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

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Abstract

Interest rate spreads fluctuate widely across time and countries. They have been identified as a major driver of the business cycle in emerging market economies (EMEs). Since the global financial crisis, spreads in advanced market economies (AMEs) have been systematically higher and more volatile, resembling the patterns previously characteristic of EMEs. Comparing the periods before and after 2008, we find business cycles in AMEs now also more closely resemble those in EMEs along several key dimensions. In the second part of the paper, we provide a structural interpretation of these changes through the lens of a small open economy business cycle model.

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. Fluctuations of interest rates and country spreads, in particular, 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. Against this background, we ask: Are business cycles in EMEs and AMEs no longer differently exposed to (global) financial markets?

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. On the contrary, after 2008, the average spread exhibits a much more similar behavior across 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.

We provide a systematic analysis of the issue on two levels. In the first part of the paper, we establish six facts. Comparing the period before and after 2008, we document that the level and volatility of country spreads, the volatility of output and consumption, and the persistence of the trade balance has changed in AMEs in ways that make them resemble EMEs. Moreover, the business cycle co-movement across AMEs and EMEs has increased strongly. Finally, the average debt level was very similar across country groups before 2008 but has increased substantially in AMEs since then. In the second part of the paper, we interpret these findings through the lens of the business cycle model for EMEs developed by García-Cicco et al. (2010), or GPU for short. We find that the changes in the behavior of country spreads are mostly a consequence of changes in the business cycle and the buildup of debt in AMEs, rather than their cause.

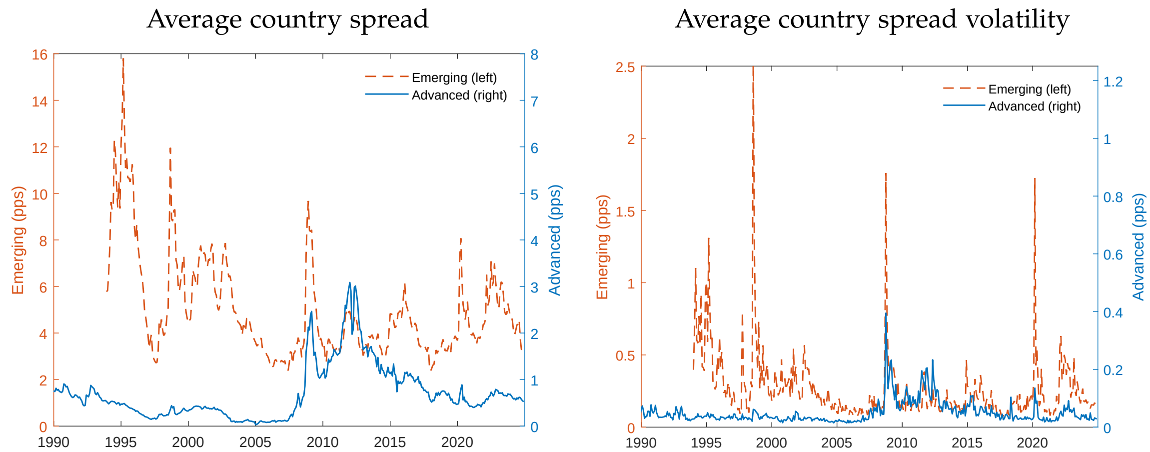

Figure 1: Left panel shows average spread for EMEs (red dashed line, left axis) and AMEs (blue solid line, right axis); right panel shows average intra-month standard deviation. Based on 14,511 country-month observations of 61 EME countries and 8,030 observations of 31 AME countries.

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. While we focus on the largest available sample for each statistic, we have about 1,900 country-quarter observations for each group. Our main focus is on the country spread as a comprehensive indicator of a country's financial stress. It is compiled as the difference in yields on a country's government bond and a riskless reference security, both issued in a foreign or common currency. We complement the time series for 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.

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. We also assess the co-movement of spreads and business cycles across country groups. Throughout, we verify that country-group averages accurately reflect general trends and are not driven by individual countries. While there is within-group heterogeneity, we focus on the broader patterns in the data. In the appendix, we also report key statistics on a country-by-country basis.

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 gone up 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 bilateral 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, and in particular speculative-grade government bonds, 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). 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. Indeed, before 2008, the autocorrelation function of the trade balance in AMEs was markedly higher than in EMEs. However, the ordering flipped after 2008. In sum, our facts support the notion that AMEs are no longer so different from EMEs.

[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).

We offer a structural interpretation of the facts 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. Against this background, it is somewhat surprising that the model also works well for AMEs—a result we obtain in the second part of the paper.

We first estimate the model twice, once for the pre-2008 period and once for the post-2008 period, targeting the moments of the data that form the basis of our facts. In this way, we verify that the model is able to account for the facts. In the estimation, we simultaneously consider prototypical AME and EME countries to account for the co-movement between the two groups, which we capture through a global component of the underlying shocks. 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 process for TFP.

Finally, we ask whether changes in country spreads are the cause or the effect of the increased volatility and global synchronization of business cycles. Based on counterfactual model simulations, we conclude that changes in the behavior of spreads mostly reflect changes in the business cycle. In particular, changes in TFP shocks—understood as a broad measure of various frictions—go a long way in explaining why AME business cycles, and consumption in particular, have become more volatile and more globally correlated. TFP shocks also contribute significantly to the increased volatility of spreads. A comprehensive account must also consider the buildup of debt in AMEs, which contributes to the rise in the level of spreads and, through a more debt-elastic country spread, to the reduced autocorrelation of the trade balance-to-output ratio.

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 2025). 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").

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

[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.

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. 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

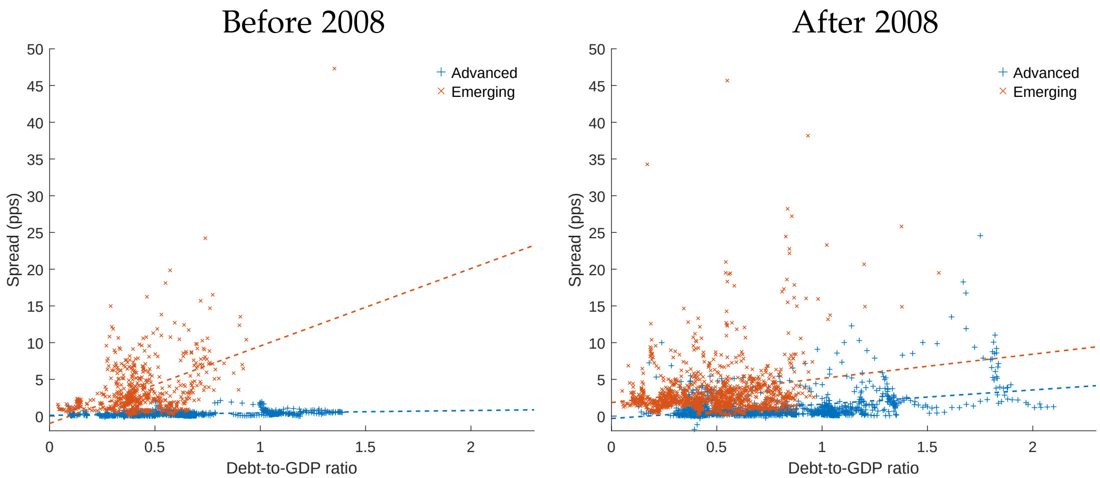

Figure 2: Quarterly observations for spread and annual debt-to-GDP ratio. Blue plus signs indicate observations for AMEs, and red x markers indicate observations for EMEs. Public debt-to-GDP ratio refers to general government debt relative to GDP based on linearly interpolated IMF data (`GGXWDG_NGDP`).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

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 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.

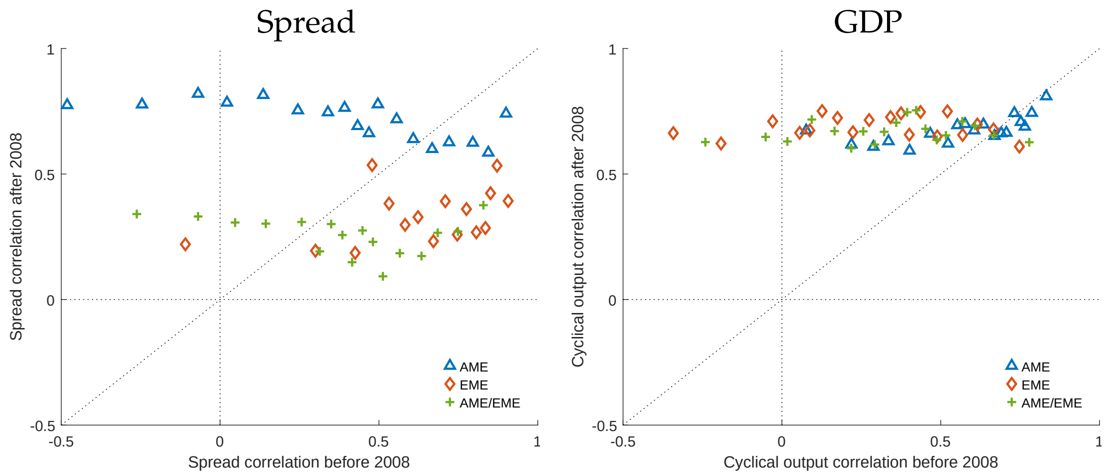

Figure 3: Binned quarterly cross-country correlation of sovereign spread (left panel) and cyclical GDP fluctuations (right panel). Red diamond markers: average bilateral cross-correlation of all country pairs within EME group; blue triangular markers: same for within AME group; green plus markers: same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

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.

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 ten 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

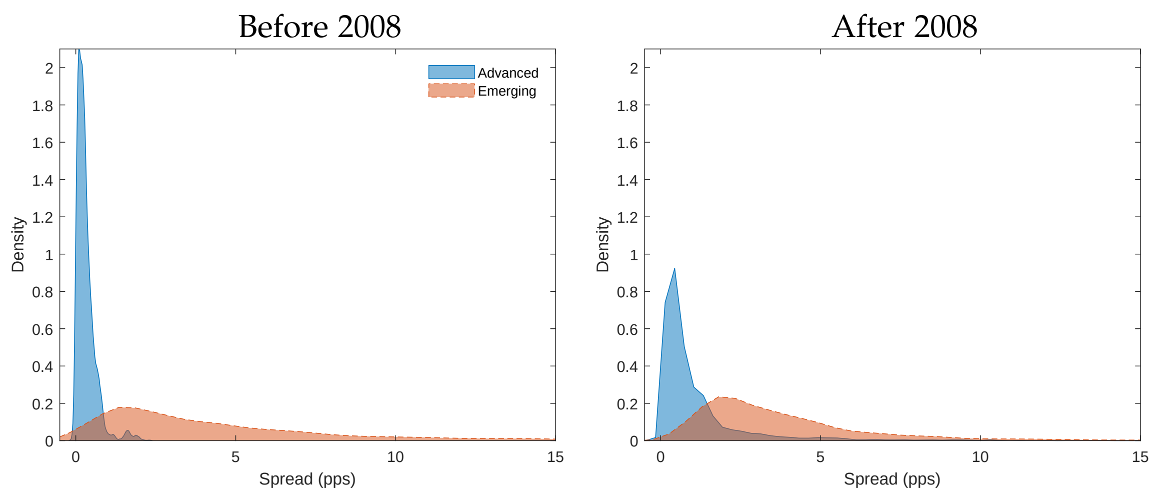

Figure 4: Distribution of the country spreads computed based on monthly data. Kernel density estimate for advanced economies (blue solid line) and emerging economies (red dashed line); spread level measured in percentage points. Kernel density estimate employs an Epanechnikov kernel.

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.*

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.

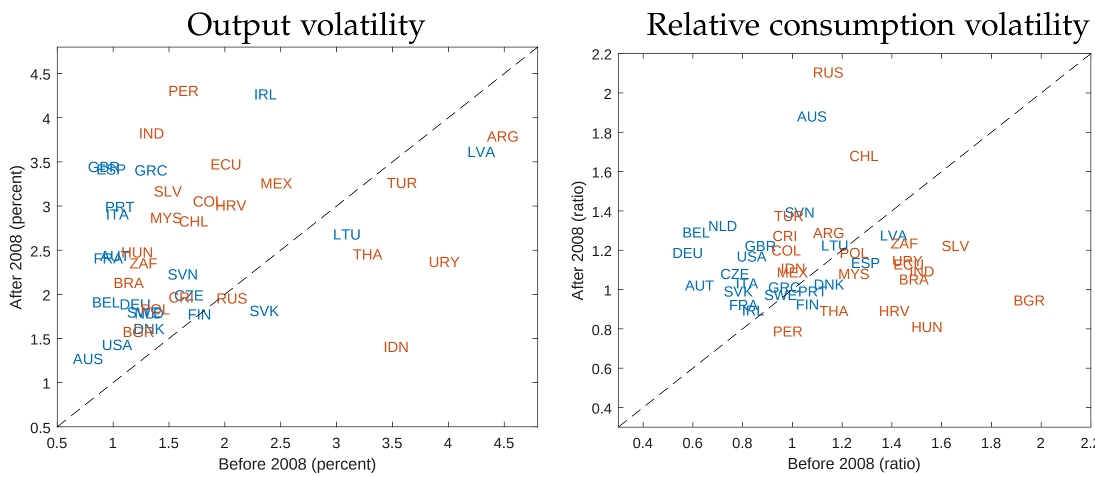

Figure 5: Output and relative consumption volatility across samples. Left (right) panel: output volatility in percent (consumption volatility relative to output volatility). Output and consumption volatility measured in percent and based on cyclical fluctuations around HP-filtered trend ($\lambda = 1{,}600$).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

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 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

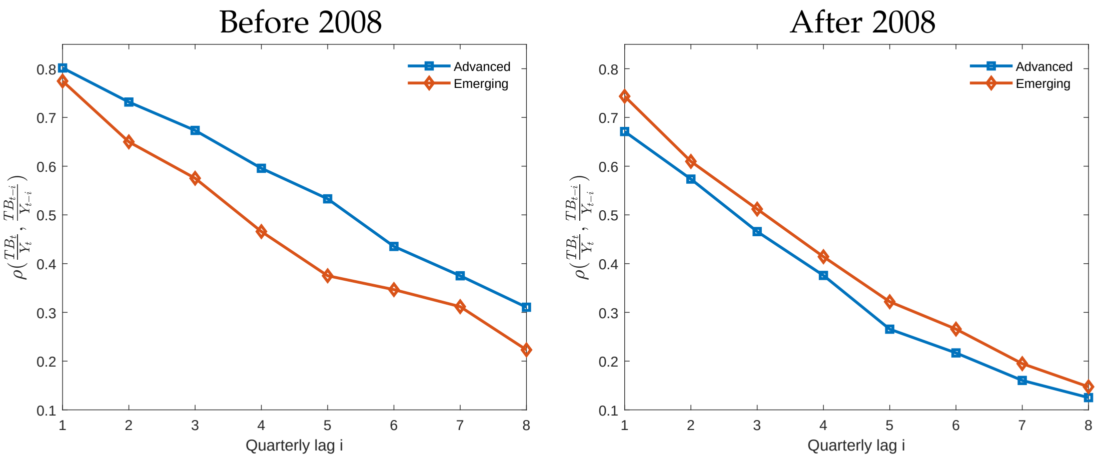

Figure 6: Quarterly autocorrelation of the trade balance-to-output ratio. Blue lines with square markers represent AMEs; red lines with diamond markers indicate EMEs. The x-axis represents the quarterly lag i; y-axis represents the average trade balance-to-output ratio autocorrelation in the respective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

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 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. 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.

3 A structural interpretation

What explains the change in AME country spreads and business cycles after 2008? In what follows, we attempt to answer this question by interpreting the evidence through the lens of the business cycle model of GPU. Though highly stylized, the model has been shown to account for business cycle dynamics in EMEs. In this section, we demonstrate that the model can also offer valuable insights into AME business cycles, particularly in the post-2008 period.

First, we briefly outline the model setup. Then, we estimate the model using key data moments from before and after 2008. Finally, we run model-based counterfactuals to quantify the contributions of different factors to changes in AME business cycles and country spreads.

3.1 Model setup

We base our analysis on a slightly simplified version of the GPU small open economy model.[4] Therefore, we keep the description of the model brief.

A representative household maximizes lifetime welfare

$$E_0 \sum_{t=0}^{\infty} \beta^t \frac{\left[C_t - \theta \frac{X_{t-1} h_t^{\omega}}{\omega}\right]^{1-\gamma} - 1}{1-\gamma} , \tag{1}$$

where C_t is consumption, h_t is hours worked, and X_{t-1} denotes a deterministic total factor productivity (TFP) growth trend with growth rate $\bar{g} = \frac{X_t}{X_{t-1}}$. The discount factor is denoted by β, γ is the risk aversion parameter, ω is related to the Frisch elasticity, and θ is the relative weight of labor in utility.

The production function is given by

$$Y_t = a_t K_{t-1}^{\alpha} \left(X_t h_t\right)^{1-\alpha} , \tag{2}$$

where Y_t is output, K_{t-1} is the capital stock, and α is the output elasticity of capital. The stationary technology shock, a_t, evolves according to a stochastic process that will be specified in the next subsection.

[4] Starting from the original GPU model, we drop the exogenous spending and nonstationary TFP shocks, as these were found to be quantitatively unimportant, as well as the preference shock.

Capital is accumulated according to the standard law of motion

$$K_t = (1-\delta)K_{t-1} + I_t \,, \tag{3}$$

where I_t is investment and δ is the depreciation rate.

The economy can issue external one-period debt with face value D_t. This debt is issued at a debt-elastic gross interest rate r_t, which the household takes as given:

$$r_t = r^* + \psi_0 \bar{D} + \psi \ln\left(\frac{D_t}{\bar{D}}\right) + \ln \mu_t \,. \tag{4}$$

Here, r^* is the steady-state risk-free gross world interest rate. The country spread is given by $\Delta r_t \equiv r_t - r^*$. Departing from GPU, we allow for a non-zero spread in steady state, parameterized by ψ_0. ψ is a key parameter in the analysis that follows. It measures the elasticity of the country spread with respect to debt, denoted by D_t, measured in terms of deviations from its long-run value $\bar{D}$.[5] μ_t captures exogenous fluctuations in the interest rate—a spread shock—for which we specify a process below.

The household faces the budget constraint

$$Y_t + \frac{D_t}{r_t} = D_{t-1} + C_t + I_t + \bar{S} + \frac{\phi}{2}\left(\frac{K_t}{K_{t-1}} - \bar{g}\right)^2 K_{t-1} \,. \tag{5}$$

The available resources are either domestically produced or borrowed from abroad. They are used for debt repayment, consumption C_t, investment I_t, exogenous domestic spending $\bar{S}$, and capital adjustment costs parameterized by ϕ.

The household maximizes (1) subject to the constraints (2), (3), (4), (5), the exogenous laws of motion, the usual no-Ponzi conditions on debt and capital, and initial values for K_0 and D_0.

3.2 Quantitative analysis

We perform a quantitative analysis based on model simulations, focusing on the model's predictions for the moments highlighted in Section 2. Since these include observations on the co-movement of country spreads and output in AMEs and EMEs, we jointly simulate a prototypical AME and EME.

[5] In the context of our first-order approximation to the model, ψ_0 measures the average debt elasticity, while ψ measures the marginal elasticity.

Before assigning parameter values and estimating the model, we must first specify the processes for TFP and the spread shock. An important feature in both processes is the inclusion of a global component that drives TFP and country spreads in AMEs and EMEs simultaneously. This accounts for changes in co-movement across country groups. Specifically, for TFP, we assume:

$$a_t = \phi_a \Gamma_t^a + \rho_a a_{t-1} + \varepsilon_t^a \,, \quad \varepsilon_t^a \overset{iid}{\sim} \mathcal{N}(0, \sigma_a^2) \tag{6}$$

where ϕ_a measures the exposure to the TFP factor Γ_t^a, which is common to AMEs and EMEs. It follows an AR(1) process:

$$\Gamma_t^a = \rho_{a,c} \Gamma_{t-1}^a + \varepsilon_t^{a,c} \,, \quad \varepsilon_t^{a,c} \overset{iid}{\sim} \mathcal{N}(0, \sigma_{a,c}^2) \,. \tag{7}$$

Analogously, the spread shock process is given by

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

where ϕ_μ measures the exposure to the common international risk factor Γ_t^μ:

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

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 2 summarizes the parameters fixed before estimation for the prototypical AME.[6] 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, is set to 0.0021, implying an investment-to-output ratio of 19 percent. The labor disutility parameter, θ, and the long-run debt target, $\bar{D}$, 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).[7] The labor supply elasticity, ω, is set to 1.6 to imply a Frisch elasticity of 1.7, a common value

[6]The parameters specific to the emerging economy are reported in Table C.1.

[7]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.

Table 2: Parameters fixed prior to estimation: AME

Parameter	Value	Target
γ	2.0000	Standard value
α	0.3200	Standard value
δ	0.0021	19 percent I/Y
θ	10.2675	$h = 0.2$
$\bar{D}$	0.1437	Annual $D/Y = 50$ percent
ω	1.6000	Frisch elasticity of 1.7
r^*	1.0050	2 percent risk-free interest rate
$\bar{g}$	1.0025	1 percent growth per year
$\bar{S}$	0.23	$S/Y = 20$ percent
ψ_0	0.0047	Quarterly mean spread of 0.0675 percent
β	0.9993	Value consistent with steady-state spread
ϕ	20	Standard value

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

in studies of small open economies. The share of exogenous spending in output, $\bar{S}$, is set to 20 percent. We set $r^* = 1.005$ to imply an annualized risk-free interest rate of 2 percent. The average debt elasticity, ψ_0, is set to achieve a data-consistent 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_t, the spread shock μ_t, the global factors $\Gamma^i_t, i \in \{a, \mu\}$, and the debt elasticity ψ—for both samples and both country groups via moment matching. We solve the model using first-order perturbation in Dynare 6.4 (Adjemian et al. 2024) and use theoretical moments.

In what follows, we focus on the results for the two AME samples before and after 2008. The results for EMEs are in Appendix C. 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 $\lambda = 1600$. 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. Third, we target the autocorrelation of the unfiltered trade

Table 3: Estimated parameters for AME model

Parameter	**Before 2008**	**After 2008**
ψ	0.00028	0.00414
ρ_a	0.98747	0.99164
σ_a	0.00637	0.00022
ρ_μ	0.00003	0.98794
σ_μ	0.00036	0.00000
ϕ_a	0.01356	0.06071
ϕ_μ	0.00943	0.01840
$\rho_{a,c}$	0.29106	0.84297
$\sigma_{a,c}$	0.13672	0.05852
$\rho_{\mu,c}$	0.88163	0.93784
$\sigma_{\mu,c}$	0.01362	0.00564

Notes: Parameter estimates for AMEs for the sample before 2008 (first column) and after 2008 (second column).

balance-to-output ratio at lags 1, 4, and 8. The fourth target is the 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 $\Gamma_t^i, i \in \{a, \mu\}$, although to potentially different degrees. 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 7), which is associated with a 90-basis-point increase in the spread.[8]

Table 3 reports the estimated parameter values for the prototypical AME that we match to the data moments before and after 2008. The results for EMEs are reported in Appendix C. A key finding is that the debt elasticity of the spread, represented by the parameter ψ, has increased substantially after 2008. As we demonstrate below, this increase is a key factor driving the changes observed in AME business cycles and country spreads across the two sample periods.

[8]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 impose an upper bound of 0.9975 on the autocorrelation coefficients of the exogenous processes and apply a quadratic penalty function with a weight of 100^2 to values exceeding 0.99.

Table 4: The change in AME business cycles: model vs. data

Fact		Before 2008		After 2008	
		Data	Model	Data	Model
1)	Δr	0.27	0.27	1.17	1.17†
2)	D/Y	0.50	0.50	0.77	0.77†
3a)	$\sigma_{\Delta r}$	0.05	0.07	0.25	0.29
3b)	$\rho\left(\Delta r_t^{EME}, \Delta r_t^{AME}\right)$	0.39	0.40	0.23	0.31
4a)	σ_y^{hp}	1.54	1.53	2.44	2.39
4b)	$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.36	0.35	0.66	0.65
5)	$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.93	1.15	1.12

Notes: Model fit based on moment matching. The first two rows present the average 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) 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.

Three main patterns emerge when we turn to the parameters of the shock processes. First, shock processes have generally become more persistent after 2008. Second, exposure to global factors has increased at the expense of idiosyncratic components. The ratio of the unconditional variance of the global component, $\phi_i \sigma_{i,c}^2/(1-\rho_{i,c}^2)$, relative to that one of the idiosyncratic component, $\sigma_i^2/(1-\rho_i^2)$, has increased by two orders of magnitude. Third, the variance of TFP shocks has increased at the expense of spread shocks. For the global component, which dominates after 2008, the ratio of the unconditional variance of TFP relative to the spread shock has tripled.

Table 4 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.[9] First, consider the average spreads. The model predicts a value of 0.27 for the period before 2008, which aligns with the data. After 2008, the

[9]Table B.1 in the appendix shows additional model predictions and compares them to the data.

average spread increases to 1.17 (Fact 1). To account for Fact 2, we compute the spread associated with a debt level equal to 154 percent of its steady-state level (which we assume remains unchanged at 0.5 throughout). And indeed, in this scenario, the model fully accounts for the rise in the spread observed in the data. Intuitively, this target helps to identify the debt elasticity of the spread, ψ.

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 0.07 to 0.29—a strong increase comparable to what we observe in the data. Similarly, the model correctly predicts a substantial decline in the correlation of country spreads across AMEs and EMEs, although somewhat less pronounced than observed in the data. Next, consider the standard deviation of output, reported in row 4a. The model tracks changes in the data across the two sample periods particularly well because it fully accounts for Fact 4, which is an increase in volatility by approximately two-thirds. It also reproduces the nearly doubled 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 fairly well reproduces Fact 5: before 2008, the consumption volatility is 0.93, measured relative to output, just as in the data. After 2008, it rises to 1.12 in the model, which is close to the observed value of 1.15.

Figure 7 displays the autocorrelation of the trade balance-to-output ratio. Here, we compare the model predictions for both AMEs and EMEs (solid lines with 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.

3.3 Counterfactuals

Thus far, we have established that the model can adequately explain the observed changes in AME business cycles. Three aspects are particularly striking. First, coun-

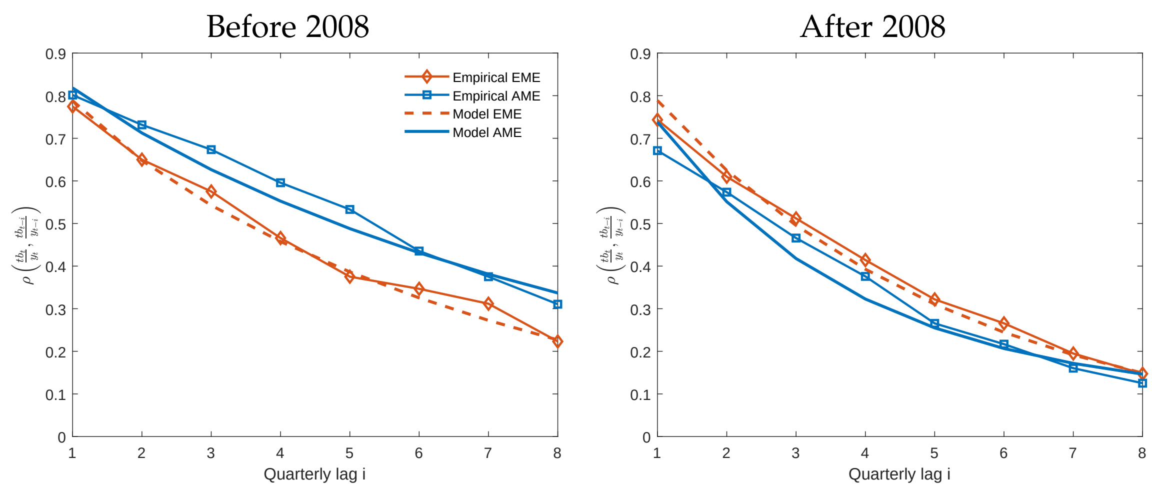

Figure 7: Autocorrelation of the trade balance-to-output ratio. Left panel: before 2008; right panel: after 2008. Blue lines: advanced economies; red lines: emerging economies. Solid lines with markers: empirical autocorrelations (squares for AME, diamonds for EME); lines without markers: model autocorrelations (solid for AME, dashed for EME).

try spreads have increased significantly, accompanied by a rise in their volatility. Second, overall business cycle volatility has increased, particularly for consumption. Third, the comovement of the business cycle with that of EMEs has also increased considerably, while the trade balance has become much less autocorrelated—all of which suggests greater exposure to international financial markets. Against this backdrop, we ask whether the changes in spreads are the cause or the effect of shifts in the fundamentals.

We address this question using model-based counterfactuals. Within the confines of the model, these changes must result from the changes in the estimated parameters, reported in Table 3 above. To structure our analysis, we distinguish changes in the debt elasticity of the spread, ψ, changes in the TFP process, and changes in the exogenous spread shock process as distinct factors. To quantify their contributions to the overall change in AME business cycles, we start with the model estimate based on the pre-2008 sample. Then, we modify one factor at a time by setting its parameters to their post-2008 estimates, keeping all other parameters at their pre-2008 values.[10]

[10] In the counterfactuals involving the exogenous processes, we jointly set the idiosyncratic and global shock processes, as well as the factor loading, to their respective post-2008 values.

Table 5: Model-based counterfactuals

	Before 2008	Spread	TFP	ψ	After 2008
Δr	0.33	0.33	0.33	1.17	1.17
$\sigma_{\Delta r}$	0.07	0.20	0.24	0.07	0.29
$\rho\left(\Delta r_t^{EME}, \Delta r_t^{AME}\right)$	0.40	$0.13^{\dagger}$	$0.27^{\dagger}$	$0.13^{\dagger}$	$0.31^{\dagger}$
σ_y^{hp}	1.53	1.54	2.44	1.53	2.39
$\rho\left(y_t^{EME}, y_t^{AME}\right)$	0.35	$0.23^{\dagger}$	$0.65^{\dagger}$	$0.22^{\dagger}$	$0.65^{\dagger}$
$\sigma_c^{hp}/\sigma_y^{hp}$	0.93	0.94	1.13	0.92	1.12

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) 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 the spread Δr_t. Data moments are cross-country averages. † indicates that cross-correlations are computed conditional on the post-2008 parameter values for EME countries.

We show results in Table 5. First, consider the impact of the change in the exogenous process on the spread (second column).[11] First and foremost, this change increases the volatility of the spread. However, as might be expected, it is also important for spread comovement. Turning to the change in the TFP process, we find a strong effect on consumption volatility. Furthermore, the increase in the persistence and volatility of the TFP shock primarily drives the rise in business cycle volatility. This is plausible, as changes in TFP also capture a wide range of frictions (Aguiar and Gopinath 2007; Chari et al. 2007). Additionally, the change in the TFP process endogenously causes a substantial increase in the volatility of the country spread, which turns out to be the primary driver of business cycle comovement across country groups. Conversely, changes in the spread process account for a significant decline in the cross-correlation of the spread.

To complete the picture, we account for the change in ψ. Along with the increase in the debt-to-GDP ratio, it explains the increase in the country spread. The change

[11] Note that we compute cross-correlations conditional on the post-2008 parameter values for EME countries. This change alone results in a drop in the spread correlation to 0.18 and an increase in the output correlation to 0.22.

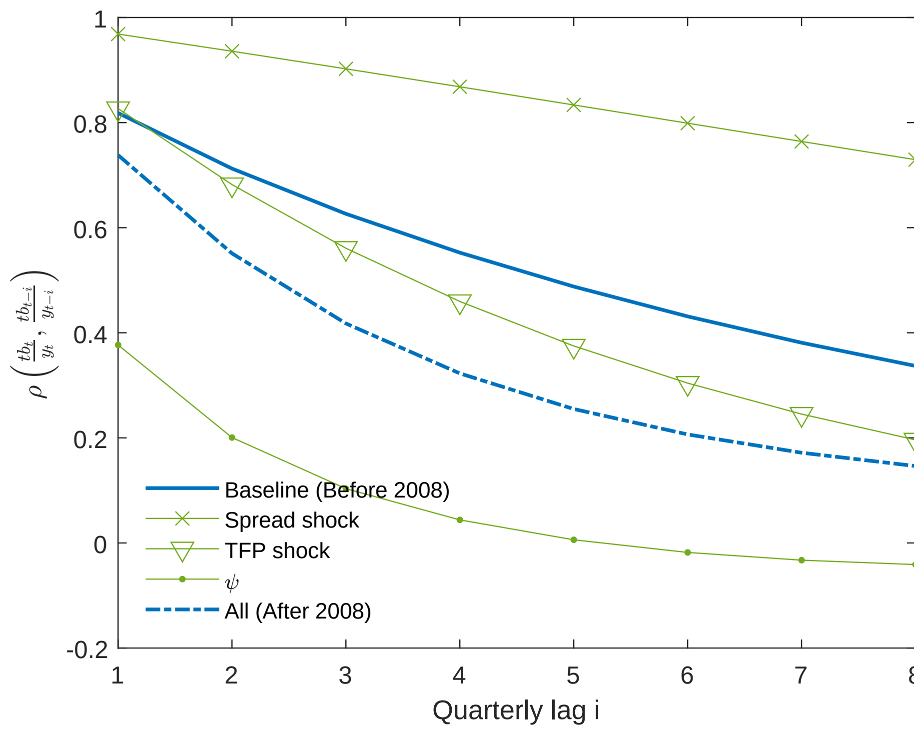

Figure 8: Counterfactual autocorrelation of the model trade balance-to-output ratio. Blue solid line: pre-2008 baseline model correlation; blue dashed line: post-2008 model correlation. Green solid line with triangular markers: baseline with ψ set to post-2008 value. Green solid line with plus markers: baseline with spread process set to post-2008 value. Green solid line with x markers: baseline with TFP process set to post-2008 value.

in ψ is also essential to explaining the decline in the trade balance-to-output ratio, and we provide a decomposition of this ratio based on counterfactual simulations in Figure 8. It turns out that the change in ψ causes the largest reduction of the autocorrelation of the trade balance by far. This is intuitive: A higher value of ψ induces a faster correction of changes in external debt, necessitating a swifter adjustment of the trade balance-to-GDP ratio.

The parameter ψ is a comprehensive measure of financial frictions, a key aspect of EME business cycles according to the analysis of GPU. We estimate that these frictions have intensified substantially in AMEs after 2008. Essentially, the value of the parameter ψ determines how strongly the country spreads respond to changes in the debt ratio. Because the GPU model assumes a linear relationship between the country spread and the debt ratio, the model remains highly tractable. However, it is well understood that spreads tend to increase nonlinearly as debt increases; see, for instance, the discussion in Corsetti et al. (2013). Therefore, we may also think of the increase of ψ as simply reflecting the buildup of debt (Fact 2). Under this interpretation, developments *within* AMEs have contributed to the rise in spreads in two ways: As debt ratios have gone up, financial frictions have become more prevalent, and country spreads have increased not only because of higher debt levels but also because the debt elasticity of the spread has gone up.

3.4 Discussion

Country spreads have increased and become more volatile in AMEs after 2008. At the same time, AME business cycles have become more volatile and more influenced by global developments. Are changes in spreads the cause or the consequence of the increased volatility and the global synchronization of business cycles? When we interpret the data through the lens of the GPU model, we find that changes in the spread are mostly a consequence. Changes in TFP shocks—understood as a broad measure of various frictions—go a long way in explaining why AME business cycles, and consumption in particular, have become more volatile and more globally correlated (Facts 4 and 5). TFP shocks also contribute significantly to the increased volatility of the spread, which can only partly be attributed to changes in the spread process itself (Fact 3). A comprehensive account must also consider the buildup of debt in AMEs. This buildup contributes to the rise in the level of spreads (Facts 1 and 2) and, through a more debt-elastic country spread, to the reduced autocorrelation of the trade balance-to-output ratio (Fact 6).

Given that country spreads and business cycles appear to differ much less systematically between AMEs and EMEs after 2008, it is natural to ask whether there are other criteria based on which countries can be grouped. One possibility appears to be a country's openness.[12] As a first and necessarily preliminary step toward exploring this possibility, the left panels of Figure 9 relate openness after 2008—measured on the vertical axis for the countries in our sample—to openness before 2008, measured on the horizontal axis. The top left panel considers trade openness, that is, the share of imports plus exports in GDP. The bottom left panel shows financial openness, measured as total financial liabilities to nonresidents as

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

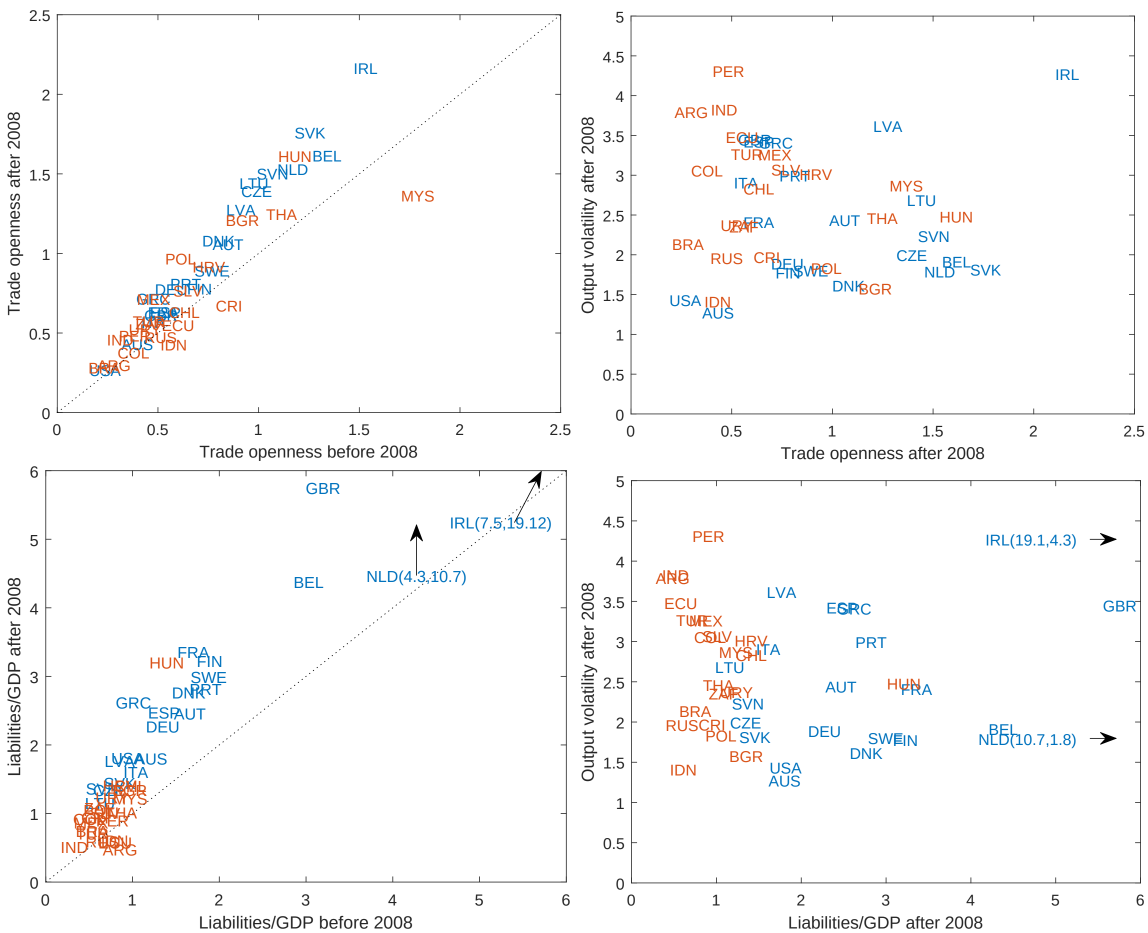

Figure 9: Average trade openness (top row) and financial openness (bottom row). Left column: average openness before 2008 (horizontal axis) vs. after 2008 openness (vertical axis). Right column: post-2008 openness (horizontal axis) vs. cyclical output volatility. Ireland and the Netherlands are outliers, whose coordinates are given in brackets. Blue acronyms: observations for AMEs; red acronyms: observations for EMEs. Black dotted line indicates 45-degree line.

a share of GDP, as in, for instance, Avdjiev and Spasova (2022).[13] Regardless of the specific measure, we make two observations. First, trade and financial openness have increased across the board. Second, AMEs (shown in blue) tend to be more open than EMEs (shown in red)—and perhaps even more so after 2008.

Hence, although openness appears to be correlated with income and therefore the AME/EME distinction, we may still ask whether increased openness has con-

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

tributed to the rise in the volatility of AME business cycles—potentially explaining why TFP shocks have become more volatile. To explore this, the right panels of the same figure show the relationship between average output volatility, measured on the vertical axis, and trade openness (top) and financial openness (bottom), both measured on the horizontal axis. While this representation also confirms that AMEs tend to be more open than EMEs, output volatility does not appear to be systematically related to openness. Thus, prima facie, it seems unlikely that openness is a key driver of the developments documented above. However, we leave a more systematic assessment of the issue for future research.

4 Conclusion

Are business cycles in EMEs and AMEs no longer differently exposed to (global) financial markets? 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.

We wish to highlight two caveats regarding our conclusion. First, our comparison is limited to a few specific dimensions. For instance, we ignore issues related to institutional quality. However, recent developments suggest that, just as with business cycles, there may be signs of "unpleasant convergence" in this area as well. Perhaps sadly, this represents a promising avenue for future research.

The second caveat allows for a more optimistic reading of our results. 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 various geoeconomic shocks. Of course, "a series of tail events" is somewhat 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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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-)

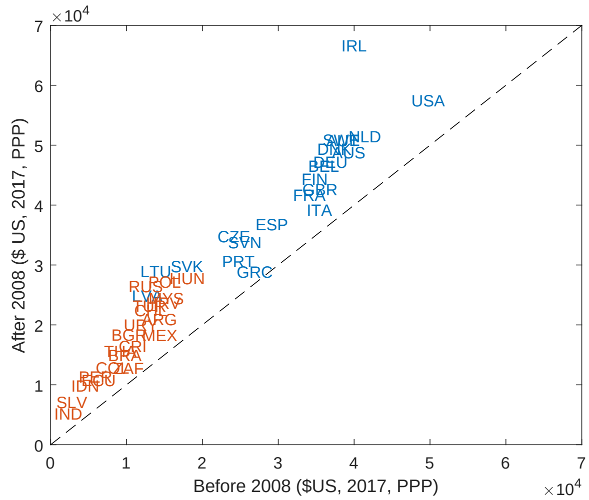

Figure A.1: Average real GDP per capita from 1994 to 2007 (horizontal axis) and from 2009-2019 (vertical axis). Data refer to expenditure-side real GDP at chained PPPs (2017 US$) from the Penn World Tables 10.1 (`rgdpe`). Blue acronyms: observations for AMEs; red acronyms: observations for EMEs. Black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

B Advanced economy model

Table B.1: 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	2.85	3.59	2.56	2.45	1.84	2.38	2.09
$\sigma_{tb/y}^{hp}$	1.23	0.26	1.93	1.13	2.02	1.01	1.83	1.24
$\rho^{hp}\left(\frac{tb_t}{y_t}, y_t\right)$	-0.24	-0.52	-0.34	0.02	-0.10	0.23	-0.14	0.05
$\rho^{hp}(c_t, y_t)$	0.63	1.00	0.70	0.99	0.82	0.93	0.89	0.95
$\rho^{hp}(i_t, y_t)$	0.77	0.97	0.77	0.46	0.64	0.77	0.70	0.75

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.

C Emerging economy model

In this section, we describe the parameterization of the emerging market economy used to generate Figure 7. The parameters governing the steady state are mostly identical to those in Table 2, except for the ones outlined in Table C.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 C.1: Parameters fixed prior to estimation: EME

Parameter	Value	Target
δ	0.0161	19% I/Y
θ	5.3506	$h = 0.2$
$\bar{D}$	0.0749	Annual $D/Y = 50\%$
$\bar{S}$	0.1198	$S/Y = 20\%$
ψ_0	0.1361	Quarterly mean spread of 1.02%
β	0.99	Value consistent with steady-state spread

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

Table C.2: Estimated parameters: EME

	Pre 2008	Post 2008
ψ	0.06532	0.00161
ρ_a	0.99077	0.97787
σ_a	0.00001	0.00918
ρ_μ	0.97415	0.59081
σ_μ	0.00199	0.00369
ϕ_a	0.05409	0.04290
ϕ_μ	0.28382	0.04374
$\rho_{a,c}$	0.29106	0.84297
$\sigma_{a,c}$	0.13672	0.05852
$\rho_{\mu,c}$	0.88163	0.93784
$\sigma_{\mu,c}$	0.01362	0.00564

Notes: Parameter estimates for emerging economies for the sample before 2008 (first column) and after 2008 (second column).