

Online Appendix to

Do Investor Differences Impact Monetary Policy Spillovers to Emerging Markets?

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A. Additional Empirical Results

In this appendix, we provide additional results based upon alternative measures of the monetary policy shocks.

A.1. Euro Area Monetary Policy Shocks

Figure A1

Euro Area monetary policy shocks: Identified via high-frequency changes during monetary event windows

Source: [Altavilla et al. \(2019\)](#); [Bauer and Swanson \(2023\)](#)

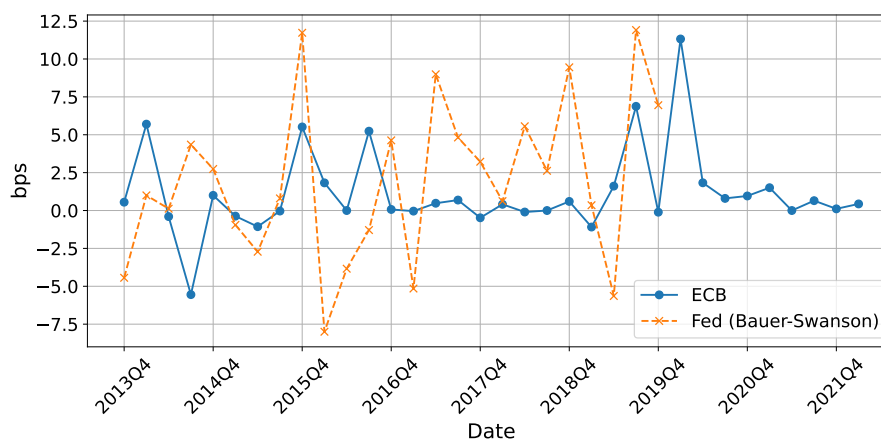


Figure A1 plots the baseline ECB monetary shocks identified using a high-frequency approach around ECB monetary event windows ([Altavilla et al., 2019](#)) and the U.S. monetary shocks compiled by [Bauer and Swanson \(2023\)](#) (stopping at 2019Q4), also using a high-frequency approach. For ECB, we choose shocks to 3-month OIS rate as the benchmark shock series. Shocks at the event/monthly level are summed up to the quarterly level.

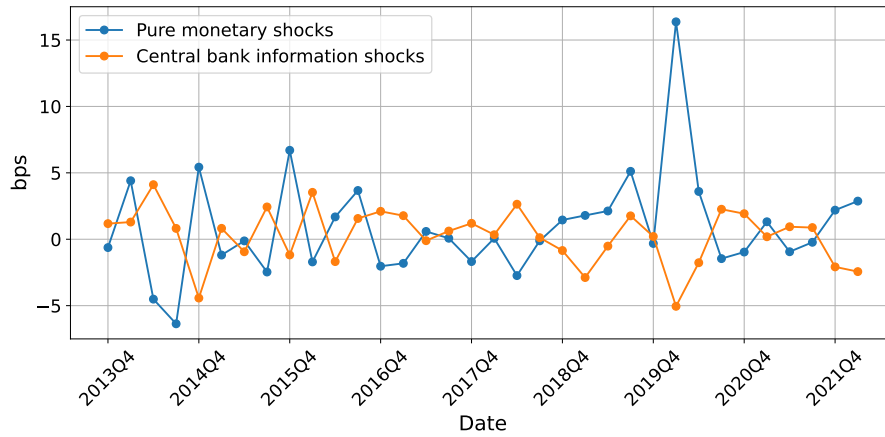
A.2. Alternative Monetary Policy Shocks

Figure A2 Panel a plots the ECB monetary shocks decomposed into the pure monetary shocks and the central bank information shocks as in [Jarociński and Karadi \(2020\)](#). Figure

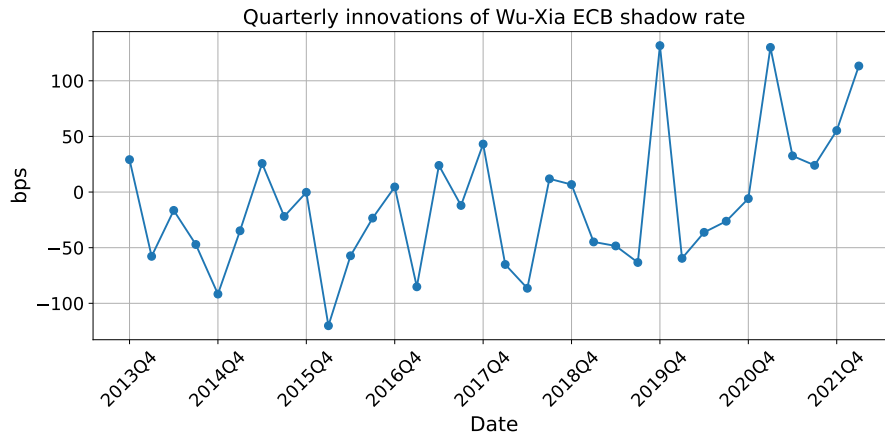
A2 Panel b gives the values over time of the shadow ECB policy rate estimated by Wu and Xia (2020).

Figure A2
Paths of estimated Euro Area shadow policy rate / monetary shock components

Source: Jarociński and Karadi (2020); Wu and Xia (2016, 2017, 2020) and authors' calculations



(a) Jarociński and Karadi (2020) decomposition of ECB monetary shocks (3-month OIS)



(b) Wu and Xia (2020) shadow ECB policy rate, quarterly innovations

Figure A2 plots estimated monetary shock components (Panel (a)) and shadow policy interest rate (Panel (b)) for the Euro Area. Panel (a) is obtained by applying the sign restriction identification approach of Jarociński and Karadi (2020) to high-frequency responses of 3-month Euro OIS rate around monetary policy event windows (Altavilla et al., 2019) used in the baseline analysis. Panel (b) report quarterly innovations of the shadow ECB policy rate estimated by Wu and Xia (2020) using a shadow term structure model (Wu and Xia, 2016, 2017). For both panels, the unit is in basis points.

A.3. Portfolio Responses to Shadow Policy Rates

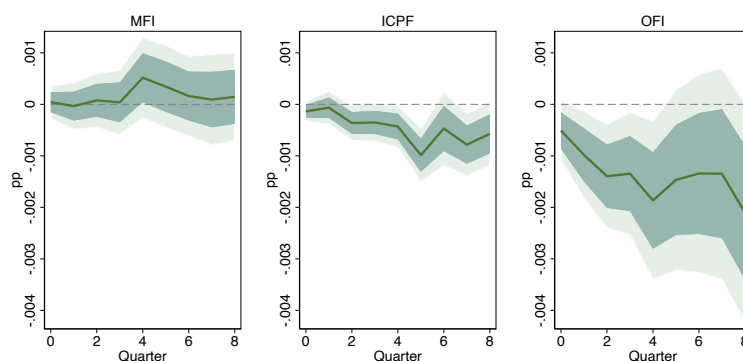
Below we report in Figure A3 the EA investor portfolio responses to an increase in the ECB shadow rate. As shown in Figure A2 and described in the text, the shadow rate series is more variable than our benchmark series. As a result, the responses are less precisely estimated, generating largely insignificant effects. Nevertheless, the OFI (investment fund) sector shows some slight decline. These results are consistent with our benchmark analysis that highlights the greatest response arising from the investment fund sector. However, our baseline results are based upon a more precise measure, thereby generating more robust implications.

A.4. Response of Euro Area Long-term rate Tightening

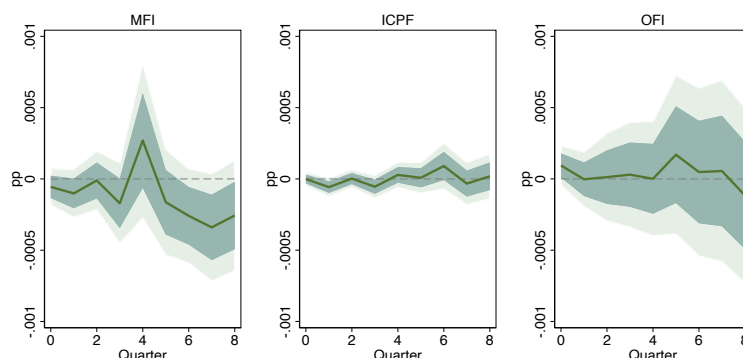
The local projection analysis above was based upon monetary policy shocks to the short term interest rate. Given that our sample includes an extended period of zero and even negative interest rates, monetary policy shocks over some of the period appeared in the long term rates. As a measure of this type of tightening, we consider the portfolio effect of increases in the long rate in excess of the short term rate. These estimates are plotted in Figures A4 for the four issuer groups previously considered. Once again, the pattern that OFI (investment funds) are the most responsive can be seen. This result is apparent across all sectors in Panel (a) and in sovereign issuers in Panel (d). As before, the significant response suggest increases, rather than reversals, in foreign holdings by EA investors in response to monetary shocks.

Figure A3
Impulse response of EA investors' emerging market debt allocation (portfolio weight) to 25bps shadow policy rate hikes

Source: ECB Securities Holdings Statistics, [Wu and Xia \(2016, 2017, 2020\)](#)



(a) Debt issued by all sectors

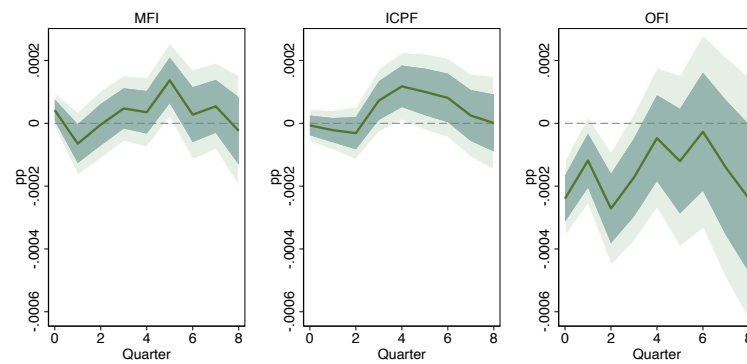


(b) Debt issued by financial corporations

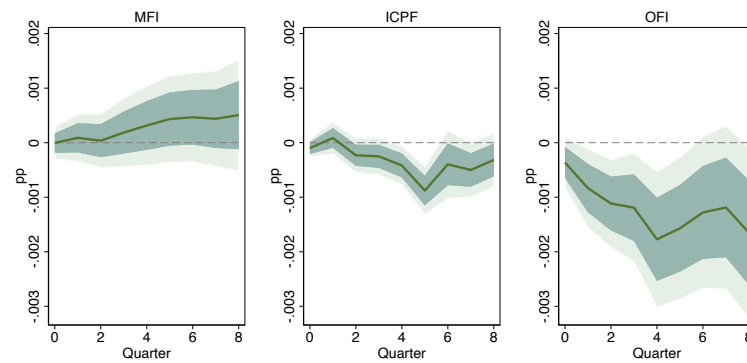
Figure A3 plots impulse responses of Germany-based and U.S.-based investors' foreign debt allocation (including both AE and EME debt) to 25 bps increase in the shadow ECB policy rate estimated by [Wu and Xia \(2016, 2017, 2020\)](#) using a shadow term structure model. Impulse responses are estimated using local projection by investor sector (bank+MMF, ICPF, and other financial institutions), and by issuer sector (all sectors, financial corporations, non-financial corporations and government). The control variables include 3 lags of monetary policy shock and lagged changes (for 3 months) of the dependent variables. The unit of the y -axis is percentage point. 68% and 90% confidence interval with robust standard error are reported. For Panel (a) and (b), the dependent variable is the total *face value* of external debt issued by an issuer sector held by a German investor sector, scaled by the total size of the debt securities portfolio (also in face value terms). For Panel (c) and (d), the dependent variable is the total market value of sovereign or corporate debt held by a U.S. investor sector, scaled by the total size of the securities portfolio in market values (including debt, investment fund shares and equities).

Figure A3
Impulse response of EA investors' emerging market debt allocation (portfolio weight) to 25bps shadow policy rate hikes (continued)

See the first part of the figure for detailed notes.



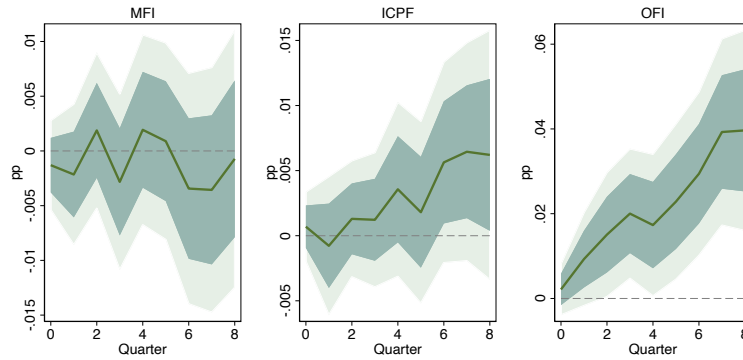
(c) Debt issued by non-financial corporations



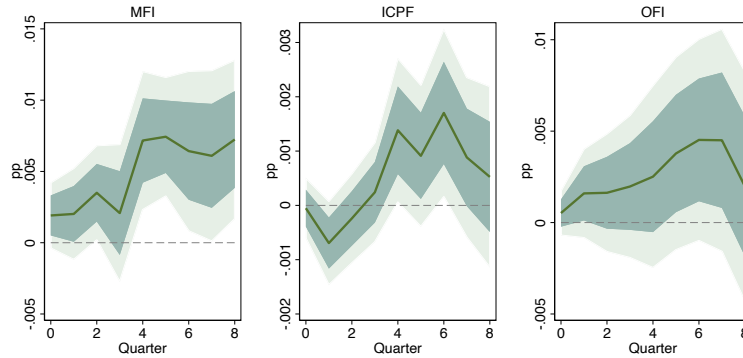
(d) Debt issued by governments

Figure A4
Impulse response of EA Emerging Market debt allocation (portfolio weights)
to 25 bps EA long-term rate tightening relative to short rate

Source: ECB Securities Holdings Statistics



(a) Debt issued by all sectors

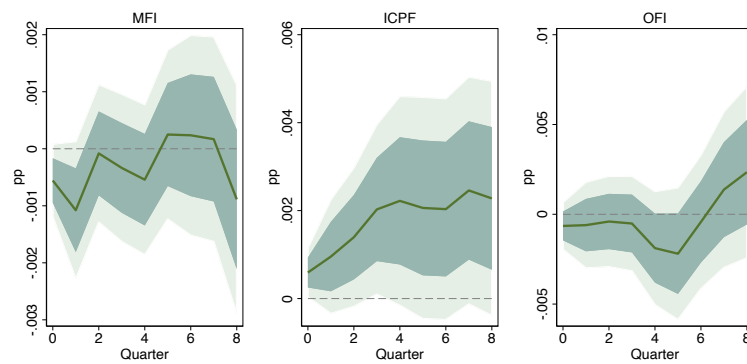


(b) Debt issued by financial corporations

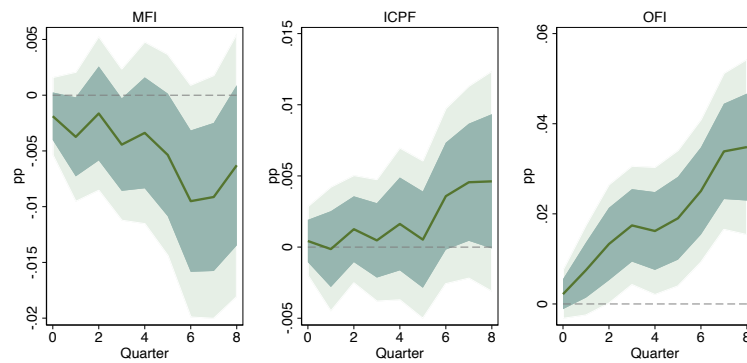
Figure A4 reports impulse responses of Euro Area investors' long-term emerging market debt allocation, measured by portfolio weights, towards 25 basis point surprise tightening of 10-year German Bund yield relative to 3-month Bund yield. The impulse responses are estimated following (1) separately for each of the three types of investors. MFI refers to bank and MMF investors. ICPF refers to insurance companies and pension funds, and OFI refers to other financial institutions (investment funds). The control variables include 3 lags of high-frequency identified monetary shocks (Altavilla et al. (2019)), lagged changes (for 3 months) of the dependent variables, as well as issuer country-level controls. The unit of the y -axis is percentage point. 68% and 90% confidence interval with robust standard error are reported.

Figure A4
Impulse response of EA Emerging Market debt allocation (portfolio weights)
to 25 bps EA long-term rate tightening relative to short rate (continued)

See the first part of the figure for detailed notes.



(c) Debt issued by non-financial corporations



(d) Debt issued by governments

B. Supplemental Information: Data and Coverage

In this appendix, we provide supplemental information about the data summary statistics and country coverage.

Table A1

Summary statistics: Controls, shocks, and state indicators

Source: National central banks, International Financial Statistics, World Bank QPSD, [Altavilla et al. \(2019\)](#), [Bauer and Swanson \(2023\)](#).

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
CPI inflation (yoy, %)	698	4.301	7.87	-3.203	55.752	2.625
Unemployment rate change (qoq, %)	666	-.092	.903	-7.82	6.97	-.1
Industrial production index change (qoq, 100*log)	687	.686	5.402	-36.68	32.094	.803
Local currency share of government debt (%)	714	74.339	22.815	17.367	100	78.157
Government debt to GDP ratio (%)	699	52.306	24.72	10.782	129.833	46.739

(a) Emerging market characteristics

Variable	Obs	Mean	Std. Dev.	Min	Max	P50
ECB monetary shocks: 3-month OIS high-frequency response (bps)	34	1.15	2.87	-5.55	11.32	.46
Pure ECB monetary shocks (3-month OIS, bps)	34	.89	3.93	-6.37	16.37	-.02
Central bank information shocks (3-month OIS bps)	34	.26	2.08	-5.05	4.11	.72
ECB monetary shocks: 10y-3m Bund high-frequency response (bps)	34	-.47	5.25	-16.15	11.2	.2
Bauer-Swanson orthogonalized monetary policy shock (bps)	25	1.91	5.38	-8	11.91	1

(b) Monetary policy shocks and interest rates

Note: Table A1 reports the summary statistics for country-level characteristics used in the estimation of the local projection (1) and (4) (Panel A), as well as the statistics for the time-series of high-frequency identified monetary policy shocks for both ECB ([Altavilla et al., 2019](#)) and the Fed ([Bauer and Swanson, 2023](#)). The [Bauer and Swanson \(2023\)](#) U.S. monetary policy shock ends at the end of 2019. The pure monetary shocks and the central bank information shocks are identified using the sign-restriction approach of [Jarociński and Karadi \(2020\)](#) on 3-month OIS high-frequency responses around ECB monetary event windows.

Table A2
Summary statistics: Euro Area investor holding of EME securities
Source: ECB Securities Holdings Statistics

	MFI			OFI			ICPF			
	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75
holdings (market value, mil. EUR)	1363.44	(2811.09)	26.21	212.51	1391.16	4350.88	(6921.76)	288.39	1528.11	4184.94
portfolio weight (%)	0.02	(0.05)	0.00	0.00	0.02	0.04	(0.06)	0.00	0.01	0.04
Observations	2108					2136				2129

(a) Emerging market economies sample

	MFI			OFI			ICPF			
	mean	sd	p25	p50	p75	mean	sd	p25	p50	p75
holdings (market value, mil. EUR)	57810.3	(109918.9)	1632.9	7673.3	47265.6	50551.4	(81349.1)	4446.5	13910.3	49161.7
portfolio weight (%)	1.0	(1.9)	0.0	0.1	0.8	0.5	(0.8)	0.0	0.1	0.5
Observations	2476					2495			2496	

(b) Advanced economies sample

Note: Table A2 reports portfolio holding of EME securities by Euro Area investor, broken down into investor categories in each set of columns. “MFI” denotes monetary-financial institutions (banks, money market funds). “OFI” denotes investment funds. “ICPF” denotes insurers and pension funds.

Table A3
List of emerging market economies in the analysis

Country	In Bundesbank sample	In public ECB SHS sample	High LC (2021Q1)	High public debt (2021Q1)
Armenia	✓			
Argentina	✓	✓		✓
Azerbaijan	✓			
Bosnia and Herzegovina	✓			
Bulgaria	✓	✓		
Brazil	✓	✓	✓	✓
Belarus	✓			
Chile	✓	✓		
China	✓	✓	✓	
Colombia	✓			
Costa Rica	✓			
Cyprus	✓	✓	✓	✓
Czechia	✓	✓	✓	✓
Dominican Republic	✓			
Ecuador	✓			
Egypt	✓			
Croatia	✓	✓		✓
Hungary	✓	✓	✓	✓
Indonesia	✓	✓		
India	✓	✓	✓	✓
Kazakhstan	✓			
Sri Lanka	✓			
Lithuania	✓	✓	✓	✓
Latvia	✓	✓	✓	✓
Montenegro	✓			
Mexico	✓	✓	✓	
Malaysia	✓			
Peru	✓			
Philippines	✓			
Pakistan	✓			
Poland	✓	✓	✓	✓
Paraguay	✓			
Romania	✓	✓		✓
Serbia	✓			
Russia	✓	✓	✓	
Slovenia	✓	✓	✓	✓
Slovakia	✓	✓	✓	✓
Thailand	✓			
Türkiye	✓	✓		
Ukraine	✓			
Uruguay	✓			
Uzbekistan	✓			
Vietnam	✓			
South Africa	✓	✓	✓	✓

Note: Table reports the list of emerging market economies included in the confidential Bundesbank sample (column 2) and the public ECB SHS sample (column 3). In column 4 and 5, we illustrate the country split used in the state-dependent local projection (Section 6) by providing a snapshot of countries classified as having a high local currency share of government debt (column 4) and countries having a high public debt to GDP ratio (column 5) as of 2021Q1.