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THE RESILIENCE OF CENTRAL, EASTERN AND SOUTHEASTERN EUROPE (CESEE) COUNTRIES DURING ECB'S MONETARY CYCLES

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ABSTRACT

We investigate the resilience of CESEE countries during ECB monetary cycles after the entrance of ten countries to the EU in 2004. Undeniably, these countries have experienced a 'miracle' growth during the 2000s decade. However, several obstacles appeared following the global financial crisis and the euro crisis. In many CESEE countries, the quality of institutions has stalled, or even worse, has known a deterioration. Our investigation examines how fundamental and institutional variables influence cross-country resilience regarding exchange rates, interest rates, stock prices, inflation, and growth during the subsequent monetary cycles. Specifically, we focus on five ECB tightening and easing cycles observed during 2005-2023. Cross-sectional regressions reveal that limiting inflation, active management of precautionary buffers of international reserves, current account surpluses, better financial development, and institution quality are important predictors of resilience in the next cycle. The panel regressions show that the US shadow rate strongly influences resilience during the ECB monetary cycles. Besides, various asymmetries are discovered for current account balances, international reserves, and fuel import shares during tightening cycles. Panel quantile regressions detect asymmetries along the distribution of the dependent variables for financial development, central bank independence, and the inflation rate preceding the cycles. These findings may provide guidelines that are useful for returning to the trajectory observed before the euro crisis by identifying the main fundamental and institutional variables that enhance the resilience of CESEE.

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A data appendix is available at http://www.nber.org/data-appendix/w32957

1. Introduction

The collapse of the Soviet Union in 1991, the growing scope and importance of the EU, and the launching of the euro by the ECB in 1999 have provided ample new opportunities and challenges to the emerging Central, Eastern, and Southeastern Europe (CESEE) countries.[1] New growth opportunities unleashed forces that challenged the old order, old borders, and the pre-1990 states' institutions. CESEE growth patterns during 1990-2015 were concisely summarized in the IMF (International Monetary Fund, 2016) report: "From 1990 to 2008, CESEE countries made significant progress along the convergence path on the back of strong total factor productivity (TFP) growth and, to a lesser extent, capital accumulation," raising the question "How Can CESEE Countries Get Back on the Fast Convergence Path?"

This query reflected the changing global growth trajectory propagated by the Global Financial Crisis (GFC) and its aftermath. While the GFC started in the US, the financial globalization of leverage and portfolio investment morphed the GFC into a global crisis, forcing the ECB to adopt a sequence of tightening and easing to stabilize the Euro and testing for the first time the resilience of the Euro. Figure 1 summarizes the timeline of these cycles, where shaded areas are tightening, and the white areas are easting. The blue line is the ECB Deposit Facility rate for the Euro Area; the red line is the Wu-Xia Euro shadow rate,[2] both using the left percentage scale. The blue line is the US Dollar per Euro rate, using the right scale 1 to 1.6.

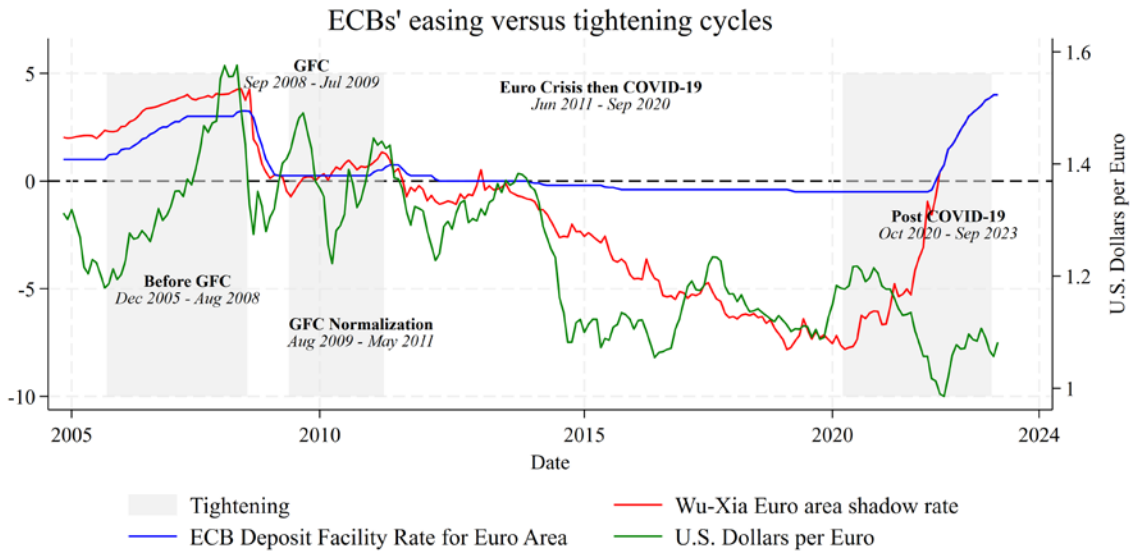

Figure 1: ECB tightening and easing cycles 2005-2023

[1] CESEE defined by the IMF (accessed July 2024) includes Turkey and the following subregions: **Central and Eastern Europe (CEE)**, consisting of the Czech Republic, Hungary, Poland, the Slovak Republic and Slovenia. **Southeastern European EU member states**, Bulgaria, Croatia, and Romania. **Southeastern European non-EU member states**, consisting of Albania, Bosnia & Herzegovina, Kosovo, FYR Macedonia, Montenegro, and Serbia. **The Baltic region,** consisting of Estonia, Latvia and Lithuania. **The CIS group**, consisting of Belarus, Moldova, Russian Federation and Ukraine.

[2] When the federal funds rate hovers near zero, many economic models stop working. Wu and Xia (2016) developed a "shadow rate" that can stand in for the fed funds rate, drop into negative territory, and make those models functional again. The shadow rate tracks the movements of various benchmark data. Wu and Xia applied their methodology also the ECB, where ECB deposit facility rate plays similar role to the Federal Funds rate in the US.

The 'honeymoon period' following the successful launching of the Euro is captured in Figure 1 by the Dec 2005-Aug 2008 tightening, increasing the Euro shadow rate from 2% to 4%; the ECB deposit facility rate increased from 1% to 3%, experiencing the sharp appreciation of the Euro/Dollar rate. This honeymoon is captured by the optimistic evaluation of Otmar Issing, Member of the Executive Board of the ECB, in a Helsinki speech, on 24 March 2006, "The euro – a currency without a state: After more than seven years, the euro is firmly established as the currency of over 300 million people." This buoyant attitude of the Euro founding fathers was tested by the GFC. Euro's first crisis was induced by European banks facing US Dollar funding challenges, inducing the opening of elastic FED swap lines to the ECB in December 2007,[3] followed by a sharp easing during Sep. 2008-Jul. 2009, reducing the shadow ECB rate by 3%. The gradual US normalization from 2009 induced a mild tightening of Euro's area shadow rate (by about 2%) from Aug 2009 to May 2011. This illusive stability evaporated following the rapid increase of the sovereign spreads of the 5 most fragile Euro countries to two-digit spreads. The outcome was growing financial fragmentation due to the elevated concerns of the collapse of the Euro, and the limited appetite for a Hamiltonian type of 'debt mutualization' by Euro's Core countries.

This induced the ECB president, Mario Draghi, to announce in his London speech on 26 July 2012[4] "Within our mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough."[5] The new policies including massive Quantitative Easing (QE), led to a dramatic decline of Euro shadow rate, dropping in almost a linear fashion, reaching about - 7% in October 2020, while the ECB deposit facility rate moved marginally down, -0.5 % by 2021. The tightening of Oct 2020-Sep 2020 started with a sharp increase of the Euro shadow rate, reaching about zero in 2022, while the ECB deposit facility rate increased gradually from 0 in July 21, 2022, reaching 4% in mid-September 2023.

Consequently, the economic trajectory of CESEE countries during the past twenty years was dominated by the challenges associated with the Global Financial Crisis (GFC) and the subsequent Euro crisis. From the perspective of the CESEE countries, ECB policy cycles and the Euro/Dollar evolving exchange rates are exogenous shocks, testing their resilience. Our paper uses the exogeneity of ECB's cycles to explain the performance of CESEE countries during the past five ECB cycles. Specifically, we investigate how macroeconomic conditions at the outset of each cycle influence the performance of CESEE countries during each cycle. Do ex-ante macroeconomic fundamentals explain why some CESEE

[3] The swap lines were intended "to address elevated pressures in short-term funding markets," and to do so without the Fed having to fund foreign banks directly.

[4] Accessed on August 5, 2023: https://www.ecb.europa.eu/press/key/date/2012/html/sp120726.en.html

[5] Draghi's speech vividly explained the challenges facing the ECB: "*The short-term challenges in our view relate mostly to the financial fragmentation that has taken place in the euro area. Investors retreated within their national boundaries.*" "*The interbank market is not functioning, because for any bank in the world the current liquidity regulations make - to lend to other banks or borrow from other banks - a money losing proposition. So the first reason is that regulation has to be recalibrated completely.*" "*The interbank market is not functioning. It is only functioning very little within each country by the way, but it is certainly not functioning across c*ountries." "*Risk aversion has to do with counterparty risk. Now to the extent that I think my counterparty is going to default, I am not going to lend to this counterparty. But it can be because it is short of funding. And I think we took care of that with the two big LTROs where we injected half a trillion of net liquidity into the euro area banks. We took care of tha*t." "*Then there's another dimension to this that has to do with the premia that are being charged on sovereign states borrowings. These premia have to do, as I said, with default, with liquidity, but they also have to do more and more with convertibility, with the risk of convertibility. Now to the extent that these premia do not have to do with factors inherent to my counterparty - they come into our mandate. They come within our remit. To the extent that the size of these sovereign premia hampers the functioning of the monetary policy transmission channel, they come within our mandate.*"

countries are more resilient than others during monetary cycles? How CESEEs' institutions account for their resilience?

Figure 2 traces the CESEE countries' institutional changes during the past decades. CESEE countries' history reveals the large heterogeneity of their institutional pattern. A portion of the countries experienced an overall stable trajectory (exemplified by Slovakia, Slovenia & Estonia), while other countries experienced large volatility (exemplified by Poland, Turkey & Hungary). We will investigate how greater volatility is associated with the performance of the affected countries.

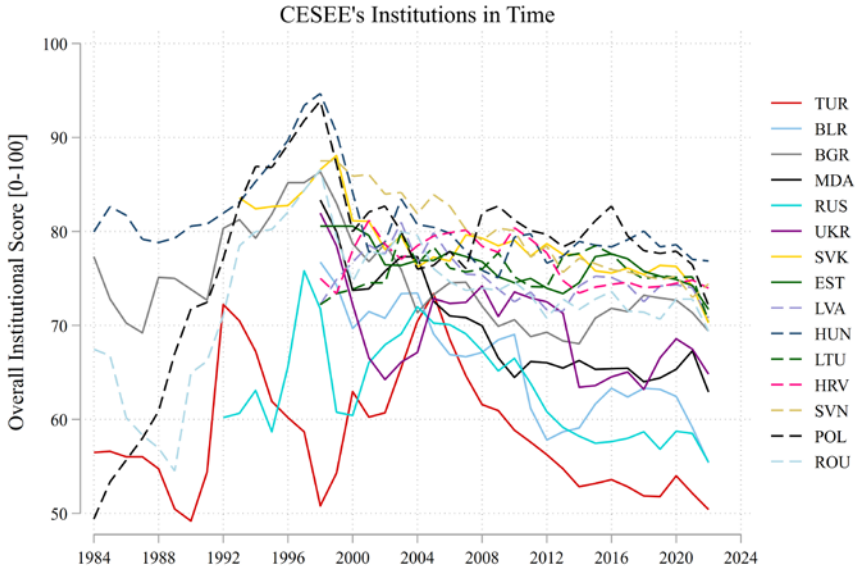

Figure 2: ICRG overall institutional Score, normalized 0-100

2. Literature review

Previous literature has examined the impact of U.S. Federal Reserve's monetary policy on emerging market (EM) macroeconomic dynamics. Existing studies also sought to identify the characteristics that explain why the impact of such shocks varies across EMs. For example, Caldara et al. (2023) show that episodes of global tightening are associated with larger economic downturns, worse financial conditions, and a relatively muted decline in inflation. Ahmed et al. (2023) study the role of FX reserves in buffering the exchange rate against the US dollar during the 2021-22 Federal Reserve monetary policy tightening. They distinguish between mechanisms through which FX reserves mitigate currency depreciation. A 'balance sheet' channel implies that strong fundamentals linked with large reserves reduce currency risk even without using these reserves to intervene. Alternatively, the 'intervention' channel suggests that large reserve countries can directly intervene to protect their currencies against depreciation[6].

[6] Ahmed et al. (2023) focus on the role of international reserve holdings to test the validity of the buffer effect. A larger set of macroeconomic fundamentals is considered in Mishra et al. (2014) and Ahmed et al. (2017), namely: current account balance, fiscal balance, inflation, and foreign exchange reserves.

Similarly, Georgiadis et al. (2024) investigate the role in the transmission of global risk to the world economy. They show that global risk shocks appreciate the dollar, induce tighter global financial conditions, and a synchronized contraction of global economic activity. Walerych and Wesołowski (2021) find that the EM spillovers from the monetary policies of the Fed and European Central Bank are global. Ugurlu and Razmi (2023) explore the economic, political, and institutional correlates of real exchange rate (RER) levels. They find that Central bank independence, imported input intensity of exports, non-tradable share of GDP, and capital account openness are positively associated with real exchange rate overvaluation. In developing countries, the RER is more overvalued under democracies. The broader set of country-specific characteristics that drive macroeconomic outcomes should include the economic structure. Ahmed et al. (2017) suggest that financial institutions, financial depth, and local currency bond markets may play an important role. Their results support the findings in Chapter 2 of the IMF (2014) World Economic Outlook (WEO), which finds that the structures of the investor base and local financial systems matter. Besides financial depth, trade and financial openness also play a major role in transmitting external shocks. The distinction between commodity importers versus exporters also matters as Aizenman et al. (2011) discussed in the context of different policy regimes.

Another branch of the literature analyzes monetary policy shocks. Hoek et al. (2022) study how US interest rates generate adverse spillovers to EMs. They undertake an event study-type approach around Federal Open Market Committee (FOMC) meetings and distinguish between two types of shock—i.e., higher rates stemming from stronger US growth versus hikes stemming from hawkish FED policy or inflationary pressures. They find the latter to be more disruptive for EMs with greater macroeconomic and financial vulnerabilities. Ahmed et al. (2017), rank EMs according to seven indicators of vulnerability, namely current account deficit, gross government debt, inflation, change in bank credit to the private sector, the ratio of external debt to exports, foreign exchange reserves, and the ratio of dollar debt net of international reserves to GDP. Ugazio and Xin (2024) study the impact of US monetary policy spillovers, in terms of both policy shock and policy news shock.

Motivated by the above literature, Aizenman et al. (2024) investigate the determinants of emerging markets performance throughout five U.S. Federal Reserve monetary tightening and easing cycles during 2004 - 2023. They study how macroeconomic and institutional conditions of an Emerging Market (EM) at the beginning of a cycle explain EM resilience during each cycle. The baseline cross-sectional regressions examine how those conditions affect three measures of resilience -- bilateral exchange rate against the USD, exchange rate market pressure, and country-specific Morgan Stanley Capital International index (MSCI). They then stack the five cross-sections to build a panel database to investigate potential asymmetry between tightening versus easing cycles. The evidence indicates that macroeconomic and institutional variables are associated with EM performance, determinants of resilience differ during tightening versus easing cycles, and institutions matter more during difficult times. The present paper applies the methodology of Aizenman et al. (2024), focusing on the determinants of resilience in CESEE countries during the ECB’s monetary cycles.

3. Methodology and data

3.1. Data

Our dataset consists of two sets of variables, described in full detail in Appendix A. The ***first*** is composed of independent variables observed at a monthly or quarterly frequency. The set of independent variables includes six variables: the bilateral exchange rate against the US dollar, the long-term term interest rate on government bonds, stock prices, CPI inflation, Real GDP growth, and the coefficient of variation of growth. In the regressions, we will investigate the change of these independent during ECB monetary cycles.

In Figures 1 to 3, we show the distribution of these variables (exchange rate, inflation, and growth) in the CESEE countries group thanks to quantile plots. In Figures 4 to 6, we present several maps of these cross-sectional changes for the exchange rate, inflation, and growth in Europe. These cross-sectional changes will be regressed on several dependent variables, also described in full detail in Appendix A. This ***second*** group of variables are fundamental and institutional variables are observed at the yearly frequency. Following Mishra et al. (2014), Ahmed et al. (2017), and Aizenman et al. (2024), we will use the observed value of these variables one year before the monetary cycles. The objective is to understand whether these *ex-ante* fundamental and institutional variables explain the resilience of CESEE countries during ECB monetary cycles. In Tables 1 to 5, we present descriptive statistics of these *ex-ante* fundamental and institutional variables and provide some t-tests as preliminary evidence to characterize the CESEE country group.

Table 1. Descriptive statistics for the full sample after the birth of the euro

	Non-CESEE 3,938 (89.9%)	CESEE 440 (10.1%)	Total 4,378 (100.0%)	Test
Current Account Balance	-1.78 (15.37) -8.64	-4.30 (6.71) -1.56	-2.06 (14.68) -7.11	<0.001
Reserve-to-GDP ratio	19.29 (20.74) 1.07	18.83 (9.84) 0.52	19.24 (19.78) 1.03	0.647
Net International Investment Position	-13.72 (128.26) -9.35	-46.47 (30.15) -0.65	-17.94 (120.70) -6.73	<0.001
Gov. Net Lending/Borrowing	-1.92 (6.97) -3.62	-2.71 (3.03) -1.12	-2.01 (6.66) -3.32	0.019
General Gov. Gross Debt	57.18 (47.00) 0.82	41.64 (20.57) 0.49	55.51 (45.16) 0.81	<0.001
Consumer Price Inflation	6.03 (16.95) 2.81	6.58 (9.69) 1.47	6.09 (16.32) 2.68	0.515
Fuel Export on Total Exports in %	17.11 (27.63) 1.61	10.69 (13.40) 1.25	16.34 (26.41) 1.62	<0.001
Fuel Import on Total Exports in %	14.77 (8.64) 0.59	14.11 (7.83) 0.55	14.69 (8.55) 0.58	0.138
Chinn-Ito index, normalized [0-100]	52.52 (37.96) 0.72	58.65 (33.06) 0.56	53.14 (37.53) 0.71	0.003
Inflation Targeters dummy	0.14 (0.35) 2.47	0.29 (0.45) 1.56	0.16 (0.36) 2.33	<0.001
Financial Development Index [0-100]	30.92 (23.84) 0.77	30.53 (12.27) 0.40	30.88 (22.91) 0.74	0.753
Exchange Rate Stability Index [0-100]	63.78 (30.33) 0.48	51.19 (28.40) 0.55	62.63 (30.37) 0.48	<0.001
Central Bank Independence [0-100]	64.31 (16.41) 0.26	78.46 (11.72) 0.15	66.05 (16.57) 0.25	<0.001
Households, loans and debt securities	42.70 (34.32) 0.80	22.02 (11.66) 0.53	39.01 (32.47) 0.83	<0.001
Overall Institutional Score [0-100]	68.42 (11.82) 0.17	72.34 (6.94) 0.10	68.88 (11.43) 0.17	<0.001
Growth GDP per capita (2017 PPP)	1.66 (6.30) 3.81	3.38 (4.29) 1.27	1.84 (6.14) 3.34	<0.001

In the top row of this table, we have the number of observations and the frequency in percent in parenthesis. For the variable in the rows behind the top row, we have the mean, followed by the standard deviation in parenthesis, and the coefficient of variation. Finally, we have the p-value from a pooled t-test for equality of means in the last column. We use the *de jure* Chinn-Ito index for financial openness for comparability with previous works.

Table 1 shows that CESEE countries' fundamental and institutional variables, on average, significantly differ from the global sample in several key characteristics. On average CESEE countries are running higher current account deficits, having inferior external positions (i.e., lower net international investment position), greater exchange rate flexibility (lower score in the exchange rate stability index), greater use of inflation targeting, higher central bank independence, higher openness to capital flows, better institutions, and higher per capita growth rates. In contrast, the mean of the CESEE countries' international reserves holding, the CPI inflation, the financial development, and the fuel import are not significantly different from the rest of the sample.

Table 2. Descriptive statistics CESEE sample after the birth of the euro

	CEESE low 269 (76.4%)	CEESE high 83 (23.6%)	Total 352 (100.0%)	Test
Current Account Balance	-3.17 (6.20) -1.96	-3.38 (3.78) -1.12	-3.22 (5.72) -1.78	0.765
Reserve-to-GDP ratio	17.70 (10.38) 0.59	16.82 (8.06) 0.48	17.50 (9.88) 0.56	0.480
Net International Investment Position	-41.23 (26.56) -0.64	-52.34 (24.41) -0.47	-43.90 (26.46) -0.60	<0.001
Gov. Net Lending/Borrowing	-2.50 (3.11) -1.24	-3.72 (2.59) -0.70	-2.79 (3.04) -1.09	0.001
General Gov. Gross Debt	39.54 (21.89) 0.55	43.74 (18.34) 0.42	40.54 (21.15) 0.52	0.114
Consumer Price Inflation	7.64 (10.04) 1.31	3.97 (4.88) 1.23	6.77 (9.21) 1.36	0.001
Fuel Export on Total Exports in %	12.68 (15.81) 1.25	6.15 (5.28) 0.86	11.12 (14.30) 1.29	<0.001
Fuel Import on Total Exports in %	14.72 (9.10) 0.62	11.74 (4.67) 0.40	14.01 (8.36) 0.60	0.004
Chinn-Ito index, normalized [0-100]	55.92 (35.72) 0.64	72.86 (23.84) 0.33	60.11 (33.95) 0.56	<0.001
Inflation Targeters dummy	0.29 (0.45) 1.57	0.40 (0.49) 1.24	0.32 (0.47) 1.48	0.065
Financial Development Index [0-100]	30.17 (12.15) 0.40	37.94 (12.30) 0.32	32.09 (12.62) 0.39	<0.001
Exchange Rate Stability Index [0-100]	51.55 (29.76) 0.58	50.17 (24.24) 0.48	51.19 (28.40) 0.55	0.704
Central Bank Independence [0-100]	76.97 (12.89) 0.17	80.06 (8.98) 0.11	77.70 (12.15) 0.16	0.042
Households, loans and debt securities	21.50 (12.17) 0.57	23.55 (11.19) 0.48	22.09 (11.91) 0.54	0.185
Overall Institutional Score [0-100]	70.09 (6.37) 0.09	79.63 (1.83) 0.02	72.34 (6.94) 0.10	<0.001
Growth GDP per capita (2017 PPP)	3.51 (4.52) 1.29	3.41 (4.17) 1.22	3.48 (4.43) 1.27	0.866

See footnote of Table 1.

In Table 2, we proceed to the comparison of high scores of institution quality versus low institutional quality within the CESEE country group. We split the sample into high institutional quality, corresponding to observations above the third quantile of the overall institutional score; versus the remaining lower institutional quantiles. The high institutional quality group is characterized by lower inflation, lower dependence on energy trade, greater financial openness, and greater financial development. In contrast, we do not find significant differences in the means for the current account, international reserves, exchange stability, central bank independence, private debt, and GDP per capita growth.

In Figure 3, the distribution of exchange variation during ECB monetary cycles shows that non-EU members of the CESEE[7] countries group have higher exchange rate depreciations throughout the cycles, particularly for large depreciations. In Figure 4, we show that non-EU members of the CESEE group have experienced higher inflation rates, including medium-to-large inflation rates. In Figure 5, we do find some differences for growth rates, for negative values. However, this may be driven by the availability of quarterly real GDP data for the non-EU CESEE countries.

[7] See Footnote 1 for the composition of the CESEE sub-groups. We also provide descriptive statistics for these CESEE sub-group, see Appendix 2 of the online appendix.

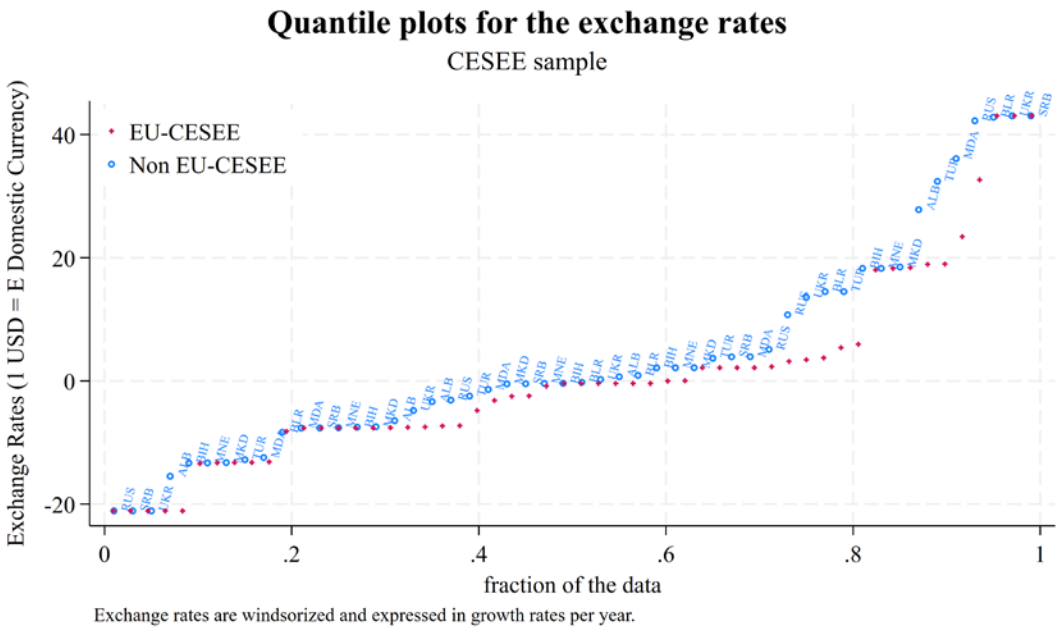

Figure 3. Quantile plots for the exchange rates

The variation over each cycle of the year-on-year growth rate of the bilateral exchange rate (1 USD = E Domestic currency unit) is represented in the quantile plot, expressed as a percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations.

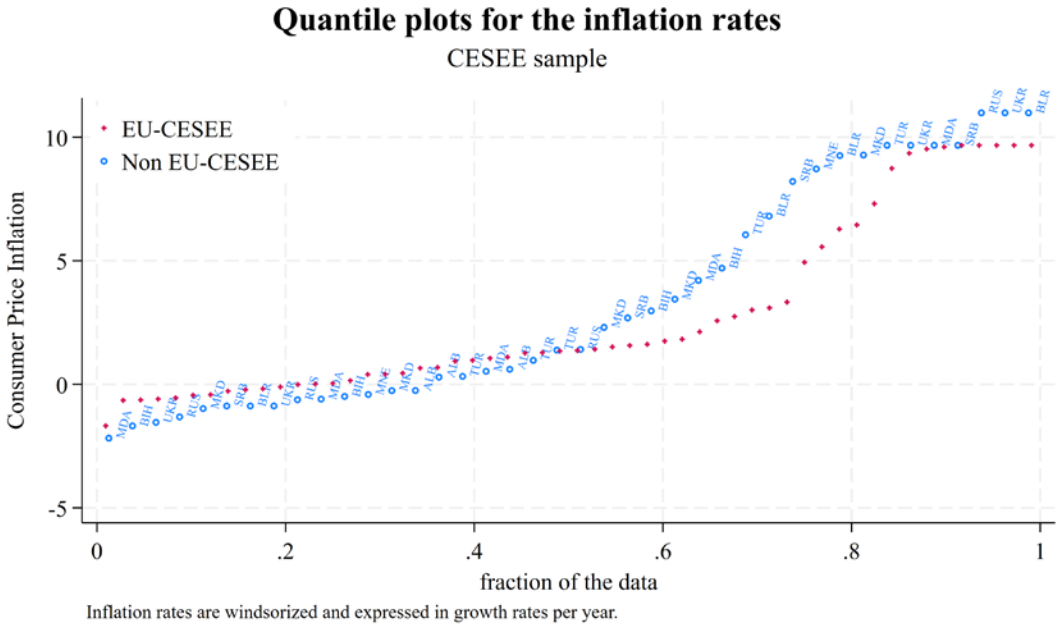

Figure 4. Quantile plots for the inflation rates

The variation over each cycle of consumer price inflation is represented in the quantile plot, expressed as a percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations.

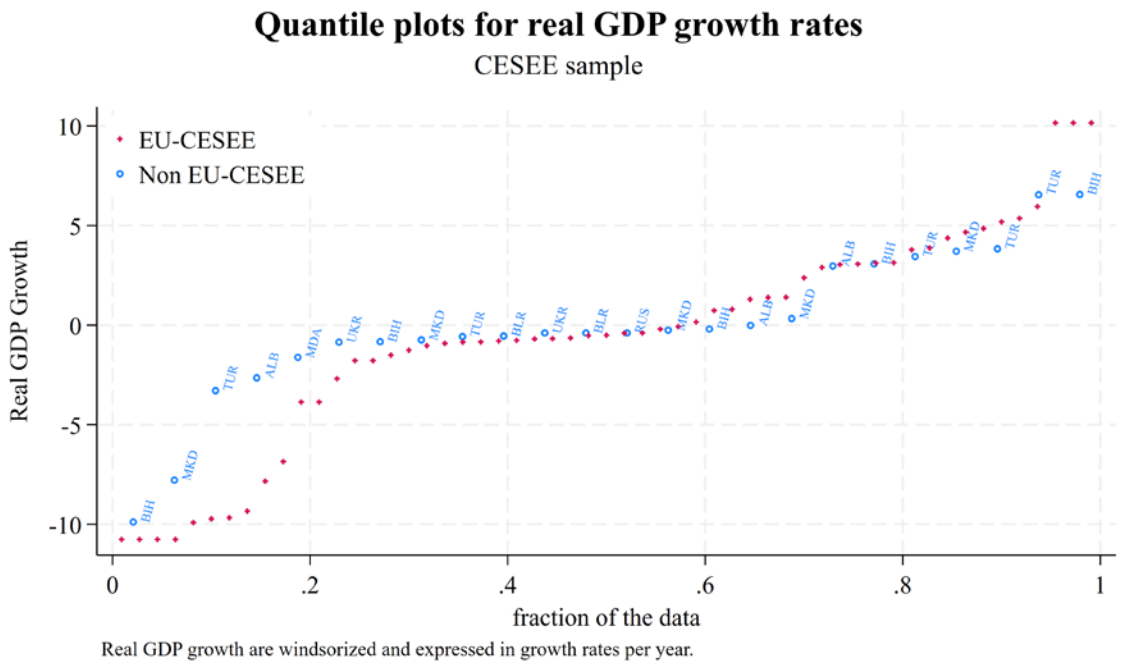

Figure 5. Quantile plots for the growth rates

The variation over each cycle of real GDP growth is represented in the quantile plot, expressed as a percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations. Data is available until July 2022.

In Figure 6, we visualize the spatial dispersion of exchange rate depreciations. During ECB tightening cycles (cycles 1, 3, and 5), the exchange rate appreciates in CESEE countries (fewer red colors). In contrast, the exchange rate depreciates during ECB easing cycles (cycles 2 and 4). This notable difference may reflect the fact observation that ECB tightening cycles were associated with higher risk appetite (risk-on) for global investors in the financial market. In contrast, the easing cycles correspond to risk-off behavior, associated with financial stress and capital flights from CESEE to the core of the eurozone. Figure 7 shows the spatial dispersion of inflation rates during ECB monetary cycles. In CESEE countries, inflation was higher than in the eurozone during the GFC and after the pandemic. Figure 8 shows the spatial dispersion of growth. During the first cycle, the growth was slower at the first cycle's end, in August 2008. Thereby, the slowdown of the growth rate of CESEE countries was already observable in some countries at that time. The two easing cycles were associated with slower growth. The second and the last tightening cycles (Cycles 3 and 5) were associated with faster growth in almost all CESEE countries. However, growth rate changes were slightly lower in CESEE countries during the last tightening cycle (Cycle 5).[8]

[8] Russia and Ukraine are the only two countries that experienced a slowdown in growth over Cycle 5. Notably, our real GDP data are available until the second quarter of 2022, thus the effects of the War in Ukraine on Ukraine and Russia's GDP are not fully captured.

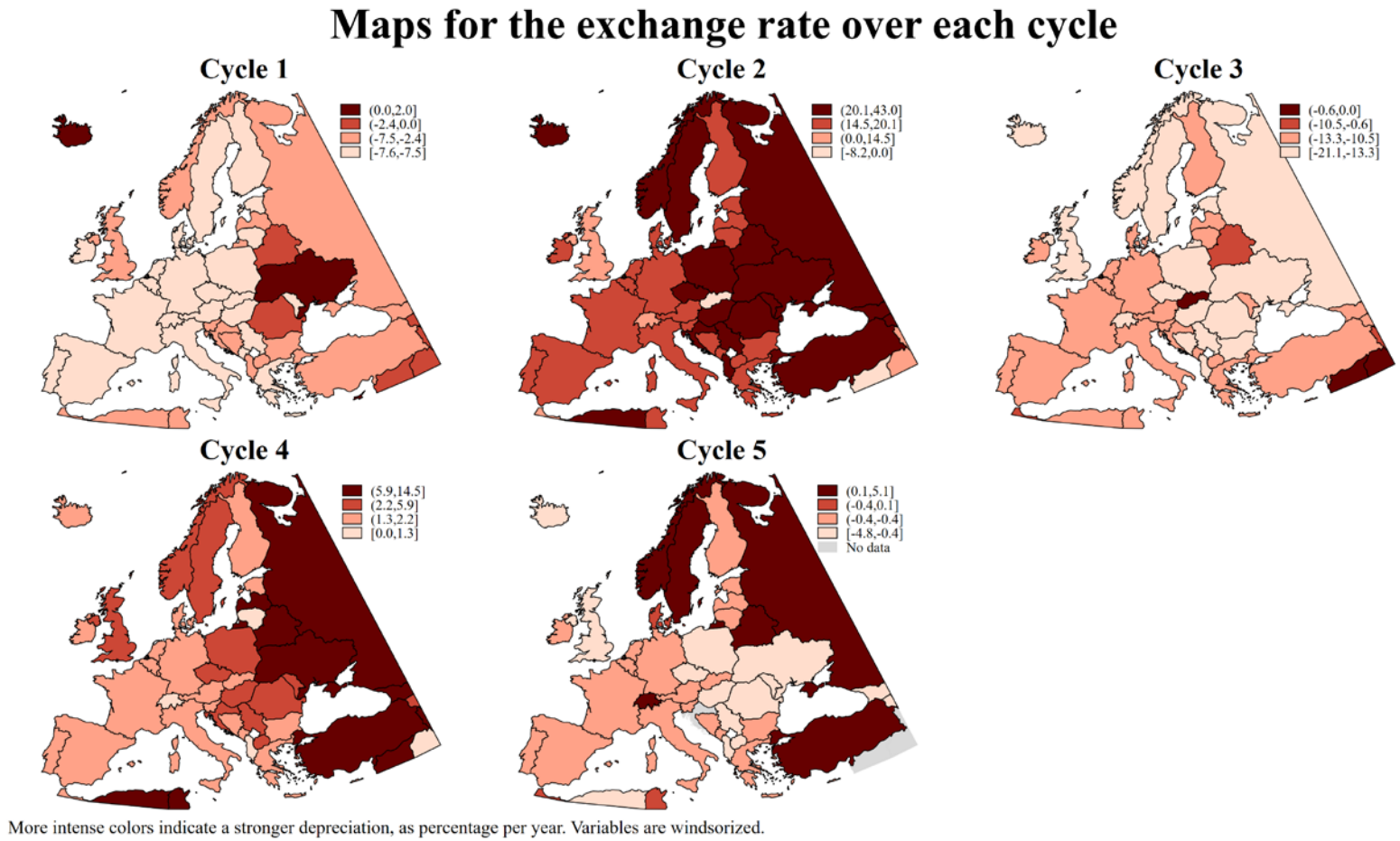

Figure 6. Maps for the exchange rates

The variation over each cycle of the year-on-year growth rate of the bilateral exchange rate (1 USD = E Domestic currency unit) is represented in the maps, expressed as percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations.

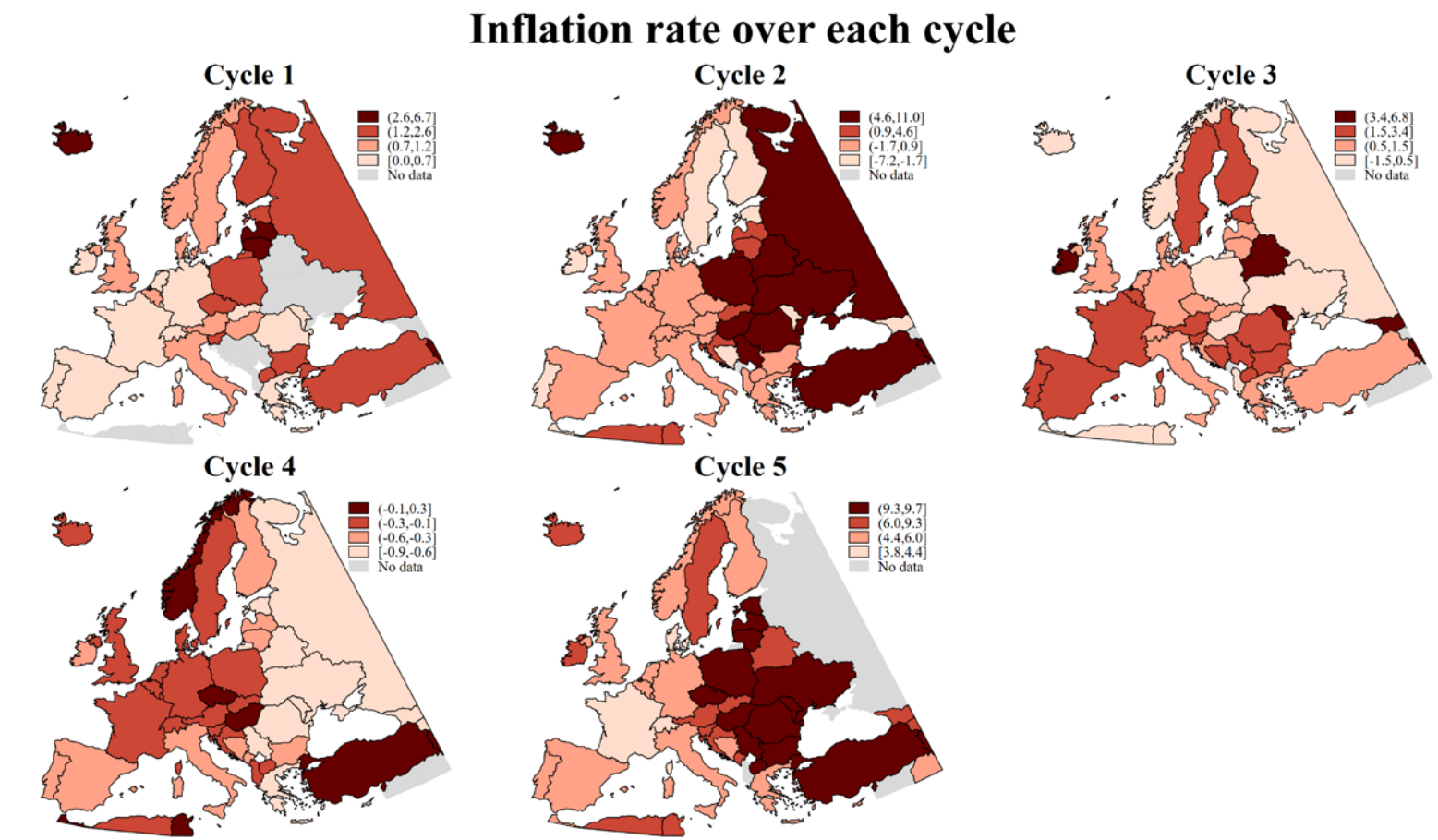

Figure 7. Maps for the inflation rates

The variation over each cycle of consumer price inflation is represented in the maps, expressed as a percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations.

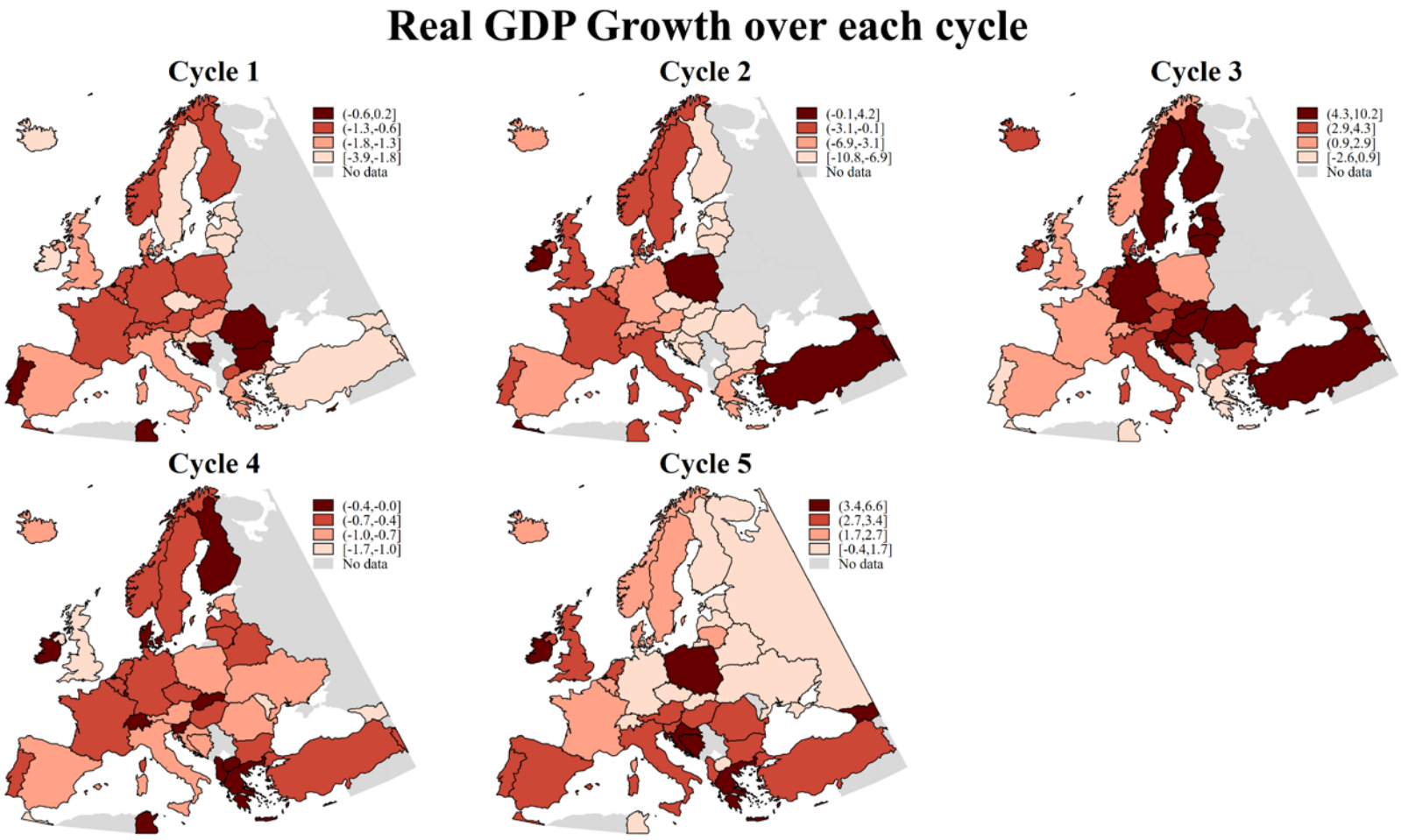

Figure 8. Maps for the growth rates

The variation over each cycle of real GDP growth is represented in the maps, expressed as a percentage per year. The 21 CESEE countries are observed during the 5 monetary cycles, thus each country appears 5 times for a total of 105 possible observations. Data is available until July 2022.

3.2. Methodology

Our methodology is based on the contributions of Mishra et al. (2014), Ahmed et al. (2017), and Aizenman et al. (2024). We will regress our set of six independent variables on *ex-ante* values of several dependent variables. These dependent variables are observed the year before ECB monetary cycles. The rationale behind this choice is to capture the fundamentals and institutional features that could explain cross-country differences in resilience in the wake of an external shock. In particular, for the CESEE countries, ECB's decision to start a monetary cycle is an external shock that may have important spillover effects on the rest of Europe. The possible set of fundamentals and institutional characteristics that could explain why some CESEE countries are more resilient than others is large. We focus on the most common variables in the literature, without claiming uniqueness. In addition, we are constrained by data availability in some instances. This analysis can be expanded when new data will be available.

In the first step, we will run five cross-sectional regressions for each independent variable. The objective is to determine what are the dependent variables that explain the cross-country differences in resilience. Ultimately, this will help us to formulate policy recommendations, as future ECB monetary cycles will put to the test once again the resilience of CESEE countries. The baseline equation can be written as follows:

$$\Delta Y_i = c + \sum_j \alpha_j X_{i,j} + \sum_l \beta_l Z_{i,l} + \varepsilon_i$$

where *i*, denotes each particular countries; *Y*, stands for change in one of the six dependent variables over the ECB monetary cycles (the bilateral exchange rate against the US dollar, the long-term term interest rate on government bonds, the stocks prices, CPI inflation, Real GDP growth, and the coefficient of variation of growth); *X*, stands for macroeconomic fundamentals observed the year before the cycle (the current account balance, the international reserves, the net international investment position, the government net lending, the general government gross debt, the share of fuel trade in total trade, the financial development index (Svirydzenka, 2016), the *de jure* financial openness (Chinn and Ito, 2006), the exchange rate stability index (Aizenman et al, 2009)); and *Z*, stand for institutional variables observed the year before the cycle (the Central Bank independence index (Romelli, 2022), the institutional score index (ICRG, PRS group), and the inflation targeting status).

Following Aizenman et al. (2024), we stack our five cross-sections to build pseudo-panel regressions for our six independent variables to investigate the asymmetries during tightening and easing cycles. We can write the model as follows:

$$\Delta Y_{it} = c + \sum_j \alpha_j X_{it-1,j} + \sum_l \beta_l Z_{it-1,l} + tight_{it} + shadow_{it} + \varepsilon_{it}$$

where *tight*, is a dummy variable for ECB tightening cycles; *shadow*, stands for the Wu-Xia Shadow Federal Funds Rate. The interaction terms with the tightening dummies will allow us to determine which dependent variable increases resilience during tightening cycles. In addition, it is important to control for the US monetary policy cycles, as ECB and FED cycles are not fully synchronized (Figure 9).[9]

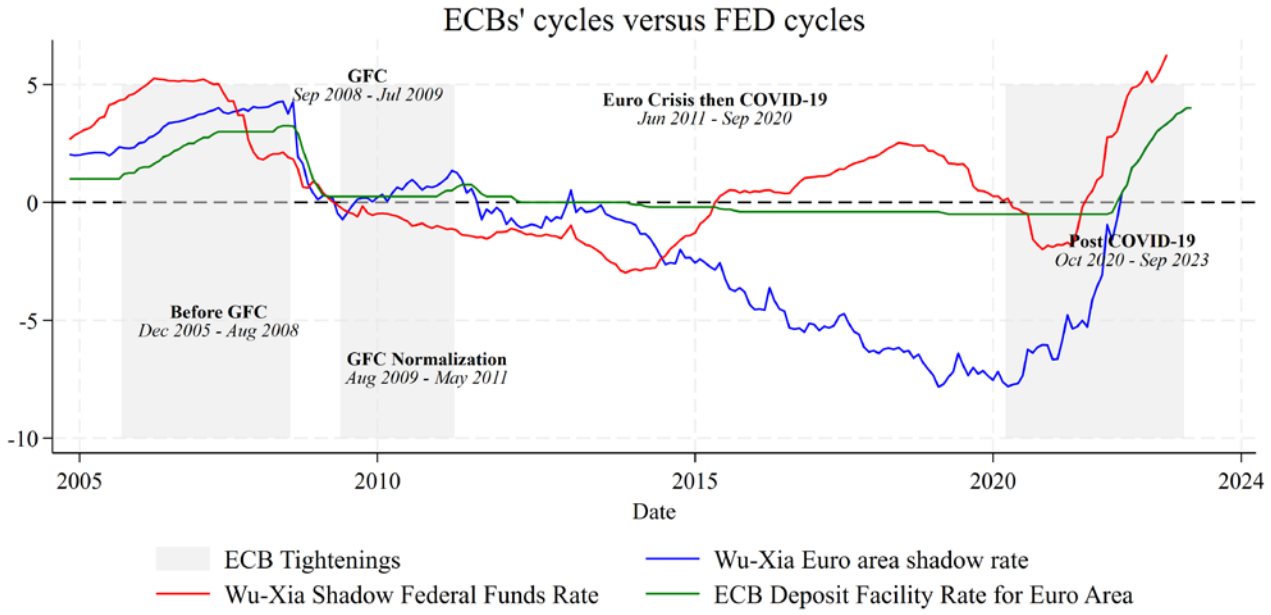

Figure 9. ECB versus FED cycles 2005-2023

4. Empirical results

4.1. Cross-sectional regressions

The set of fundamental variables observed before each ECB monetary cycle include the current account balance as a percent of GDP, the reserve-to-GDP ratio, the net international investment position as a percent of GDP, the government net lending as a percent of GDP, the general government gross debt as a percent of GDP, the share of fuel export on total exports, the share of fuel import on total imports, the aggregate financial development index (Svirydzenka, 2016), the Chinn-Ito index for de *jure* financial openness (Chinn and Ito, 2008), the exchange rate stability index (Aizenman et al, 2009), the Central Bank independence index (Romelli, 2022), the institutional score index mentioned in the introduction, and two dummy variables, one for the inflation targeting status and another one for the CESEE group. To ease the reading, we only report the significant coefficients in the following tables.[10]

[9] The Wu-Xia Shadow Federal Funds Rate may be viewed as a proxy of the elastic supply of dollar swap line by the FED to the ECB at the peak of the GFC and the Euro crisis, Bahaj and Reis (2018).

[10] In the cross-sectional regressions, the residuals are normal at the conventional level of significance. Furthermore, the variance inflated factors (VIF) indicate that the variables are moderately correlated. The complete regressions tables can be found in the on-line appendix.

In Tables 3 to 8, we will present the results of the cross-sectional regressions for our six measures of resilience, namely the bilateral exchange rates, the long-term interest rates on government bonds, the stock prices, the inflation rates, the growth rate, and its coefficient of variation.

First, we focus on ***exchange rates*** in Table 3. The green cells report the negative significant coefficients, as they indicate that an increase in the variable will produce an appreciation of the exchange rate during the next cycles. The orange cells report the positive significant coefficients, as they indicate an increase in the variable will produce a depreciation of the exchange rate during the next cycles.[11] As in Ahmed et al. (2023) and Aizenman et al. (2024), the buffer effect of international reserves is confirmed for the exchange rate during easing, rather than during tightenings. This notable difference in the behavior of exchange rates between ECB and Fed monetary cycles. Differences in consumer price inflation are a robust predictor of exchange rate depreciation during the next cycle. This last result is in line with the purchasing power parity hypothesis (PPP), where exchange rate depreciation reflects the price differential over the medium-run.

Rose (2020) explained the success of inflation-targeting regimes by their performance and resilience in the face of external shocks, especially when compared to rigid exchange rate regimes. In the CESEE country group, inflation targeters performed differently in three cycles out of five, the first two tightening cycles. This result of a possible "buffer effect" of inflation targeting is not found in the rest of our cross-sections of countries. In contrast, higher values in the exchange rate stability index (i.e., more rigid exchange rate regimes) is associated with depreciations during the first two tightening cycles, but with appreciation during the first easing cycle.

Another interesting finding is that institutional quality explains cross-sectional performance differences during the first two tightening episodes, especially in the CESEE group. After the euro crisis, two groups of countries in terms of institutional quality have emerged. As we can see in Figure 2, some CESEE countries have converged to form a first cluster of countries with relatively high institutional quality, above 70, and some other CESEE countries have formed a more heterogeneous second group with a lower score of institutional quality, below 70.

This may explain why institutional quality scores have been progressively replaced by the financial development index as a predictor of exchange rate depreciation during the next monetary cycle. During the last cycle, the post-pandemic tightening cycle, the interaction terms with the CESEE is no longer significant. This may reflect the dollar dominance, demonstrated by Rey's VAR analysis (2016), a force that has been particularly strong during this period.

[11] Throughout the tables the minimum level of significance is the 5 percent level.

Table 3. Cross-sectional regressions for the exchange rates

	Before GFC Tightening I Dec 2005 - Aug 2008	GFC Easing I Sep 2008 - Jul 2009	After GFC Tightening II Aug 2009 - May 2011	Euro crisis Easing II Jun 2011 - Sep 2020	Post-COVID Tightening III Oct 2020 - Sep 2023
Current Account Balance			0.51		
Reserves-to-GDP ratio	0.14	-0.16		-0.60	
Net International Investment Position				0.11	
Gov. Net Lending					
General Gov. Gross Debt			0.08		
Consumer Price Inflation	0.40			5.04	1.12
Fuel Export on Total Exports			-0.12		
Fuel Import on Total Imports	0.35				
Chinn-Ito index, normalized	-0.07	0.12		-0.28	
Inflation Targeters	12.07				
Financial development index			-0.16	-0.51	0.10
Exchange Rate Stability Index	0.07	-0.09	0.09		0.13
Central Bank Independence					
Institutional score	-0.07		-0.40		
Chinn-Ito index # CESEE		-0.25			
Inflation Targeters # CESEE	-11.28	11.30	-10.24		
Financial Development index # CESEE				1.28	
Central Bank Independence # CESEE		-0.38			
Institutional score # CESEE	-0.07	0.72			
Number of countries	71	80	80	77	74
Mean of the dependent variable	-11.08	14.69	-21.35	46.84	-0.99

The explained variable is the variation over the cycle of the year-on-year growth rate of the bilateral exchange rate (1 USD = E Domestic currency unit).

Second, we now focus on the ***long-term interest rates*** in Table 4. The green cells report the negative significant coefficients, as they indicate that an increase in the variable will produce a decrease in long-term interest rates on government bonds during the next cycles. The orange cells report the positive significant coefficients, indicating an increase in long-term interest rates on government bonds during the next cycles. The results of the cross-sectional regressions for the interest rates reveal that the current account balance and the reserve-to-GDP ratio have contributed to lower long-term interest rates during three cycles out of five. Consumer price inflation is associated with higher interest rates during the first easing and third tightening cycle, but with lower interest rates during the first tightening cycle.

Higher values of financial development and *de jure* capital account openness (Chinn-Ito index), observed one year before the cycles, contribute to lower interest rates in four cycles, especially in CESEE countries. More independent Central Banks are associated with higher interest rates during the easing cycles. Countries with better institutional scores before the first cycle have known lower interest rates in the following cycle. However, this reduction in interest rates was significantly lower in CESEE countries. During the next cycles, better institutional score was associated with higher interest rates. We already mentioned that institutional quality heterogeneity has been reduced after the start of the euro crisis. In turn, the significance of this variable is lower in the two last cycles.

Table 4. Cross-sectional regressions for the interest rate

	Before GFC Tightening I Dec 2005 - Aug 2008	GFC Easing I Sep 2008 - Jul 2009	After GFC Tightening II Aug 2009 - May 2011	Euro crisis Easing II Jun 2011 - Sep 2020	Post-COVID Tightening III Oct 2020 - Sep 2023
Current Account Balance	-0.03			0.15	
Reserves-to-GDP ratio			-0.06		-0.02
General Gov. Gross Debt	-0.003	0.01			
Consumer Price Inflation	-0.21	0.25			0.26
Fuel Export on Total Exports		0.01			
Fuel Import on Total Imports					-0.04
Chinn-Ito index, normalized				-0.02	0.02
Inflation Targeters					
Financial development index		0.01			
Exchange Rate Stability Index					
Central Bank Independence	0.02			-0.03	
Institutional score	-0.04	0.03			
Chinn-Ito index, normalized # CESEE			-0.02	0.06	-0.02
Inflation Targeters # CESEE	-0.65			2.73	
Financial development index # CESEE	-0.04	-0.05			
Central Bank Independence # CESEE	-0.08	0.04		0.23	
Institutional score # CESEE	0.10		0.17		
Number of countries	37	38	38	38	40
Mean of the dependent variable	0.89	0.22	-0.56	-3.7	3.2

The explained variable is the variation of the long-term interest rate over the cycle.

Overall, the buffer effects of international reserves are more significant during the last tightening cycles. An additional 10 percentage points of international reserves imply that long-term interest rates (on government bonds maturing in ten years) will be lower by around 2 percent in our cross-section of countries. The results are similar during the second tightening cycle, albeit the buffer effect is stronger. Maintaining a large stock of international reserves and limiting current account deficits allows for preserving some fiscal space during the incoming tightening cycles.

Third, we now turn to the results of the cross-sectional regressions for the ***stock prices*** in Table 5. The green cells report the positive significant coefficients, as they indicate that an improvement in the variable is associated with higher stock prices during the next cycles. The orange cells report the negative significant coefficients, indicating a decrease in the stock prices during the next cycles. During the three monetary cycles, the current account balance is a strong predictor of the cross-sectional performance during the next monetary cycle. These positive coefficients indicate that limiting the current account deficit contributes to a better stock market performance in future cycles. Similarly, limiting the level of public debts has contributed to better performance during the first two cycles. During the first easing, due to the GFC, and the first tightening, inflation targeters performed better. This superior performance of inflation targeters seems to have been driven by the CESEE country group.

Table 5. Cross-sectional regressions for the stock prices

	Before GFC Tightening I Dec 2005 - Aug 2008	GFC Easing I Sep 2008 - Jul 2009	After GFC Tightening II Aug 2009 - May 2011	Euro crisis Easing II Jun 2011 - Sep 2020	Post-COVID Tightening III Oct 2020 - Sep 2023
Current Account Balance		1.30	0.60	4.45	
Reserves-to-GDP ratio	0.87				
General Gov. Gross Debt	-0.23	-0.23			
Consumer Price Inflation			2.44		6.07
Fuel Export on Total Exports					
Fuel Import on Total Imports					
Chinn-Ito index, normalized					
Inflation Targeters			15.08		
Financial development index					
Exchange Rate Stability Index					
Central Bank Independence		-0.24		-1.05	
Institutional score		-1.33			
Chinn-Ito index, normalized # CESEE	-0.36				1.26
Inflation Targeters # CESEE		26.62			
Financial development index # CESEE	1.29	-0.51		-1.58	2.12
Central Bank Independence # CESEE				1.10	
Institutional score # CESEE	-0.47				-2.25
Number of countries	43	45	45	45	45
Mean of the dependent variable	-53.65	-21.8	19.72	31.88	38.77

The explained variable is the variation of the stock price index over the cycle, expressed as percentage.

During tightening cycles, higher financial development has a positive effect on the stock market performance, especially in CESEE countries. However, financial development is associated with inferior performance during easing cycles. This asymmetry can be understood through the lens of the contagion. Indeed, the ECB easing cycles accommodated the elevated financial stress following the US monetary policy stance with a lag (a one-year lag for the easing cycle started after the GFC, and a six-month lag for the tightening cycle that started after the end of the pandemics, for example). These lags may create elevated levels of tensions in the financial markets. Finally, while more independent central banks are not particularly rewarded by the stock markets, higher institutional scores are associated with inferior performance during the next cycles in three cycles out of five.

Fourth, we now turn to the results of the cross-sectional regressions for the ***inflation rates*** in Table 6. The green cells report the negative significant coefficients, indicating that an increase in the variable is associated with a decrease in the inflation rates during the next cycles. The orange cells report the positive significant coefficients, indicating an increase in the inflation rates during the next cycles. During the two last tightening cycles, inflation observed the year before the cycle is associated with higher inflation in the next cycles. Energy exporters experience higher inflation during the two easing cycles. Inflation targeters performed well during the post-GFC tightening cycle but showed less resilience during the two easing cycles surrounding the GFC.

Table 6. Cross-sectional regressions for the inflation rates

	Before GFC Tightening I Dec 2005 - Aug 2008	GFC Easing I Sep 2008 - Jul 2009	After GFC Tightening II Aug 2009 - May 2011	Euro crisis Easing II Jun 2011 - Sep 2020	Post-COVID Tightening III Oct 2020 - Sep 2023
Current Account Balance					-0.26
Reserves-to-GDP ratio					
General Gov. Gross Debt			-0.03	0.02	
Consumer Price Inflation			0.20		1.18
Fuel Export on Total Exports		0.04	-0.04	0.03	
Fuel Import on Total Imports					
Chinn-Ito index, normalized		-0.04			
Inflation Targeters		1.89	-2.50	2.28	
Financial development index	-0.09				
Exchange Rate Stability Index					
Central Bank Independence	-0.11	-0.15			
Institutional score				0.08	
Chinn-Ito index, normalized # CESEE	0.04				0.06
Inflation Targeters # CESEE					
Financial development index # CESEE	0.20		-0.06	0.16	-0.13
Central Bank Independence # CESEE	0.25			0.13	
Institutional score # CESEE	-0.40	0.19		-0.22	0.20
Number of countries	53	78	77	96	87
Mean of the dependent variable	4.64	1.56	2.94	-2.83	19.34

The explained variable is the variation over the cycle of consumer price inflation, expressed as a percentage.

During the two first cycles, financial development and central bank independence were associated with lower inflation for the full sample. In the CESEE country group, a higher financial development limits inflation, especially during the last two tightening cycles. However, central bank independence is associated with higher inflation in the CESEE countries. Better institutional scores help to contain inflation during the first tightening and the second easing cycle, but are associated with higher inflation during the GFC cycle and the post-pandemic cycle.

Five, we now turn to the results of the cross-sectional regressions for the ***growth rates*** in Table 7. The green cells reflect positive significant coefficients, indicating that an increase in the variable is associated with higher growth rates during the next monetary cycles. The orange cells report the negative significant coefficients, indicating that an increase in the variable is associated with a decrease in the growth rates during the next monetary cycles. Financial development is associated with lower growth rates during the first and the last tightening cycle. Institutional development is associated with higher growth during the post-COVID tightening cycle.

Table 7. Cross-sectional regressions for the growth rates

	Before GFC Tightening I Dec 2005 - Aug 2008	GFC Easing I Sep 2008 - Jul 2009	After GFC Tightening II Aug 2009 - May 2011	Euro crisis Easing II Jun 2011 - Sep 2020	Post-COVID Tightening III Oct 2020 - Sep 2023
Current Account Balance					
Reserves-to-GDP ratio				-0.04	
General Gov. Gross Debt					
Consumer Price Inflation					-0.47
Fuel Export on Total Exports					
Fuel Import on Total Imports			-0.11		
Chinn-Ito index, normalized		-0.04			
Inflation Targeters					
Financial development index	-0.05				-0.08
Exchange Rate Stability Index					
Central Bank Independence					
Institutional score					0.14
Chinn-Ito index, normalized # CESEE		-0.05	0.18	0.02	
Inflation Targeters # CESEE		3.64			
Financial development index # CESEE					0.29
Central Bank Independence # CESEE	-0.28	0.09	0.34		
Institutional score # CESEE	0.33		-0.47		
Number of countries	61	68	71	80	76
Mean of the dependent variable	-3.57	-2.97	5.08	-6.95	7.36

The explained variable is the variation over the cycle of real GDP growth, expressed as a percentage

Overall, countries with better financial openness, more independent central banks, and more developed financial systems[12], and better institution scores have experienced higher growth rates during these monetary cycles in the CESEE country group. This is in line with the recent evidence showing that better institutions help to navigate through the cycles. In this respect, the case of Turkey and Poland during the GFC is interesting. Turkey and Poland are the only countries in the CESEE group that do not experience negative growth during the GFC. To some extent and at that time, these two countries were similar if we look at the level of international reserves (between 10 and 20 percent of GDP), public debt (40% of GDP), financial development, energy imports, financial development, and central bank independence. There have also important differences in terms of inflation and institutional scores.[13]

[12] Notably, the Financial development index (Svirydzenka, 2016) includes the financial institution index.
[13] The on-line appendix presents the correlations of our six independent variables and the ex-ante fundamentals during each cycle for the CESEE countries.

Table 8. Cross-sectional regressions for the growth rates' coefficient of variation

	Tightening I Dec 2005 - Aug 2008	Easing I Sep 2008 - Jul 2009	Tightening II Aug 2009 - May 2011	Easing II Jun 2011 - Sep 2020	Tightening III Oct 2020 - Sep 2023
Current Account Balance					
Reserves-to-GDP ratio	0.04		0.01		-0.01
General Gov. Gross Debt		0.01	0.03		
Consumer Price Inflation	0.13	0.11			
Fuel Export on Total Exports				-0.04	
Fuel Import on Total Imports	0.09				
Chinn-Ito index, normalized	-0.02	-0.01			
Inflation Targeters					
Financial development index	-0.02		-0.02	-0.07	-0.01
Exchange Rate Stability Index					
Central Bank Independence	0.02		0.05		
Institutional score		0.04			
Chinn-Ito index, normalized # CESEE					-0.02
Inflation Targeters # CESEE		-1.46		1.95	
Financial development index # CESEE		-0.04		0.09	0.05
Central Bank Independence # CESEE				0.08	
Institutional score # CESEE			-0.06	-0.16	
Number of countries	61	67	70	79	75
Mean of the dependent variable	3.78	1.69	2.43	7.69	2.82

The explained variable is the variation over the cycle of the real GDP growth's coefficient of variation (computed as the ratio between the standard error and the mean).

Six, and finally, we now turn to the results of the cross-sectional regressions for the ***growth rates' coefficient of variation*** in Table 8. The green cells report the negative significant coefficients, indicating that a higher variable is associated with a reduction in the growth rate's coefficient of variation during the next monetary cycles. The orange cells report the positive significant coefficients, as indicating an increase in the coefficient of variation during the next monetary cycles. Higher rates of inflation and higher public debt are associated with higher growth rates' coefficient of variation during the first monetary cycles.

A striking result is that both financial openness and financial development allow a country to navigate through the cycles by reducing real GDP growth volatility. In the CESEE country group, these effects are confirmed for financial openness, but less significant financial development for the CESEE country group during the last two cycles. Last but not least, better institution scores are associated with less volatile growth in the CESEE countries.

4.2. Panel regressions

Table 9. Pseudo-panel regressions for exchange rates

	1		2		3	
Tightening cycle dummy	-36.139	***				
	(1.516)					
Reserves-to-GDP ratio	-0.065		-0.036		-0.075	
	(0.036)		(0.049)		(0.038)	
Net International Investment Position	0.015	**	-0.011		0.025	***
	(0.007)		(0.009)		(0.007)	
Gov. Net Lending	-0.292	***	-0.415	**	0.137	
	(0.110)		(0.198)		(0.189)	
Wu-Xia Shadow Federal Funds Rate	2.944	***	2.945	***	2.945	***
	(0.221)		(0.224)		(0.224)	
Consumer Price Inflation	0.263	**	0.282	**	0.282	**
	(0.133)		(0.130)		(0.130)	
Fuel Export on Total Exports	0.051		0.093		0.001	
	(0.034)		(0.066)		(0.037)	
Central Bank Independence	-0.072		0.203	***	-0.246	***
	(0.037)		(0.042)		(0.039)	
Reserves-to-GDP ratio # Tightening cycle dummy			-0.039			
			(0.055)			
Net International Investment Position # Tightening cycle dummy			0.036	***		
			(0.011)			
Gov. Net Lending # Tightening cycle dummy			0.552	**		
			(0.279)			
Fuel Export on Total Exports # Tightening cycle dummy			-0.092			
			(0.074)			
Central Bank Independence # Tightening cycle dummy			-0.449	***		
			(0.023)			
Reserves-to-GDP ratio # Easing cycle dummy					0.039	
					(0.055)	
Net International Investment Position # Easing cycle dummy					-0.036	***
					(0.011)	
Gov. Net Lending # Easing cycle dummy					-0.552	**
					(0.279)	
Fuel Export on Total Exports # Easing cycle dummy					0.092	
					(0.074)	
Central Bank Independence # Easing cycle dummy					0.449	***
					(0.023)	
Intercept	21.271	***	-0.823		-0.823	
	(3.597)		(3.568)		(3.568)	
Number of observations	351		351		351	
R-squared	0.68		0.68		0.68	
RMSE	10.68		10.76		10.76	
AIC	2667.76		2676.87		2676.87	

The explained variable is the variation over the cycles of the year-on-year growth rate of the bilateral exchange rate (1 USD = E Domestic currency unit), expressed as a percentage. We use backward selection in all the models. Robust SE in parenthesis. ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

As recalled in the data section in Figure 6, we find that the exchange rate appreciates during tightening cycles, in line with the results in Table 9. As in Table 3, in the cross-sectional regressions for the exchange rates, we find that inflation is significantly associated with depreciation. The Wu-Xia shadow rate for the US is significant at the one percent level. When the US shadow rate increases by 1 pp, we find that the bilateral exchange depreciates by 3 pp. When the US rates increase, the investors reallocate funds to the US, and the exchange rate in emerging markets tends to depreciate. Once we

consider the panel, the central bank independence has an asymmetrical effect. Greater central bank independence significantly limits depreciation during tightening cycles.

Table 10. Pseudo-panel regressions for interest rates

	1		2		3	
Current Account Balance	-0.112	***	-0.154	***	-0.021	
	(0.026)		(0.030)		(0.022)	
Reserves-to-GDP ratio	-0.018	**	-0.014	**	-0.014	**
	(0.007)		(0.007)		(0.007)	
Net International Investment Position	0.002		0.002		0.002	
	(0.001)		(0.001)		(0.001)	
Gov. Net Lending	0.214	***	0.267	***	0.016	
	(0.031)		(0.054)		(0.037)	
Tightening cycle dummy	1.383	***				
	(0.255)					
Wu-Xia Shadow Federal Funds Rate	0.539	***	0.517	***	0.517	***
	(0.037)		(0.030)		(0.030)	
Fuel Export on Total Exports	-0.027	***	-0.033	**	-0.009	
	(0.008)		(0.015)		(0.008)	
Fuel Import on Total Imports	-0.045	***	-0.088	***	-0.016	
	(0.016)		(0.025)		(0.014)	
Institutional Score	-0.039	**	-0.017		-0.017	
	(0.018)		(0.018)		(0.018)	
Financial Development Index	0.009		0.003		0.003	
	(0.006)		(0.005)		(0.005)	
Current Account Balance # Tightening cycle dummy			0.133	***		
			(0.036)			
Gov. Net Lending # Tightening cycle dummy			-0.251	***		
			(0.061)			
Fuel Export on Total Exports # Tightening cycle dummy			0.024			
			(0.016)			
Fuel Import on Total Imports # Tightening cycle dummy			0.072	***		
			(0.021)			
Current Account Balance # Easing cycle dummy					-0.133	***
					(0.036)	
Gov. Net Lending # Easing cycle dummy					0.251	***
					(0.061)	
Fuel Export on Total Exports # Easing cycle dummy					-0.024	
					(0.016)	
Fuel Import on Total Imports # Easing cycle dummy					-0.072	***
					(0.021)	
Intercept	2.287		1.597		1.597	
	(1.402)		(1.389)		(1.389)	
Number of observations	186		186		186	
R-squared	0.71		0.76		0.76	
RMSE	1.39		1.29		1.29	
AIC	661.01		636.46		636.46	

The explained variable is the variation over the cycles of the interest rates. We use backward selection in all the models. Robust SE in parenthesis. . ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

In Table 10, we find that the buffer effect of international reserves on interest rates is similar to what we find in Table 4. An additional 10 percentage points of international reserves imply that long-term interest rates on government bonds maturing in ten years will be lower by around 1.5 to 2 percent in our cross-section of countries. In addition, a higher US shadow rate is associated with higher interest rates on government bonds. Fuel exports and imports are associated with lower interest rates.

Table 11. Pseudo-panel regressions for stock prices

	1		2		3	
Current Account Balance	3.235	***	4.404	***	1.796	
	(0.611)		(0.599)		(0.983)	
Tightening cycle dummy	-14.103	**				
	(6.129)					
Net International Investment Position	-0.099	**	-0.173	***	-0.024	
	(0.046)		(0.039)		(0.064)	
Gov. Net Lending	-1.927	***	-1.745	***	-1.745	***
	(0.584)		(0.601)		(0.601)	
Wu-Xia Shadow Federal Funds Rate	4.890	***	4.877	***	4.877	***
	(1.198)		(1.280)		(1.280)	
Consumer Price Inflation	4.546	***	4.287	***	4.287	***
	(1.372)		(1.541)		(1.541)	
Inflation Targeters	17.889	***	19.791	**	15.782	**
	(5.759)		(7.770)		(7.601)	
Fuel Import on Total Imports	1.378	***	1.348	***	1.348	***
	(0.429)		(0.432)		(0.432)	
Chinn-Ito index, normalized	0.341	***	0.326	***	0.326	***
	(0.105)		(0.109)		(0.109)	
Financial Development Index			0.110		-0.025	
			(0.177)		(0.177)	
Current Account Balance # Tightening cycle dummy			-2.609	**		
			(1.080)			
Net International Investment Position # Tightening cycle dummy			0.150	**		
			(0.074)			
Inflation Targeters # Tightening cycle dummy			-4.009			
			(10.481)			
Financial Development Index # Tightening cycle dummy			-0.135			
			(0.107)			
Current Account Balance # Easing cycle dummy					2.609	**
					(1.080)	
Net International Investment Position # Easing cycle dummy					-0.150	**
					(0.074)	
Inflation Targeters # Easing cycle dummy					4.009	
					(10.481)	
Financial Development Index # Easing cycle dummy					0.135	
					(0.107)	
Intercept	-67.424	***	-74.832	***	-74.832	***
	(13.976)		(18.688)		(18.688)	
Number of observations	218		218		218	
R-squared	0.22		0.24		0.24	
RMSE	40.52		40.49		40.49	
AIC	2242.45		2245.90		2245.90	

The explained variable is the variation of the stock price index over the cycle, expressed as a percentage. We use backward selection in all the models. Robust SE in parenthesis. . ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

As for the cross-sectional regressions for stock prices in Table 5, we find a greater inflation resilience during the cycles in Table 11. The US shadow rate is positively associated with stock prices. In line with the cross-sectional regressions, inflation targeters countries have experienced better resilience. A higher share of fuel imports is associated with better stock prices.

Table 12. Pseudo-panel regressions for inflation

	1		2		3	
CESEE	1.540	**	0.200		2.748	***
	(0.706)		(0.870)		(1.010)	
Reserves-to-GDP ratio	-0.019		-0.053	***	0.011	
	(0.015)		(0.015)		(0.025)	
Tightening cycle dummy	3.620	***				
	(0.576)					
Gov. Net Lending	0.109	**	0.217	***	-0.019	
	(0.047)		(0.077)		(0.081)	
Wu-Xia Shadow Federal Funds Rate	2.472	***	2.542	***	2.542	***
	(0.135)		(0.137)		(0.137)	
Consumer Price Inflation	0.235	**	0.255	**	0.255	**
	(0.108)		(0.110)		(0.110)	
Inflation Targeters	0.996		1.221	**	0.741	
	(0.512)		(0.610)		(0.747)	
Financial Development Index	-0.020		-0.027		-0.007	
	(0.014)		(0.015)		(0.016)	
Reserves-to-GDP ratio # Tightening cycle dummy			0.064	**		
			(0.028)			
Gov. Net Lending # Tightening cycle dummy			-0.236	**		
			(0.111)			
Inflation Targeters # Tightening cycle dummy			-0.480			
			(0.945)			
Financial Development Index # Tightening cycle dummy			0.020			
			(0.012)			
CESEE # Tightening cycle dummy			2.548	**		
			(1.292)			
Reserves-to-GDP ratio # Easing cycle dummy					-0.064	**
					(0.028)	
Gov. Net Lending # Easing cycle dummy					0.236	**
					(0.111)	
Inflation Targeters # Easing cycle dummy					0.480	
					(0.945)	
Financial Development Index # Easing cycle dummy					-0.020	
					(0.012)	
CESEE # Easing cycle dummy					-2.548	**
					(1.292)	
Intercept	-1.022		0.549		0.549	
	(1.204)		(1.270)		(1.270)	
Number of observations	347		347		347	
R-squared	0.74		0.73		0.73	
RMSE	4.73		4.78		4.78	
AIC	2071.76		2082.67		2082.67	

The explained variable is the variation over the cycle of consumer price inflation, expressed as a percentage. We use backward selection in all the models. Robust SE in parenthesis. . ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

In Table 12, the tightening cycle dummy indicates that inflation is higher during ECB tightening cycles, as shown in Figure 7. The US shadow rate is significant and positively associated with inflation. We also find that higher consumer price inflation before entering the cycle is associated with higher inflation during the cycle. in line with the results of Table 6, revealing a degree of state dependencies. CESEE economies tend to have higher inflation, especially during ECB tightening cycles.

Table 13. Pseudo-panel regressions for growth

	1		2		3	
Inflation Targeters	1.017		-0.038		1.710	
	(0.648)		(0.819)		(0.897)	
Financial Development Index	0.043	***	0.029		0.056	***
	(0.014)		(0.016)		(0.017)	
Wu-Xia Shadow Federal Funds Rate	0.692	***	0.812	***	0.812	***
	(0.122)		(0.126)		(0.126)	
Tightening cycle dummy	6.678	***				
	(0.653)					
Central Bank Independence	0.035		0.037		0.037	
	(0.022)		(0.024)		(0.024)	
Consumer Price Inflation	0.444	***	0.477	***	0.477	***
	(0.122)		(0.123)		(0.123)	
Fuel Export on Total Exports	-0.027		-0.051	**	-0.016	
	(0.017)		(0.021)		(0.023)	
Fuel Import on Total Imports	0.108	***	-0.020		0.207	***
	(0.041)		(0.052)		(0.053)	
Chinn-Ito index, normalized	0.017		0.018		0.018	
	(0.011)		(0.012)		(0.012)	
Fuel Export on Total Exports # Tightening cycle dummy			0.035			
			(0.028)			
Fuel Import on Total Imports # Tightening cycle dummy			0.228	***		
			(0.057)			
Inflation Targeters # Tightening cycle dummy			1.749			
			(1.092)			
Financial Development Index # Tightening cycle dummy			0.027			
			(0.017)			
Fuel Export on Total Exports # Easing cycle dummy					-0.035	
					(0.028)	
Fuel Import on Total Imports # Easing cycle dummy					-0.228	***
					(0.057)	
Inflation Targeters # Easing cycle dummy					-1.749	
					(1.092)	
Financial Development Index # Easing cycle dummy					-0.027	
					(0.017)	
Intercept	-14.486	***	-11.108	***	-11.108	***
	(2.398)		(2.541)		(2.541)	
Number of observations	339		339		339	
R-squared	0.44		0.42		0.42	
RMSE	5.29		5.41		5.41	
AIC	2101.55		2119.28		2119.28	

The explained variable is the variation over the cycle of real GDP growth, expressed as a percentage. We use backward selection in all the models. Robust SE in parenthesis. . ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

In Table 13, we find that growth is higher during ECB tightening cycles in line with Figure 8 during Cycles 3 and 5. The US shadow rate is significant and positively associated to the variation of the real GDP growth over the cycles. Financial Development is associated with higher growth rates, as reported in Table 7 for the CESEE economies. During tightening cycles, higher shares of fuel imports before tightening cycles are associated with increased growth rates.

Table 14. Pseudo-panel regressions for growth CV

	1		2		3	
Current Account Balance	0.041	**	0.040		0.013	
	(0.019)		(0.032)		(0.019)	
Reserves-to-GDP ratio	0.023	***	0.050	***	0.005	
	(0.008)		(0.013)		(0.006)	
Financial Development Index	-0.031	***	-0.031	***	-0.031	***
	(0.006)		(0.006)		(0.006)	
Gov. Net Lending	-0.183	***	-0.339	***	-0.015	
	(0.036)		(0.056)		(0.026)	
General Gov. Gross Debt	-0.006		-0.005		-0.006	**
	(0.004)		(0.006)		(0.003)	
Consumer Price Inflation	-0.056	**	-0.059	***	-0.059	***
	(0.022)		(0.021)		(0.021)	
Tightening cycle dummy	-1.625	***				
	(0.296)					
Current Account Balance # Tightening cycle dummy			-0.027			
			(0.036)			
Reserves-to-GDP ratio # Tightening cycle dummy			-0.045	***		
			(0.013)			
Gov. Net Lending # Tightening cycle dummy			0.324	***		
			(0.062)			
General Gov. Gross Debt # Tightening cycle dummy			-0.001			
			(0.006)			
Current Account Balance # Easing cycle dummy					0.027	
					(0.036)	
Reserves-to-GDP ratio # Easing cycle dummy					0.045	***
					(0.013)	
Gov. Net Lending # Easing cycle dummy					-0.324	***
					(0.062)	
General Gov. Gross Debt # Easing cycle dummy					0.001	
					(0.006)	
Intercept	6.105	***	5.098	***	5.098	***
	(0.529)		(0.464)		(0.464)	
Number of observations	363		363		363	
R-squared	0.26		0.31		0.31	
RMSE	2.42		2.34		2.34	
AIC	1679.25		1658.77		1658.77	

The explained variable is the variation over the cycle of the real GDP growth's coefficient of variation (computed as the ratio between the standard error and the mean). We use backward selection in all the models. Robust SE in parenthesis. Robust SE in parenthesis. . ***, ** indicates statistical significance at the 1, 5 percent level, respectively.

In Table 14, international reserves are associated with a higher coefficient of variation, in line with Table 8. The financial development index is associated with a lower coefficient of variation for growth. This result is significant at the one percent level in Table 15, and robust over the cycles.

4.3. Robustness checks

Panel FE. In the following, we explore the robustness of our results to the inclusion of fixed effects capturing unobservable time-invariant characteristics for each country in our pseudo-panel regressions. Some variables, like institutional variables, capture most of these time-variant features. The first robustness consists of adding fixed effects in the pseudo-panel regressions of Tables 9 to 14. For the sake of brevity, we focus on column 2 of each regression, commenting on the main differences between pooled OLS regressions and fixed effect regressions.

For the exchange rates and interest rates in Tables 9 and 10, we obtain similar results with fixed effects and pooled OLS regressions. For the stock prices in Table 11, we obtain slightly different results when we include fixed effects. The inflation rate and the government net lending are no longer significant. Importantly, better financial development is now associated with a higher stock market performance in the next cycles. We find some differences in inflation in Table 12. When fixed effects are included, the reserves-to-GDP ratio is insignificant, and the financial development times the tightening dummy becomes significant at the 1 percent level, and the CESEE dummy becomes insignificant. We also find very similar results with Table 13 for the real GDP growth. For the coefficient of variation of growth, the results are very similar to Table 14.

Quantile regressions. In Figures 10 to 15, we show quantile regressions for our six independent variables. In the following, we only focus for the sake of brevity on the interesting cases of asymmetry. In Figure 10, we can observe, in the last row and the last column, that better scores in central bank independence produce better resilience during the next tightening, especially for large depreciations. In Figure 11, we can see that the buffer effect of international reserves on the interest rate is significant for the lower percentiles of interest rate variation. In Figure 12, we do not detect significant asymmetries in the stock prices.

In Figure 13, we find that higher inflation becomes a bigger drag on resilience for countries that experience a higher increase in inflation during the cycle. This asymmetry is potentially important for policy makers, as it reminds the benefit of controlling inflation in the wake of ECB monetary spillovers. For the growth regression in Figure 14, we show that financial development may help to stabilize growth during the monetary cycles, especially for the lower percentiles of growth. Lastly, Figure 15 indicates that financial development may help to stabilize growth, especially when growth is highly dispersed during the next monetary cycles.

Quantile regressions with FE. In Appendix B, we show the results for the panel quantile regressions with fixed effects, following Canay (2011) and Besstremyannaya and Golovan (2019). Following Rios-Avila et al. (2024), we compute standard errors through bootstrapping in the Canay's estimator. The results are similar. We can note that better financial development improves growth and reduces its covariance during the next monetary cycles.

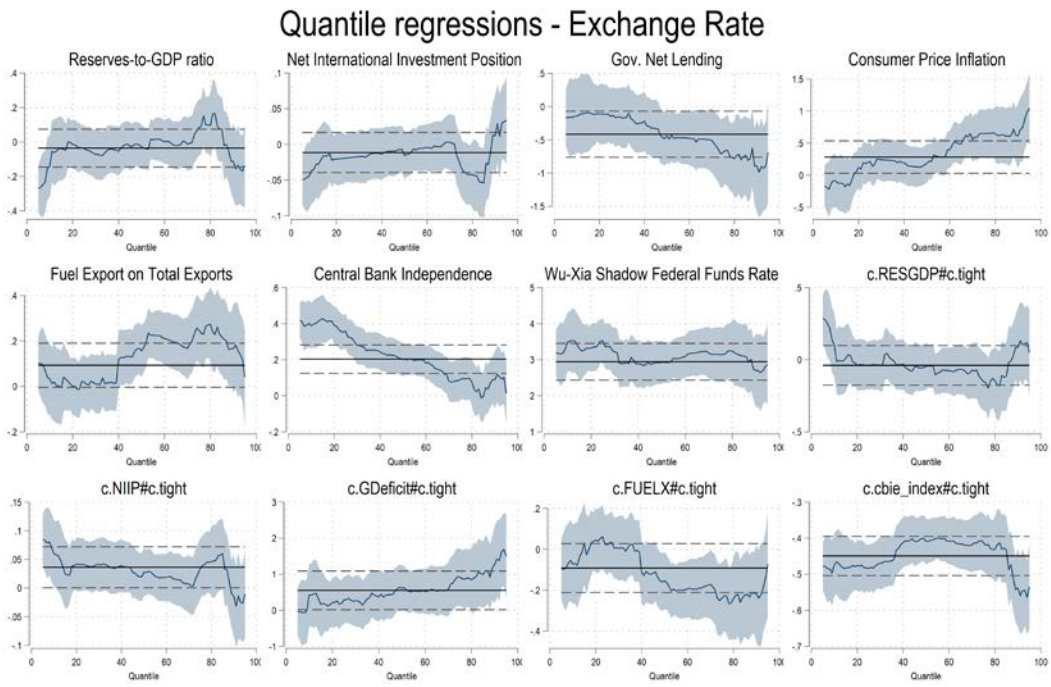

Figure 10. Quantile regressions for the exchange rates.

Source: authors' calculations.

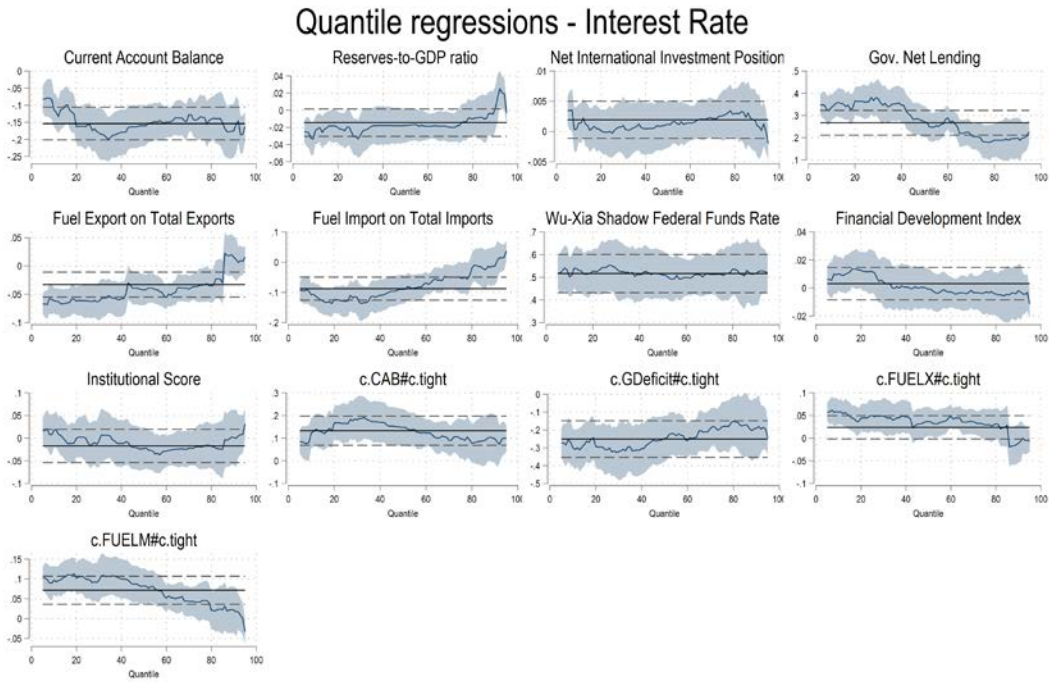

Figure 11. Quantile regressions for the interest rates.

Source: authors' calculations.

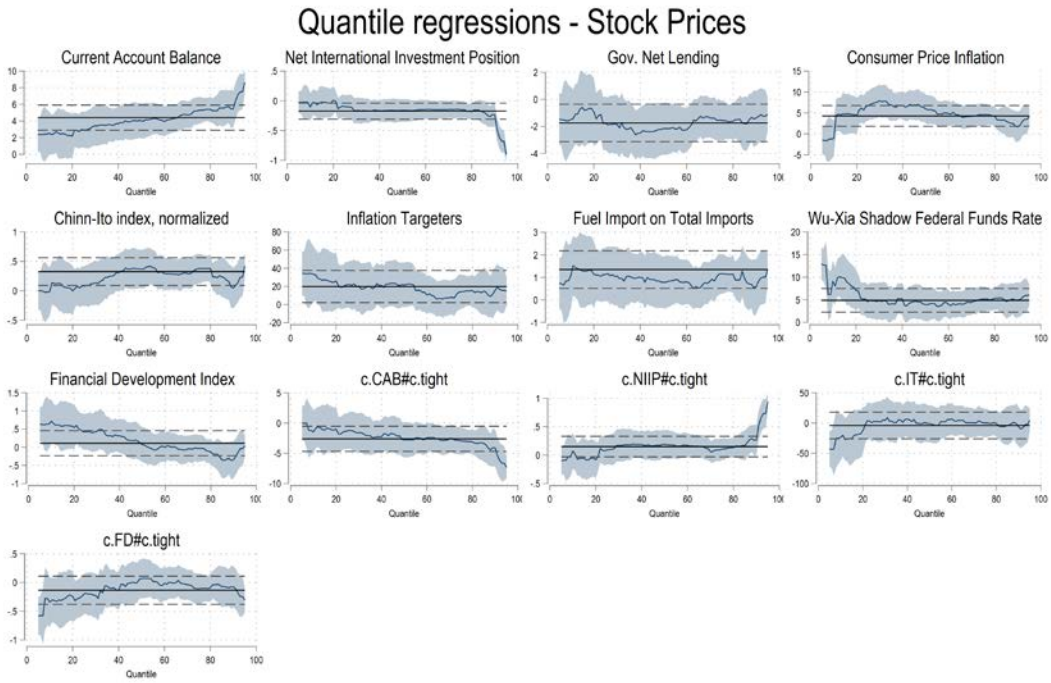

Figure 12. Quantile regressions for the stock prices.

Source: authors' calculations.

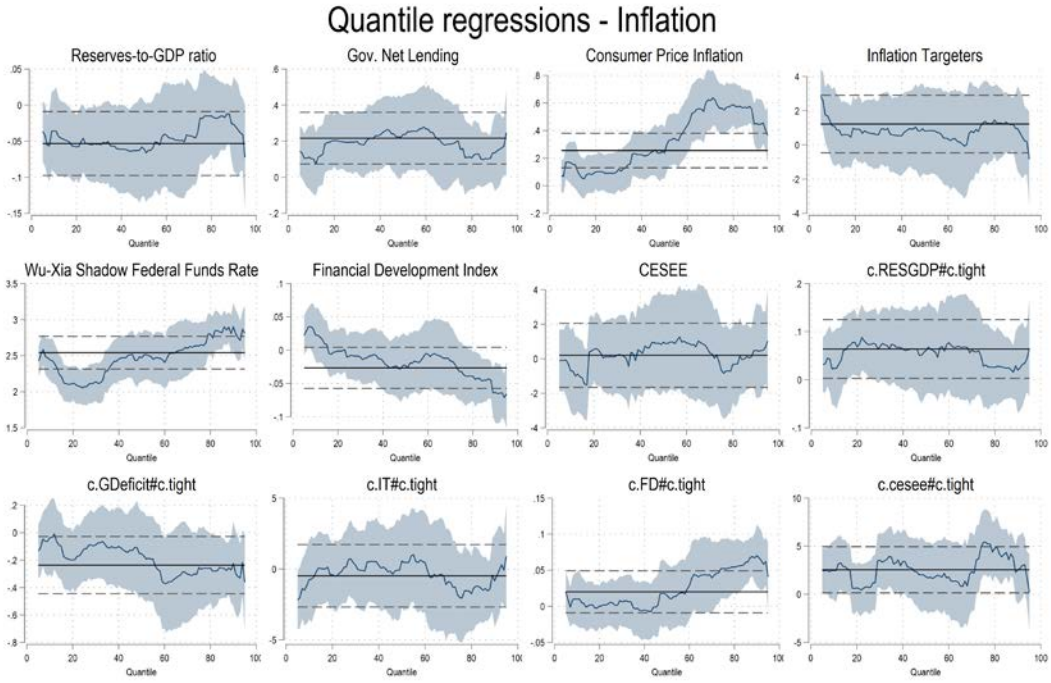

Figure 13. Quantile regressions for inflation.

Source: authors' calculations.

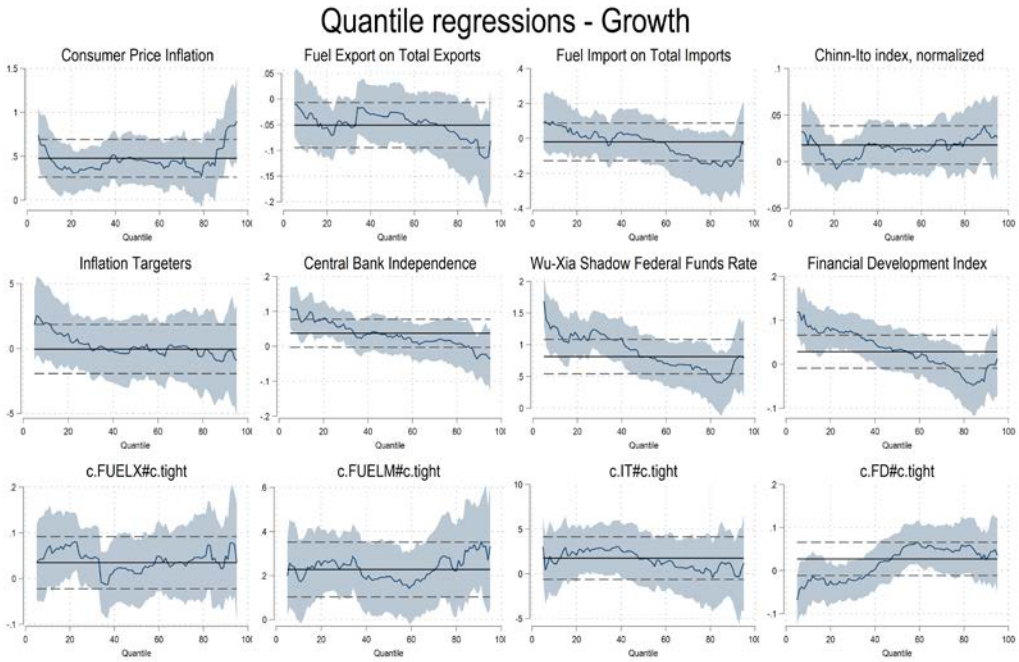

Figure 14. Quantile regressions for growth.

Source: authors' calculations.

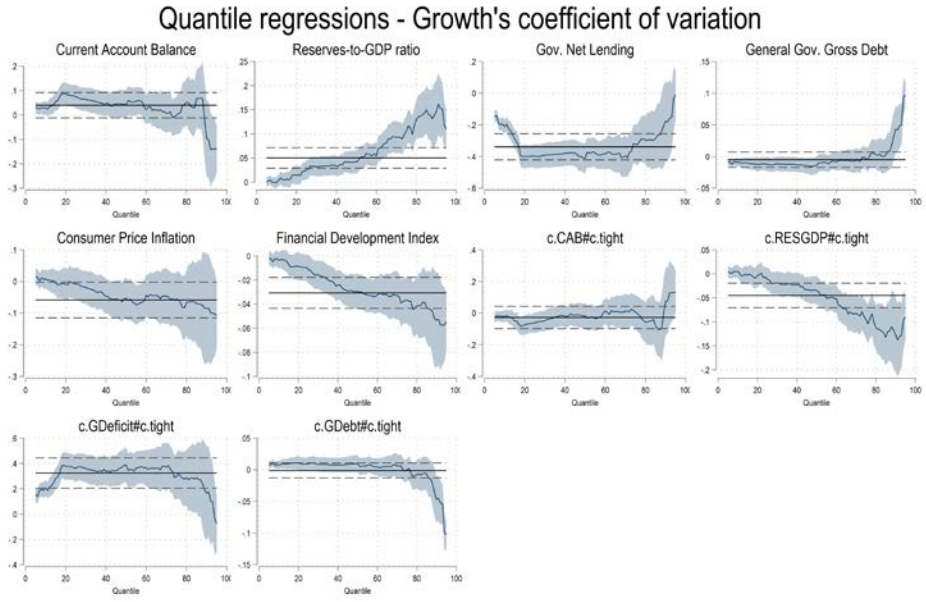

Figure 15. Quantile regressions for growth's coefficient of variation.

Source: authors' calculations.

5. Conclusion

This paper explores the resilience of CESEE countries during ECB monetary cycles. We identify the main fundamental and institutional variables that enhance resilience; including efficient management of international reserves, current accounts, financial institutions, and other structural factors affecting the ability to deal with the spillover effects of the ECB's and FED's policies. We also validated that the US shadow Federal Funds rate strongly influences CESEE performance during ECB monetary cycles. Financial development and central bank independence have asymmetrical effects between easing and tightening cycles.

We conclude by noting that CESEE's average 'miracle' growth during the 2000s does not guarantee future performance, and will be challenged by growing headwinds associated with growing geo-political challenges. The high growth rates of CESEE countries were helped substantially by the generous European Union's Cohesion Policy. The successful convergence of most CESEE countries and the geo-political headwinds affecting the EU and the ECB may reduce future allocations to CESEE.

The EU countries that have kept their currencies, and managed their monetary and exchange rate policies competently, frequently applying their version of Inflation Targeting, may face growing headwinds from the EU to converge towards adopting the Euro. The uneven trajectory of the institutional quality of CESEE countries, and the growing geo-challenges associated with the growing frictions between the EU and Russia, China, and their allies will test the cohesion of the EU and CESEE, possibly imposing negative externalities on the future growth and stability of CESEE.

Key results:

- We explore the resilience of CESEE countries during ECB monetary cycles;
- We identify the main fundamental and institutional variables that enhance resilience;
- Proper management of inflation, international reserves, current account, and financial institutions matter;
- The US shadow rate strongly influences CESEE performance during ECB monetary cycles;
- Financial development and central bank independence have asymmetrical effects.

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Appendix A. Data sources and definitions

Variables	Frequency, Units	Source, Identifier
Bilateral Exchange Rate	Monthly data, year-on-year growth rate variation between the start and the end of the monetary cycle "i"	IMF, IFS, EDNA_USD_XDC_RATE
Long-term interest rates	Monthly data, variation between the start and the end the monetary cycle "i"	OECD, KEI, IRLTLT01.ST.M
Stock prices	Monthly data, variation between the start and the end the monetary cycle "i"	OECD, MEI, SPASTT01.IXOB.M
Consumer Price Inflation	Monthly data, year-on-year growth rate variation between the start and the end of the monetary cycle "i"	IMF, CPI, PCPI_IX
Real GDP Growth	Quarterly data, year-on-year growth rate variation between the start and the end of the monetary cycle "i"	Haver Statistics, s_ngpc_g10
Growth rate (CV)	Monthly data, Standard deviation over average of Real GDP over the cycle "i"	Haver Statistics, authors' computations
Current Account Balance	Annual data, Percent of GDP	World Bank, WDI, BN.CAB.XOKA.GD.ZS
Reserve-to-GDP ratio	Annual data, Percent of GDP	World Bank, WDI, FI.RES.XGLD.CD, NY.GDP.MKTP.CD
Net International Investment Position	Annual data, Percent of GDP	Lane-Milesi-Ferretti, https://www.brookings.edu/articles/theexternal-wealth-of-nations-database/, authors' computations
Gov. Net Lending/Borrowing	Annual data, Percent of GDP	IMF, WEO, GGXCNL_NGDP
General Gov. Gross Debt	Annual data, Percent of GDP	IMF, WEO, GGXWDG_NGDP
Consumer Price Inflation	Annual data, Year-on-year growth rate	World Bank, WDI, FP.CPI.TOTL.ZG
Fuel Export on Total Exports in %	Annual data, Percent of total export	World Bank, WDI, TX.VAL.FUEL.ZS.UN
Fuel Import on Total Exports in %	Annual data, Percent of total import	World Bank, WDI, TM.VAL.FUEL.ZS.UN
Chinn-Ito Index, normalized	Annual data, Index that ranges between 0 and 100	Chinn-Ito, https://web.pdx.edu/~ito/ChinnIto_website.htm
Inflation Targeters dummy	Annual data, Binary variable	Author's elaboration based on the literature
Financial Development Index	Annual data, Index that ranges between 0 and 100	IMF, FDI, FD_FD_IX
Exchange Rate Stability Index	Annual data, Index that ranges between 0 and 100	Aizenman-Ito-Chinn, https://web.pdx.edu/~ito/trilemma_inde xes.htm
Central Bank Independence	Annual data, Index that ranges between 0 and 100	Romelli, https://dromelli.github.io/cbidata/index.html
Households, Loans and Debt securities	Annual data, Percent of GDP	IMF, GDD, https://www.imf.org/external/datamapper/datasets/GDD
Overall Institutional Score	Annual data, Index that ranges between 0 and 100	ICRG index, PRS group, https://www.prsgroup.com/
De facto Measure of Financial Openness	Annual data, Index that ranges between 0 and 100	Ito-Kawai, https://web.pdx.edu/~ito/ADBIWP381.pdf

Appendix B. Quantile regressions with fixed effects

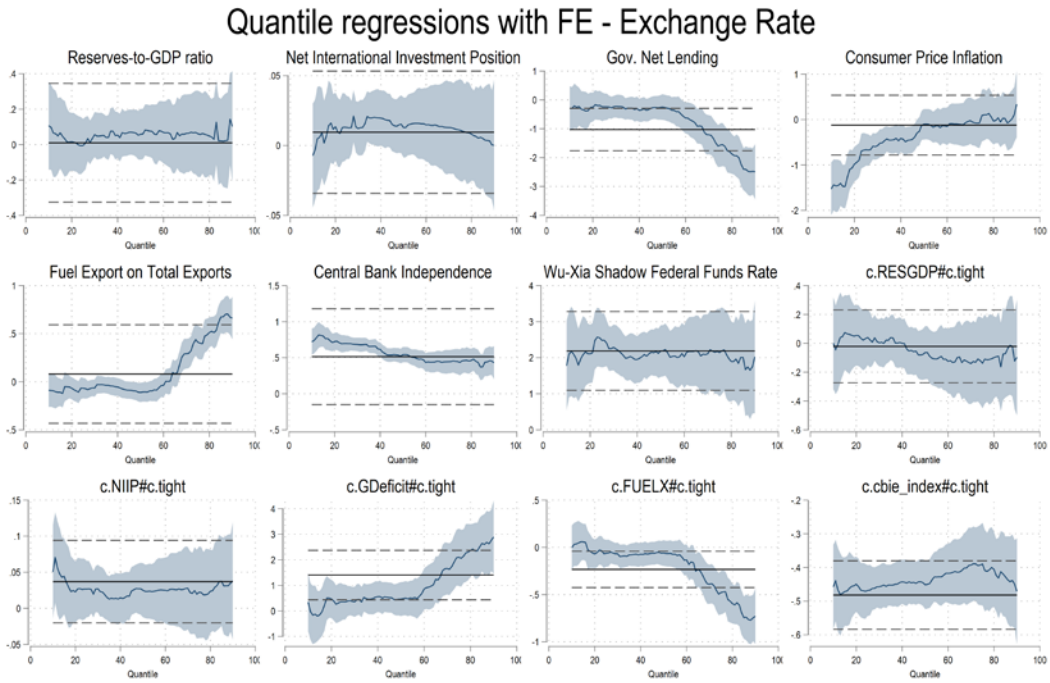

Figure B1. Quantile regressions with FE for the exchange rates.

Source: authors' calculations.

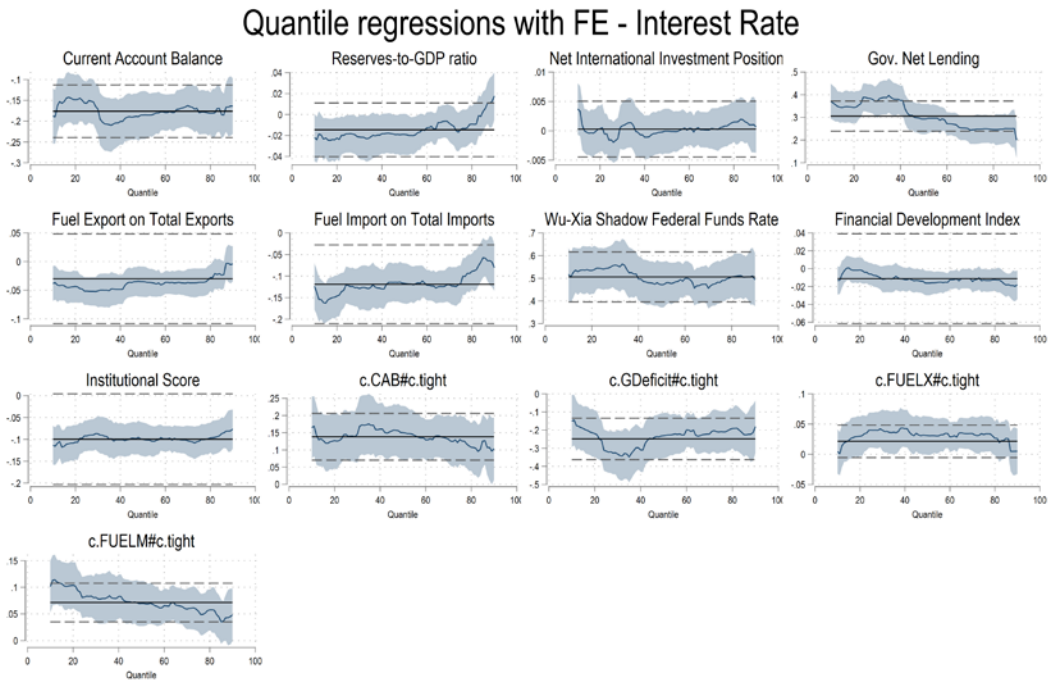

Figure B2. Quantile regressions with FE for the interest rates.

Source: authors' calculations.

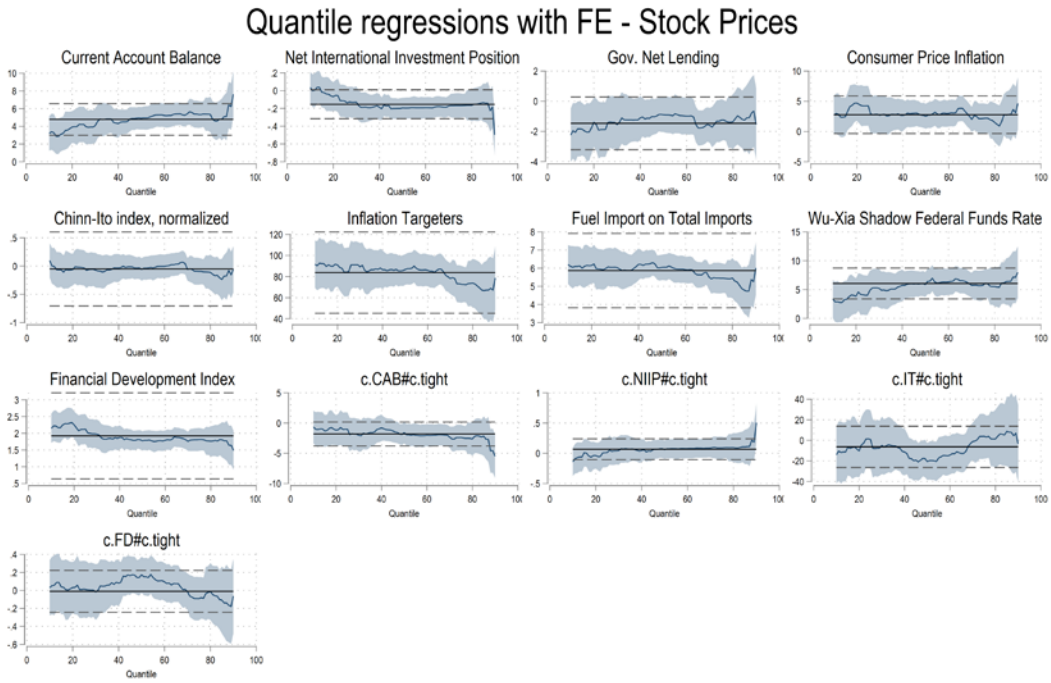

Figure B3. Quantile regressions with FE for the stock prices.

Source: authors' calculations.

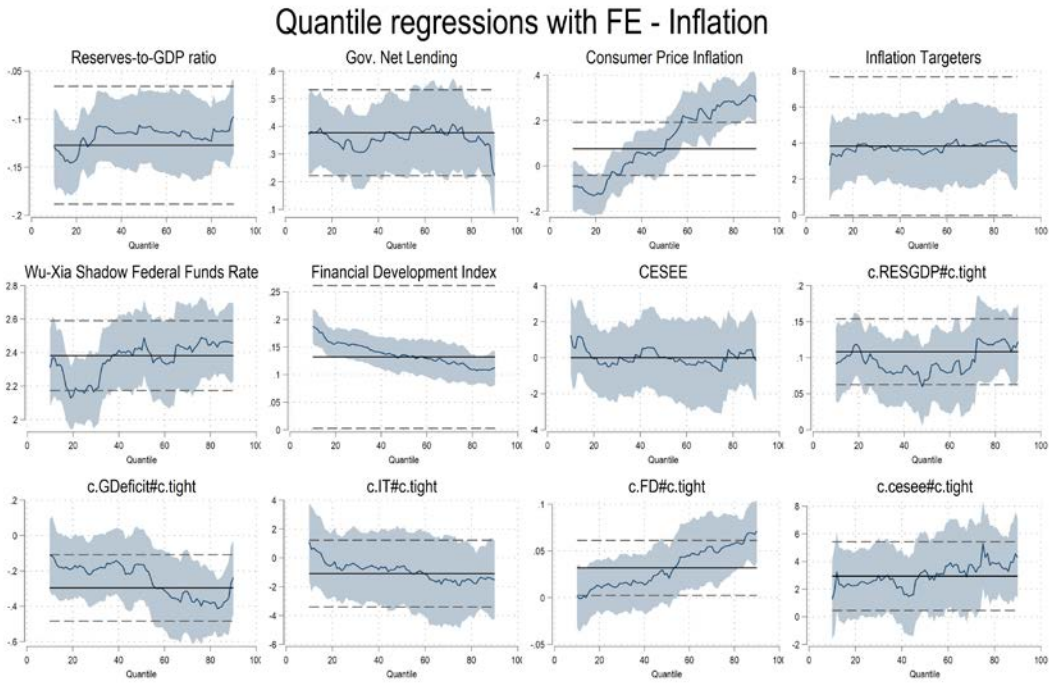

Figure B4. Quantile regressions with FE for inflation.

Source: authors' calculations.

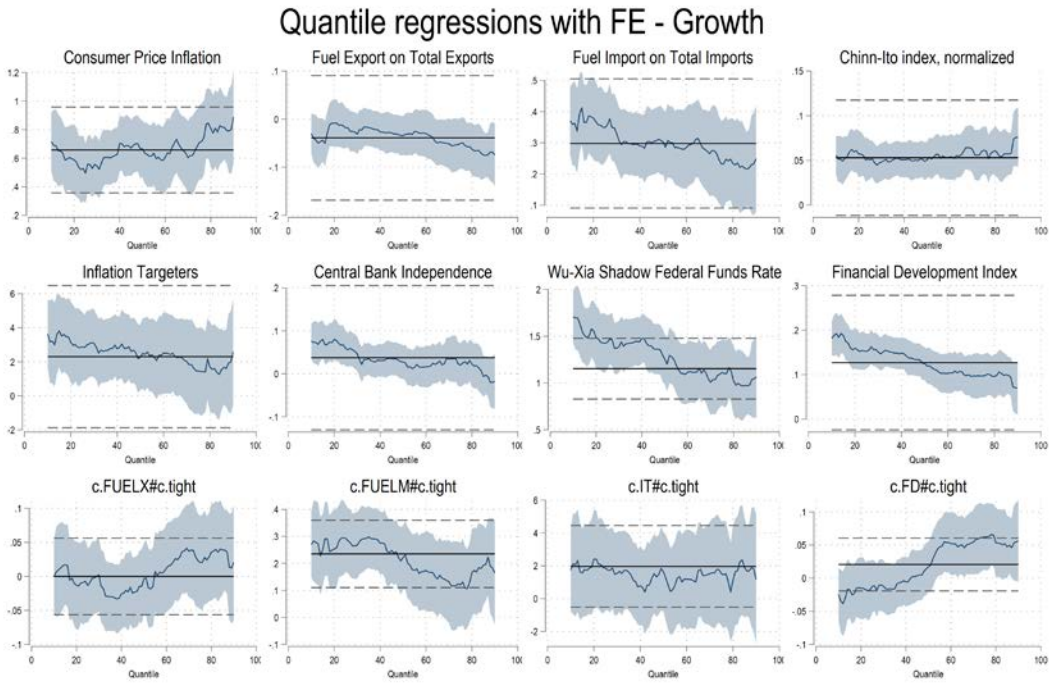

Figure B5. Quantile regressions for growth.

Source: authors' calculations.

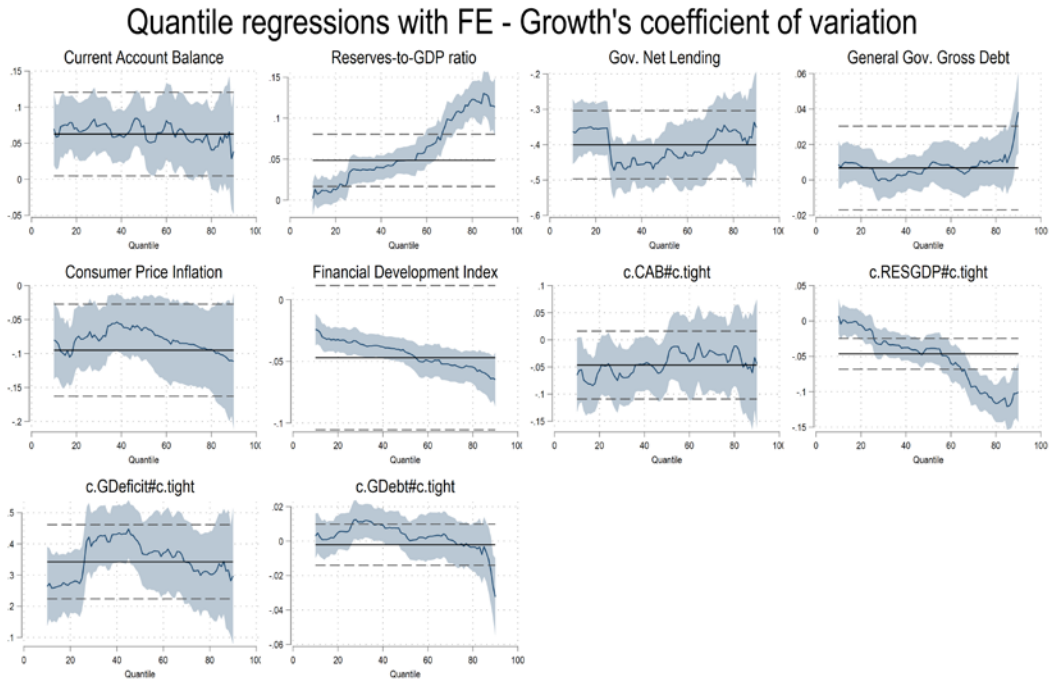

Figure B6. Quantile regressions for growth's coefficient of variation.

Source: authors' calculations.