Financial Stress in Emerging Markets: The Tail-Risk Trade-Offs Between Growth and Financial Stability Policies

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ERSA working paper 914

August 2025

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Abstract

We apply quantile regressions to analyse how macroprudential policies and capital controls affect the spillover of financial stress on future economic growth in emerging markets. Our findings reveal a key intertemporal trade-off: macroprudential policies, while dampening short-term growth, enhance economic resilience and support long-term growth. In contrast, capital controls do not present this trade-off and are most effective during periods of strong economic performance. The results suggest that shrinking economies should prioritize domestic financial stability, while growing economies should focus on protecting against external financial instability. We contribute to the literature by refining and extending the financial stress indicator for a group of 27 emerging markets from 1996Q1 to 2022Q4 and demonstrate the distinct roles of these policies across different stages of the economic growth distribution.

Key words: *macroprudential policy, capital controls, financial stability, growth-at-risk*

JEL codes: C31, E32, E58, G01, G28

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1. Introduction

Financial stress in emerging market economies (EMEs) presents unique challenges, affecting economic growth and financial stability due to vulnerabilities linked to external shocks and global financial cycles. EMEs are particularly susceptible to sudden reversals in capital flows, currency depreciation, and inflation during periods of heightened financial stress, necessitating robust policy measures to mitigate potential economic downturns.

This paper provides an empirical analysis of the growth-at-risk (GaR) framework, quantifying how financial stress influences growth vulnerabilities in EMEs. Using a unique dataset spanning 27 emerging market economies from 1996Q1 to 2022Q4, we estimate the differential effects of financial conditions, macroprudential policies (MaPPs), and capital controls (CCs) on the lower tail of the GDP growth distribution. This study contributes to the literature by focusing on EME-specific risks and policy implications, providing insights into the resilience-building role of MaPPs and CCs against financial stress.

Our findings indicate that MaPPs stabilize financial conditions in EMEs during periods of high capital inflows or financial upturns, helping to prevent overheating. However, these policies may also constrain growth when applied during stable financial periods. Additionally, we find that capital controls offer critical support during extreme financial volatility by buffering EMEs against sharp capital outflows. These results contribute to the literature by demonstrating that a tailored GaR approach captures unique vulnerabilities in EMEs, filling a gap in studies focused primarily on advanced economies.

Our policy recommendations suggest a strategic application of MaPPs during financial upturns to manage financial risks and a complementary use of CCs during periods of acute external vulnerability. This dynamic policy framework supports growth and stability in EMEs by adapting to varying global financial conditions, offering a balanced approach to economic resilience. However, given the significant diversity among EMEs in terms of economic structure, financial system development, and institutional capacities, the effectiveness of these tools may vary widely. Policymakers should approach these recommendations with prudence, tailoring responses to national circumstances and remaining aware of the limitations and potential trade-offs of each policy tool.

The literature review in Section 2 provides a comprehensive overview of the complex macro-financial linkages in EMEs. It highlights how financial systems can foster economic growth while also posing risks of systemic instability, and discusses how financial crises deepen economic downturns, affect monetary policy effectiveness, and increase fiscal pressures. This review also covers Growth-at-Risk (GaR) methodologies, which assess the impact of financial conditions on future GDP growth, with a particular focus on downside risks. Studies primarily in advanced economies suggest that MaPPs can limit financial vulnerabilities, such as excessive credit growth, though they may also reduce average growth. The review provides essential insights into policy tools that can help stabilize growth in EMEs amid global financial fluctuations.

Following the literature review, Section 3 outlines the panel quantile regression methodology and the construction of the financial stress indicator, macroprudential index, and capital controls index. Section 4 provides a detailed description of the data, and Section 5 presents the empirical results. The main findings and policy implications are summarized in Section 6. The appendix provides an extended literature review on macro-financial vulnerabilities in emerging markets, details the construction of the financial stress index and policy indicators, and includes robustness checks and alternative specifications that support the empirical findings.

2. Literature review

2.1 Financial stress and macroeconomic vulnerabilities in EMEs

Emerging market economies (EMEs) are particularly vulnerable to global financial volatility, with financial stress often amplifying macroeconomic instability due to their exposure to external shocks and relatively less developed institutional frameworks. Studies such as Beck (2014) and Balakrishnan et al. (2011) highlight the dual role of financial systems: while they can drive growth, they can also trigger systemic risks. The IMF (2023) emphasizes how financial crises can deepen economic downturns, drive capital flight, and destabilize exchange rates, underscoring the need for robust policy responses.

These studies underscore the need for policies that can pre-emptively address vulnerabilities and mitigate crisis impacts. However, research is limited on how these dynamics specifically affect EMEs, particularly regarding the optimal timing and nature of policy interventions. This paper addresses this gap by examining EME-specific policy tools, providing a framework for mitigating financial stress in economies especially prone to external shocks.

2.2 Growth-at-Risk (GaR) methodologies and findings

The GaR framework has emerged as a vital tool for assessing downside growth risks by examining the impact of financial conditions on the distribution of future GDP growth. Originally applied in advanced economies, studies such as Adrian et al. (2019) and Figueres and Jarociński (2020) demonstrate GaR's ability to quantify tail risks based on financial conditions. However, these studies do not fully capture the distinct dynamics of EMEs, which are more sensitive to external volatility. Galán (2020) partially bridges this gap by applying GaR to a combined sample of advanced and emerging economies, showing that downside risks are especially pronounced in EMEs.

Our study builds on this foundation by tailoring the GaR model specifically for EMEs, focusing on how financial stress impacts growth vulnerabilities in these economies. By doing so, we contribute a more granular understanding of GaR applications in EMEs, addressing the unique risk profiles and policy needs of these economies.

2.3 Role of macroprudential policies and capital controls

Macroprudential policies (MaPPs) and capital controls (CCs) are widely viewed as essential tools for managing the trade-offs between growth and financial stability in EMEs. Research suggests that MaPPs are particularly effective during financial upturns, as they help contain excessive credit growth and asset bubbles, thus reducing vulnerability to external shocks (Gelos et al. 2023). Aikman et al. (2019) highlight that a well-capitalized banking system can counteract downside risks, especially during credit booms. Capital controls, meanwhile, serve as complementary tools during extreme financial volatility, providing an additional buffer when MaPPs alone may be insufficient.

Despite these insights, limited empirical research exists on the distinct effects of MaPPs and CCs within EME contexts. Especially given that emerging market economies tend to have unique macroprudential policy usage patterns, as highlighted by Cerutti et al. (2017). Our study extends the literature by empirically examining the effects of these tools across a diverse set of EMEs, providing evidence for a combined policy approach that adapts to varying phases of the financial cycle. This approach addresses the need for a nuanced policy framework that accounts for the high variability among EMEs, particularly as near-term risks are shaped by market conditions (O'Brien and Wosser, 2021), while macroprudential policies have been shown to reduce output volatility by supporting the lower tail of growth outcomes in advanced economies (Fernández-Gallardo, Lloyd and Manuel, 2023).

2.4 Summary of literature

Table 1 in the appendix offers a comparative summary of previous GaR applications, financial stress indicators, and their implications for growth and stability across various economies. This table complements the focused literature review here and an extended literature review in the appendix, allowing readers to reference a wide range of methodological approaches and findings. Overall, this paper's unique contribution lies in its exclusive focus on EMEs, applying GaR methodologies to assess financial stress and evaluate policy tools specifically tailored to mitigate these economies' vulnerabilities.

3. Methodology

This paper uses a panel quantile regression model to assess the impact of macroprudential policies on growth-at-risk (GaR) in emerging economies. Panel quantile regression, developed by Koenker and Bassett (1978), is particularly suitable for capturing differential effects across the GDP growth distribution, focusing on both central and tail outcomes. This methodology has been widely used in the GaR literature (e.g., Galán, 2020; Adrian, Boyachenko, and Giannone, 2019) to quantify how financial stress and policy variables influence future economic growth.

Unlike standard regression methods that focus on the conditional mean, quantile regression is valuable for understanding how variables like financial stress and credit conditions affect different parts of the growth distribution. This approach allows us to analyse the heterogeneity in the effects of financial conditions across the GDP growth distribution, isolating the impacts of various indicators associated with financial stability.

The estimated baseline model is defined as follows:

$$\hat{Q}_{y_{i,t+h}|x_{it},\alpha_i}(\tau|X_{it},\alpha_i) = \hat{\alpha}_{i,\tau} + \hat{\beta}_{1,\tau}y_{it} + \hat{\beta}_{2,\tau}FSI_{it} + \hat{\beta}_{3,\tau}credit_{it} + \hat{\beta}_{4,\tau}HP_{it} + \hat{\beta}_{5,\tau}CAB_{it} + \hat{\beta}_{6,\tau}MPI_{it}; \qquad \tau = 5, 10, \dots, 90, 95; \quad h = 1, 2, \dots, 16.$$

In this model:

- $y_{i,t+h}$ represents the annualised real GDP growth of a country i at $t + h$ quarters ahead
- α_i is the country-specific intercept, included to capture time-invariant structural characteristics.
- y_{it} is the contemporaneous GDP annual growth rate.
- FSI_{it}, $credit_{it}$, HP_{it}, CAB_{it}, MPI_{it} CCI_{it} are, respectively, the financial stress index, credit-to-GDP ratio (2-year average change), house price growth (2-year average), current account balance as a percentage of GDP, and the macroprudential policy index. The construction of the FSI, the MPI, and the capital controls index (CCI) are discussed in detail in the appendix.
- τ represents the quantiles, from the 5th to the 95th percentiles, allowing analysis across different segments of the growth distribution.

The choice of specific quantiles – namely the 5th, 25th, 50th, 75th and 95th percentiles – is motivated by their policy relevance and widespread usage in the GaR literature.[4] The 5th percentile captures extreme downside risks which is a concern for financial stability. The 50th percentile allows us to capture the central tendency of growth and serves as a reference point.

[4] This quantile structure is consistent with prior applications in the Growth-at-Risk literature. For example, Adrian, Boyarchenko, and Giannone (2019) and Galán (2020) use a similar ranges to evaluate systemic risk transmission.

The 25th and 75th percentiles represent moderate deviations from typical growth – and jointly delineate the interquartile range (IQR), often referred to as the “middle 50%” of the distribution. This range provides a useful view of how macro-financial conditions affect more common, non-extreme growth scenarios. The 95th percentile provides insights into unusually high growth episodes. To ensure that our results are not sensitive to specific cutoffs, we estimate the model at finer intervals – every 5th percentile between the 5th and 95th quantiles, and report coefficient paths across the full distribution in Figure 1. These plots show that the main relationships are stable across nearby quantiles, with no sharp discontinuities.

To reduce potential endogeneity concerns, lagged values of explanatory variables are used where possible. For instance, since MaPPs may be deployed in response to anticipated economic cycles or financial conditions, using lagged values helps mitigate simultaneity bias. As the dependent variable represents future GDP growth, the model inherently controls for temporal separation between policy applications and subsequent economic impacts.

The Financial Stress Index (FSI) captures immediate economic pressures and is essential for assessing short-horizon conditional GDP growth. In contrast, credit growth, house price growth, and the current account balance are included as indicators of longer-term economic stability, following approaches used in studies like Aikman et al. (2018) and Galán (2020). Averaging credit and house price growth over a 2-year period aligns with prior research, capturing persistent changes that are known to signal financial risks (Schularick and Taylor, 2012). The FSI reflects current economic stress, while the 2-year averages for credit and house price growth help mitigate short-term fluctuations, thus exposing underlying cyclical trends.

The FSI is constructed following methodologies proposed in Balakrishnan et al. (2011), Cevik et al. (2013), and Park and Mercado (2014), and adapted for emerging markets where financial instability often stems from banking, currency, and sovereign debt crises. The index aggregates five components reflecting stress channels: financial sector beta (based on the CAPM beta of financial stocks), stock market returns, equity return volatility (via GARCH(1,1) estimates), sovereign debt spreads, and an exchange market pressure index (EMPI). Each component is demeaned and standardised using a variance-equal weighting approach, then summed to produce the composite FSI. This method captures the intensity and breadth of financial stress across asset classes and markets.

Due to data limitations in many emerging markets, the financial beta uses the broader MSCI financials index instead of a pure banking sector measure, enhancing consistency across countries. While the composite index offers a comprehensive snapshot of systemic financial pressures, it is subject to known limitations, including sensitivity to U.S. dollar shocks (via

EMPI), equal weighting assumptions, and lack of policy reaction capture. Nevertheless, the FSI aligns with established practices in the literature and provides a consistent cross-country metric of financial stress over time.

The Macroprudential Policy Index (MPI) measures policy intensity and scope, allowing for an analysis of how policy interventions correlate with growth-at-risk across different quantiles of GDP growth. It is constructed from the Alam, Alter, Eiseman, Gelos, Kang, Narita, Nier and Wang (2019) dataset. For each macroprudential instrument, the index assigns a value of +1 for a tightening action and −1 for a loosening. The MPI is computed as the net sum of policy changes over a four-quarter rolling window, thus capturing the cumulative stance of macroprudential policy over the past year. Similar methodologies for constructing macroprudential indexes (MPIs) using dummies were followed by Aizenman et al (2020) and Cerutti et al (2017). Similarly, the capital controls index (CCI) follows a similar structure, using the Pasricha et al. (2018a, 2018b) dataset, which captures changes in capital flow management measures. These index-based measures improve upon simple dummies by capturing multiple actions over short windows and enabling cross-country comparisons. However, they also have limitations. Differences in reporting standards, instruments and enforcement capacity can affect cross-country comparability. Moreover, the indices do not capture the intensity of actions – treating all policy changes equally regardless of their size – which may obscure important variation in the strength of interventions.

The MPI and CCI employed in this study capture the frequency and direction of policy changes but not their intensity or enforcement quality. Moreover, the composite FSI aggregates equally weighted components that may not reflect the relative importance of different stress channels in individual economies. While these constructs align with established practices in the literature, such simplifications may limit cross-country comparability and precision. Consequently, the estimated effects of MaPPs and CCs on growth-at-risk should be interpreted as average associations, not precise causal impacts, and policy conclusions should be tempered accordingly

The annualized GDP growth rate for each country, $y_{i,t+h}$, is calculated as:

$$y_{i,t+h} = \ln\left(\frac{GDP_{i,t+h}}{GDP_{i,t}}\right) \Big/ \left(\frac{h}{4}\right); h = 1; 2; \dots; 16.$$

In this formulation, $y_{i,t+h}$ is the annualised annual growth rate over horizons of 1 to 16 quarters ahead. By examining the effects of current financial conditions and policy measures on future economic growth, the model aims to reduce endogeneity concerns while still capturing the impact of anticipated financial risks on policy responses.

The constant term, α_i, representing unobserved country effects, accounts for time-invariant structural characteristics such as trade openness, financial integration, and economic size. These country-specific effects are essential to control for unique, slow-moving factors that might attract foreign investment or influence economic stability (O'Brien and Wosser, 2021).

The coefficients β_τ describe associations between future economic growth and each explanatory variable, with a focus on quantiles that indicate the risk distribution. While the model provides insight into associations rather than causation, this approach enables a nuanced understanding of how variables like financial stress and MaPPs interact with economic growth, particularly at the tails of the growth distribution.

In summary, this panel quantile regression approach offers a detailed perspective on growth-at-risk in EMEs, accounting for the heterogeneity in responses to financial stress and policy measures across the GDP growth distribution. The Appendix includes robustness tests that compare results with alternative growth horizons and additional specifications to validate the findings.

4. Data description

The sample consists of an unbalanced panel of 27 emerging market economies, covering the period from 1996Q1 to 2022Q4.[5] Key variables include GDP growth, the 2-year average change in the credit-to-GDP ratio, the 2-year average change in house prices, the current account balance, the financial stress index (FSI), and the macroprudential policy index (MPI). Table 1 provides summary statistics, showing the distribution of these variables across specific percentiles. Additional details on variable definitions and data sources are available in Table A5 of the Appendix, and Figure A11 in the Appendix plots the 25th, 50th, and 75th quartiles of all variables over the sample period.

Table 1: Summary statistics

	p5	p25	p50	p75	p95
GDP (1y growth, %)	-0.035	0.020	0.040	0.058	0.085
Credit-to-GDP (2y avg., change, %)	-0.066	-0.015	0.018	0.053	0.111
House prices (2y avg., growth, %)	-0.060	-0.004	0.018	0.046	0.113
Current account balance (% of GDP)	-9.400	-2.500	-0.400	1.000	8.400
Financial stress index (FSI)	-3.498	-1.803	-0.582	0.899	3.586
Macroprudential policy index (MPI)	-2.000	0.000	1.000	2.000	5.000
Capital controls index (CCI)	-1.000	0.000	0.000	1.000	6.000

Notes: This table reports the distribution of the main variables used in the analysis across selected percentiles of the sample. The GDP growth, credit-to-GDP change, and house price growth are expressed as annualized growth rates over a two-year average window. The current account balance is reported as a percentage of GDP. The FSI, MPI, and CCI are composite indices, standardized as described in the methodology.
Sources: *Alam et al. (2019); BIS (2023); Bloomberg (2023); Pasricha et al. (2018b).*

[5] The countries included are: Argentina, Bangladesh, Brazil, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic (Czechia), Hungary, India, Indonesia, Israel, Korea (South), Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Taiwan, Thailand, and Türkiye.

Table 1 highlights notable patterns in the data. GDP growth is right-skewed, with positive values above the 25th percentile, indicating that most periods experience moderate to strong growth. Whereas, the 5th percentile is equivalent to a downturn in economic growth. Credit-to-GDP and house price growth also show positive values above the median, highlighting their tendency to increase over time, which could signal financial expansion or buildup of cyclical risks in these economies. The median FSI value of -0.5821 suggests that financial markets are generally stable, with financial stress episodes being relatively infrequent. This distribution reflects a sample environment where financial stability prevails more than half the time, though the presence of stress at higher percentiles indicates episodes of market turbulence.

5. Empirical results

This section presents the primary findings from the quantile regressions, focusing on how macroprudential policies (MaPPs) and capital controls (CCs) influence economic growth in emerging market economies under different financial stress conditions. The analysis addresses whether these policy measures enhance resilience to external shocks, thereby mitigating systemic risks and stabilizing growth across short- and medium-term horizons.

Our application of the quantile regression framework, which explores the additive impacts of financial stress and cyclical systemic risks on growth across the distribution, aligns with the core methodology of the Growth-at-Risk (GaR) literature (e.g., Adrian et al., 2019; Figueres and Jarociński, 2020; Adrian et al., 2022). Consistent with these studies, we find that the lower quantiles of GDP growth in emerging markets are highly sensitive to financial conditions, whereas the upper quantiles exhibit greater stability over time.

In the short term (4-quarter horizons), growth risks are predominantly driven by cyclical systemic vulnerabilities such as housing booms and rapid credit expansion. These vulnerabilities influence the left tail of the growth distribution, highlighting the immediate impact of macro-financial conditions on downside growth risks. By contrast, over the medium term (12-quarter horizons), financial market stresses—captured by the financial stress index (FSI)—exert a more substantial influence on growth, particularly at lower quantiles.

Section 5.1 presents the results related to the macroprudential policy index (MPI), while Section 5.2 focuses on the 5th percentile (left-hand tail) of the growth distribution to highlight the impact on tail risks. In Section 5.3, we compare these findings with those obtained using the capital controls index (CCI). The regressions are estimated for GDP growth at 4- and 12-quarter horizons, allowing us to distinguish short- and medium-term effects of the included variables. Specification and diagnostic tests for the quantile regression methodology are provided in the Appendix.

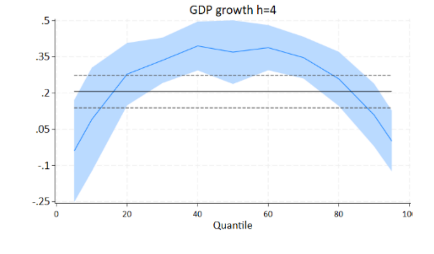
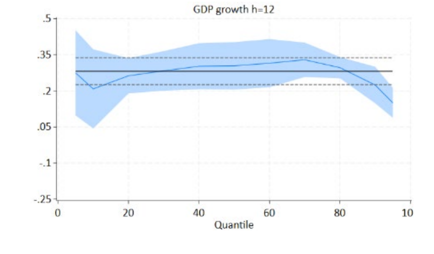
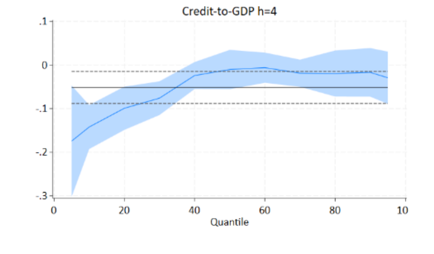
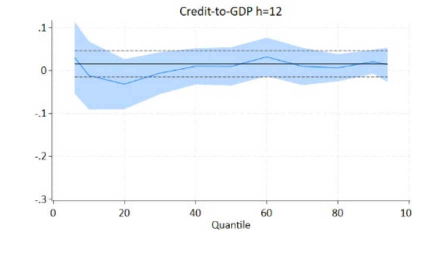
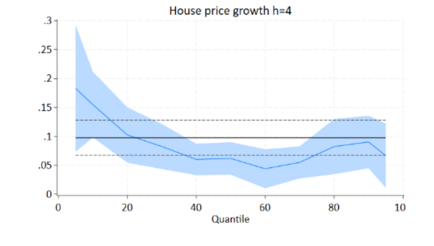
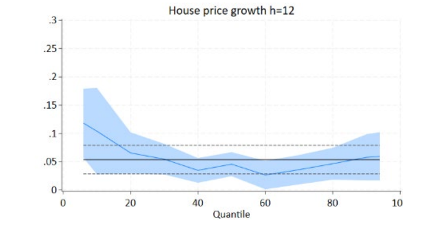
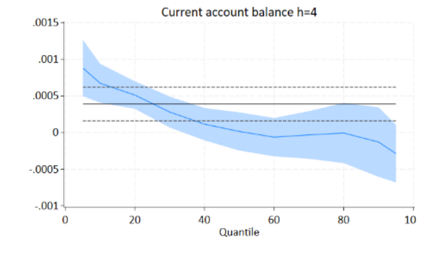
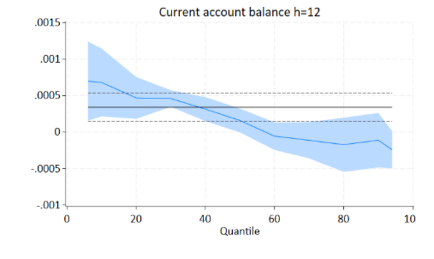
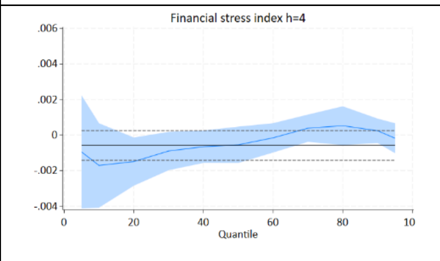
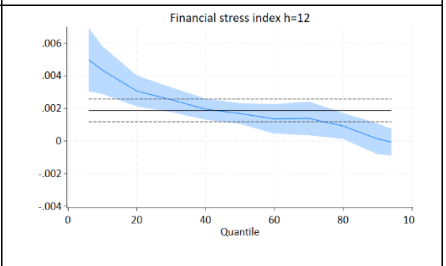
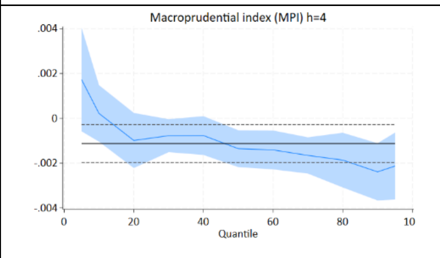
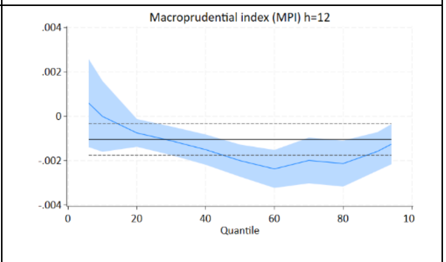
Comprehensive sensitivity and robustness checks are conducted to validate the findings. The sensitivity analysis examines the impact of excluding individual sub-indicators from the financial stress index (FSI), with re-estimations showing that all reduced FSI indexes remain within a confidence interval around the full FSI. Uncertainty analysis quantifies the output variability due to input fluctuations, following the approach of Saisana, Saltelli, and Tarantola (2005). In the robustness analysis, the main FSI is compared with alternative FSIs to demonstrate the stability of results across different data-generating processes. Additionally, the model is re-estimated using a re-centred influence function (RIF) regression, and the main results are contrasted with findings from comparable studies, reinforcing the reliability of the analysis.

5.1 Macroprudential index

The results for the macroprudential policy index (MPI) reveal an intertemporal trade-off in economic growth. In the short term, a 1-unit increase in MPI corresponds to a modest decrease in GDP growth, particularly at the left-hand tail (e.g., a 2% reduction at the 5th percentile 2 quarters ahead). This finding suggests that while MaPPs may dampen growth initially, they provide stability by curbing financial excesses and preventing systemic risk buildup. Over the medium term, MaPPs become less significant at the left tail beyond 8 quarters, indicating that their stabilizing effects may be more short-lived. Figure 1 plots the estimated coefficients on the explanatory variables at the 5th, 25th, 50th, 75th and 95th percentiles for future GDP growth, 4- and 12- quarters ahead (short- and medium-term horizons). Table A6 and Table A7 in the Appendix present the full regressions.[6]

[6] The results are not sensitive to our baseline modelling decisions with regards to growth rate calculations. In Appendix Table A4, alternative specification results are presented to compare to the main baseline (5th percentile, 12 quarters ahead) results within this subsection. Using alternative growth calculations for the credit-to-GDP ratio and house price growth do not meaningfully change the results (in terms magnitude, signs, and significance).

Figure 1: Quantile regression coefficients at 4-quarter and 12-quarter horizons

GDP (1 year growth, %)		
Credit-to-GDP (2 year average change, %)		
House prices (2 year average growth, %)		
Current account balance (% of GDP)		
Financial stress index (FSI)		
Macroprudential policy index (MPI)		

Note: This figure presents the estimated coefficients from quantile regressions for future GDP growth at 4-quarter and 12-quarter horizons, illustrating how the impact of key macroeconomic and policy variables varies across the conditional distribution of future GDP growth. Each panel shows the estimated coefficient for a specific explanatory variable (e.g., GDP, Credit-to-GDP, House Prices, Current Account Balance, Financial Stress Index (FSI), Macroprudential Policy Index (MPI)) across quantiles (0 to 100). The continuous blue line represents the estimated coefficient at each quantile, while the shaded blue area indicates the 95% confidence bands obtained using bootstrapped standard errors. The dashed horizontal lines indicate the estimated coefficient from an OLS *regression (dark dashed line) and its corresponding 95% confidence bands (light dashed lines). The analysis covers the sample period from 1996Q1 to 2022Q4.*

5.1.1 Financial stress index

Lower FSI values represent looser financial conditions and higher FSI values represent tighter financial conditions. Our findings regarding the Financial Stress Index (FSI) demonstrate a time-varying impact on economic growth. Specifically, we observe negative and significant coefficients for FSI over short-term horizons (4 quarters ahead), with a 1% increase in FSI associated with a 0.1-0.5% decrease in future economic growth. This immediate dampening effect of financial stress on growth, , particularly pronounced in EMEs due to their vulnerability to global financial volatility and exposure to external shocks (Beck, 2014; Balakrishnan et al., 2011), underscores how financial systems can trigger systemic risks and deepen economic downturns (IMF, 2023). These short-run results also strongly resemble the findings of O'Brien and Wosser (2021), who highlight the influence of current financial market conditions on near-term tail risks, and Galán (2020), whose EM-FSI also captures significant effects. However, our results diverge over the medium term (12 quarters ahead), where FSI coefficients become positive and significant. This suggests that while tighter financial conditions initially constrain growth, they may signal a period of necessary correction or risk reduction that supports medium-term growth in emerging markets, a nuance not explicitly captured by some prior studies focused primarily on advanced economies (e.g., Adrian et al., 2019; Adrian et al., 2022, who emphasize the larger effect of financial conditions at the left tail). Our results also confirm Adrian et al.'s (2022) finding that financial conditions have a larger effect at the left-hand tail than the median of growth, as evidenced by the greater negative impact of FSI at the 5th percentile. This change in coefficients over the forecast horizon specific to the 5th percentile is elaborated in subsection 5.2. In emerging markets, the left-hand tail as well as most of the growth distribution varies with financial conditions, and only the right-hand tail (95th percentile) is stable over time – as evidenced by the non-significance of FSI at the right-hand tail. Financial conditions have a larger effect on the lower 5th percentile of conditional growth than the median.

Over the full GDP distribution, FSI for the most part not significant 4 quarters ahead – furthermore, Figure 1 indicates that it is not very different than the constant OLS result. Financial stress has more of a negative impact at the left-hand tail through to the median levels of growth. Cyclical systemic components have a greater influence on growth than financial stress in the short-run.

In contrast, across the distribution, it is positive and significant 12 quarters ahead. Firstly, this implies that financial conditions matter more over longer time horizons. Secondly, loose financial conditions are not detrimental to medium-term future growth at the left-hand tail. Thirdly, for 12 quarter ahead growth, at the right-tail, it can be seen that tighter financial conditions do not dampen future growth. However, this result is not significant.

5.1.2 Cyclical systemic risk

The variables representing cyclical systemic risk are also the control variables for broader financial conditions. Namely, they are credit-to-GDP, house price growth and the current account balance. Their inclusion stems from the literature such as Rey (2015) suggesting that they are amongst the best predictors of financial crises and Adrian et al (2019) who finds that adding cyclical variables improves the identification of growth-at-risk. At horizons of 4-quarters ahead, the early-warning variables of cyclical systemic risk are mostly significant. These variables therefore contain useful information in forecasting growth over the short-run. In forecasting growth in the medium-run (12 quarters ahead), house price growth is the most informative of these cyclical systemic risk control variables. In Figure 1 we see that the cyclical systemic risk coefficients are marginally different from their OLS counterparts, with most of this difference concentrated around the tails of the distribution.

5.1.2.1 House price growth

At the median, in the short term (4 quarters ahead), a 1-unit increase in house price growth is associated with a 6% increase in future economic growth, similarly, over longer horizons (12 quarters ahead), a 1-unit increase in house price growth is associated with a 6% increase in future economic growth. Unlike some studies focusing on advanced economies, our findings consistently show that house price growth positively influences future GDP growth across all horizons and quantiles. Notably, this effect is largest at the left-hand tail (e.g., 0.183 in the short-run, 0.100 in the medium-run), implying that wealth effects can significantly bolster growth even in periods of economic weakness. This result provides a key contrast to Aikman et al. (2019), who identify property price booms as posing material downside risks to growth over medium-term horizons (three to five years) in their sample of advanced economies. Our divergence is likely attributable to the distinct characteristics of emerging market housing markets, which tend to be smaller and may lack well-functioning secondary markets for housing finance, thereby limiting the potential for broad spillover effects observed in advanced economies.

In 4-quarter ahead forecasts of growth, house price growth is significant and positive across the entire distribution, implying impressive signalling power. Furthermore, at the 5th percentile the impact of house price growth is larger, with the affect tapering as we move across the distribution. Nevertheless, this result implies that wealth effects tend to have a positive impact on economic growth in both the short-run and the medium-run. This finding for EMEs, where house price growth consistently contributes positively to growth, stands in notable contrast to some studies focused on advanced economies (e.g., Aikman et al., 2019) that often link property price booms to material downside risks over medium-term horizons. Our differing findings may be attributed to the unique characteristics of EME housing markets, suggesting that policies affecting house price growth can help emerging economies adjust to adverse growth shocks without the same long-term negative implications seen elsewhere.

5.1.2.2 Current account balance

Our analysis of the current account balance reveals a quantile-dependent influence on future GDP growth. Specifically, current account deficits appear to amplify growth at lower quantiles but dampen it at upper quantiles over both short- and medium-term horizons. This complex relationship aligns partially with previous literature. Our finding that higher current account balances insulate emerging economies from financial stresses at the left-hand tail resonates with Galán (2020)'s broader insights into the role of external balances in emerging markets. Furthermore, the observation that current account deficits pose material downside risks to growth at higher quantiles is consistent with Aikman et al. (2019), who highlight that wide current account deficits in advanced economies pose material downside risks to growth over medium-term horizons

5.1.2.3 Credit-to-GDP ratio

Over the entire distribution, credit-to-GDP always negatively impacts future economic growth over horizons less than 4-quarters ahead. Over horizons 12-quarters ahead, this negative result does not hold at the tails. In the medium-run, credit-to-GDP has a positive influence between the 25th and 75th percentiles. Our results for the credit-to-GDP ratio reveal an intertemporal trade-off between credit expansion and growth, particularly at the left-hand tail. In the short-run (less than 4 quarters ahead), excessive credit poses a downside risk to growth, with a negative impact across the entire distribution. This is consistent with Adrian et al. (2022), who also identify such an intertemporal trade-off where rapid credit-to-GDP growth amplifies downside risks in later quarters. However, our findings indicate that this negative effect dissipates and becomes insignificant at the left tail over the medium term (12 quarters ahead), and even exhibits a positive influence between the 25th and 75th percentiles. This nuance is important, as Aikman et al. (2019) emphasize that credit booms pose material downside risks to growth at horizons of three to five years, suggesting that the initial vulnerabilities may evolve or be mitigated over longer horizons in emerging markets.

The coefficient estimates for credit-to-GDP show notable deviations from the OLS results, especially at the distribution's tails. This underscores the importance of focusing on the extremes, as these areas may signal distinct risks. Aikman et al. (2019) further argue that such downside risks can be mitigated through higher bank capitalisation, which helps cushion the economy against financial stress.

Lastly, it is worth noting that the coefficient estimates for credit-to-GDP and house price growth typically have opposite signs across different horizons. This finding highlights an inverse relationship between credit expansions and house price growth, suggesting that while credit expansion may pose risks to economic growth, house price growth could potentially act as a counterbalance.

5.1.3 Macroprudential policy

The impact of macroprudential policy (MPI) is heterogeneous across the GDP growth distribution, revealing an intertemporal trade-off. In the short term (4 quarters ahead), MPI significantly and negatively influences growth from the median to the right-hand tail of the distribution. At the median, for instance, a 1-unit increase in MPI is associated with a 0.1% decrease in economic growth. This finding implies that tighter macroprudential policies lead to a small decrease in GDP growth in the short-run, effectively taming the business cycle and helping to prevent an economy from overheating. This aligns with the literature suggesting that MaPPs are particularly effective during financial upturns to contain excessive credit growth and asset bubbles, thereby reducing vulnerability (Gelos et al. 2023).

Conversely, at the left-hand tail (5th percentile) of the distribution, tightening macroprudential policy exhibits a positive, albeit initially not statistically significant, effect on growth. This is interpreted to mean that safeguarding against systemic risks can ultimately have a positive influence on growth by enhancing resilience, consistent with findings by Fernández-Gallardo, Lloyd and Manuel (2023) who argue that macroprudential policies reduce the variance of future GDP growth by boosting the left tail. However, it is noted that this positive effect seems to dissipate over time, and MPI is not significant at the left-hand tail over horizons less than 4-quarters ahead, implying that macroprudential policy cannot lift a country out of a low economic growth path in the immediate term.

Our findings concerning the persistence of MPI's effects diverge from some previous literature. Specifically, while Galán (2020) observes that macroprudential policies (MPI) maintain explanatory power for GDP growth across all quantiles and horizons, with a pronounced impact at longer horizons (e.g., 12 quarters), we find that the growth-constraining effects of MPI diminish and become statistically insignificant at horizons beyond eight quarters, particularly at the left tail. This indicates that while MaPPs are effective in mitigating short-term downside risks, their direct stabilizing effects on the left tail in emerging markets may be more short-lived. This difference likely reflects the distinct dynamics of emerging market economies and their unique macroprudential policy usage, as highlighted by Cerutti et al. (2017).

Over medium-term horizons (12-quarters ahead), the influence of macroprudential policy shifts. MPI becomes significant at and around the median (25th to 75th percentiles), where a 1-unit increase in MPI is associated with a 0.2% decrease in economic growth. However, MPI remains insignificant at both the left-hand and right-hand tails over this longer horizon. This indicates benefits to employing macroprudential policies over the medium-run, particularly around the median, where mitigating systemic risks promotes macroeconomic stability and growth without a clear trade-off. The MPI coefficients across the distribution (see Figure 1) are notably similar to those found by Galán (2020: 8), especially when comparing our Figure 1 to his Figure 4, which also depicts macroprudential policy effects over the economic growth distribution at 4- and 8-quarter-ahead horizons.

5.1.4 Country-effects

Country-specific effects (encapsulated by the constant term) are significant across the growth distribution over both the short-term and medium term: over the 25^{th}-95^{th} percentiles, a 1 unit increase in these factors is associated with a 1-7% increase in future GDP; however, at the left-hand tail (5^{th} percentile) country-specific factors are associated with a 1% reduction in future economic growth.

Over both 4-quarter and 12-quarter horizons, country-fixed effects are significant across the distribution and they are positive everywhere, but negative at the 5^{th} percentile. This suggests that structural (slow moving) characteristics of economies and their financial systems are always important for growth outcomes. By reducing the left tail, and boost the right tail, country specific effects are shown to increase the variation of future GDP growth in emerging markets. This aligns with O'Brien and Wosser (2021), who suggest that structural factors might include trade and financial openness, economic size and foreign direct investment (FDI) dependency, as well as measures of banking system concentration.

5.1.5 Contemporaneous GDP growth

A 1% increase in current GDP is associated with a 27.0%-37% increase in growth in the short-run (but only between the 25^{th}-75^{th} percentiles) and a 15.0%-31% increase in growth over the medium-term (right across the distribution of growth). While GDP growth is positive and significant over both the short-run (4 quarters) and the medium-run (12 quarters) for most of the distribution, this significance is not present at the 5th or 95th percentiles during the short-run. This pattern suggests that contemporaneous growth is a reliable predictor of future growth for the central part of the distribution, but its predictive power diminishes at the tails of the distribution in the short run. Our findings on contemporaneous GDP growth, which show a significant positive influence on future growth for the central part of the distribution across both short- and medium-term horizons, broadly align with O'Brien and Wosser (2021). However, our estimated magnitudes are notably larger, suggesting a more pronounced role of current growth rates in driving future growth in emerging market economies compared to the advanced economies in their sample.

Over 4 horizons, the relationship between future GDP growth and current GDP growth is parabolic in shape, with current GDP growth having a negative influence at the tails of the distribution, and having a positive influence centred around the median. This pattern holds over 12 quarters but is much flatter and in the middle of the distribution resembles the OLS case. Nevertheless, it implies that current growth matters more for future growth in countries experiencing average growth rather than countries experiencing high- or low- growth circumstances. Over both horizons, at the right-hand, tails the magnitude of effects of current growth on future growth is small in magnitude.

At the 5th percentile, unobserved country-effects are negative, meaning that country specific characteristics can lead to divergent GDP growth outcomes. Moreover, financial stress is negative in the short-run, but positive in the medium-run. This is attributed to sample characteristics, whereby emerging markets with developed financial markets are also those exposed to the systemic financial risks.

5.2 Tail-risks

Focusing on the 5th percentile of the growth distribution (or 'tail-risks' to growth), the findings underscore the heightened vulnerability of EMEs to financial stress at the lower tail. The FSI is significant across all horizons at this percentile, pointing to the persistent influence of financial stress on downside growth risks. These tail effects support the role of MaPPs in stabilizing short-term growth by counteracting vulnerabilities, even as their medium-term effects diminish.

Figure 2 plots the estimated quantile regression coefficients in the baseline model for quarters 1 to 16 for the 5th percentile, with 95% confidence bands. This figure illustrates the evolution of the impact of financial stress and other cyclical systemic risks on the tail of predicted GDP growth over time. The results capture the relationships between these endogenous variables, emphasising their additive impact on the 5th percentile of GDP growth. To provide a more comprehensive view of these relationships, the model is re-estimated over different horizons using three progressively detailed specifications: (i) including contemporaneous GDP growth and the financial stress index (FSI), (ii) adding cyclical systemic risk factors, and (iii) further incorporating the macroprudential policy index (MPI). This stepwise approach enables an assessment of how including additional variables contributes to explaining tail risks in GDP growth over time.

5.2.1 Macroprudential policy index

Macroprudential policies affect growth in the near-term, but the effects dissipate over time. Table 2 reveals that MPI has a statistically significant negative effect on GDP growth at shorter horizons (e.g., 2, 6, and 8 quarters), suggesting that the immediate tightening of macroprudential policies constrains growth. However, this effect becomes statistically insignificant at horizons beyond two years (8 quarters), reflecting a potential adjustment by market participants to the policy environment.

The results highlight a trade-off between stability and growth: increased macroprudential tightening mitigates short-term growth risks but constrains economic growth at the 5th percentile, reflecting a contractionary impact on the left tail of the distribution. This finding contrasts with Galán's results (2020) who finds that macroprudential policies (MPI) have explanatory power for GDP growth across all quantiles and horizons, particularly at the 5th percentile, with a pronounced impact at longer horizons (e.g., 12 quarters). In this study, however, the dampened effects of MPI beyond eight quarters and the persistent influence of cyclical systemic risks reflect differences in emerging market dynamics. This aligns with Cerutti et al. (2017), who emphasise distinct macroprudential policy usage in emerging market economies compared to advanced economies.

Despite the short-term contractionary effects on the left tail, our analysis also shows that the overall effect of tightening macroprudential policy at the left-hand tail can become positive over medium-term horizons (as noted in the full distribution discussion and Figure 1), which we interpret as the safeguarding against systemic risks having a net positive influence on growth. This observation of MPI's ability to "boost" the left tail (i.e., reduce downside tail risk) is consistent with Fernández-Gallardo, Lloyd and Manuel (2023), who argue that macroprudential policies reduce the variance of future GDP growth by boosting the left tail while simultaneously reducing the right.

Furthermore, MPI's indirect effects on tail risks through cyclical systemic risk channels are evident. Comparing Table 2 to appendix Tables A11a and A11b, over horizons of 2- to 4-quarters, MPI's inclusion in the model dampens the influence of house price growth and credit-to-GDP on future growth. These effects, while short-lived and not discernible beyond this horizon, imply that macroprudential policy can effectively mitigate these specific sources of vulnerabilities in emerging markets during critical short-term periods. These findings on the dampening effect of MPI on financial cycle variables are similar to those of Sánchez and Röhn

(2016) and Gelos et al (2023), further reinforcing the role of macroprudential policy in enhancing financial stability and reducing tail risks.

The range of potential channels through which macroprudential policies act is further assessed in Tables A8a and A8b (see Appendix). We find that tighter liquidity conditions raise economic growth in the short run but dampen growth over longer horizons. Additionally, curbing excessive credit growth supports economic growth over longer horizons. While MPI appears to be growth-constraining in the near term, other variables such as tighter credit conditions (e.g., credit channel) and current account balances (CAB) show mixed effects across horizons, and cyclical systemic risk factors (such as house price dynamics) have a persistent and significant influence across horizons, likely overshadowing the direct contribution of MPI to medium-term growth at the extreme tail.

5.2.2 Financial stress index

In the short-run, and beyond 5-quarters ahead, increases in FSI are associated with a contraction in GDP growth, with a 1-point rise in FSI leading to a 0.4% reduction in growth during the next quarter. These effects dissipate beyond 5-quarters, transitioning to a positive influence on growth in the medium term.

The coefficients associated with FSI do not change meaningfully when current GDP growth is also included in the regression (Tables A6 to A7 in the Appendix). Suggesting FSI captures unique information about future GDP vulnerabilities, independent of other macroeconomic or systemic risk factors. This finding highlights the importance of monitoring financial stress indicators, especially in the short run, as they can signal immediate risks to growth trajectories before stabilising over time.

5.2.3 Cyclical systemic risks

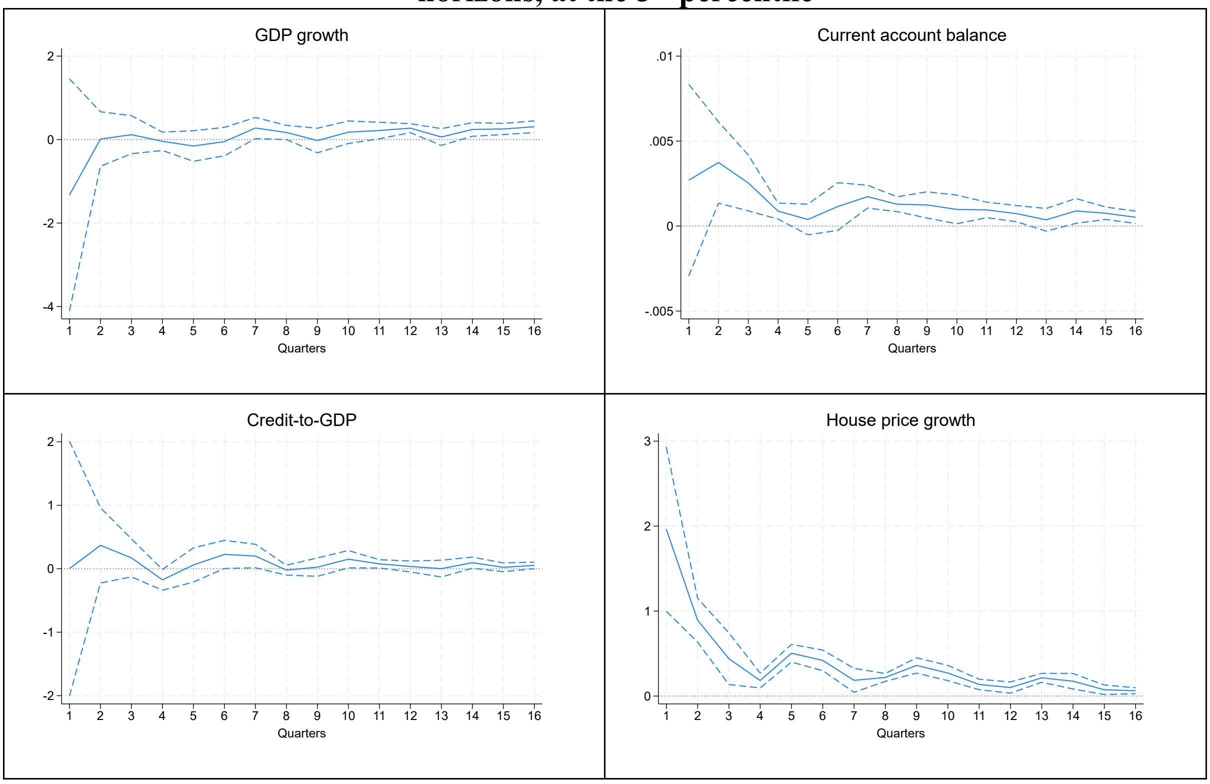
Credit-to-GDP has a similar effect, whereby excessive credit negatively influence future growth in the near term, but this switches and stays positive beyond 6-quarters. Some of these negative and positive effects are significant and documented in Table 2.

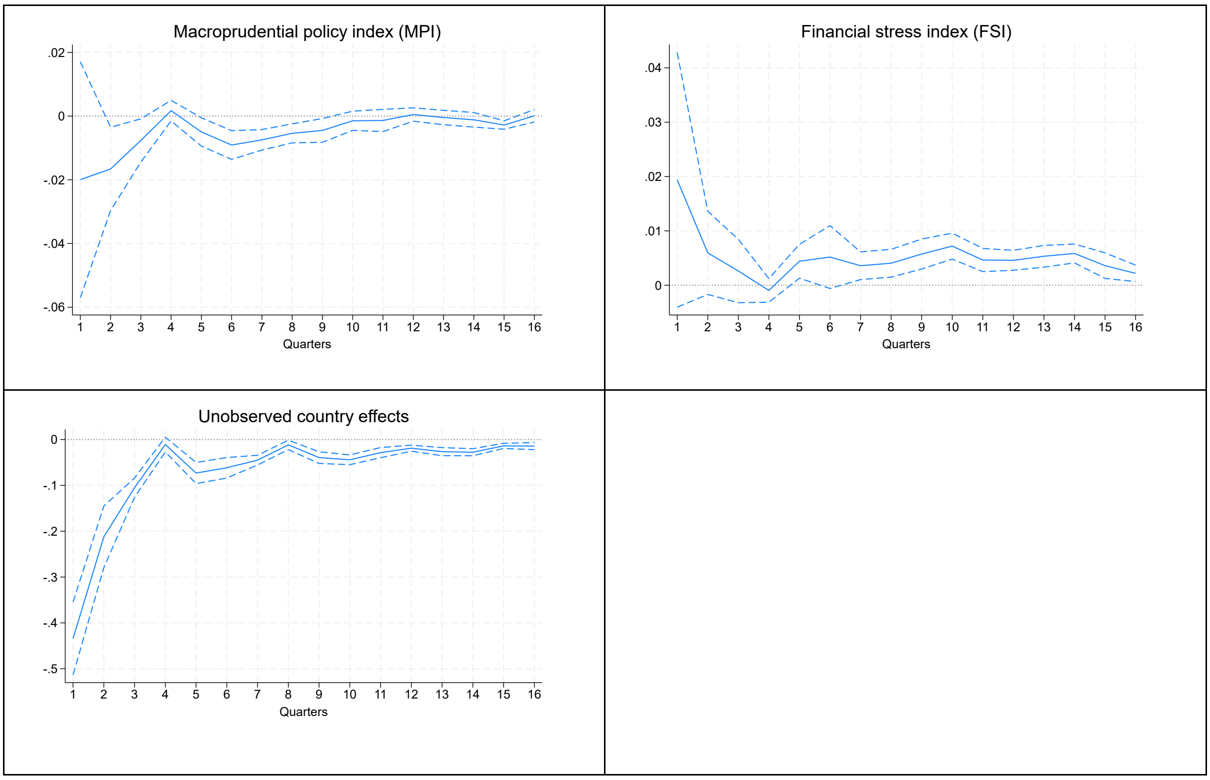
Over all horizons, house price growth positively influences future growth. This suggests that an expansionary phase of high house price growth has the largest negative impact on growth-at-risk in the following quarter, implying the onset of vulnerabilities in the housing market are immediate. These effects are evident in Tables 2 and Figure 2 (see also Table A7 in the Appendix). The aforenoted differences to Aikman et al (2019) are attributed to sampling differences, where the sample is entirely composed of EMs, while their sample is composed of AEs. EMs' housing markets tend to be smaller and it is more likely EMs lack a well-functioning secondary market for housing finance. This implies less potential for spillover effects from the housing market to the rest of the economy.

A 1-point increase in the current account balance, provides a 0.4% increase in GDP growth 1-quarter ahead. However, this effect decreases to 0.1%, but does not dissipate and in every quarter ahead, and leads to increases future GDP growth. This result implies that higher current account balances therefore insulate an economy from financial stresses at the left-hand tail.

Our study finds direct evidence that macroprudential policies can mitigate the influence of cyclical systemic vulnerabilities. Specifically, the inclusion of the MPI in our model dampens the influence of both house price growth and credit-to-GDP on future growth over short-term horizons (2- to 4-quarters ahead). This suggests that MaPPs are effective in curbing the immediate downside risks stemming from housing market excesses and rapid credit expansion in emerging markets. While these dampening effects are short-lived and not discernible beyond this horizon, this finding aligns with the broader consensus on the countercyclical role of macroprudential policies, similar to results found by Sánchez and Röhn (2016) and Gelos et al (2023), who also highlight the efficacy of these policies in managing financial vulnerabilities.

Figure 2: Estimated coefficients of growth-at-risk regressions from 1- to 16-quarter horizons, at the 5th percentile





Note: This figure illustrates the evolution of estimated coefficients from the quantile regression model for the 5th percentile (left tail) of future real GDP growth, spanning forecast horizons from 1 to 16 quarters ahead. The solid blue line represents the estimated coefficient at each horizon, and the dashed blue lines indicate the corresponding 95% confidence bands obtained using bootstrapped standard errors. The grey dashed horizontal line indicates a coefficient value of zero. This figure highlights the dynamic impact of explanatory variables on downside growth risks over time. The analysis covers the sample period from 1996Q1 to 2022Q4.

Table 2: 5th percentile quantile regression estimates for real GDP growth with FSI and cyclical systemic risk and MPI

	h=2	h=4	h=6	h=8	h=10	h=12	h=14	h=16
GDP growth	0.014 (0.298)	-0.040 (0.103)	-0.047 (0.236)	0.172 (0.105)	0.178 (0.115)	0.275*** (0.078)	0.244** (0.107)	0.309*** (0.062)
FSI	0.006* (0.003)	-0.001 (0.001)	0.005*** (0.002)	0.004*** (0.001)	0.007*** (0.001)	0.005*** (0.001)	0.006*** (0.001)	0.002** (0.001)
Credit	0.369 (0.344)	-0.175** (0.072)	0.226*** (0.079)	-0.022 (0.054)	0.151** (0.060)	0.036 (0.041)	0.096* (0.054)	0.053* (0.027)
HP	0.894*** (0.197)	0.183*** (0.040)	0.420*** (0.051)	0.219*** (0.059)	0.271*** (0.051)	0.100*** (0.033)	0.175*** (0.039)	0.063*** (0.023)
CAB	0.004** (0.002)	0.001*** (0.0002)	0.001** (0.001)	0.001*** (0.0003)	0.001** (0.0004)	0.001*** (0.0002)	0.001*** (0.0003)	0.001*** (0.0002)
MPI	-0.017*** (0.006)	0.002 (0.002)	-0.009*** (0.003)	-0.005*** (0.001)	-0.001 (0.002)	0.0005 (0.001)	-0.001 (0.001)	0.0001 (0.0009)
Country-effects	-0.212*** (0.024)	-0.011** (0.005)	-0.062*** (0.009)	-0.012* (0.006)	-0.044*** (0.006)	-0.019*** (0.005)	-0.028*** (0.005)	-0.014*** (0.004)

This table reports the estimated coefficients from panel quantile regressions at the 5th percentile of the conditional GDP growth distribution, capturing downside risk. The regressions are estimated at forecast horizons (h) ranging from 2 to 16 quarters ahead. Explanatory variables include lagged GDP growth, the Financial Stress Index (FSI), credit-to-GDP growth (2-year average), house price growth (2-year average), the current account balance (as % of GDP), and the Macroprudential Policy Index (MPI). Country-specific intercepts are included to account for time-invariant heterogeneity. Standard errors are shown in parentheses.
*'***' denotes significance at the 99% confidence level; '**' denotes significance at the 95% confidence level; '*' denotes significance at the 90% confidence level. Sample period: 1996Q1 -2022Q4*

5.3 Capital control index

This section evaluates the role of capital controls (CCs) in influencing GDP growth, comparing these findings with those for macroprudential policies (MaPPs). The analysis assesses the effectiveness of capital controls across the growth distribution, examining whether they help stabilize growth and mitigate risks, particularly under varying economic conditions. Overall, capital controls demonstrate a stabilizing influence, particularly in the medium term, with implications for their use as a complementary tool alongside macroprudential policies.

For most quantiles, the estimated coefficients for capital controls fall within the 95% confidence interval of the OLS regression, indicating a similar effect across the growth distribution. Given the consistency of results across quantiles, which is evident in Tables 3 and 4, only select plots are displayed, as the full set adds little to the interpretation. Tables 3 and 4, show results for 4- and 12-quarter horizons, respectively. Table 9 and Figure 3 present additional results, over different horizons. Figure 3 further shows that quantile regression estimates for CCs do not significantly diverge from the OLS benchmarks.

At the median, a 1-unit increase in capital controls is associated with a 0.1% decrease in economic growth in the short term (4 quarters ahead) and a similar 0.1% decrease in the medium term (12 quarters ahead). These results align in both sign and magnitude with those obtained for macroprudential policies in Tables 2 (and Tables A6 and A7), suggesting comparable effects on growth dynamics.

Table 3: Quantile regression results, conditional GDP growth 4 quarters ahead: CCI

	q05	q25	q50	q75	q95
GDP	0.0114	0.3350***	0.2845***	0.2177***	-0.0425
	(0.1337))	(0.0676)	(0.0744)	(00555)	(0.0504)
FSI	-0.0017	-0.0012	-0.0005	0.0008*	0.0004
	(0.0016)	(0.0008)	(0.0006)	(0.0005)	(0.0004)
Credit	-0.0448	-0.0448	-0.0329	0.0188	0.0464*
	(0.0659)	(0.0473)	(0.0375)	(0.0264)	(0.0249)
HP	0.2216***	0.0869***	0.0488**	0.0611***	0.0577***
	(0.0716)	(0.0249)	(0.0252)	(0.0264)	(0.0214)
CAB	0.0012***	0.0005**	0.0001	0.0004*	-0.0001
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0003)
CCI	-0.0007	0.0008***	0.0009***	0.0007***	0.0010***
	(0.0010)	(0.0003)	(0.0002)	(0.0002)	(0.0002)
Country -effects	-0.0160*	0.0049**	0.0421***	0.0421***	0.0684***
	(0.0082)	(0.0021)	(0.0027)	(0.0027)	(0.0029)

The table presents estimated coefficients from quantile regressions for future GDP growth (4 quarters ahead), incorporating the Capital Controls Index (CCI) along with other macroeconomic and cyclical systemic risk variables. Quantiles (q) represent the 5th, 25th, 50th, 75th, and 95th percentiles of the conditional GDP growth distribution. Standard errors are in parentheses.
*'***' denotes significance at the 99% confidence level; '**' denotes significance at the 95% confidence level; '*' denotes significance at the 90% confidence level. Sample period: 1996Q1 -2022Q4*

Table 4: Quantile regression results, conditional GDP growth 12 quarters ahead: CCI

	q05	q25	q50	q75	q95
GDP	0.1733**	0.2402***	0.2361***	0.2162***	0.1607***
	(0.0840)	(0.0378)	(0.0616)	(0.0612)	(0.0378)
FSI	0.0034***	0.0018***	0.0012***	0.0012***	0.0001
	(0.0010)	(0.0005)	(0.0004)	(0.0005)	(0.0004)
Credit	-0.0828	-0.0338	0.0141	0.0520***	0.0992***
	(0.0587)	(0.0315)	(0.0220)	(0.0196)	(0.0171)
HP	0.1150***	0.0653***	0.0416**	0.0421**	0.0247**
	(0.0364)	(0.0165)	(0.0177)	(0.0211)	(0.0100)
CAB	0.0008***	0.0005***	0.0001	-0.00004	0.0001
	(0.0002)	(0.0001)	(0.0001)	(0.0003)	(0.0002)
CCI	0.0007*	0.0005**	0.0006**	0.0007***	0.0008***
	(0.0004)	(0.0002)	(0.0003)	(0.0002)	(0.0001)
Country	-0.0006	0.0126***	0.0236***	0.0361***	0.0501***
-effects	(0.0062)	(0.0021)	(0.0021)	(0.0020)	(0.0023)

The table presents estimated coefficients from quantile regressions for future GDP growth (12 quarters ahead), incorporating the Capital Controls Index (CCI) along with other macroeconomic and cyclical systemic risk variables. Quantiles (q) represent the 5th, 25th, 50th, 75th, and 95th percentiles of the conditional GDP growth distribution. Standard errors are in parentheses.
*'***' denotes significance at the 99% confidence level; '**' denotes significance at the 95% confidence level; '*' denotes significance at the 90% confidence level. Sample period: 1996Q1 -2022Q4*

Table 3 and 4 presents quantile regression results for conditional GDP growth 4 and 12 quarters ahead across selected quantiles (q05, q25, q50, q75, and q95). At both 4- and 12-quarter horizons, capital controls are positive and significant, though not at the left tail of the distribution in the short run. Additional estimations indicate that the significance threshold for CC effectiveness is approximately the 18th percentile, which corresponds to periods when an economy is not shrinking. This suggests that in the short term, capital controls do not sacrifice growth for risk mitigation when the economy is stable or growing. Over a 12-quarter horizon, capital controls remain significant across the distribution, indicating effectiveness at higher GDP growth levels. These findings align with Glick et al. (2006), who observed that an economy's pre-existing conditions influence the likelihood and timing of implementing capital controls. Our results further suggest that CCs are beneficial in emerging markets experiencing growth above their peers, as they prevent overheating from speculative inflows. This effect is consistent for forecasts spanning 2 to 16 quarters ahead, with Table 5 presenting the coefficient estimates for the 95th percentile. As shown in Figure 3, capital controls are positive and significant across almost all forecasts, highlighting their stabilizing potential when no suitable macroprudential policy is available.

These results contrast with studies such as Bergant et al. (2020), which suggest that tightening MaPPs reduces GDP shock sensitivity while capital controls offer no comparable gain. Here, the consistent effectiveness of capital controls across the growth distribution supports their role as a complementary measure to macroprudential policies in managing systemic risks and stabilizing growth in emerging markets.

Table 5: 5th percentile quantile regression estimates for Real GDP growth with FSI and cyclical systemic risk and CCI

	h=2	h=4	h=6	h=8	h=10	h=12	h=14	h=16
GDP growth	0.111 (0.438)	0.011 (0.182)	0.029 (0.167)	0.090 (0.073)	0.215** (0.146)	0.173* (0.104)	0.134 (0.127)	0.136** (0.069)
FSI	0.006 (0.005)	-0.002 (0.002)	0.003** (0.001)	0.002*** (0.001)	0.004** (0.002)	0.003*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Credit	-0.464* (0.251)	-0.045 (0.070)	-0.102 (0.139)	-0.108*** (0.032)	-0.107 (0.88)	-0.083* (0.049)	-0.089 (0.055)	-0.007 (0.048)
HP	0.817*** (0.142)	0.222** (0.098)	0.323*** (0.053)	0.193*** (0.020)	0.233*** (0.042)	0.115*** (0.030)	0.151*** (0.034)	0.095*** (0.025)
CAB	0.003 (0.002)	0.001*** (0.0003)	0.001** (0.0004)	0.001*** (0.0003)	0.001** (0.0003)	0.001*** (0.0002)	0.001** (0.003)	0.001*** (0.0002)
CCI	0.002 (0.002)	-0.001 (0.001)	0.001 (0.001)	0.001** (0.0003)	0.001 (0.001)	0.0007* (0.0004)	0.001* (0.0004)	0.001** (0.0004)
Country-effects	-0.173*** (0.026)	-0.016** (0.006)	-0.043*** (0.005)	-0.003 (0.004)	-0.022*** (0.007)	-0.001 (0.005)	-0.010* (0.005)	-0.001 (0.004)

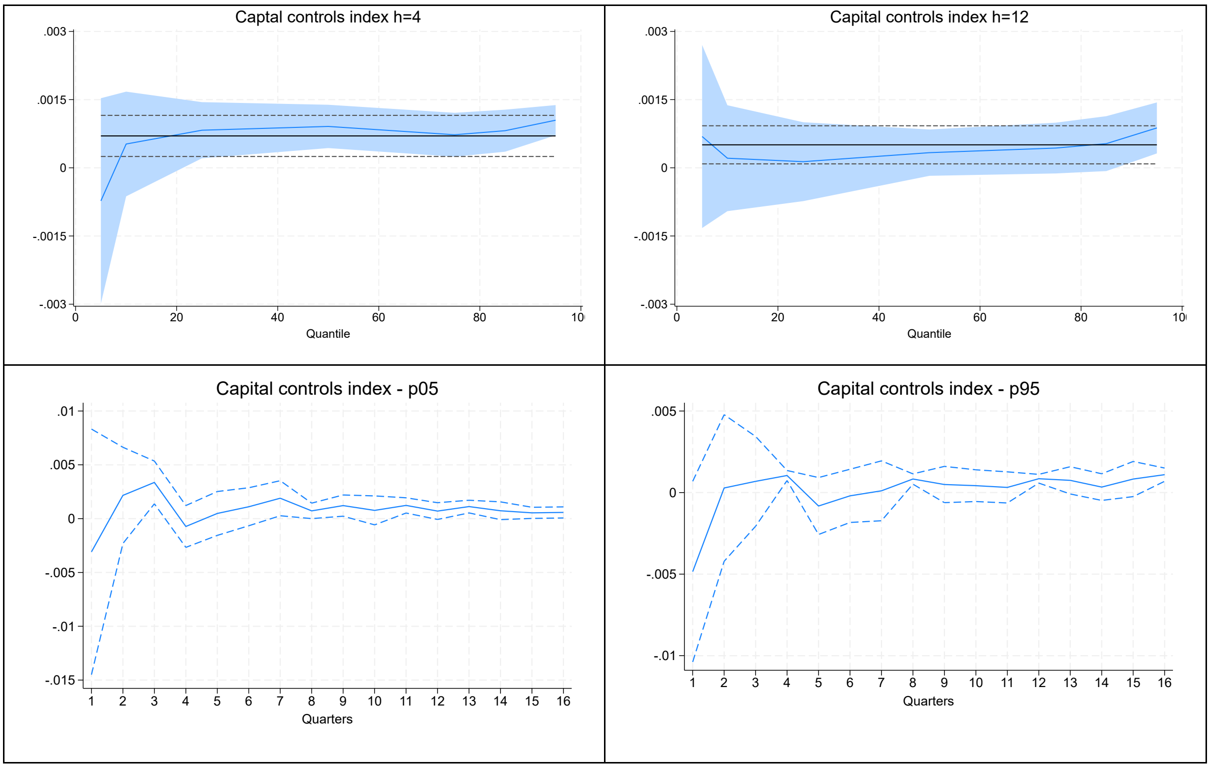
*This table displays the quantile regression coefficients specifically for the 5th percentile (q05) of the conditional real GDP growth distribution, across various forecast horizons (h) from 2 to 16 quarters ahead. The regression model includes contemporaneous GDP growth, the Financial Stress Index (FSI), key cyclical systemic risk variables (Credit-to-GDP ratio, House Price Growth, Current Account Balance), and the Capital Controls Index (CCI), alongside country-specific effects. The analysis provides insights into the drivers of downside growth risks in emerging market economies. Standard errors are provided in parentheses below the coefficients ‘***’ denotes significance at the 99% confidence level; ‘**’ denotes significance at the 95% confidence level; ‘*’ denotes significance at the 90% confidence level. Sample period: 1996Q1 -2022Q4*

Table 6: 95th percentile quantile regression estimates for Real GDP growth with FSI and cyclical systemic risk and CCI

	h=2	h=4	h=6	h=8	h=10	h=12	h=14	h=16
GDP growth	0.986* (0.548)	-0.042 (0.084)	0.413*** (0.156)	0.128*** (0.028)	0.249*** (0.092)	0.161*** (0.028)	0.209*** (0.069)	0.195*** (0.035)
FSI	-0.003 (0.007)	0.0004 (0.0006)	0.0004 (0.002)	0.0002 (0.0003)	-0.001 (0.001)	0.00005 (0.0004)	-0.0004 (0.001)	0.0002 (0.0001)
Credit	0.530** (0.209)	0.046 (0.046)	0.159* (0.088)	0.081*** (0.023)	0.123*** (0.044)	0.099*** (0.019)	0.111*** (0.030)	0.125*** (0.018)
HP	-0.569*** (0.154)	0.058* (0.031)	-0.168*** (0.053)	0.056*** (0.014)	-0.099*** (0.026)	0.025** (0.011)	-0.049** (0.023)	0.012 (0.009)
CAB	-0.001 (0.001)	-0.0001 (0.0003)	-0.001 (0.001)	0.0002* (0.0001)	-0.001** (0.0003)	0.00001 (0.0002)	-0.001*** (0.0001)	-0.00005 (0.0002)
CCI	0.0003 (0.002)	0.001*** (0.0002)	0.0002 (0.0008)	0.001*** (0.0001)	0.0004 (0.0005)	0.001*** (0.0001)	0.0003 (0.0003)	0.001*** (0.0002)
Country-effects	0.200*** (0.021)	0.068*** (0.005)	0.098*** (0.008)	0.054*** (0.002)	0.069*** (0.004)	0.050*** (0.002)	0.062*** (0.004)	0.046*** (0.002)

*This table displays the quantile regression coefficients specifically for the 95th percentile of the conditional real GDP growth distribution, across various forecast horizons (h) from 2 to 16 quarters ahead. The regression model includes contemporaneous GDP growth, the Financial Stress Index (FSI), key cyclical systemic risk variables (Credit-to-GDP ratio, House Price Growth, Current Account Balance), and the Capital Controls Index (CCI), alongside country-specific effects. The analysis provides insights into the drivers of downside growth risks in emerging market economies. Standard errors are provided in parentheses below the coefficients ‘***’ denotes significance at the 99% confidence level; ‘**’ denotes significance at the 95% confidence level; ‘*’ denotes significance at the 90% confidence level. Sample period: 1996Q1 -2022Q4.*

Figure 3: Collection of capital controls quantile plots



Note: This figure presents the estimated coefficients from quantile regressions for future GDP growth at 4-quarter and 12-quarter horizons, illustrating how the impact of the Capital Controls Index (CCI)) across quantiles (0 to 100). The continuous blue line represents the estimated coefficient at each quantile, while the shaded blue area indicates the 95% confidence bands obtained using bootstrapped standard errors. The dashed horizontal lines indicate the estimated coefficient from an OLS regression (dark dashed line) and its corresponding 95% confidence bands (light dashed lines). The analysis covers the sample period from 1996Q1 to 2022Q4.

5.4 Robustness tests

The choice of lag structures for key predictors – particularly the 2-year average growth in credit-to-GDP and house prices – follows the GaR literature (e.g., Galán, 2020; Adrian et al., 2022) and is grounded in evidence that persistent changes in these variables are strong predictors of systemic financial risk (Schularick and Taylor, 2012).To verify that our findings are not sensitive to this choice, we estimate additional specifications using 1-year and 3-year average growth rates. These results are presented in Table 7. Alongside this, we present estimates by region to assess cross-country heterogeneity. We also estimate the model for regional subgroups (Latin America, Emerging Europe, Emerging Asia, and Others). These subsample results reveal some heterogeneity in the magnitude and significance of coefficients, especially for macroprudential policies, which appear more effective in some regions than others. This highlights the importance of structural and institutional differences across EMEs, and supports the need for country-tailored approaches.

Table 7: Robustness of Baseline Model to Lag Structures and Regional Subsamples (12-Quarter Ahead GDP Growth, 5th Percentile)

		Change to specification				Sub-sample			
	Baseline	Credit-to-GDP (1 y. av. growth)	Credit-to-GDP (3 y. av. growth)	House price 1 y. av. growth)	House price (3y. av. growth)	Latin America	Emerging Europe	Emerging Asia	Other
GDP	0.2748***	0.2510***	0.2627***	0.2858***	0.2523***	0.1548	-0.0827	0.2062*	-0.3217***
	(0.0912)	(0.0694)	(0.0871)	(0.0792)	(0.0864)	(0.1656)	(0.3033)	(0.1234)	(0.0590)
FSI	0.0046***	0.0048***	0.0042***	0.0043***	0.0049***	0.0016	0.0012	0.0050***	0.0003
	(0.0009)	(0.0013)	(0.0006)	(0.0011)	(0.0011)	(0.0018)	(0.0029)	(0.0015)	(0.0009)
Credit	0.0362	0.0258	0.0612	0.0607*	0.0449	0.0541	-0.0138	-0.0835	-0.0745***
	(0.0423)	(0.0401)	(0.0402)	(0.0324)	(0.0397)	(0.0659)	(0.1140)	(0.1506)	(0.0233)
HP	0.1004***	0.1043***	0.1049***	0.1184***	0.0870***	0.2774***	-0.0636	0.2174**	0.0807***
	(0.03008)	(0.0272)	(0.0221)	(0.0288)	(0.0249)	(0.0827)	(0.0831)	(0.0906)	(0.0130)
CAB	0.0007***	0.0007***	0.0007***	0.0008***	0.0006***	0.0014**	-0.0005	0.0005	0.0029***
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0006)	(0.0003)	(0.0003)	(0.0010)
MPI	0.0005	0.0005	0.0008	0.0003	0.0013	0.0006	-0.0001	-0.0053**	-0.0260***
	(0.0012)	(0.0010)	(0.0010)	(0.0012)	(0.0011)	(0.0021)	(0.0019)	(0.0022)	(0.0066)
Country-effects	-0.0189***	-0.0178***	-0.0194***	-0.0191***	-0.0193***	-0.0239***	0.0015	0.0025	0.0331***
	(0.0042)	(0.0046)	(0.0049)	(0.0046)	(0.0045)	(0.0067)	(0.0143)	(0.0083)	(0.0035)

*This table presents robustness checks for the baseline quantile regression model, focusing on the 5th percentile of conditional GDP growth 12 quarters ahead. Columns 2-5 show results with alternative lag structures for Credit-to-GDP and House Price growth (1-year and 3-year average growth). Columns 6-9 show results for regional subsamples (Latin America, Emerging Europe, Emerging Asia, and Other EMEs). Coefficients for GDP, FSI, Credit, HP, CAB, MPI, and Country-effects are shown. Standard errors are in parentheses. '***' denotes significance at the 99% confidence level; '**' denotes significance at the 95% confidence level; '*' denotes significance at the 90% confidence level.*

6. Conclusion

This paper examines the effects of financial stress, macroprudential policies (MaPPs), and capital controls (CCs) on growth vulnerabilities in emerging market economies (EMEs), using a growth-at-risk (GaR) framework. By constructing a financial stress index (FSI) and quantifying the impacts of MaPPs and CCs across the growth distribution, the study provides insights into the conditions under which these policies enhance resilience to external shocks and manage systemic risks.

The results indicate that the drivers of growth-at-risk differ over short and medium-term horizons. In the short term (4 quarters ahead), cyclical systemic vulnerabilities – such as housing booms and rapid credit expansion – are key contributors to growth risks, especially at the left tail of the growth distribution. Here, MaPPs play a stabilizing role, as a 1-unit increase in the MaPP index is associated with a slight reduction in GDP growth at the median and lower quantiles, demonstrating a trade-off where stability comes at the cost of some short-term growth.

In the medium term (12 quarters ahead), financial stress becomes a more prominent influence on growth, with the FSI showing significant effects on the growth distribution. While MaPPs continue to contribute to stability, their effects are less significant at the left tail beyond 8 quarters. By contrast, capital controls exhibit consistent, positive impacts across the distribution at this horizon, particularly in high-growth scenarios, suggesting that CCs are more effective at curbing speculative inflows and managing overheating in growth phases.

The results highlight a complementary relationship between MaPPs and CCs. MaPPs are particularly effective in the short term, targeting cyclical risks and maintaining stability. CCs, on the other hand, prove valuable over the medium term, where they can manage capital flows and reduce vulnerabilities in growth cycles. This dual approach allows policymakers to tailor interventions based on economic conditions, thereby enhancing resilience to financial stress without compromising long-term growth potential.

Policymakers in emerging market economies should consider a flexible approach that combines macroprudential policies to address short-term cyclical risks with capital controls to mitigate external vulnerabilities over the medium term. This dual strategy allows for targeted responses that enhance resilience to financial stress without compromising long-run growth potential, provided interventions are tailored to the stage of the financial cycle and broader macroeconomic conditions.

While the results support a differentiated role for macroprudential policies and capital controls in managing financial stress across the business cycle, these recommendations should be interpreted with caution. First, the effectiveness of these tools is likely to vary across countries, depending on institutional capacity, regulatory enforcement, and financial system depth. Second, although lagged regressors help mitigate endogeneity concerns, policy changes may still be reactive to anticipated economic conditions, making it difficult to establish causality. Third, the macroprudential and capital control indexes used here capture only the frequency and direction of policy changes, without accounting for variation in intensity, scope, or implementation design. Finally, while grounded in the literature, the financial stress index aggregates equally weighted components, which may understate the role of specific stress channels that differ in importance across EMEs. These caveats suggest that policy implementation should be tailored and complemented by granular, country-specific diagnostics rather than guided by general rules alone.

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