Different no more: Country spreads in advanced and emerging economies*

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Abstract

Interest rate spreads vary widely across time and countries and are a central driver of business cycles in emerging market economies (EMEs). Since 2008, advanced market economies (AMEs) have exhibited persistently higher and more volatile spreads, alongside increased macroeconomic volatility and stronger co-movement with EMEs. We document six facts showing that AMEs have become more similar to EMEs along key dimensions. We interpret these patterns through a small open economy model and uncover a stark dichotomy: higher spreads reflect greater indebtedness and lower debt tolerance, whereas greater macroeconomic volatility and co-movement are driven by stronger global shocks.

Keywords: Country spreads, debt, interest rate shocks, business cycle, financial frictions
JEL-Codes: F41, G15, E32

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1 Introduction

A distinctive feature of emerging market economies (EMEs) is their high exposure to global financial markets, manifesting in sudden stops and high, volatile interest rate spreads. In fact, fluctuations in interest rates and country spreads have been identified as a major driver of their business cycle (Neumeyer and Perri 2005; Uribe and Yue 2006; Fernández-Villaverde et al. 2011; Born and Pfeifer 2014; Fernández and Gulan 2015). Meanwhile, the Global Financial Crisis of 2008 abruptly ended the period of stable growth and low inflation that advanced market economies (AMEs) had enjoyed during the Great Moderation period (McConnell and Perez-Quiros 2000; Stock and Watson 2002). Ever since, virtually all countries around the world—AMEs and EMEs alike—are experiencing a series of shocks and crises. In this paper, we ask: Are business cycles in EMEs and AMEs no longer different?

Figure 1 provides suggestive evidence by displaying the average country spread for EMEs (red dashed line, left axis) and AMEs (blue solid line, right axis). Before 2008, the average spread was relatively low and stable in AMEs, but high and volatile in EMEs. After 2008, the time-series behavior of the average spread becomes much more similar across the two country groups. In the right panel of the same figure, we zoom in on the volatility of the spread, measured by the standard deviation of daily observations within a month. In this case, too, we observe that the pattern has become much more similar across country groups after 2008, as the volatility of the spread in AMEs has increased.

First, we establish six facts. Comparing the periods before and after 2008, we document that the level and volatility of country spreads, the volatility of output and consumption, the persistence of the trade balance, and the business cycle comovement between AMEs and EMEs have changed in ways that make AMEs resemble EMEs. Finally, average debt levels differed markedly across country groups before 2008, but debt in AMEs has increased substantially since then. In the second part of the paper, we interpret these changes through the lens of the business cycle model for EMEs developed by García-Cicco et al. (2010), hereafter GPU, and ask whether they reflect structural developments within AMEs or simply bad luck, that is, more severe global shocks. We find a clear dichotomy: the increase in spreads reflects the buildup of debt coupled with reduced debt tolerance, while the increase in business cycle volatility reflects more severe global shocks.

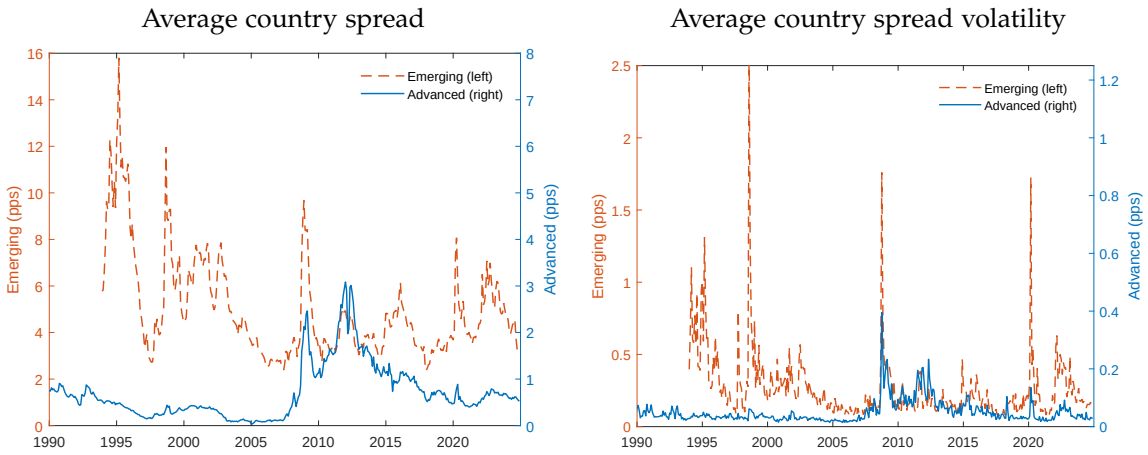

Figure 1: Left panel shows average spread for EMEs (red dashed line, left axis) and AMEs (blue solid line, right axis); right panel shows average intra-month standard deviation. Country groups plotted on different y-axis scales to enhance visibility of within-group variation. Based on 14,511 country-month observations of 61 EME countries and 8,030 observations of 31 AME countries.

Our empirical analysis builds on and extends the dataset of Born et al. (2020), covering the period from the early 1990s to the end of 2024. It includes observations for 42 countries, 21 EMEs and 21 AMEs. Our main focus is on the country spread as a comprehensive indicator of a country's financial stress, net of expectations of exchange rate movements. It is compiled as the difference in yields on a country's government bond and a riskless reference security, both issued in the same currency. We complement the country spread with data for government debt, real GDP, and private consumption, as well as the trade balance-to-output ratio. While observations for the spread are available at a daily frequency, we conduct most of our analysis at a quarterly frequency due to the availability of time series for macroeconomic aggregates. This yields approximately 2,000 country-quarter observations per country group.

In order to establish the six facts, we focus on average developments in AMEs before and after 2008, benchmarking these developments against those in EMEs. Our first set of facts concerns the country spread and its main driver, the level of debt. First, we establish that the average country spread has increased by a factor of five after 2008. EME spreads are still three times higher on average, but no longer ten times higher than in the pre-2008 period. Second, the debt-to-GDP ratio

has risen in AMEs but not in EMEs. Before 2008, the average debt-to-GDP ratio was about 50 percent for both country groups. It has increased to 77 percent in AMEs after 2008.[1] Third, we show that the co-movement of country spreads between AMEs and EMEs has declined considerably, while the volatility of the spread in AMEs has increased strongly. This fact is particularly noteworthy because interest rate shocks have been identified as a main driver of EME business cycles in the influential studies by Neumeyer and Perri (2005) and Uribe and Yue (2006). More recent work has highlighted that EMEs are particularly exposed to shifts in global risk aversion or financial risk (Mauro et al. 2002; Longstaff et al. 2011; Akinci 2013; Gilchrist et al. 2022; Georgiadis et al. 2024).

The second set of facts concerns the macroeconomic aggregates that have been the focus of the literature on EME business cycles: output, consumption, and the trade balance. Fact 4 is that the volatility of AME business cycles, as measured by the standard deviation of the cyclical component of GDP, has gone up by more than 60 percent across the two sample periods. The business cycle co-movement across AMEs and EMEs has also increased significantly, essentially doubling after 2008. Fact 5 is that the volatility of consumption relative to the volatility of output has increased from below to above 1 in AMEs—a salient feature of the EME business cycle (Aguiar and Gopinath 2007; Na and Yoo 2025). Finally, Fact 6 deals with the trade balance-to-output ratio. As stressed by GPU, a distinct feature of EMEs has been a low autocorrelation of the trade balance, suggesting limits to consumption smoothing via international financial markets. As such, the autocorrelation of the trade balance is closely related to sudden stops—episodes of binding external financing constraints that force an abrupt adjustment of the current account and a sharp contraction in consumption. It is thus noteworthy that before 2008, the autocorrelation of the trade balance in AMEs was markedly higher than in EMEs. However, the ordering flipped after 2008.

Taken together, these facts support the notion that, on average, AMEs are no longer so different from EMEs. We also verify that country-group averages accurately reflect general trends and are not driven by individual countries. That

[1]These numbers refer to government debt rather than external debt due to better data coverage. It is still relevant for the country spread because it is a) measured based on government or government-guaranteed bonds and b) relevant for private sector borrowing because of the "sovereign ceiling", according to which private borrowers typically do not face better financing conditions than their sovereign (Durbin and Ng 2005; Corsetti et al. 2013).

said, we acknowledge that our sample of AMEs is dominated by countries that are part of the euro area (EA), of which 15 out of 21 are members. Hence, we assess whether the changes we document for AMEs ultimately reflect developments in EA countries. We find that the increase in spreads is largely specific to these countries, whereas the changes in business cycle dynamics are not. In this context, we also emphasize that AME countries—particularly those now in the euro area—were not immune to crises before 2008. Yet, at least according to our measure of the country spread, such episodes were less pervasive.

Why have AMEs become more like EMEs after 2008? This convergence may reflect structural changes in AMEs or simply a sequence of major global shocks that affected AMEs and EMEs similarly. Consistent with the latter hypothesis, a closer inspection of Figure 1 reveals that spikes in average spreads and their variance occur around 2010, 2014, and again in 2020—that is, around major global crisis episodes. To make some headway in assessing these alternatives, we offer a structural interpretation of the patterns in the data based on a variant of the GPU model. It is a very parsimonious model of EME business cycles—a small open economy model with incomplete international financial markets. The key friction is that domestic interest rates are sensitive to the level of debt, which in turn limits the ability to smooth consumption. While highly stylized, the model has been shown to provide an empirically successful account of the EME business cycle.

In the original paper, GPU estimate the model on long time series data for Argentina and Mexico using full-information Bayesian methods. By contrast, our objective is to account for the six facts in an unbalanced AME–EME panel before and after 2008. We therefore estimate the model by moment matching, separately for the pre-2008 and post-2008 periods. In the estimation, we jointly model prototypical AME and EME countries and account for comovement between them through a global component in the shock processes. We allow three sets of parameters to differ across sample periods: the debt elasticity of the spread, the process governing exogenous innovations in the spread, and the shock processes that govern TFP.

Based on the estimated model, we run counterfactual simulations, allowing one parameter set to vary at a time. The results are clear-cut. Changes in the debt elasticity and in the global component of TFP shocks both matter, but along different dimensions, while changes in the spread process are less important. First,

the increase in the debt elasticity of the spread, together with higher debt levels, accounts for the rise in spreads. In our model, this elasticity is a deep parameter. Its change, however, may be interpreted as reflecting structural change—particularly in our sample, where the increase in AME spreads is largely driven by EA countries. By joining the EA, these countries gave up monetary autonomy and, during the sovereign debt crisis, faced the absence of a lender of last resort, leading to capital flight until the "whatever it takes" moment in 2012. Spreads declined thereafter (see again Figure 1), but whether they will return to pre-2008 levels remains an open question.

Second, our counterfactual simulations indicate that the remaining changes in the data are largely driven by a greater importance of global shocks. This is notable, as these changes are broad-based across AMEs and not confined to EA countries. We provide external validation of this model-based result by extracting the first common component of output growth from all 42 countries in our sample. By construction, it comoves closely with average output growth across EMEs and AMEs, but its importance increases considerably after 2008.

The paper is organized as follows. In the remainder of the introduction, we situate the paper within the existing literature and clarify its contribution. The next section introduces our data set and establishes the six facts. Section 3 presents a variant of the GPU model, explains how it is estimated, and explores counterfactuals to understand the changes in AME business cycles. A final section concludes with some caveats.

Related Literature. Our paper relates to several strands of the literature. First, there is work on sovereign default and country spreads. Classic studies linking country spreads to fundamentals include Eaton and Gersovitz (1981) and Arellano (2008). Other authors examine the fluctuations of spreads over the business cycle, typically from the perspective of EMEs (e.g., Brei and Buzaushina 2015; Fernández and Gulan 2015). More recent contributions to the sovereign debt literature have emphasized the possibility of self-fulfilling debt crises (Cole and Kehoe 2000; Bocola and Dovis 2019; Lorenzoni and Werning 2019). Halac and Yared (2025) propose a political economy model that explains the recurring emergence of fiscally irresponsible regimes. Our analysis neither considers default nor seeks to explain why debt has increased in AMEs. Instead, it assumes a reduced-form relationship

between the spread and the level of debt, following the approach of GPU.

Second, fluctuations in the spread may also reflect a varying degree of risk aversion of investors, in turn, influenced by US monetary policy (Lizarazo 2013; Miranda-Agrippino and Rey 2020) or news about US macroeconomic conditions (Boehm and Kroner 2026). Likewise, EMEs have been found to be particularly sensitive to the global financial cycle, US monetary policy, and currency mismatch (Rey 2013; Kalemli-Özcan 2019; Bertaut et al. 2024). Our results suggest that such an assessment is a promising venue for future work. Third, numerous studies since the global financial crisis have documented the importance of financial frictions for AMEs (for instance, Gertler and Karadi 2011; Gilchrist and Zakrajšek 2012). Other contributions have stressed similarities in the exposure of EMEs and AMEs (see, for instance, Kollmann et al. 2011; Passari and Rey 2015; Miyamoto and Nguyen 2017). Fourth, there is work on the graduation of EMEs in terms of fiscal policy, or more generally, the policy response to crises (Frankel et al. 2013; Vegh and Vuletin 2014; Li and Mihalache 2025), and the "original sin" of borrowing in foreign currency (Hofmann et al. 2022). A somewhat pessimistic reading of our results for AMEs suggests that the reverse is a distinct possibility.

Finally, this paper relates to our earlier time series investigation of how country spreads respond to fiscal shocks (Born et al. 2020). In the present analysis, we build on that work by constructing country spreads for a larger sample in terms of both time and countries. Our focus differs in that we investigate the unconditional co-movement of country spreads and the business cycle, interpreting it through the lens of the structural GPU model.

2 Advanced vs. emerging market economies

In what follows, we briefly highlight key aspects of our data, notably the construction of the country spread. We then establish six facts, contrasting advanced market economies (AMEs) and emerging market economies (EMEs) before and after 2008. To clearly distinguish between these periods, we exclude all observations from the whole of 2008 and compare data up to the end of 2007 ("before 2008") with data from the beginning of 2009 onwards ("after 2008"). Finally, we zoom in on the EA.

2.1 Country classification and spreads

Our sample covers data from the early 1990s to the end of 2024 for 42 countries. According to IMF (2015), 21 of the countries in our sample are classified as EMEs, and 21 as AMEs; see Tables A.1 and A.2 for details on the sample coverage. The IMF classification has evolved over time with the objective "to facilitate analysis by providing a reasonably meaningful method of organizing data" (IMF 2025). During our sample period, there were few changes in the classification of countries in the IMF's World Economic Outlook. First, until 2001, the IMF also used a third category: "countries in transition." In our analysis, we combine these with EMEs. Second, the following countries "graduated" from EME to AME status: the Czech Republic (2008), Latvia (2013), Lithuania (2014), Slovakia (2009), and Slovenia (2007). In our analysis, these countries are classified as AMEs. One IMF classification criterion is GDP valued at purchasing power parity (IMF 2025). Indeed, we find that, in both the pre- and post-2008 samples, the average per capita GDP is lower in virtually all of the 21 EMEs than in the AMEs, see Figure A.1. However, our focus is not on income levels, but rather on countries' exposure to financial markets and their business cycle. In this regard, the difference between AMEs and EMEs has declined considerably, as we document below.

To this end, we rely on observations of macroeconomic, fiscal, and financial market variables measured at different frequencies. Our analysis centers on country spreads, which we compile by building on and extending the database assembled in previous work (Born et al. 2020). Specifically, following Uribe and Yue (2006), we measure the country spread as the yield differential between foreign currency-denominated government or government-guaranteed bonds and risk-free bonds in the same currency. Consequently, changes in the spread reflect changes in default risk and/or risk aversion (rather than inflation expectations and/or expected currency depreciation). Since the construction of the spread is based primarily on liquid securities with comparable maturities, it is also unlikely to be driven by liquidity or term premia. We exclude default episodes from our sample; see Appendix A for details. Throughout our analysis, we focus on the spread rather than the level of the (real) interest rate because we are interested in differential developments between AMEs and EMEs—as opposed to movements in the underlying risk-free interest rate, which is likely to be more common across both country groups.

As emphasized by Neumeyer and Perri (2005), interest rates on government debt are not identical to those of the private sector, but there is generally a very strong co-movement. Like Uribe and Yue (2006), we rely on the JPMorgan Emerging Market Bond Index (EMBI) dataset, as well as several additional sources, as detailed in earlier work (Born et al. 2020).[2] In what follows, we adopt the same approach as in Born et al. (2020), updating the data to include observations up to December 2024. The spread data are available at a daily frequency. When focusing on quarterly observations, 2,129 country-quarter observations are available for AMEs and 2,056 for EMEs, excluding default episodes and the year 2008.[3]

2.2 Before vs. after 2008: Six facts

In the following, we calculate several statistics for the periods before and after 2008. Table 1 reports summary statistics for end-of-quarter spreads in AMEs and EMEs, measured in percentage points. Before 2008, we observe very different spread levels across country groups. The mean and median are both more than ten times higher in EMEs than in AMEs. In contrast, for the period after 2008, we find that the spread behaves much more similarly in the two groups of countries. The average spreads in EMEs are now only three times higher, see also the left panel of Figure 1 above. This is due to *both* an increase in the average spread in AMEs and a decrease in EMEs compared to the previous period. However, the former makes a greater contribution to the convergence of spread levels. This pattern emerges consistently, regardless of whether we pool all observations or consider averages over country means (C by C). Against this background, we state

Fact 1. *Country spreads in AMEs and EMEs have converged considerably after 2008. Before 2008, EME spreads were 10 times higher; now they are only 3 times higher.*

A key determinant of the country spread is the debt-to-GDP ratio. Unsurprisingly, therefore, we find that debt ratios have risen sharply in AMEs after 2008.

[2]The EMBI spread was kindly provided by J.P. Morgan. The following disclaimer applies: "Information has been obtained from sources believed to be reliable but J.P. Morgan does not warrant its completeness or accuracy. The Index is used with permission. The Index may not be copied, used, or distributed without J.P. Morgan's prior written approval. Copyright 2025, JPMorgan Chase & Co. All rights reserved."

[3]When further restricting the sample to include only observations with available spread and national account data, 2,036 AME and 1,977 EME observations remain. Appendix Tables A.1 and A.2 provide details on the sample coverage.

Table 1: Country spreads at quarterly frequency

	Before 2008		After 2008	
	AME	EME	AME	EME
Mean	0.34	4.38	1.19	3.44
Mean (C by C)	0.27	4.08	1.17	3.50
Median	0.26	2.81	0.57	2.36
Std. Dev.	0.32	4.85	1.91	5.08
Std. Dev. (C by C)	0.19	2.85	0.99	2.42
Min	−0.15	0.15	−1.81	0.17
Max	2.20	57.92	24.56	128.40
Skewness	2.34	4.41	4.62	13.40
Kurtosis	10.96	38.13	35.83	296.25
Corr. (within groups)	0.38	0.63	0.71	0.34
Corr. (across groups)	0.39		0.23	
Observations	857	767	1272	1276

Notes: Country spread is yield differential between foreign currency-denominated government or government-guaranteed bonds and risk-free bonds in the same currency. Statistics are based on pooled country-group sample and computed from end-of-quarter values, measured in percentage points. "C by C" denotes averages of country statistics. Correlations are average bilateral cross-correlations of all country pairs within/across EME and AME groups.

We measure the debt ratio based on general government debt because the data coverage is better than for external debt, which would be our preferred measure. That said, a sizable share of government debt is held by external investors (roughly between 30 and 50 percent). Before 2008, the average debt-to-GDP ratio across countries was remarkably similar in EMEs and AMEs, at 47 percent and 53 percent, respectively. However, this changed after 2008, when the average debt ratio rose to 77 percent in AMEs, while remaining roughly constant at 49 percent in EMEs. More details can be found in Tables A.7 and A.8. We record this observation as

Fact 2. *In AMEs, the average debt-to-GDP ratio has increased from 53 percent before 2008 to 77 percent after. Meanwhile, it has remained stable at around 50 percent in EMEs.*

Figure 2 illustrates the correlation between the debt ratio (measured along the horizontal axis) and the spread (measured along the vertical axis). Blue plus markers indicate observations for AMEs, while red x markers represent EMEs. For the period before 2008 (shown in the left panel), distinct patterns emerge for EMEs and AMEs. Although the range of the debt-to-GDP ratios observed in this period

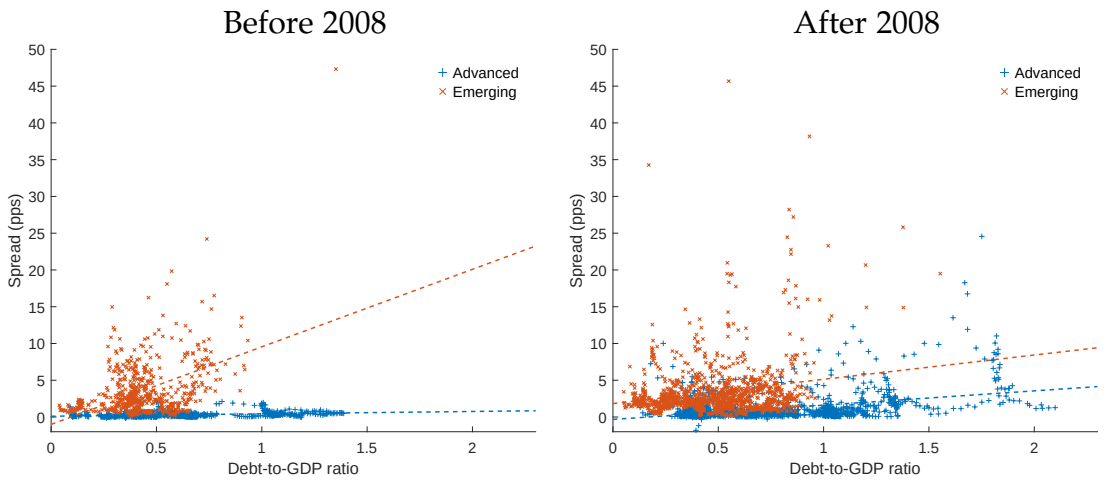

Figure 2: Quarterly observations for spread and annual debt-to-GDP ratio. Blue plus signs indicate observations for AMEs, and red x markers indicate observations for EMEs. Public debt-to-GDP ratio refers to general government debt relative to GDP based on linearly interpolated IMF data (`GGXWDG_NGDP`). Dashed lines indicate the best linear fit.

is similar for both groups of countries, the relationship between spreads and debt levels is much stronger for EMEs. We visualize this observation by including different regression lines in the panel. It is positively sloped for EMEs but flat for AMEs. After 2008, the spread also correlates more strongly with the debt ratio in AMEs, but less so in EMEs, as the right panel of the figure shows. The slope of the regression line is now essentially the same for both country groups. We stress that spreads and borrowing are jointly determined in equilibrium (e.g. Arellano 2008). For this reason, the regression line is merely suggestive and will not serve as a fact in our analysis below.

Table 1 above also reports the standard deviation of the spread. A similar pattern emerges. Before 2008, the spreads of AMEs were much less volatile than those of EMEs. Since then, however, the standard deviation has increased sixfold and is now much more similar to that of EMEs, as the right panel of Figure 1 above also illustrates. Table 1 also reports the maximum and minimum spread in both samples. Again, the changes over the sample periods paint a similar picture. Importantly, Tables A.3 and A.4 in the appendix confirm that these results are not driven by individual countries.

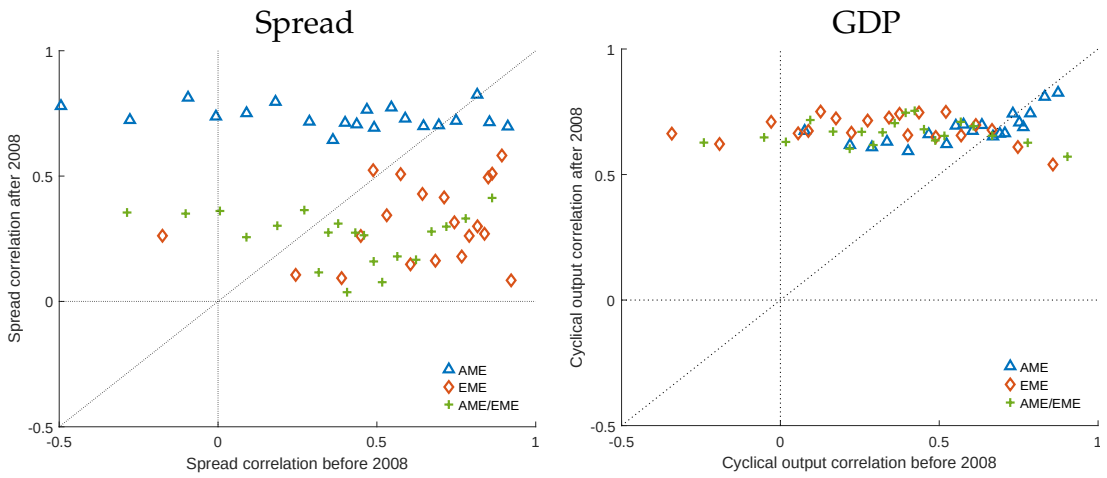

Figure 3: Binned quarterly cross-country correlation of sovereign spread (left panel) and cyclical GDP fluctuations (right panel). Red diamond markers: average bilateral cross-correlation of all country pairs within EME group; blue triangular markers: same for within AME group; green plus markers: same for across AME/EME country groups. x-axis displays correlations before 2008, y-axis after 2008. 210 country pairs have been binned into twenty equally-sized bins based on their before-2008 correlations.

Finally, the bottom panel of Table 1 documents significant changes in cross-country correlations of spreads within and between EMEs and AMEs. The left panel of Figure 3 visualizes these changes using a binned scatter plot. Blue triangles represent bilateral AME-country pairs; red diamonds, bilateral EME-country pairs; and green crosses, bilateral AME–EME pairs. The horizontal axis shows 20 equally sized bins based on the correlation values before 2008, and the vertical axis measures the correlation of spreads after 2008. Two observations stand out. First, bilateral correlations have increased among AMEs and decreased among EMEs. Second, the co-movement of spreads between EMEs and AMEs, computed on a country-by-country basis, has declined considerably. We summarize these observations as follows:

Fact 3. *The volatility of country spreads has converged considerably after 2008. Before 2008, EME spread volatility was around 15 times higher; now it is only 2.7 times higher. Bilateral correlations of spreads across EMEs and AMEs have declined by about 40 percent on average.*

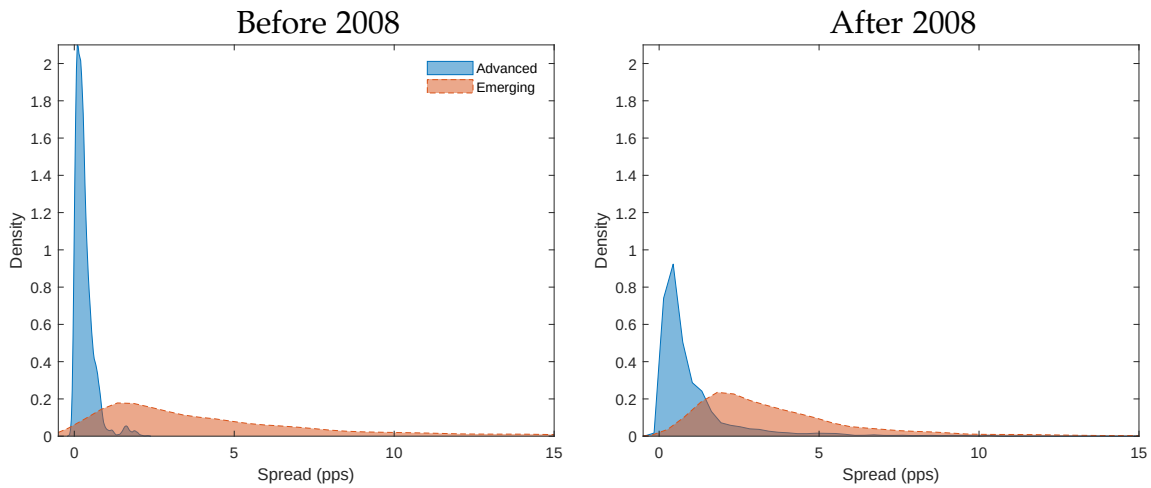

Figure 4: Distribution of the country spreads computed based on monthly data. Kernel density estimate for advanced economies (blue solid line) and emerging economies (red dashed line); spread level measured in percentage points. Kernel density estimate employs an Epanechnikov kernel.

To visualize the change in the spread distribution over time, we show kernel density estimates for average monthly spreads in Figure 4. The left and right panels contrast the data for the period before and after 2008. In each panel, the blue area shows the distribution of spreads for AMEs, and the red area shows the distribution for EMEs. Once again, we observe that the distributions of spreads for the two groups of countries differ greatly before 2008 but become much more similar afterwards. Before 2008, the mass of the observations for AME spreads is close to zero. This changes considerably after 2008, when the distribution becomes wider and less concentrated around zero—once a feature characterizing the distribution for EMEs.

Turning to higher moments, we observe that the distributions are right-skewed for both time periods and country groups. This is not surprising, given that spreads are bounded from below. However, it is noteworthy that the skewness has increased after 2008 and more so for AMEs (see also Table 1). While positive excess kurtosis (that is, >3) is ubiquitous for both country groups in both sample periods, it is even higher after 2008 (see, again, Table 1).

In terms of the broader business cycle, EMEs are generally more volatile, notably in terms of consumption (e.g. Neumeyer and Perri 2005; Aguiar and Gopinath 2007; Fernández and Gulan 2015). We revisit this dimension by contrasting AMEs

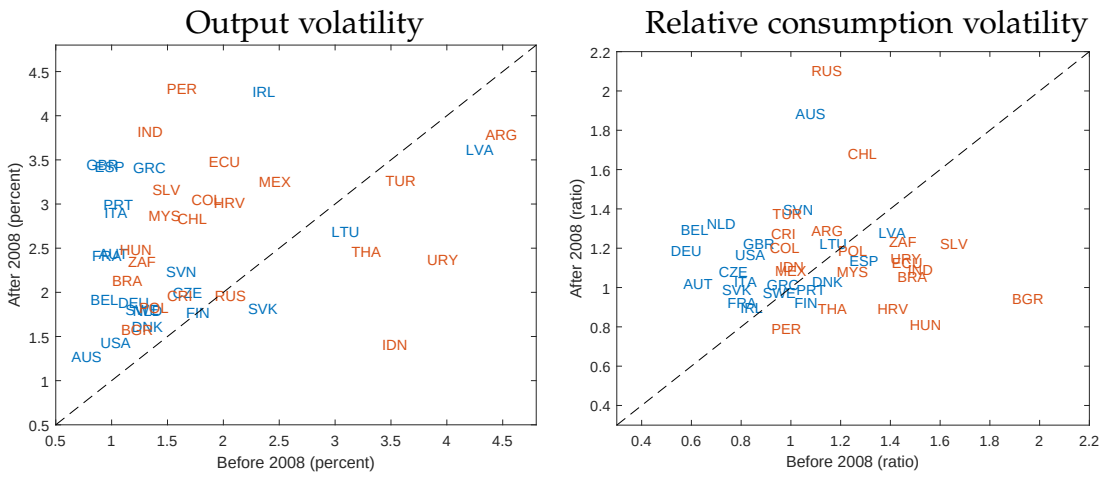

Figure 5: Output and relative consumption volatility across samples. Left (right) panel: output volatility in percent (consumption volatility relative to output volatility). Output and consumption volatility measured in percent and based on cyclical fluctuations around HP-filtered trend ($\lambda = 1{,}600$). Blue acronyms: observations for AMEs; red acronyms: observations for EMEs. Black dashed line indicates 45-degree line.

and EMEs again. As in the earlier literature, we extract the cyclical component of the quarterly time series for real consumption and output using a Hodrick-Prescott filter with a smoothing parameter of $\lambda = 1,600$.

The panels of Figure 5 show the results. To set the scene, the left panel visualizes the change in output volatility over the two sample periods for both AMEs (in blue) and EMEs (in red). The standard deviation of the cyclical component of output in the earlier sample period is plotted on the horizontal axis, and the corresponding value for the post-2008 sample is plotted on the vertical axis. Most observations are clustered above the 45-degree line, indicating increased output volatility. The dispersion of values across AMEs has also increased considerably. On average, output volatility in AMEs has now reached a level previously characteristic of EMEs. It was 1.54 percent before 2008 and has risen to 2.44 percent since.

At the same time, the co-movement of business cycles across countries has increased considerably, both within and across country groups. Consider the right panel in Figure 3 to illustrate this. As for spreads, shown in the left panel, it presents a binned scatter plot of bilateral correlations of the cyclical component of output. The observations are clearly clustered above the 45-degree line—indicating

a strong increase in the co-movement of international business cycles. The average bilateral correlation of output across AMEs and EMEs has increased from 0.36 before 2008 to 0.66 after 2008. Hence,

Fact 4. *Over the two sample periods, output volatility in AMEs has increased by almost two-thirds. The business cycle co-movement between AMEs and EMEs has nearly doubled.*

The right panel of Figure 5 shows how the volatility of consumption relative to the volatility of output has changed across periods on a country-by-country basis. A clear pattern emerges here: most observations for AMEs are clustered above the 45-degree line, while most observations for EMEs are clustered below. Against this background, we state

Fact 5. *The volatility of consumption, measured relative to output, has largely converged in AMEs and EMEs. Before 2008, it was typically below one in AMEs and above one in EMEs. Now, it is close to or above one in many countries, both in AMEs and EMEs.*

We report the specific numbers in the appendix, see Tables A.5 and A.6 for AMEs and EMEs, respectively. The average volatility ratio for AMEs has increased from 0.93 to 1.15. For EMEs, it has declined from 1.29 to 1.18.

Finally, we turn to one last statistic that has received considerable attention in the literature on EME business cycles. In particular, GPU show that, when benchmarked against the frictionless real business cycle model, the autocorrelation function of the trade balance-to-output ratio is low in EMEs. In the absence of financial frictions, the autocorrelation is flat and close to unity—testifying to a country's ability to smooth the impact of shocks on consumption over time. Financial frictions, on the other hand, lower the autocorrelation function. And because—according to the received wisdom—EMEs face stronger financial frictions, their trade balance-to-output ratio, the argument goes, exhibits less persistence. Against this background, we compute the autocorrelation function of the trade balance-to-output ratio for AMEs and EMEs, again for both sample periods.

The left panel of Figure 6 shows the result for the sample before 2008. As expected, the autocorrelation is higher for the AMEs (shown in blue, as squares) than for the EMEs (shown in red, as diamonds). However, strikingly, the order reverses after 2008, as shown in the right panel. While the autocorrelation functions are now very similar for both country groups, the autocorrelation is actually lower

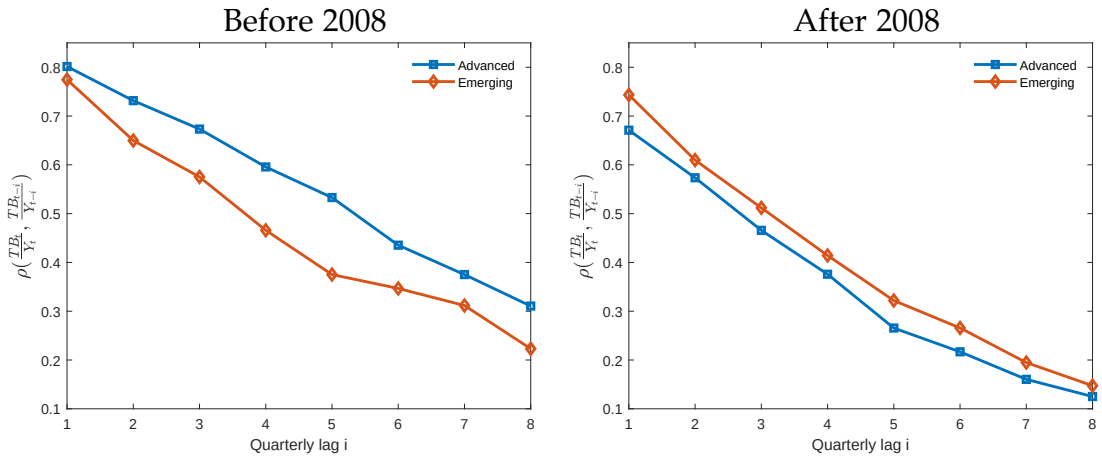

Figure 6: Quarterly autocorrelation of the trade balance-to-output ratio. Blue lines with square markers represent AMEs; red lines with diamond markers indicate EMEs. The x-axis represents the quarterly lag *i*; y-axis represents the average trade balance-to-output ratio autocorrelation in the respective country group.

for the AMEs at all horizons. By comparing the two panels, we can see that this is mainly due to the decreased autocorrelation function of the AMEs.[4] Hence,

Fact 6. *The autocorrelation function of the trade balance-to-output ratio for AMEs and EMEs has converged after 2008. Before 2008, it was flatter for AMEs.*

Taken together, these facts paint a fairly clear picture. When we compare the period before and after 2008, we find that business cycles in AMEs now resemble those in EMEs across several key dimensions. There is also stronger co-movement in terms of output, though not in terms of country spreads.

2.3 AMEs vs. EA members

Our sample of AMEs is dominated by countries in the euro area (EA), with 15 out of 21 countries being members of EA today. Against this background, a natural question is to what extent the changes we document reflect merely an EA phenomenon rather than a broader AME phenomenon. After all, the sovereign

[4]See Figure A.2 in the appendix for the country-level autocorrelation profiles before and after 2008. The figure suggests that the lower post-2008 autocorrelation among AMEs is not driven by a small number of outliers, but reflects a broader pattern across countries.

Table 2: The change in business cycles—EA vs. non-EA advanced economies

	Before 2008		After 2008	
	EA	Non-EA	EA	Non-EA
Δr	0.26	0.29	1.49	0.37
D/Y	0.58	0.42	0.84	0.59
$\sigma_{\Delta r}$	0.19	0.17	1.29	0.26
σ_y^{hp}	1.69	1.17	2.44	2.64
$\sigma_c^{hp}/\sigma_y^{hp}$	0.92	0.93	1.15	1.11

Notes: The first two rows present the average annualized spread and debt-to-GDP ratio. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. Data moments are cross-country averages.

debt crisis in the euro area in the wake of the global financial crisis proved to be long-lasting and affected many EA countries. It has also been argued that a distinct feature of the crisis in the euro area was a sudden stop, as private lending to crisis countries dried up. In particular, the Baltic countries—which at the time were not members of the EA but maintained a peg to the euro—experienced a very sharp reversal of their current accounts. More generally, a monetary union does not shield countries from capital flight, and financial integration remains limited in EA (Fornaro 2022; Beck et al. 2024).

Against this background, we zoom in on the sample of AMEs and provide a breakdown of our six facts, distinguishing between the 15 EA countries and the remaining 6 AME countries. Table 2 reports the moments underlying the first five facts across the two sample periods, while Figure A.3 in the appendix shows the autocorrelation function of the trade balance-to-output ratio for both country groups. In the presence of financial frictions—and sudden stops in particular—the autocorrelation is expected to be less persistent.

A clear dichotomy emerges. On the one hand, the changes in spreads—both in terms of levels and volatility—are largely confined to the EA sample (rows 1 and 3 of Table 2). On the other hand, the increase in the debt ratio (row 2) and the changes in business cycle properties are broad-based: output volatility (row 4) increased sharply for both country groups, as did the relative volatility of

consumption (last row), which rises above one in both country groups—a defining feature of EME business cycles. The autocorrelation of the trade balance has also declined after 2008 in both EA and non-EA countries, see Figure A.3. Overall, EA countries stand out in terms of increased financial fragmentation in the post-2008 sample, whereas the broader changes in business cycle dynamics are common across advanced economies.

The EA case highlights an important caveat. As we focus on the differences between AMEs and EMEs and how these evolve over time, we inevitably abstract from heterogeneity across countries.[5] Importantly, although EME and AME countries are clearly distinct in the pre-2008 sample—with EMEs more crisis-prone—this does not imply that AMEs never experienced crises during this period. In fact, prior to 2008, several countries that are today members of the EA and classified as AMEs experienced clear sudden stops. This is not apparent from Figure 1, which only shows the average spread for both country groups.

A striking example is the crisis of the European Monetary System (EMS), when the United Kingdom and Italy were forced out of the Exchange Rate Mechanism (ERM). During this episode, Italy experienced high and volatile spreads vis-à-vis German Bunds, shown by the solid (green) line in the left panel of Figure 7. Importantly, this line shows the nominal spread, which may also reflect expected currency depreciation. And, indeed, the dashed (violet) line shows the monthly depreciation of the Italian lira against the Deutsche Mark. The vertical dotted line marks the onset of the EMS crisis in September 1992. At this point we observe the strongest depreciation. Following the introduction of the euro in 1999, these effects disappear and spreads remain low until 2008.

We contrast this with the real spread, which forms the basis of our analysis and is shown in the right panel of Figure 7 for Italy and for the AME sample as a whole. Three remarks are in order. First, the real spread for Italy was somewhat elevated during the 1992 crisis, yet quantitatively it is dwarfed by the nominal spread, suggesting that the latter primarily reflected exchange rate expectations. Second, once expressed in real terms, the increase in spreads after 2008 is much more dramatic. Third, country-specific movements are reflected in the aggregate but receive limited weight—the aggregate measure necessarily fails to give full justice to country-level dynamics.

[5]That said, Appendix A provides a breakdown at the country level.

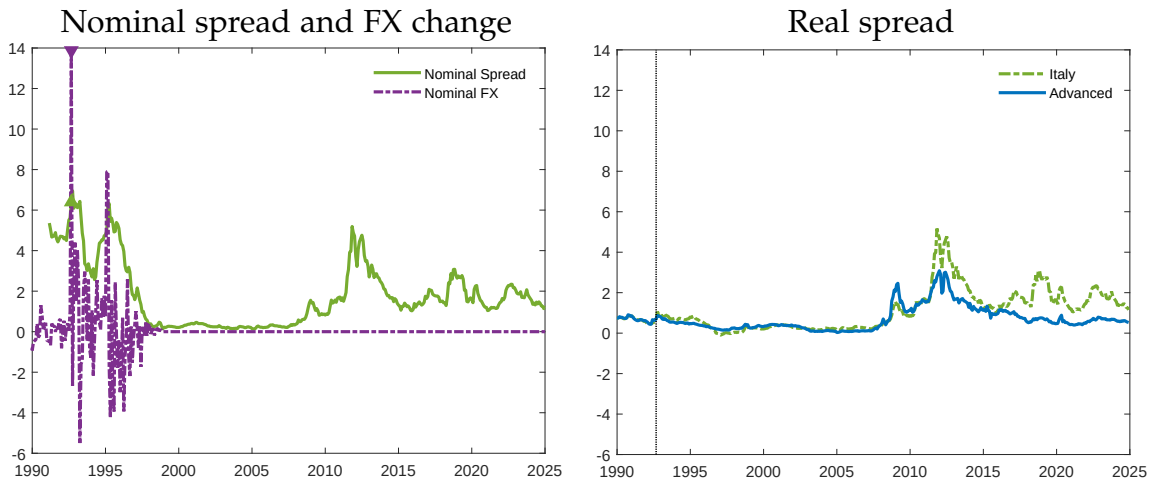

Figure 7: Zooming in on Italy. Solid (green) line in left panel shows nominal spread between long-term convergence rates of Italy and Germany, dash-dotted (violet) line shows percentage change in the Italian Lira per Deutsche Mark exchange rate. Right panel: solid (blue) line shows average real monthly spread in advanced economies, dashed dotted (green) line: average real monthly spread in Italy. The x-axis represents months; y-axis represents the spread/interest rate in percentage points and the FX change in percent. Markers in left panel and vertical black dashed line in right panel denote the onset of the EMS crisis in September 1992.

In concluding this section, we therefore note that crisis episodes *did* occur in AMEs before 2008; however, their extent—both in terms of breadth (i.e., the number of countries involved) and depth—was more limited than what we document for the post-2008 period.

3 A structural interpretation

What explains the change in AME country spreads and business cycles after 2008? We address this question through the lens of the GPU small-open-economy model. Although highly stylized, the model has been shown to account for business-cycle dynamics in EMEs. We will argue below that it also provides useful insights into AME business cycles, especially in the post-2008 period.

3.1 Model setup

We base our analysis on a slightly simplified version of the GPU small open economy model.[6] We therefore keep the model description brief. Since the empirical facts documented in Section 2 include the co-movement of country spreads and output across AMEs and EMEs, we model and jointly simulate a prototypical AME and EME. Variables and parameters indexed by $i \in \{AME, EME\}$ are country-group specific, whereas objects without the subscript i are common across country groups.

A representative household maximizes lifetime welfare

$$E_0 \sum_{t=0}^{\infty} \beta_i^t \frac{\left[C_{i,t} - \theta_i \frac{X_{i,t-1} h_{i,t}^{\omega}}{\omega}\right]^{1-\gamma} - 1}{1-\gamma} , \tag{1}$$

where $C_{i,t}$ is consumption, $h_{i,t}$ is hours worked, the discount factor is denoted by β_i, γ is the risk aversion parameter, ω is related to the Frisch elasticity, and θ_i is the weight on labor disutility. Finally, $X_{i,t}$ denotes non-stationary total factor productivity (TFP) with growth rate $g_{i,t} = \frac{X_{i,t}}{X_{i,t-1}}$, which follows

$$\ln g_{i,t} = (1 - \rho_{g,i})\bar{g} + \rho_{g,i} \ln g_{i,t-1} + \varepsilon_{i,t}^{g} , \quad \varepsilon_{i,t}^{g} \overset{iid}{\sim} \mathcal{N}(0, \sigma_{g,i}^2) , \tag{2}$$

where $\bar{g}$ denotes the steady state growth rate.

The production function is given by

$$Y_{i,t} = a_{i,t} K_{i,t-1}^{\alpha} \left(X_{i,t} h_{i,t}\right)^{1-\alpha} , \tag{3}$$

where $Y_{i,t}$ is output, $K_{i,t-1}$ is the capital stock, and α is the output elasticity of capital. An important feature of the stationary technology shock, $a_{i,t}$, is a global component, Γ_t^a, that drives TFP in AMEs and EMEs simultaneously and generates co-movement across country groups. Specifically, we assume

$$\ln a_{i,t} = \Gamma_t^a + \rho_{a,i} \ln a_{i,t-1} + \varepsilon_{i,t}^{a} , \quad \varepsilon_{i,t}^{a} \overset{iid}{\sim} \mathcal{N}(0, \sigma_{a,i}^2) , \tag{4}$$

[6] Starting from the original GPU model, we drop the exogenous spending shock, as it was found to be quantitatively unimportant, as well as the preference shock.

where the global factor, in turn, follows the process:

$$\Gamma_t^a = \rho_a \Gamma_{t-1}^a + \varepsilon_t^a \,, \quad \varepsilon_t^a \overset{iid}{\sim} \mathcal{N}(0, \sigma_a^2) \,. \tag{5}$$

Capital is accumulated according to the standard law of motion

$$K_{i,t} = (1 - \delta_i) K_{i,t-1} + I_{i,t} \,, \tag{6}$$

where $I_{i,t}$ is investment and δ_i is the depreciation rate.

The economy can issue external one-period debt with face value $D_{i,t}$. This debt is issued at a debt-elastic gross interest rate $r_{i,t}$, which the household takes as given:

$$r_{i,t} = r^{\text{rf}} + \psi_{0,i} \bar{D}_i + \psi_i \ln \left(\frac{D_{i,t}}{X_{i,t} \bar{D}_i} \right) + \ln \mu_{i,t} \,. \tag{7}$$

Here, r^{rf} is the steady-state risk-free gross world interest rate. The time-varying country spread is given by $\Delta r_{i,t} \equiv r_{i,t} - r^{\text{rf}}$. The term $\psi_{0,i} \bar{D}_i$ captures the steady state spread faced by our small open economy, given the steady state debt level $\bar{D}_i$. ψ_i is a key parameter in the analysis that follows. It measures the elasticity of the country spread with respect to debt, denoted by $D_{i,t}$, measured in terms of deviations from its long-run value $\bar{D}_i$.[7] $\mu_{i,t}$ captures exogenous fluctuations in the interest rate—a spread shock—for which the process is given by

$$\ln \mu_{i,t} = \Gamma_t^\mu + \rho_{\mu,i} \ln \mu_{i,t-1} + \varepsilon_{i,t}^\mu \,, \quad \varepsilon_{i,t}^\mu \overset{iid}{\sim} \mathcal{N}(0, \sigma_{\mu,i}^2) \,, \tag{8}$$

with common international risk factor Γ_t^μ:

$$\Gamma_t^\mu = \rho_\mu \Gamma_{t-1}^\mu + \varepsilon_t^\mu \,, \quad \varepsilon_t^\mu \overset{iid}{\sim} \mathcal{N}(0, \sigma_\mu^2) \,. \tag{9}$$

The household faces the budget constraint

$$Y_{i,t} + \frac{D_{i,t}}{r_{i,t}} = D_{i,t-1} + C_{i,t} + I_{i,t} + \bar{S}_i + \frac{\phi}{2} \left(\frac{K_{i,t}}{K_{i,t-1}} - \bar{g} \right)^2 K_{i,t-1} \,. \tag{10}$$

The available resources are either domestically produced or borrowed from abroad. They are used for debt repayment, consumption $C_{i,t}$, investment $I_{i,t}$, exogenous domestic spending $\bar{S}_i$, and capital adjustment costs parameterized by ϕ_i.

[7] In the context of our first-order approximation to the model, $\psi_{0,i}$ measures the average debt elasticity, while ψ_i measures the marginal elasticity.

The household maximizes (1) subject to the constraints (3), (6), (7), (10), the exogenous laws of motion, the usual no-Ponzi conditions on debt and capital, and initial values for $K_{i,0}$ and $D_{i,0}$.

3.2 Estimation approach

We perform a quantitative analysis based on model simulations, focusing on the model's predictions for the moments highlighted in Section 2. To pin down parameter values, we proceed in two steps. First, we fix the parameters that govern the long-run relationships following GPU. However, as our facts relate to quarterly data, we assume that a period in the model represents a quarter (rather than a year) and adjust the values accordingly.

Table 3 summarizes the parameters fixed before estimation for the prototypical AME.[8] The risk aversion parameter, γ, is set to 2 and the capital share parameter, α, is set to 0.32, both of which are standard values in the literature. The depreciation rate, δ_i, is set to 0.0021, implying an investment-to-output ratio of 19 percent. The labor disutility parameter, θ_i, and the long-run debt target, $\bar{D}_i$, are chosen to achieve a steady-state hours share of 20 percent and an annual debt-to-GDP ratio of 50 percent. The steady state annual debt-to-GDP ratio of 50 percent is consistent with the average of EMEs and AMEs during the pre-2008 sample (see Fact 2).[9] The labor supply elasticity, ω, is set to 1.6 to imply a Frisch elasticity of 1.7, a common value in studies of small open economies. The share of exogenous spending in output, $\bar{S}_i/Y_i$, is set to 20 percent. We set $r^{\text{rf}} = 1.005$ to imply an annualized risk-free interest rate of 2 percent. The average debt elasticity, $\psi_{0,i}$, is set to achieve a data-consistent steady state spread level for the pre-2008 AME subsample, and $\bar{g}^{\gamma}/\beta$ is set to be consistent with a steady state at this interest rate. The capital adjustment cost parameter, ϕ, is set to 20.

Second, we estimate the remaining model parameters—the exogenous processes for TFP, $a_{i,t}$ and $g_{i,t}$, the spread shock $\mu_{i,t}$, the global factors Γ^j_t, $j \in \{a, \mu\}$, and the debt elasticity ψ_i—for both samples and both country groups via moment matching. We solve the model using first-order perturbation in Dynare 7.0 (Adjemian et al. 2026) and use theoretical moments.[10]

[8] The parameters specific to the emerging economy are reported in Table D.1.

[9] Technically, we treat the subsequent debt increase in AMEs as a temporary deviation from the steady state in order to focus on the dynamics around a common steady state.

[10] We reconstruct the HP-filtered theoretical moments of the trending variables like GDP from their growth rates following the approach detailed in Burnside (1999).

Table 3: Parameters fixed prior to estimation: AME

Parameter	Value	Target
γ	2.0000	Standard value
α	0.3200	Standard value
δ_i	0.0021	19 percent I/Y
θ_i	10.2675	$h = 0.2$
$\bar{D}_i$	0.1437	Annual $D/Y = 50$ percent
ω	1.6000	Frisch elasticity of 1.7
r^{rf}	1.0050	2 percent risk-free interest rate
$\bar{g}$	1.0025	1 percent growth per year
$\bar{S}_i$	0.23	$S/Y = 20$ percent
$\psi_{0,i}$	0.0047	Quarterly mean spread of 0.0675 percent
β_i	0.9993	Value consistent with steady-state spread
ϕ	20	Standard value

Notes: parameter (first column), value (second column), and calibration target (third column).

With respect to moments, we essentially target the six facts outlined in Section 2. The first set of targets pertains to national account volatilities at business-cycle frequencies. To extract the cyclical components of the simulated time series, we apply a Hodrick-Prescott filter with smoothing parameter $\lambda = 1{,}600$. We target the standard deviation of output (in percent) and the relative volatility of consumption to output. Second, we target the volatility of the country spread Δr_i. Third, we target the autocorrelation of the unfiltered trade balance-to-output ratio at lags 1, 4, and 8. The fourth target is the average correlation of the country spread and cyclical output fluctuations across country groups.

Recall that we jointly simulate a prototypical AME and a prototypical EME: Both face idiosyncratic TFP and spread shocks, but are also exposed to global factors $\Gamma_t^j, j \in \{a, \mu\}$. Finally, for the period after 2008, we also target an increase in spreads associated with the rise in debt. Specifically, as in the data, we impose an increase in the debt stock to 154 percent of the steady-state value (from 50 percent to 77 percent of GDP; see also footnote 9), which is associated with a 90-basis-point increase in the spread.[11]

[11]We use a diagonal weighting matrix: We assign a unit weight to the (relative) volatilities and cross-correlations, a weight of 1 to output volatility, 10 to spread volatility, 20 to relative consumption volatility, 1 to cross-correlations, and 10 to autocorrelations of the trade balance. For the post-2008 sample, we assign a weight of 20 to the spread increase. As a practical matter, we

4 Results

In this section, we present the estimation results. Before turning to the full model, we first estimate a real business cycle (RBC) version of the model, as it has been successfully applied to business cycle dynamics in EMEs by Aguiar and Gopinath (2007). However, mirroring the findings of GPU for EMEs, we find that the RBC specification substantially overpredicts the autocorrelation of the trade balance in AMEs after 2008.

4.1 Setting the stage: results for the RBC case

The RBC version is nested in our model: it abstracts from financial frictions—other than the debt-elastic interest-rate schedule required for stationarity[12]—and from spread shocks. Since the RBC model cannot account for spread dynamics by construction, we estimate it using the moments corresponding to Facts 4–6 in Section 2. The RBC version of the model fits most business-cycle moments reasonably well but fails to match the rise in the relative volatility of consumption in AMEs after 2008. The model fit and the estimated parameters are reported in Tables B.1 and B.2 in the appendix.

We focus here on the autocorrelation of the trade balance-to-output ratio. Figure 8 contrasts the data with the model predictions for both sample periods. Lines with square and diamond markers represent the AME and EME data, while the solid and dashed lines correspond to the model predictions for AMEs and EMEs, respectively. Consistent with the findings of GPU, the RBC model substantially overpredicts the persistence of the trade balance in EMEs, both before and after 2008. For AMEs, however, the picture differs across periods. Before 2008, the RBC benchmark tracks the empirical autocorrelation profile reasonably well, particularly at intermediate horizons. After 2008, by contrast, it predicts a much more persistent trade balance than observed in the data. Thus, after 2008, the argument leveled by GPU against the RBC model for EMEs applies to AMEs as well.

impose an upper bound of 0.99 on the autocorrelation coefficients of the exogenous processes and apply a quadratic penalty function with a weight of 1000^2 to values exceeding 0.99.

[12] As a practical matter, we set $\psi_i = 0.0001$

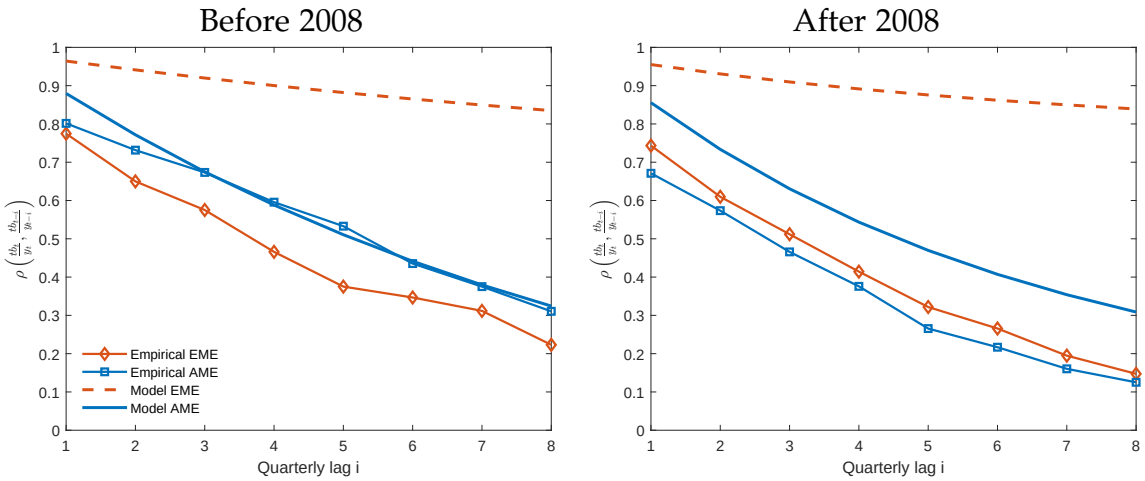

Figure 8: Autocorrelation of the trade balance-to-output ratio. Left panel: before 2008; right panel: after 2008. Blue lines: advanced economies; red lines: emerging economies. Solid lines with markers: empirical autocorrelations (squares for AME, diamonds for EME); lines without markers: RBC model autocorrelations (solid for AME, dashed for EME).

4.2 Baseline model

We now turn to the results for the baseline model, which features financial frictions. We focus first on the estimated parameter values for the prototypical AME that match the data moments before and after 2008. These are reported in Table 4. A key finding is that the debt elasticity of the spread, represented by the parameter ψ_i, increases tenfold after 2008 (top panel). Below, we investigate to what extent this change accounts for differences in business cycles and country spreads across the two sample periods.

The remaining panels report the parameter estimates for the shock processes. Three main patterns emerge. First, all shock processes become more persistent after 2008 (Panel B), with the global TFP shock standing out: its persistence parameter rises from 0.55 to 0.89. Second, turning to standard deviations (Panel C), (idiosyncratic) permanent TFP shocks play a minor role and are dwarfed by stationary TFP shocks, both idiosyncratic and global. For spreads, global shocks also matter more than country-specific ones. Third, the estimated standard deviations change little across sample periods. Nevertheless, shocks may contribute to the observed changes through increased persistence, as we document below.

Table 4: Estimated parameters for AME model

Parameter	Before 2008	After 2008	Description
Panel A. Debt elasticity			
ψ_i	0.00031	0.00294	Country spread
Panel B. Persistence parameters			
$\rho_{i,a}$	0.98656	0.99002	Idiosyncr. stationary TFP
$\rho_{i,g}$	0.78430	0.97283	Idiosyncr. perm. TFP growth
ρ_a	0.54845	0.88873	Global stationary TFP
$\rho_{i,\mu}$	0.97059	0.97986	Idiosyncr. spread shock
ρ_μ	0.31263	0.50324	Global spread shock
Panel C. Shock standard deviations			
$\sigma_{i,a}$	0.00394	0.00424	Idiosyncr. stationary TFP
$\sigma_{i,g}$	0.00080	0.00001	Idiosyncr. perm. TFP growth
σ_a	0.00321	0.00273	Global stationary TFP
$\sigma_{i,\mu}$	0.00003	0.00107	Idiosyncr. spread shock
σ_μ	0.00014	0.00036	Global spread shock

Notes: Parameter estimates for advanced economies for the pre-2008 and post-2008 samples.

Table 5 presents the main result of our quantitative model analysis, contrasting the model predictions for the moments underlying Facts 1–5 with their empirical counterparts. We will consider Fact 6 separately below. The left panel shows the values for the period before 2008, and the right panel shows the values for the period after 2008.[13] First, consider average spreads. The model predicts a value of 0.27 for the period before 2008, in line with the data. After 2008, the average spread increases to 1.17 (Fact 1). To account for Fact 2, we compute the spread associated with a debt-to-GDP ratio of 0.77. This corresponds to 154 percent of the steady-state level, which we assume remains unchanged at 0.5 throughout. In other words, we do not explain but instead take as given the increase in the debt ratio (Fact 2). By targeting the level of the spread, we effectively identify the debt elasticity of the spread, ψ_i. Given the estimated value of ψ_i, the model can largely account for the rise in spreads observed in the data.

[13]Table C.2 in the appendix shows additional model predictions and compares them to the data.

Table 5: The change in AME business cycles: model vs. data

		Before 2008		After 2008	
Fact		Data	Model	Data	Model
1)	Δr	0.27	0.27	1.17	$0.91^{\dagger}$
2)	D/Y	0.53	0.50	0.77	0.77
3a)	$\sigma_{\Delta r}$	0.05	0.08	0.25	0.35
3b)	$\rho\left(\Delta r_t^{EME}, \Delta r_t^{AME}\right)$	0.39	0.20	0.23	0.35
4a)	σ_y^{hp}	1.54	1.57	2.44	2.23
4b)	$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.36	0.50	0.66	0.70
5)	$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.93	1.15	1.11

Notes: Model fit based on moment matching. The first two rows present the average annualized spread and debt-to-GDP ratio. † indicates that the model statistic for the period after 2008 is evaluated at a debt ratio of 0.77 (154% of the steady state value). $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. ρ refers to the cross-correlation between AME and EME output y_t (HP-filtered) and of the spread Δr_t. Data moments are cross-country averages.

Turning to Fact 3, we examine the standard deviation of the spread and its correlation across country groups, in rows 3a and 3b of the table. The model predicts the volatility of the spread to increase from 0.08 to 0.35—a strong increase comparable to what we observe in the data. At the same time, we flag that the model fails to capture the decline in spread co-movement across country groups.

Next, consider the standard deviation of output, reported in row 4a. In this regard, the model tracks changes in the data across the two sample periods particularly well, as it fully accounts for Fact 4—an increase in output volatility of about 50 percent. It also reproduces the strong increase in the comovement of cyclical output fluctuations between AMEs and EMEs, as shown in row 4b. Finally, the last row of the table considers the relative volatility of consumption. Again, we find that the model reproduces Fact 5 well: before 2008, consumption volatility is 0.93, measured relative to output, just as in the data. After 2008, it rises to 1.11 in the model, close to the observed value of 1.15.

Figure 9 displays the autocorrelation of the trade balance-to-output ratio. Here, we compare the model predictions for both AMEs and EMEs (solid lines with

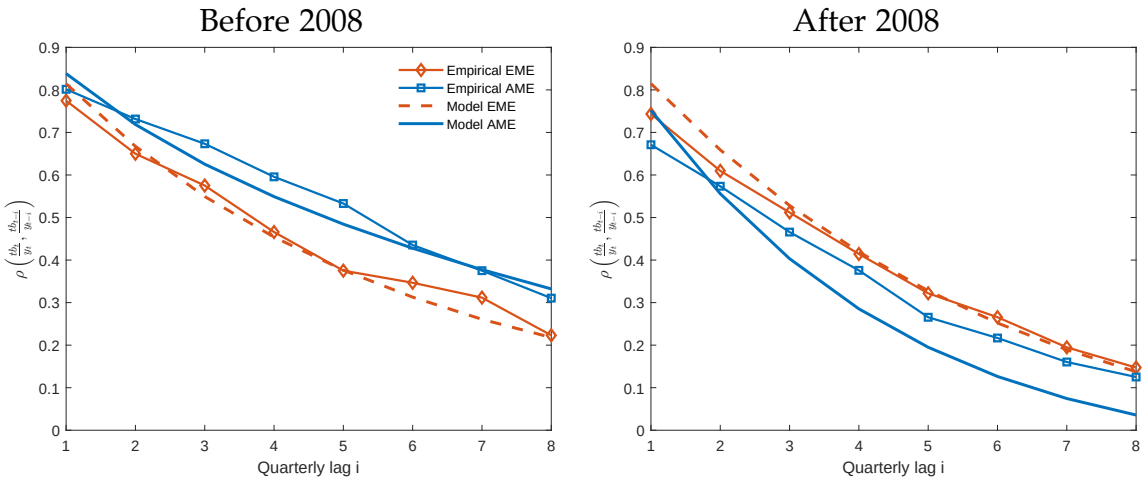

Figure 9: Autocorrelation of the trade balance-to-output ratio. Left panel: before 2008; right panel: after 2008. Blue lines: advanced economies; red lines: emerging economies. Solid lines with markers: empirical autocorrelations (squares for AME, diamonds for EME); lines without markers: baseline model autocorrelations (solid for AME, dashed for EME).

markers) with their empirical counterparts (reproduced from Figure 6 above). We find that the model is right on track for both AMEs and EMEs, as well as for the sample period before 2008 (left panel) and after 2008 (right panel). Thus, the model can replicate Fact 6 as well: The autocorrelation of the trade balance-to-output ratio is initially higher for AMEs, but it falls below that of EMEs after 2008. This is particularly noteworthy, as the GPU analysis focuses on this metric as a distinct feature of EMEs.

For completeness, Appendix D reports the corresponding estimates and model fit for the prototypical EME; see Tables D.2 and D.3. Compared with the AME case, and as expected given that the patterns in the data did not change much for EMEs, parameter changes across sample periods are less pronounced. In particular, the debt elasticity of the spread, ψ_i, actually declines rather than rises after 2008. At the same time, the model also fits the main EME business-cycle moments reasonably well, especially output volatility, the relative volatility of consumption, and spread volatility. The fit is less precise for the level of the spread and for the cross-country comovement of spreads.

4.3 Counterfactuals

We use the estimated model to shed light on why AMEs have become more like EMEs. Specifically, we ask whether the changes in the data, as captured by the six facts above, reflect structural change or shifts in the underlying shock processes. To address this question, we conduct model-based counterfactuals, attributing all changes to the variation in the estimated parameters reported in Table 4. To quantify the contributions of specific parameter changes to overall changes in AME business cycles, we start from the model estimated on the pre-2008 sample. We then modify one parameter (or set of parameters) at a time by setting it to its post-2008 estimate, while keeping all other parameters at their pre-2008 values.

Table 6: Counterfactual model fit: AME

			Common shocks		
	Pre 2008	ψ_i	Spread	TFP	Post 2008
Δr	0.34	0.91	0.34	0.34	0.91
$\sigma_{\Delta r}$	0.08	0.07	0.18	0.20	0.35
$\rho_{\Delta r}$	0.20	0.13	0.19	0.40	0.35
σ_y^{hp}	1.57	1.57	1.57	2.26	2.23
ρ_y	0.50	0.49	0.49	0.71	0.70
$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.93	0.94	1.04	1.11

Notes: Columns depict counterfactual moments when varying one set of parameters at a time, conditional on the pre-2008 values for all other parameters. The first column reports the pre-2008 moments, and the last column reports the post-2008 model moments. The first row presents the average spread evaluated at 154% of the steady-state value. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. ρ_y refers to the cross-correlation between AME and EME output y_t (HP-filtered), $\rho_{\Delta r}$ to that of the spread Δr_t. Data moments are cross-country averages. Counterfactual cross-correlations are computed conditional on the post-2008 parameter values for EME countries. For full counterfactual, see Appendix Table C.1.

We report the results in Table 6. First, we consider the change in the debt elasticity of the spread, ψ_i (and, as above, we assume that the debt ratio increases to 0.77 for the post-2008 sample). As a result, the spread increases substantially, reaching the level observed in the post-2008 sample according to the estimated

model. This increase in the debt elasticity captures, albeit in a stylized manner, a structural change in AMEs. At a general level, as emphasized by GPU, ψ_i provides a comprehensive measure of financial frictions. Since our sample is dominated by EA countries, particularly with respect to spread dynamics (see Section 2.3), it is plausible to link this change to EA membership. Under this interpretation, the debt tolerance of EA members declined because the European Central Bank was initially reluctant to assume the role of lender of last resort. This was not an issue in the early years of the EA, when debt levels were low. However, it contributed to the global financial crisis evolving into a sovereign debt crisis as public finances came under strain.

In this context, it is also important to note that the change in ψ_i is essential for explaining the decline in the trade balance-to-output ratio (Fact 6), as shown in the counterfactual simulations in Appendix Figure C.1. In the figure, the blue solid line reproduces the baseline for AMEs in the pre-2008 sample. Raising ψ_i to its post-2008 level (green line with round markers) substantially lowers the autocorrelation of the trade balance. This is intuitive: a higher value of ψ_i induces a faster adjustment of external debt, necessitating a more rapid adjustment of the trade balance-to-GDP ratio. In our sample, and consistent with the arguments above, this change may also reflect sudden stops during the EA crisis.

At the same time, Table 6 shows that the increase in the debt elasticity is largely inconsequential for changes in business cycle dynamics along other dimensions (Facts 2–5). To understand what drives these changes, we consider shifts in the shock processes. We focus on global shocks, which are common to both EMEs and AMEs, as they turn out to be the most consequential, and relegate the results for country-specific shocks to Table C.1 in the appendix.

The results are clear-cut. The increase in the persistence and volatility of global spread shocks (see Table 4) accounts for the rise in spread volatility but is otherwise of limited importance. Instead, the increase in the persistence of the global TFP shock explains the changes in business cycle dynamics, particularly the rise in output volatility and, even in relative terms, consumption volatility. Notably, if unsurprisingly, it also accounts for the increased comovement of AME and EME business cycles.

Turning briefly to EMEs, Appendix Table D.4 reports the corresponding EME counterfactuals. As in the AME case, the global TFP component accounts for

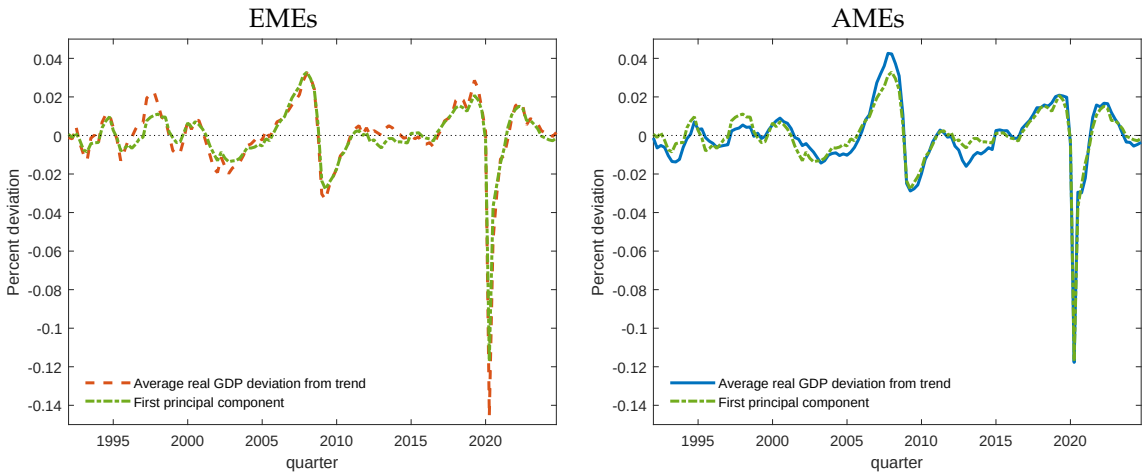

Figure 10: Global component of cyclical GDP. Left panel shows average cyclical percentage deviation of real GDP from its HP-filtered trend for EMEs (red dashed line) and the first principal component across all AME and EME countries (green dash-dotted line). Right panel shows the average cyclical GDP component for AMEs (blue solid line). Principal component has been rescaled to have the same mean and variance as the average GDP series across all AME and EME countries.

most of the increase in output volatility, the stronger comovement of AME and EME business cycles, and the rise in relative consumption volatility. At the same time, the quantitative effects are more muted, highlighting the extent of change, which we find for AMEs. Yet, for both country groups, the counterfactuals point to a stronger role for common global shocks in shaping post-2008 business-cycle dynamics.

4.4 Further evidence

We provide complementary evidence supporting the model-based account of the increased importance of global shocks. Figure 10 plots average output growth for EMEs (left panel, red dashed line) and AMEs (right panel, blue solid line), alongside the first principal component of output growth across all countries over the full sample period (green dash-dotted line). Actual output growth closely tracks the first principal component in both cases. However, closer inspection reveals that the two series become even more closely aligned after 2008, consistent with the model's implication that global shocks play a larger role in this period.

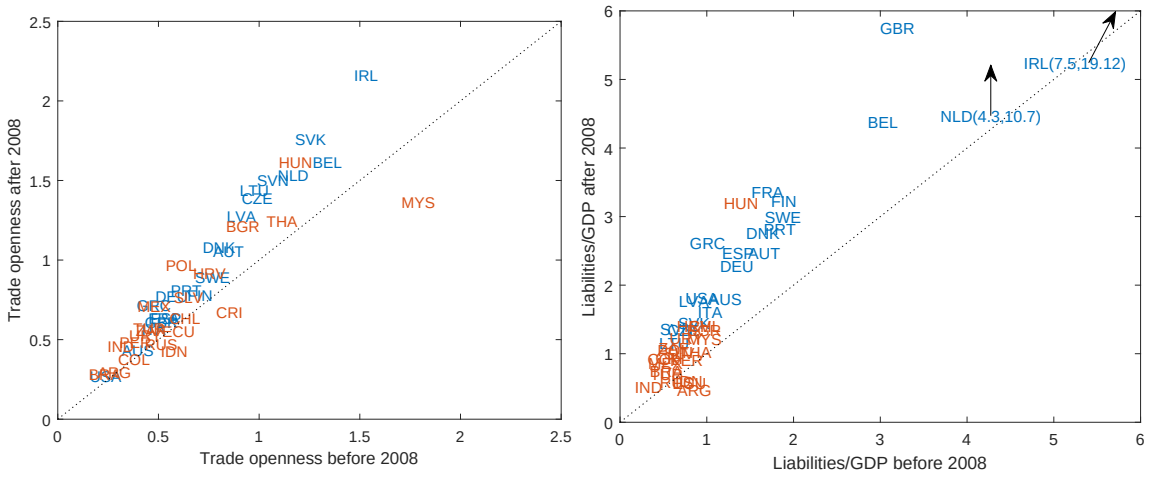

Figure 11: The change in openness. Average openness before 2008 (horizontal axis) vs. after 2008 openness (vertical axis). Ireland and the Netherlands are outliers, whose coordinates are given in brackets. Blue acronyms: observations for AMEs; red acronyms: observations for EMEs. Black dotted line indicates 45-degree line.

Consistent with this, we find that countries' openness has increased in the post-2008 period.[14] To illustrate, Figure 11 relates openness after 2008 (vertical axis) to openness before 2008 (horizontal axis) for the countries in our sample. The left panel considers trade openness, defined as the sum of imports and exports as a share of GDP. The right panel shows financial openness, measured as total financial liabilities to nonresidents as a share of GDP, as in Avdjiev and Spasova (2022).[15] Both trade and financial openness have increased across the board, with a larger rise for AMEs (blue) than for EMEs (red).

5 Conclusion

Are business cycles in EMEs and AMEs no longer different? To systematically compare the period before and after 2008, we synthesize the data and establish six facts regarding country spreads and the business cycle in AMEs and EMEs. These facts suggest that, while differences between the two groups have not disappeared entirely, they have narrowed considerably. Thus, the answer to the question above is a qualified yes.

[14]We thank our discussant, Roberto Pancrazi, for suggesting this possibility.

[15]The data are from Lane and Milesi-Ferretti (2018).

We interpret these changes through the lens of the business cycle model for EMEs developed by García-Cicco et al. (2010) and obtain a clear dichotomy. The increase in spreads reflects the buildup of debt coupled with reduced debt tolerance, consistent with structural changes—potentially including the creation of the euro area, of which roughly three-quarters of the AMEs in our sample are members. At the same time, the rise in business cycle volatility, as well as the increased co-movement between EMEs and AMEs, reflects a greater importance of global shocks.

Against this background, we close with a caveat. The world economy—and AMEs in particular—has been affected by a series of tail events, including the global financial crisis, the European sovereign debt crisis, the COVID-19 pandemic, and, more recently, various geo-economic shocks. Of course, "a series of tail events" is something of a contradictio in adjecto, which is why we interpret the observed changes as systematic rather than exceptional. Nevertheless, we cannot—nor do we wish to—rule out the possibility that the adverse effects of these shocks may eventually dissipate.

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Online Appendix

A Data

Relevant default episodes for Figure 1 are:

- Argentina (11/06/2001-06/01/2005, 07/30/2014-05/06/2016, 08/29/2019-08/30/2019, 12/20/2019-12/30/2019, 04/07/2020-09/07/2020)
- Belize (08/21/2012-03/20/2013, 03/17/2017-03/23/2017, 08/12/2020-08/21/2020, 05/24/2021-11/09/2021),
- Belarus (08/02/2022-)
- Sri Lanka (04/25/2022-)
- Cyprus (06/28/2013-07/03/2013)
- Dominican Republic (02/01/2005-06/29/2005)
- Ecuador (10/01/1999-09/30/2000, 12/15/2008-06/15/2009, 04/13/2020-09/01/2020)
- El Salvador (04/20/2017-05/05/2017, 10/02/2017-10/03/2017)
- Ghana (12/20/2022-)
- Greece (02/27/2012-05/02/2012, 12/5/2012-12/18/2012)
- Jamaica (01/14/2010-02/24/2010, 02/12/2013-03/06/2013)
- Mozambique (04/01/2016-04/15/2016, 01/18/2017-)
- Peru (09/07/2000-10/04/2000)
- Russia (01/27/1999-12/08/2000)
- Ukraine (09/25/2015-10/19/2015, 08/13/2022-08/20/2022)
- Uruguay (05/16/2003-06/02/2003)
- Venezuela (01/18/2005-03/03/2005, 11/13/2017-)
- Zambia (10/21/2020-)

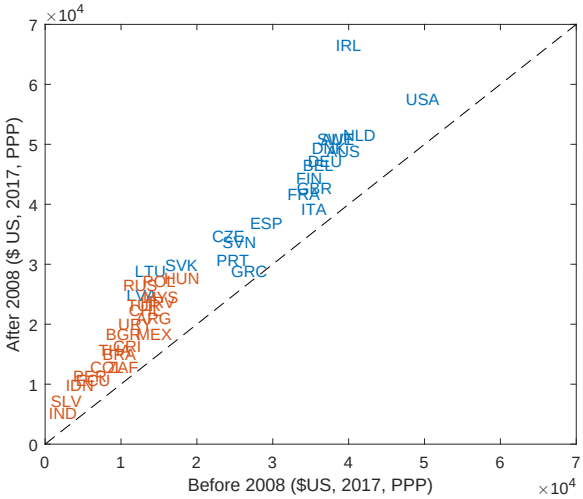

Figure A.1: Average real GDP per capita from 1994 to 2007 (horizontal axis) and from 2009-2019 (vertical axis). Data refer to expenditure-side real GDP at chained PPPs (2017 US$) from the Penn World Tables 10.1 (`rgdpe`). Blue acronyms: observations for AMEs; red acronyms: observations for EMEs. Black dashed line indicates 45-degree line.

Table A.1: Sample coverage: AMEs

Country	First obs.	Last obs.	Obs.	Missing
Australia	2003Q1	2010Q3	23	8
Austria	1995Q1	2024Q4	116	4
Belgium	1995Q1	2024Q4	116	4
Czech Republic	2004Q1	2024Q4	77	7
Denmark	1991Q1	2024Q4	116	20
Finland	1992Q2	2024Q1	124	4
France	1999Q1	2024Q4	100	4
Germany	2004Q1	2024Q1	76	5
Greece	1995Q1	2024Q4	113	7
Ireland	1995Q1	2024Q4	116	4
Italy	1995Q1	2024Q4	116	4
Latvia	2006Q1	2024Q4	72	4
Lithuania	2005Q3	2024Q4	74	4
Netherlands	1999Q1	2024Q4	100	4
Portugal	1995Q1	2024Q4	116	4
Slovakia	2004Q1	2024Q4	80	4
Slovenia	2003Q1	2024Q4	83	5
Spain	1995Q1	2024Q4	116	4
Sweden	1993Q1	2024Q4	114	14
United Kingdom	1992Q4	2024Q4	125	4
United States	2007Q4	2024Q4	63	6
Sum			2036	124

Notes: Observations for which both national accounts data and spread data are available. Default episodes and the year 2008 have been excluded/set to missing.

Table A.2: Sample coverage: EMEs

Country	First obs.	Last obs.	Obs.	Missing
Argentina	1993Q4	2024Q4	94	31
Brazil	1996Q1	2024Q4	112	4
Bulgaria	2000Q1	2024Q4	96	4
Chile	1999Q2	2024Q4	99	4
Colombia	1997Q1	2024Q4	108	4
Costa Rica	2009Q1	2024Q4	64	0
Croatia	2004Q1	2024Q4	80	4
Ecuador	1995Q1	2024Q4	108	12
El Salvador	2002Q2	2024Q4	85	6
Hungary	1999Q1	2024Q4	100	4
India	2019Q1	2024Q4	24	0
Indonesia	2004Q2	2024Q4	79	4
Malaysia	2000Q1	2024Q4	96	4
Mexico	1993Q4	2024Q4	121	4
Peru	1997Q1	2024Q4	106	6
Poland	1995Q1	2024Q4	116	4
Russia	2003Q1	2021Q3	71	4
South Africa	1994Q4	2024Q4	117	4
Thailand	1997Q2	2024Q4	107	4
Turkey	1998Q1	2024Q4	104	4
Uruguay	2001Q2	2024Q4	90	5
Sum			1977	116

Notes: Observations for which both national accounts data and spread data are available. Default episodes and the year 2008 have been excluded/set to missing.

Table A.3: Descriptive statistics country spread: AMEs

	Before 2008			After 2008		
Country	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Australia	0.18	0.09	16	0.57	0.32	7
Austria	0.18	0.09	57	0.59	0.37	64
Belgium	0.34	0.18	65	0.78	0.55	64
Czech Republic	0.09	0.04	16	0.60	0.36	61
Denmark	0.63	0.46	62	0.26	0.30	64
Finland	0.29	0.21	63	0.51	0.23	61
France	0.12	0.05	36	0.64	0.34	64
Germany	0.03	0.02	16	0.16	0.15	60
Greece	0.79	0.57	63	5.44	4.73	61
Ireland	0.31	0.22	65	1.72	2.05	64
Italy	0.47	0.28	76	2.03	1.03	64
Latvia	0.30	0.42	8	1.63	1.69	64
Lithuania	0.26	0.22	10	1.39	1.58	64
Netherlands	0.11	0.07	36	0.39	0.26	64
Portugal	0.20	0.10	59	2.75	2.68	64
Slovakia	0.10	0.04	16	1.15	0.91	64
Slovenia	0.16	0.16	19	1.54	1.42	64
Spain	0.29	0.19	62	1.63	1.15	64
Sweden	0.39	0.21	50	0.22	0.19	64
United Kingdom	0.34	0.20	61	0.35	0.25	64
United States	0.08	0.00	1	0.21	0.10	62
Average/Sum	0.27	0.18	857	1.17	0.98	1272

Notes: Level of spread measured at the end of quarter in percentage points. The last row displays the country group average for the mean and standard deviation as well as the total number of observations.

Table A.4: Descriptive statistics country spread: EMEs

	Before 2008			After 2008		
Country	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Argentina	6.62	3.24	42	11.92	7.19	52
Brazil	7.33	4.23	55	2.86	0.75	64
Bulgaria	6.37	5.25	54	1.50	1.10	64
Chile	1.42	0.55	35	1.75	0.41	64
Colombia	4.47	2.23	44	2.60	0.88	64
Costa Rica	–	–	0	3.76	1.45	64
Croatia	0.43	0.20	16	1.98	1.23	64
Ecuador	11.74	7.02	48	10.15	5.95	60
El Salvador	2.64	0.77	23	6.80	4.68	62
Hungary	0.82	0.37	36	2.47	1.34	64
India	–	–	0	1.71	0.57	24
Indonesia	2.49	0.57	15	2.44	0.99	64
Malaysia	2.00	1.69	45	1.67	0.56	64
Mexico	4.21	2.86	57	3.09	1.00	64
Peru	4.28	1.98	42	1.99	0.54	64
Poland	2.12	1.62	53	1.29	0.76	64
Russia	6.84	12.04	33	5.61	17.42	54
South Africa	2.32	1.31	53	3.23	1.02	64
Thailand	1.41	1.10	43	0.85	0.47	64
Turkey	4.85	2.67	47	3.79	1.28	64
Uruguay	5.15	3.76	26	2.12	0.88	64
Average/Sum	4.08	2.81	767	3.50	2.40	1276

Notes: Level of spread measured at the end of quarter in percentage points. The last row displays the country group average for the mean and standard deviation as well as the total number of observations.

Table A.5: Output and consumption volatility: AMEs

	Before 2008			After 2008		
	σ_y^{hp}	σ_c^{hp}	$\sigma_c^{hp}/\sigma_y^{hp}$	σ_y^{hp}	σ_c^{hp}	$\sigma_c^{hp}/\sigma_y^{hp}$
Australia	0.78	0.84	1.08	1.28	2.42	1.89
Austria	1.02	0.64	0.63	2.45	2.51	1.03
Belgium	0.94	0.58	0.62	1.92	2.49	1.30
Czech Republic	1.68	1.29	0.77	2.00	2.17	1.08
Denmark	1.33	1.52	1.15	1.62	1.67	1.03
Finland	1.78	1.89	1.06	1.78	1.66	0.93
France	0.96	0.77	0.81	2.42	2.24	0.93
Germany	1.20	0.70	0.58	1.90	2.26	1.19
Greece	1.34	1.30	0.97	3.42	3.47	1.02
Ireland	2.37	1.99	0.84	4.28	3.85	0.90
Italy	1.04	0.85	0.82	2.92	3.02	1.04
Latvia	4.30	6.06	1.41	3.62	4.64	1.28
Lithuania	3.10	3.63	1.17	2.69	3.31	1.23
Netherlands	1.32	0.95	0.72	1.80	2.39	1.33
Portugal	1.06	1.15	1.08	3.00	2.99	1.00
Slovakia	2.36	1.85	0.78	1.82	1.81	0.99
Slovenia	1.63	1.68	1.03	2.24	3.13	1.40
Spain	0.99	1.28	1.30	3.43	3.90	1.14
Sweden	1.28	1.22	0.96	1.81	1.77	0.98
United Kingdom	0.92	0.80	0.87	3.46	4.24	1.23
United States	1.04	0.87	0.84	1.44	1.69	1.17
Mean	1.54	1.52	0.93	2.44	2.74	1.15

Notes: Standard deviations refer to percentage deviations of quarterly variables from their Hodrick-Prescott filtered trend, using a smoothing parameter of $\lambda = 1{,}600$. The last row displays the country group average.

Table A.6: Output and consumption volatility: EMEs

	Before 2008			After 2008		
	σ_y^{hp}	σ_c^{hp}	$\sigma_c^{hp}/\sigma_y^{hp}$	σ_y^{hp}	σ_c^{hp}	$\sigma_c^{hp}/\sigma_y^{hp}$
Argentina	4.49	5.15	1.15	3.80	4.91	1.29
Brazil	1.14	1.70	1.49	2.14	2.26	1.06
Bulgaria	1.23	2.40	1.95	1.58	1.50	0.95
Chile	1.72	2.22	1.29	2.84	4.78	1.69
Colombia	1.85	1.81	0.98	3.06	3.69	1.20
Costa Rica	1.61	1.56	0.97	1.98	2.52	1.28
Croatia	2.06	2.90	1.41	3.02	2.71	0.90
Ecuador	2.01	2.96	1.47	3.49	3.94	1.13
El Salvador	1.49	2.48	1.66	3.18	3.89	1.23
Hungary	1.22	1.87	1.54	2.49	2.03	0.82
India	1.34	2.04	1.52	3.83	4.20	1.10
Indonesia	3.53	3.54	1.00	1.42	1.57	1.11
Malaysia	1.47	1.84	1.25	2.88	3.12	1.08
Mexico	2.46	2.46	1.00	3.27	3.56	1.09
Peru	1.63	1.61	0.98	4.32	3.42	0.79
Poland	1.38	1.72	1.25	1.84	2.19	1.19
Russia	2.07	2.37	1.15	1.97	4.14	2.11
South Africa	1.28	1.85	1.45	2.36	2.92	1.24
Thailand	3.28	3.83	1.17	2.47	2.21	0.90
Turkey	3.59	3.55	0.99	3.27	4.52	1.38
Uruguay	3.97	5.81	1.47	2.38	2.74	1.15
Mean	2.14	2.65	1.29	2.74	3.18	1.18

Notes: Standard deviations refer to percentage deviations of quarterly variables from their Hodrick-Prescott filtered trend, using a smoothing parameter of $\lambda = 1{,}600$. The last row displays the country group average.

Table A.7: Debt-to-GDP ratio: AMEs

Country	Mean	First obs.	T	Mean	Last obs.	T
	Before 2008			After 2008		
Australia	20.81	1991Q1	68	38.01	2024Q4	64
Austria	64.76	1991Q1	68	80.70	2024Q4	64
Belgium	116.11	1991Q1	68	103.43	2024Q4	64
Czech Republic	20.82	1995Q4	49	38.10	2024Q4	64
Denmark	56.16	1992Q4	61	42.06	2024Q4	64
Finland	43.42	1991Q1	68	64.08	2024Q4	64
France	57.89	1991Q1	68	98.57	2024Q4	64
Germany	57.32	1991Q4	65	69.68	2024Q4	64
Greece	100.82	1991Q1	68	174.11	2024Q4	64
Ireland	40.98	1995Q4	49	72.60	2024Q4	64
Italy	111.94	1991Q1	68	132.13	2024Q4	64
Latvia	13.92	1998Q4	37	42.14	2024Q4	64
Lithuania	20.96	1998Q4	37	37.90	2024Q4	64
Netherlands	60.67	1991Q1	68	56.30	2024Q4	64
Portugal	61.84	1991Q1	68	117.11	2024Q4	64
Slovakia	38.77	1995Q4	49	50.67	2024Q4	64
Slovenia	24.73	1995Q4	49	65.45	2024Q4	64
Spain	52.21	1991Q1	68	94.21	2024Q4	64
Sweden	56.73	1993Q4	57	38.93	2024Q4	64
United Kingdom	38.81	1991Q1	68	87.92	2024Q4	64
United States	61.51	2001Q4	25	107.76	2024Q4	64
Mean/Sum	53.39		1226	76.76		1344

Notes: Debt-to-GDP ratio refers to general government debt relative to GDP based on IMF data (`GGXWDG_NGDP`). The annual end-of-period values were assigned to the last quarter of the year and then linearly interpolated.

Table A.8: Debt-to-GDP ratio: EMEs

Country	Mean	First obs.	T	Mean	Last obs.	T
	Before 2008			After 2008		
Argentina	59.54	1992Q4	61	68.89	2024Q4	64
Brazil	67.97	2000Q4	29	75.29	2024Q4	64
Bulgaria	49.72	1998Q4	37	20.33	2024Q4	64
Chile	15.65	1991Q4	65	22.23	2024Q4	64
Colombia	36.39	1996Q4	45	48.25	2024Q4	64
Costa Rica	37.34	1996Q4	45	45.87	2024Q4	64
Croatia	36.04	1998Q4	37	70.44	2024Q4	64
Ecuador	43.15	2001Q4	25	39.98	2024Q4	64
El Salvador	36.89	1991Q4	65	76.06	2024Q4	64
Hungary	61.48	1995Q4	49	75.11	2024Q4	64
India	76.62	1991Q4	65	73.68	2024Q4	64
Indonesia	55.14	2000Q4	29	30.68	2024Q4	64
Malaysia	42.13	1991Q1	68	58.07	2024Q4	64
Mexico	38.98	1996Q4	45	49.45	2024Q4	64
Peru	42.58	2000Q4	29	27.03	2024Q4	64
Poland	42.53	1995Q4	49	51.87	2024Q4	64
Russia	46.49	1997Q4	41	14.36	2024Q4	64
South Africa	31.51	2000Q4	29	50.07	2024Q4	64
Thailand	46.91	1996Q4	45	46.31	2024Q4	64
Turkey	57.86	2000Q4	29	32.83	2024Q4	64
Uruguay	60.72	1999Q4	33	55.20	2024Q4	64
Mean/Sum	46.93		920	49.14		1344

Notes: Debt-to-GDP ratio refers to general government debt relative to GDP based on IMF data (`GGXWDG_NGDP`). The annual end-of-period values were assigned to the last quarter of the year and then linearly interpolated.

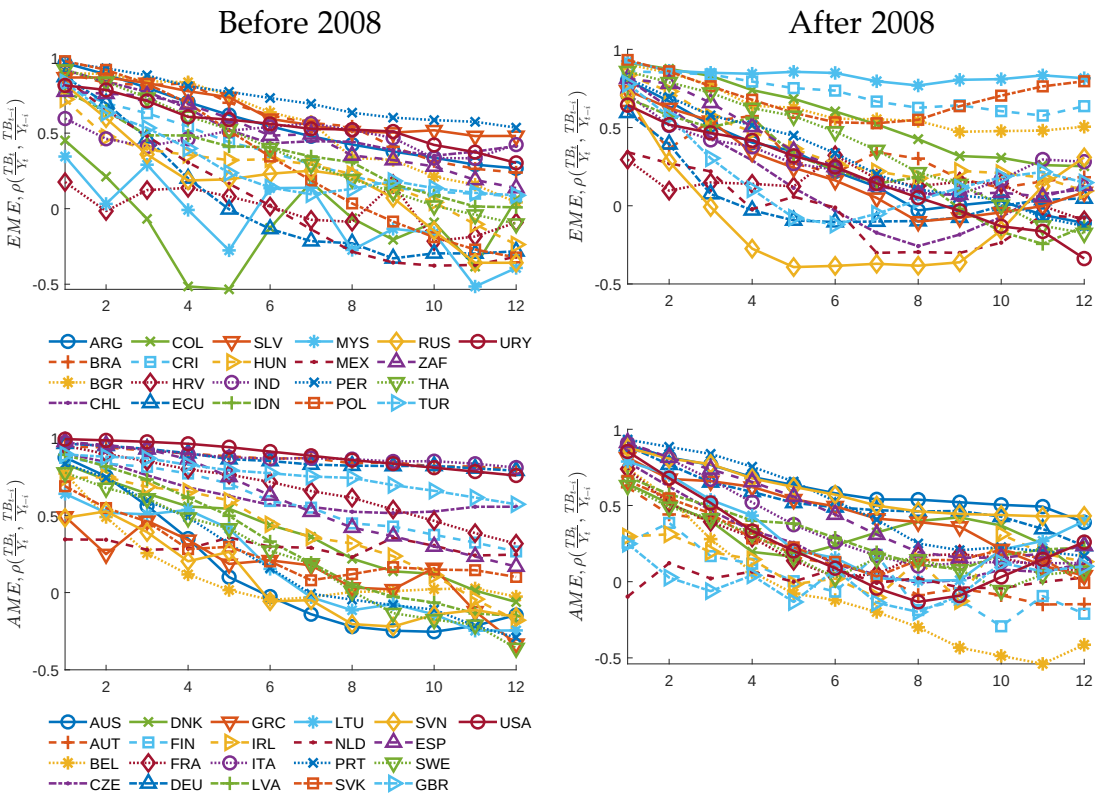

Figure A.2: Country-level quarterly autocorrelation profiles of the trade balance-to-output ratio. Each line corresponds to one country. The left column reports the pre-2008 sample and the right column the post-2008 sample. The top row shows EME countries and the bottom row AME countries. The horizontal axis reports the quarterly lag i. Country abbreviations are listed in the legends.

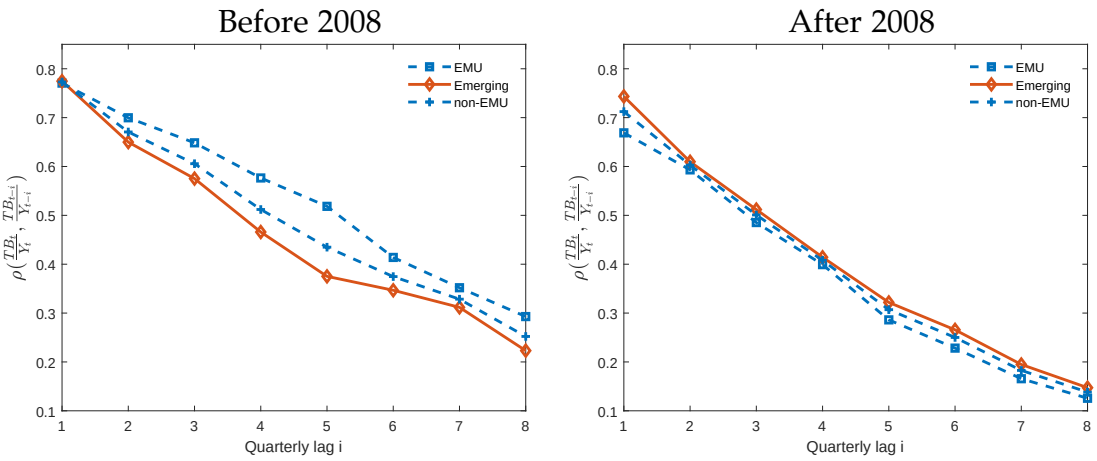

Figure A.3: Quarterly autocorrelation of the trade balance-to-output ratio. Red lines with diamond markers indicate EMEs. Blue lines represent AMEs: square markers denote EMU members, plus markers non-EMU members The x-axis represents the quarterly lag i; y-axis represents the average trade balance-to-output ratio autocorrelation in the respective country group.

B RBC model

Table B.1: The change in AME/EME business cycles—RBC Model vs. Data

	Before 2008		After 2008	
	Data	Model	Data	Model
Panel A. AMEs				
σ_y^{hp}	1.54	1.63	2.44	2.28
$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.36	0.65	0.66	0.83
$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.91	1.15	1.00
Panel B. EMEs				
σ_y^{hp}	2.13	2.06	2.74	2.87
$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.36	0.65	0.66	0.83
$\sigma_c^{hp}/\sigma_y^{hp}$	1.29	1.24	1.18	1.13

Notes: RBC model fit based on moment matching. σ^{hp} denotes the standard deviation of HP-filtered variables. ρ refers to the cross-correlation between AME and EME output y_t (HP-filtered). Data moments are cross-country averages. Panel A reports moments for AMEs; Panel B reports moments for EMEs.

Table B.2: Estimated parameters for RBC model

	AMEs		EMEs	
	Before 2008	After 2008	Before 2008	After 2008
$\rho_{a,i}$	0.97284	0.98603	0.98436	0.98000
$\sigma_{a,i}$	0.00345	0.00033	0.00005	0.00003
$\rho_{g,i}$	0.32782	0.33040	0.00018	0.00016
$\sigma_{g,i}$	0.00019	0.00012	0.01288	0.01535
$\rho_{a,c}$	0.90464	0.83664	0.90464	0.83664
$\sigma_{a,c}$	0.00182	0.00333	0.00182	0.00333

Note: Parameter estimates for advanced economies for the sample before 2008 (first column) and after 2008 (second column) and for emerging economies before 2008 (third column) and after 2008 (fourth column).

C Advanced economy model

Table C.1: Full counterfactual model fit: AME

		Idiosyncratic				Common		
	Pre 2008	Spread	TFP	Perm. TFP	ψ_i	Spread	TFP	Post 2008
Δr	0.34	0.34	0.34	0.34	0.91	0.34	0.34	0.91
$\sigma_{\Delta r}$	0.08	0.29	0.09	0.08	0.07	0.18	0.20	0.35
$\rho_{\Delta r}$	0.20	0.03	0.09	0.13	0.13	0.19	0.40	0.35
σ_y^{hp}	1.57	1.58	1.61	1.56	1.57	1.57	2.26	2.23
ρ_y	0.50	0.49	0.48	0.50	0.49	0.49	0.71	0.70
$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.94	0.98	0.94	0.93	0.94	1.04	1.11

Notes: Columns depict counterfactual moments when varying one set of parameters at a time, conditional on the pre-2008 values for all other parameters. The first column reports the pre-2008 moments, and the last column reports the post-2008 model moments. The first row presents the average spread evaluated at 154% of the steady-state value. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. ρ_y refers to the cross-correlation between AME and EME output y_t (HP-filtered), $\rho_{\Delta r}$ to that of the spread Δr_t. Data moments are cross-country averages. Counterfactual cross-correlations are computed conditional on the post-2008 parameter values for EME countries.

Table C.2: Model Fit: untargeted moments

	Before 2008				After 2008			
	EME		AME		EME		AME	
	Data	Model	Data	Model	Data	Model	Data	Model
$\sigma_i^{hp}/\sigma_y^{hp}$	3.18	3.47	3.59	3.10	2.45	3.48	2.38	2.19
$\sigma_{tb/y}^{hp}$	1.23	0.76	1.93	1.39	2.02	1.64	1.83	1.55
$\rho^{hp}\left(\frac{tb_t}{y_t}, y_t\right)$	-0.24	-0.17	-0.34	-0.02	-0.10	0.13	-0.14	0.13
$\rho^{hp}(c_t, y_t)$	0.63	0.99	0.70	0.98	0.82	0.91	0.89	0.92
$\rho^{hp}(i_t, y_t)$	0.77	0.80	0.77	0.44	0.64	0.44	0.70	0.66

Notes: Model fit for untargeted moments. The first line shows the relative investment-to-GDP volatility, the second line shows the volatility of the trade balance-to-GDP ratio, the final three lines show the cross-correlation between output and the trade balance-to-GDP ratio, consumption, and investment, respectively. σ^{hp} denotes the standard deviation of HP-filtered variables, ρ^{hp} the correlation between HP-filtered variables. Data moments are cross-country averages.

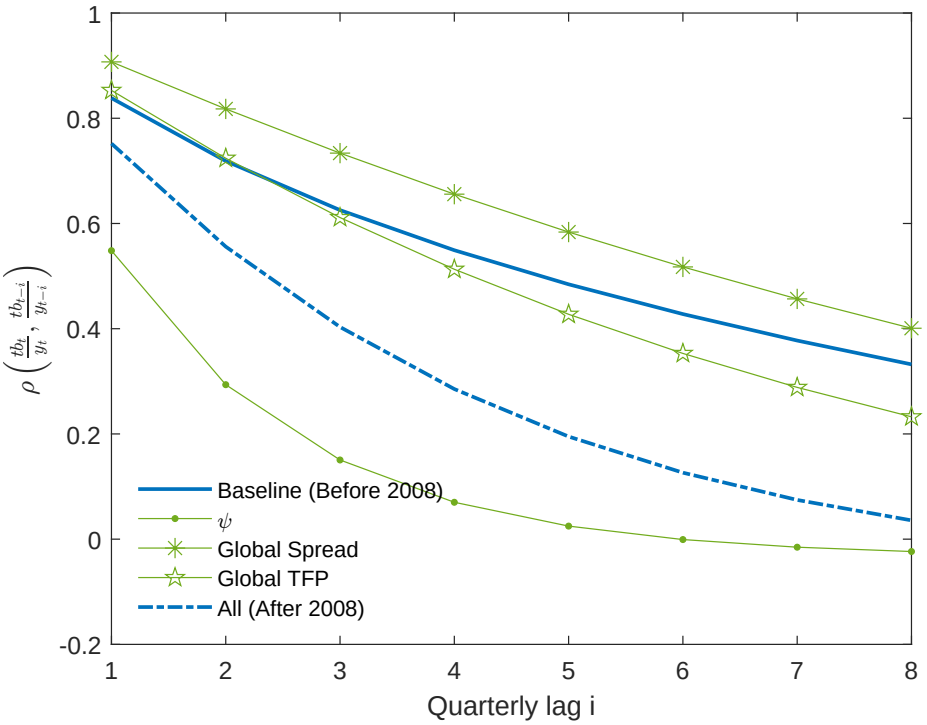

Figure C.1: Counterfactual autocorrelation of the model trade balance-to-output ratio. Blue solid line: pre-2008 baseline model correlation; blue dashed line: post-2008 model correlation. Green solid line with round markers: baseline with ψ_i set to post-2008 value. Green solid line with x markers: baseline with global spread process set to post-2008 value. Green solid line with star markers: baseline with global TFP process set to post-2008 value.

D Emerging economy model

In this section, we describe the parameterization of the emerging market economy used to generate Figure 9. The parameters governing the steady state are mostly identical to those in Table 3, except for the ones outlined in Table D.1, which need to be altered in order to hit the steady state targets. We again chose δ, $\bar{D}$, and $\bar{S}$ to get investment-, debt-, and government spending-to-output ratios of 19%, 50%, and 20%, respectively. The labor disutility parameter is chosen to obtain a share of hours worked of 0.2. ψ_0 targets a quarterly steady state spread of 1.02 percentage points, while β is set to be consistent with this spread being a steady state.

Table D.1: Parameters fixed prior to estimation: EME

Parameter	**Value**	**Target**
δ_i	0.0161	19% I/Y
θ_i	5.3506	$h = 0.2$
$\bar{D}_i$	0.0749	Annual $D/Y = 50\%$
$\bar{S}_i$	0.1198	$S/Y = 20\%$
$\psi_{0,i}$	0.1361	Quarterly mean spread of 1.02%
β_i	0.99	Value consistent with steady-state spread

Notes: parameter (first column), parameter value (second column), and calibration target (third column).

Table D.2: Estimated parameters for EME model

Parameter	Before 2008	After 2008	Description
Panel A. Debt elasticity			
ψ_i	0.00697	0.00182	Country spread
Panel B. Persistence parameters			
$\rho_{i,a}$	0.99001	0.96870	Idiosyncr. stationary TFP
$\rho_{i,g}$	0.74795	0.98615	Idiosyncr. perm. TFP growth
ρ_a	0.54845	0.88873	Global stationary TFP
$\rho_{i,\mu}$	0.98998	0.78955	Idiosyncr. spread shock
ρ_μ	0.31263	0.50324	Global spread shock
Panel C. Shock standard deviations			
$\sigma_{i,a}$	0.00736	0.00757	Idiosyncr. stationary TFP
$\sigma_{i,g}$	0.00046	0.00001	Idiosyncr. perm. TFP growth
σ_a	0.00321	0.00273	Global stationary TFP
$\sigma_{i,\mu}$	0.00355	0.00251	Idiosyncr. spread shock
σ_μ	0.00014	0.00036	Global spread shock

Notes: Parameter estimates for emerging economies for the pre-2008 and post-2008 samples.

Table D.3: The change in EME business cycles: model vs. data

		Before 2008		After 2008	
Fact		Data	Model	Data	Model
1)	Δr	4.08	4.08	3.50	4.08
2)	D/Y	0.47	0.50	0.49	0.50
3a)	$\sigma_{\Delta r}$	0.71	0.71	0.61	0.63
3b)	$\rho\left(\Delta r_t^{EME}, \Delta r_t^{AME}\right)$	0.39	0.20	0.23	0.35
4a)	σ_y^{hp}	2.13	2.11	2.74	2.71
4b)	$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.36	0.50	0.66	0.70
5)	$\sigma_c^{hp}/\sigma_y^{hp}$	1.29	1.26	1.18	1.16

Notes: Model fit based on moment matching. The first two rows present the average annualized spread and debt-to-GDP ratio. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. ρ refers to the cross-correlation between AME and EME output y_t (HP-filtered) and of the spread Δr_t. Data moments are cross-country averages.

Table D.4: Counterfactual model fit: EME

		Idiosyncratic				Common		
	Pre 2008	Spread	TFP	Perm. TFP	ψ	Spread	TFP	Post 2008
$\sigma_{\Delta r}$	0.71	0.47	0.67	0.71	0.93	0.71	1.14	0.63
$\rho_{\Delta r}$	0.20	0.15	0.03	0.10	0.07	0.15	0.61	0.35
σ_y^{hp}	2.11	2.10	2.15	2.11	2.14	2.11	2.58	2.71
ρ_y	0.50	0.49	0.48	0.49	0.49	0.49	0.69	0.70
$\sigma_c^{hp}/\sigma_y^{hp}$	1.26	1.25	1.08	1.26	1.29	1.26	1.45	1.16

Notes: Columns depict counterfactual moments when varying one set of parameters at a time, conditional on the pre-2008 values for all other parameters. The first column reports the pre-2008 moments, and the last column reports the post-2008 model moments. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) quarterly country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. ρ_y refers to the cross-correlation between AME and EME output y_t (HP-filtered), $\rho_{\Delta r}$ to that of the spread Δr_t. Data moments are cross-country averages. Cross-correlations are computed conditional on the post-2008 parameter values for AME countries.