19.6	0.0	6.0	3.1	0.9	11.5
IE	7.7	1.0	0.0	5.8	0.7	0.0	0.1
IT	33.0	4.0	0.0	4.6	14.0	0.5	9.8
LU	16.7	1.1	0.0	11.0	0.4	0.0	4.4
NL	7.6	0.2	0.0	1.7	2.9	2.1	0.8
PT	32.8	8.6	0.0	2.1	13.6	3.4	4.8

Sources: ECB Securities Holdings Securities Statistics (SHSS) and authors calculations.