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

Benjamin Born, Gernot J. Müller,
Johannes Pfeifer, and Susanne Wellmann

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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 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

*Born: Frankfurt School of Finance & Management, CEPR, and CESifo, and ifo Institute, b.born@fs.de, Müller: University of Tübingen, CEPR, and CESifo, gernot.mueller@uni-tuebingen.de, Pfeifer: Bundeswehr University Munich, johannes.pfeifer@unibw.de, Wellmann: Unternehmer Baden-Württemberg, wellmann@unternehmer-bw.de. We thank Nicos Christodoulakis, Francesco D'Ascanio, Josef-Simon Görlach, Steffen Elstner, Michael Evers, and Roberto Tamborini, and participants at various conferences and seminars for very useful comments on an earlier draft of this paper. Friederike Fourné and Nico Thurow provided excellent research assistance. We are also grateful for financial support from the German Research Foundation (DFG) under the Priority Program 1578 and from the Volkswagen Foundation. The usual disclaimer applies.

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. In contrast, 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 compile a new dataset that includes country spreads and several other key indicators. Based on this dataset, we establish six key 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 changed in AMEs in ways that make them resemble EMEs. 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. According to the model, the build-up of debt, the increase in the debt elasticity of country spreads, and exogenous spread fluctuations are key drivers of changes in AME business cycles.

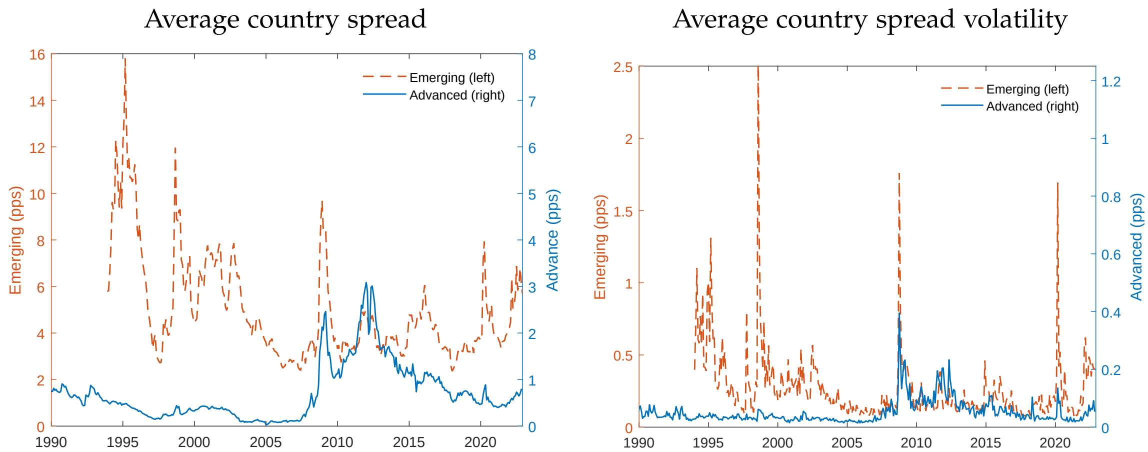

Figure 1: Left panel shows average country spread for EMEs (red dashed line, left axis) and AMEs (blue solid line, right axis); right panel shows average intra-month standard deviation. Based on 13,353 country-month observations of 61 EME countries and 7,376 observations of 31 AME countries.

The dataset we have compiled covers the period from the early 1990s to the end of 2022. It contains observations for 42 countries. According to IMF (2015), 21 of the countries in our sample are classified as EMEs, and 21 as AMEs. While we focus on the largest available sample for each statistic, we have about 1900 country-quarter observations for each group. Our main focus is on the country spread as a comprehensive indicator of a country's financial stress. We use various sources to compile it as the difference in yields on a country's government bond and a riskless reference security, both issued in a common and possibly foreign 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 establishing the six facts, we focus on the average developments in AMEs before and after 2008, benchmarking these developments against those in EMEs. 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. However, 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 more than 76 percent in AMEs.[1] Third, we show that the volatility of the spread has increased strongly for AMEs. Similar to the level of the spread, its volatility after 2008 has not yet reached the EME level, but the gap has narrowed significantly. This fact is particularly noteworthy because interest rate shocks have been identified as a main driver of EME business cycles in the influential study by Neumeyer and Perri (2005). Consistent with this, 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. EMEs also experienced an increase in volatility but to a lesser extent. 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 domestic 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.

Our quantitative model analysis proceeds in two steps. First, we 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. We also estimate the model on EME data but mainly focus on the results for AMEs.

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. We run model-based counterfactuals to assess the importance of the changes in each set of parameters and find that a comprehensive assessment relies on changes in all three sets of parameters. The increase in the debt elasticity explains the increase in the level of the spread once we account for the build-up of debt after 2008. The increased debt elasticity also explains why the trade balance is less autocorrelated post-2008, consistent with the analysis of GPU. At the same time, we find that AMEs have become more exposed to exogenous fluctuations in the spread, in line with the classical analysis of Neumeyer and Perri (2005) for EMEs. This explains the increase in the spread volatility and also goes some way towards explaining the increase in consumption volatility. Finally, we find that the increase in business cycle fluctuations is mostly captured by a more volatile TFP process, which also pushes the relative volatility above one.

The paper is organized as follows. In the remainder of the introduction, we situate the paper within the existing literature and outline its key contributions. 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.

Related Literature. Our paper shares the perspective of some important strands of the literature. First, there is the sovereign default literature, which was initially developed in the context of EMEs—simply because the phenomenon seemed to be confined to EMEs—but then applied to euro-area countries in the 2010s. Classic studies linking country spreads to a country's fundamentals include Eaton and Gersovitz (1981) and Arellano (2008). The emphasis of more recent contributions with a focus on the European debt crisis has been on the possibility of self-fulfilling debt crises (Cole and Kehoe 2000; Bocola and Dovis 2019; Lorenzoni and Werning 2019). Our analysis does not consider default as such but rather assumes a reduced-form relationship between the spread and the level of debt following GPU.[2] Still, the increase in exogenous fluctuations in the spread is consistent with the notion that self-fulfilling dynamics can be pervasive in the sovereign debt context.

Second, fluctuations in the spread may also reflect a varying degree of risk aversion of investors, which, in turn, is influenced by US monetary policy (Lizarazo 2013; Miranda-Agrippino and Rey 2020). 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). While we do not assess this formally, 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).

Finally, there is work on the graduation of EMEs in terms of fiscal policy, or more generally, the policy response to crises, and the "original sin" of borrowing in foreign currency (Frankel et al. 2013; Vegh and Vuletin 2014; Hofmann et al. 2022). A somewhat pessimistic reading of our results for AMEs suggests that the reverse is a distinct possibility.

[2] There is also work that puts forward more structural models to explore the fluctuations of spreads over the business cycle, typically taking an EME's perspective (e.g. Brei and Buzaushina 2015; Fernández and Gulan 2015).

2 Advanced vs. emerging market economies: six facts

Our analysis is based on observations of macroeconomic, fiscal, and financial market variables measured at different frequencies. Most importantly, our dataset includes country spreads. Our sample covers 21 emerging and 21 advanced economies from the early 1990s to the end of 2022. We build on and extend the database compiled in earlier work (Born et al. 2020). In what follows, we briefly explain the construction of the country spread and 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").

We follow Uribe and Yue (2006) and 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. As a result, changes in the spread reflect changes in default risk and/or risk aversion (rather than inflation expectations and/or expected currency depreciation). As the spread construction is mostly based 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).[3] In what follows, we adopt the same approach as in Born et al. (2020), updating the data to include observations up

[3]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 2023, JPMorgan Chase & Co. All rights reserved."

Table 1: Country spreads at quarterly frequency

	Before 2008		After 2008	
	AME	EME	AME	EME
Mean	0.34	4.38	1.29	3.36
Mean (C by C)	0.27	4.08	1.27	3.41
Median	0.26	2.81	0.60	2.37
Std. Dev.	0.32	4.85	2.02	5.08
Std. Dev. (C by C)	0.19	2.85	1.02	2.42
Min	−0.15	0.15	−1.81	0.17
Max	2.20	57.92	24.49	128.40
Skewness	2.34	4.41	4.32	15.20
Kurtosis	10.96	38.13	31.68	344.41
Observations	857	767	1098	1096

Notes: country spread is yield differential between foreign currency-denominated government or government-guaranteed bonds and risk-free bonds in the same currency; statistics computed based on values at the end of quarter, measured in percentage points. Statistics based on pooled country-group sample; "C by C" denotes averages of country statistics.

to November 2022. The spread data are available at a daily frequency. When we focus on quarterly observations, there are 1955 country-quarter observations for AMEs and 1863 for EMEs after excluding default episodes and the year 2008.[4] We classify countries as either AME or EME according to IMF (2015).

In the following, we calculate several statistics for both the period before and after 2008. Table 1 reports summary statistics for the end-of-quarter spread in AMEs and EMEs, measured in percentage points. For the period before 2008, we observe very different spread levels across country groups. Both the mean and the median are more than 10 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 mean and median spreads in EMEs are now only a factor of 3 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 first development makes a greater contribution to the convergence of spread levels. This pattern emerges robustly, independently of

[4]When restricting the sample further to observations where both spread and national account data are available, we are left with 1930 AME and 1847 EME observations. Appendix Table A.1 provides details on the sample coverage.

whether we pool all observations or consider averages over the 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 around 10 times higher; now they are only 3 times higher.*

A key determinant of the country spread is the debt-to-GDP ratio. Not surprisingly, therefore, we find that debt ratios have risen sharply in AMEs after 2008. We measure the debt ratio based on general government debt, as 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 50 percent, respectively. This changed after 2008, when the average debt ratio rose to 76 percent in AMEs but remained constant at 47 percent in EMEs. Details can be found in Tables A.6 and Tables A.7. We record this observation as

Fact 2. *In AMEs, the average debt-to-GDP ratio increased from 50 percent before 2008 to 76 percent after 2008. In contrast, the debt ratio in EMEs remained stable at 47 percent.*

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, we observe distinct patterns 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 basically 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, AMEs' spreads were much less volatile than those

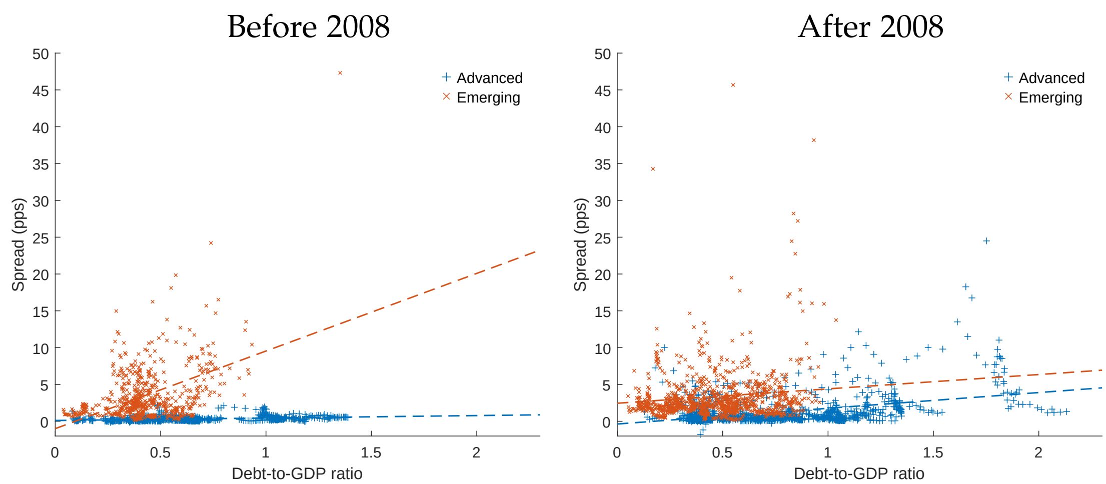

Figure 2: Quarterly observations for spread and debt-to-GDP ratio. Blue plus signs indicate observations for AMEs, and red x markers indicate observations for EMEs. Public debt-to-GDP ratio refers to general government debt relative to GDP based on linearly interpolated IMF data (`GGXWDG_NGDP`). Dashed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

of EMEs. Since then, the standard deviation has increased by a factor of 6 and is now much more similar to that of EMEs, as the right panel of Figure 1 above also illustrates. Hence,

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 2.5 times higher.*

We also report in Table 1 numbers for the maximum and minimum spread in both samples, and again the changes over the sample periods paint a similar picture. Importantly, we verify that these results are not driven by individual countries, as Tables A.3 and A.2 in the appendix confirm.

To visualize the change in the spread distribution over time, we show kernel density estimates for average monthly spreads in Figure 3. We contrast the data for the period before and after 2008 in the left and right panels. In each panel, the blue area shows the distribution of spreads for AMEs, and the red area shows the distribution for EMEs. Again, we see that the distribution of spreads for the two groups of countries is very different before 2008 and 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

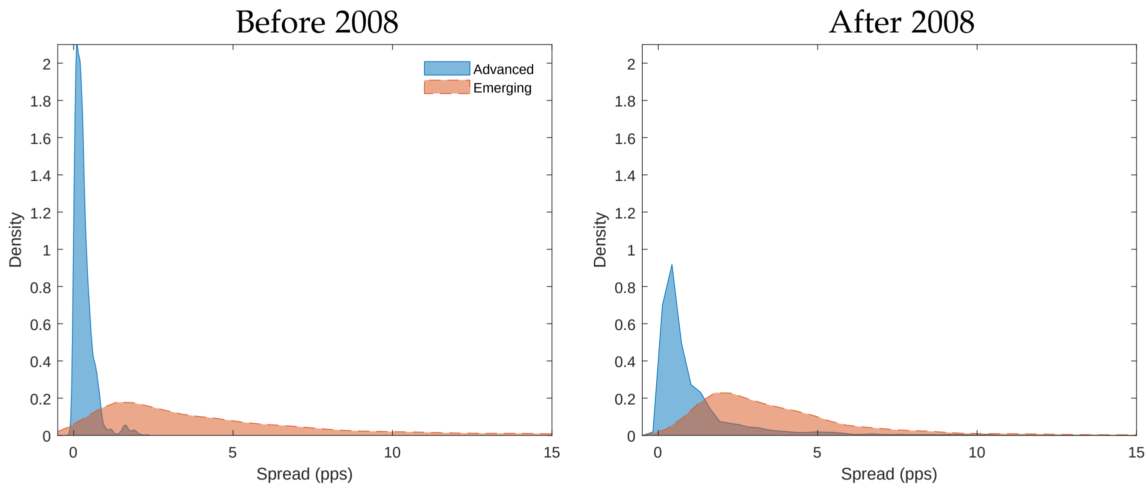

Figure 3: Distribution of the country spreads computed based on monthly data. Kernel density estimate for advanced economies (blue solid line) and emerging economies (red dashed line); spread level measured in percentage points. Kernel density estimate employs an Epanechnikov kernel.

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 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). Next, we revisit this dimension by again contrasting AMEs and EMEs. As in the earlier literature, we extract the cyclical component of the quarterly time series for real consumption and output using an Hodrick and Prescott (1997) filter with a smoothing parameter of $\lambda = 1{,}600$.

The panels of Figure 4 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 depicted on the vertical axis. Most observations are clustered above the 45-degree line, indicating that output volatility has gone

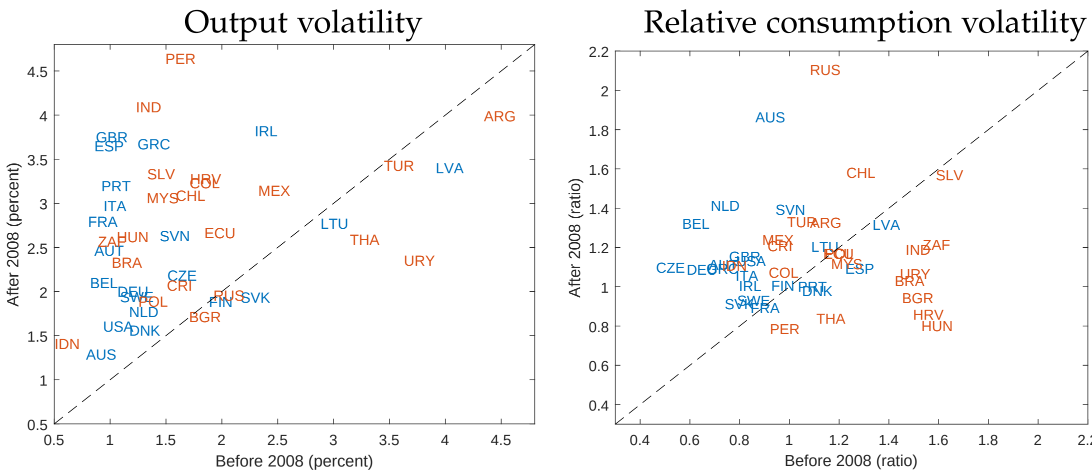

Figure 4: Output and relative consumption volatility across samples. Left (right) panel shows output volatility in percent (consumption volatility relative to output volatility). Output and consumption volatility are measured in percent and are based on cyclical fluctuations around an HP-filtered trend ($\lambda = 1{,}600$). Blue acronyms indicate observations for AMEs, and red acronyms indicate observations for EMEs. The black dashed line indicates 45-degree line.

up across the board. 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. While it was 1.54 percent before 2008, it has risen to 2.55 percent after 2008. Hence,

Fact 4. *In AMEs, output volatility has increased by two-thirds over the two sample periods, and more so than in EMEs.*

The right panel of the figure is organized in the same way, but shows the volatility of consumption relative to the volatility of output on a country-by-country basis. Here, the pattern is even more striking: most observations for AMEs are clustered above the 45-degree line, while most observations for EMEs are clustered below it. 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.*

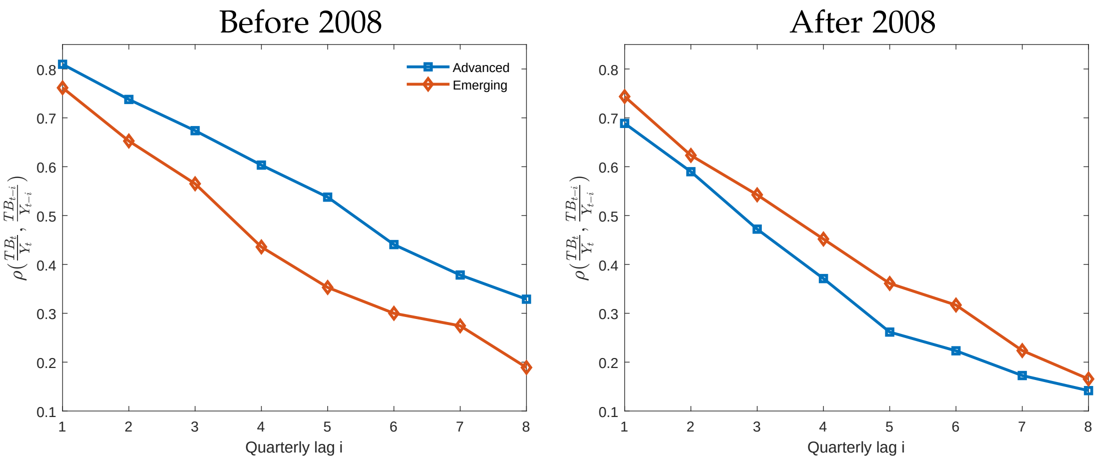

Figure 5: Quarterly autocorrelation of the trade balance-to-output ratio. Blue lines with square markers represent AMEs; red lines with diamond markers indicate EMEs. The x-axis represents the quarterly lag *i*; y-axis represents the average trade balance-to-output ratio autocorrelation in the respective country group.

We report specific numbers in the appendix, see Table A.4 and A.5 for AMEs and EMEs, respectively. The average volatility ratio for AMEs has increased from 0.9 to 1.15. For EMEs, it has declined from 1.26 to 1.18.

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

Figure 5 shows the results. The left panel shows the result for the pre-2008 sample. As expected, the autocorrelation is higher for the AMEs, shown in blue, than for EMEs, shown in red. This pattern is consistent with the notion that financial frictions preventing consumption smoothing were less pronounced in AMEs before 2008. What is striking, however, is that the order reverses after 2008. This is shown in the right panel. While the autocorrelation function is now very similar in both country groups, it is actually lower in AMEs at all horizons. Comparing the two panels, we can also see that this is mainly due to the fact that the autocorrelation function of the AMEs has decreased considerably. 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 in the AME sample.*

Taken together, these facts paint a fairly clear picture: Comparing the period before and after 2008, we find that business cycles in AMEs now resemble those in EMEs across several key dimensions.

3 A structural interpretation

What explains the change in AME business cycles? In what follows, we attempt to answer this question by interpreting the evidence through the lens of the business cycle model of GPU. Although the model is highly stylized, it has been shown to be able to account for business cycle dynamics in EMEs. In this section, we show that it can also provide useful insights into AME business cycles, especially in the post-2008 period.

In the following, we briefly outline the setup of the model. We then 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.

3.1 Model setup

We conduct our analysis based on a slightly simplified version of the small open economy model of GPU.[5] We, therefore, keep the description of the model brief.

A representative household maximizes lifetime welfare

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

[5]Starting from the original version of GPU, we drop the exogenous spending shock and the nonstationary TFP shock, which they found to be quantitatively unimportant. We also drop the preference shock.

where C_t is consumption, h_t is hours worked, and X_{t-1} denotes a deterministic 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

$$a_t = \rho_a a_{t-1} + \varepsilon_t^a \, , \, \varepsilon_t^a \overset{iid}{\sim} \mathcal{N}(0, \sigma_a^2) \ . \tag{3}$$

Capital is accumulated according to the standard law of motion

$$K_t = (1-\delta) K_{t-1} + I_t \ , \tag{4}$$

where I_t is investment and δ is the depreciation rate.

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

$$r_t = r^* + \psi_0 \bar{d} + \psi \ln \left(\frac{D_t / X_{t-1}}{\bar{d}} \right) + \ln \mu_t \ . \tag{5}$$

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, which we parameterize 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, detrended and measured in terms of deviations from its long-run value $\bar{d}$.[6] μ_t is an exogenous interest rate shock that captures movements in the risk spread faced by the small open economy. It follows the process

$$\ln \mu_t = \rho_\mu \ln \mu_{t-1} + \varepsilon_t^\mu \, , \, \varepsilon_t^\mu \overset{iid}{\sim} \mathcal{N}(0, \sigma_\mu^2) \ . \tag{6}$$

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

Table 2: Parameters fixed prior to estimation: AME

Parameter	Value	Target
γ	2.0000	standard value
α	0.3200	standard value
δ	0.0022	19% I/Y
θ	10.2260	$h = 0.2$
$\bar{d}$	0.1431	Annual $D/Y = 50\%$
ω	1.6000	Frisch elasticity of 1.7
r^*	1.0050	2% risk-free interest rate
$\bar{g}$	1.0025	1% growth per year
$\bar{S}$	0.2290	$S/Y = 20\%$
ψ_0	0.0047	Quarterly mean spread of 0.0678%
β	0.9993	Value consistent with steady-state spread
ϕ	20	standard value

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

The household faces the budget constraint

$$Y_t + \frac{D_t}{r_t} = D_{t-1} + C_t + I_t + \bar{S} + \frac{\phi}{2}\left(\frac{K_t}{K_{t-1}} - \bar{g}\right)^2 K_{t-1}\,. \tag{7}$$

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), (4), (5), (7), 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 the model. To pin down the parameters, we proceed in two steps. We first fix parameters that govern the long-run relationships following GPU. However, as our facts are concerned with quarterly data, we assume that a period in the model represents a quarter (rather than a year) and adjust values accordingly.

Table 2 summarizes the parameters fixed prior to estimation. The risk aversion

Table 3: Estimated parameters: AME

Parameter	**Pre 2008**	**Post 2008**
ψ	0.00008	0.00390
ρ_a	0.98439	0.99529
σ_{ε^a}	0.00678	0.01135
ρ_μ	0.81589	0.99038
σ_{ε^μ}	0.00037	0.00127

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

parameter $\gamma = 2$ and the capital share parameter $\alpha = 0.32$ are set to standard values in the literature. The depreciation rate δ is set to 0.031 to imply an investment-to-output ratio of 19%. The labor disutility parameter θ and the long-run debt target $\bar{d}$ are chosen to achieve a steady-state hours share of 20% and an annual debt-to-GDP ratio of 50% as in the AME subsample before 2008. The labor supply elasticity is set to $\omega = 1.6$ to imply a Frisch elasticity of 1.7, a value common in small open economy studies. The share of exogenous spending $\bar{S}$ in output is set to 20%. We set $r^* = 1.005$ to imply an annualized risk-free interest rate of 2%. We set the average debt elasticity ψ_0 to achieve a data-consistent spread level for the pre-2008 AME subsample and set $\bar{g}^\gamma/\beta$ 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, as well as the debt elasticity ψ—for both samples and both country groups via moment matching. In what follows, we focus on the results for the two AME samples before and after 2008, delegating those for EMEs to appendix C. We essentially target the six facts outlined in section 2. The first set of targets concerns national account volatilities at business cycle frequency. To extract the cyclical components, we apply a Hodrick and Prescott (1997) filter with smoothing parameter $\lambda = 1600$. We target 100 times the standard deviation of output as well as the relative volatility of consumption to output. Second, the target the volatility of the risk spread Δr. Third, we target the autocorrelation of the unfiltered trade balance-to-output ratio at lags 1, 4, and 8. Finally, for the post-2008 sample, we also target a data-consistent increase in spreads associated with the rise in debt. Specifically, a 52% increase in the debt stock from its steady

Table 4: The Change in AME business Cycles—Model vs. Data

	Before 2008		After 2008	
	Data	Model	Data	Model
Δr	0.27	0.27	1.27	$0.90^{\dagger}$
d/y	0.50	0.50	0.76	$0.76^{\dagger}$
$\sigma_{\Delta r}$	0.05	0.08	0.25	0.25
σ_y^{hp}	1.54	1.53	2.55	2.55
$\sigma_c^{hp}/\sigma_y^{hp}$	0.90	0.90	1.15	1.08

Notes: Model fit based on moment matching. The first two rows present the average spread and debt-to-GDP ratio. † indicates that the post-2008 model statistic is evaluated at a debt ratio of 0.76, that is, 152% of the steady state. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. Data moments are cross-country averages.

state value of 50% to 76% of GDP should imply a one percentage point increase in the spread.[7]

Table 3 reports the estimated parameter values for the AME sample before and after 2008. The results for EMEs are reported in Appendix C. A key result is that the spread debt elasticity, given by the parameter ψ, has increased substantially after 2008. As we show below, this is a key factor driving the changes in AME business cycles across the two sample periods. Regarding the TFP process, we find a high degree of persistence for both sample periods, but it increased further in the second period. At the same time, the volatility of TFP innovations has almost doubled. Finally, the bottom lines report the parameters governing the spread-shock process. Here, too, the persistence parameter has increased, more so than for TFP, and the volatility of spread shocks has more than tripled.

Table 4 presents the main result of our quantitative model analysis, contrasting the model's predictions for the moments underlying Facts 1 – 5 with their empirical

[7] We use a diagonal weighting matrix with a unit weight for the (relative) volatilities and cross-correlations, a weight of 1 on the output volatility, 10 on spread volatility, 20 on the relative consumption volatility, and a weight of 10 on the autocorrelations of the trade balance. Finally, for the post-2008 sample, we put a weight of 20 on the spread increase. As a practical matter, we apply an upper bound of 0.9975 to the autocorrelation coefficients of the exogenous processes and impose a quadratic penalty function with weight 100^2 to autocorrelation coefficient values exceeding 0.99.

counterparts. The left panel reports the values for the period before 2008 and the right panel for the period after 2008.[8] First, consider the average spreads. The model predicts a value of 0.27, as does the data, for the period before 2008. After 2008, the average spread increased to 1.27 (Fact 1). Note that in this sample period, the average debt level has increased from 50 to 76 percent of GDP. In the estimation, we assume the steady state to be unchanged and, hence, assume a steady-state debt ratio of 0.5 throughout. To account for Fact 2, we evaluate the spread for a level of debt that exceeds the steady-state level by 26 percentage points, all else equal. In this scenario, the model predicts a spread of 0.90, a substantial increase, but still below what is observed in the data. However, the general pattern conforms well with Fact 1.

Turning to Fact 3, we consider the standard deviation of the spread in the third row of the table. The model predicts an increase from 0.08 to 0.3, that is, a strong increase in the volatility of the spread in line with the evidence. Next, consider the standard deviation of output, reported in the fourth row. Here, the model tracks the changes in the data across the two sample periods particularly well: it fully accounts for Fact 4, the increase in volatility by approximately two-thirds. In the last row of the table, we consider the relative volatility of consumption and find again that the model is able to reproduce Fact 5 fairly well: before 2008, the consumption volatility is 0.9, measured relative to output, just like in the data. After 2008, it rises to 1.08 in the model, somewhat less than in the data (1.15).

Figure 6 displays the autocorrelation of the trade balance: In this case, to benchmark our results, we reproduce the data for both EMEs and AMEs, shown in Figure 5 above. We contrast the model predictions (solid lines with markers) with the empirical counterparts and find the model right on track, not only for EMEs and AMEs but also in the sample period before 2008 (left panel) and after 2008 (right panel). The model is thus able to replicate Fact 6 as well: The autocorrelation of the trade balance-to-output ratio is initially higher in AMEs but falls below that of EMEs after 2008. This is particularly noteworthy given that the analysis of GPU focuses on this metric as a distinct feature of EMEs.

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

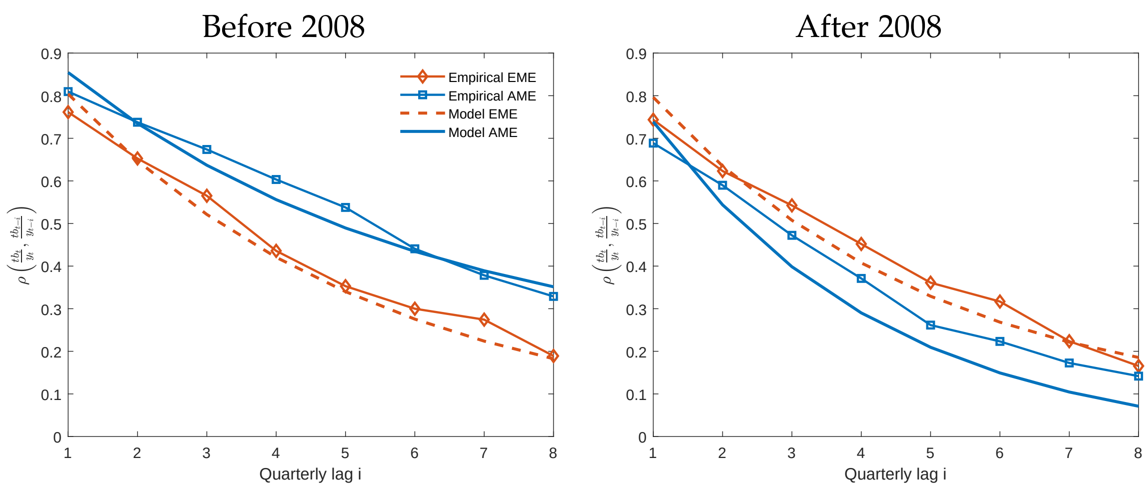

Figure 6: Autocorrelation of the trade balance-to-output ratio. Left panel: before 2008; right panel: after 2008. Blue lines: advanced economies; red lines: emerging economies. Solid lines with markers: empirical autocorrelations (squares for AME, diamonds for EME); lines without markers: model autocorrelations (solid for AME, dashed for EME).

3.3 Counterfactuals

So far, we have established that the model can reasonably account for the changes in AME business cycles observed in the data. Two features of these changes are particularly striking. On the one hand, country spreads have increased significantly, accompanied by a rise in their volatility. On the other hand, overall business cycle volatility has increased, especially for consumption, while the trade balance has become much less autocorrelated. Against this background, we ask whether the changes in spreads are the cause or the effect of shifts in the fundamentals.

We seek to answer this question through 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 the roles of the debt elasticity of the spread, ψ, changes in the TFP process, and changes in the exogenous process of spread shocks. To quantify the contribution of changes along each dimension to the overall change in AME business cycles, we start with the model estimate based on the pre-2008 sample and modify one dimension at a time, setting the parameters along this dimension to their estimated post-2008 values.

We show the results in Table 5. Note that we omit the row for debt, as we leave

Table 5: Counterfactual model fit

	Pre 2008	Spread shocks	TFP shocks	ψ	Post 2008
Δr	0.29	0.29	0.29	0.90	0.90
$\sigma_{\Delta r}$	0.08	0.47	0.16	0.07	0.25
σ_y^{hp}	1.53	1.56	2.55	1.53	2.55
$\sigma_c^{hp}/\sigma_y^{hp}$	0.90	0.97	1.09	0.90	1.08

Notes: Counterfactual model fit based on moment matching. The first row presents the average spread evaluated at a debt ratio of 0.76, that is, 152% of steady state. $\sigma_{\Delta r}$ denotes the standard deviation of the (unfiltered) country spread, σ^{hp} denotes the standard deviation of HP-filtered variables. Data moments are cross-country averages.

the steady-state debt ratio unchanged and only assess the spread at a debt-to-GDP ratio of 0.76. First, consider the impact of the change in the exogenous process of spread shocks (second column). First and foremost, it raises the volatility of the spread. But it is also important for the (relative) volatility of consumption, which increases significantly, even if all other parameters remain at their pre-2008 values. Thus, the exogenous change in the spread process impacts business cycle dynamics in AMEs more broadly.

Turning to the change in the TFP process, we find a similar but stronger effect on consumption volatility. Moreover, the increase in the persistence and the volatility of the TFP shock is clearly the primary driver of the rise in business cycle volatility. This is plausible to the extent that changes in TFP also capture a wide range of frictions (Aguiar and Gopinath 2007; Chari et al. 2007). Note, however, that this change has very little effect on spreads. This is another central result of our model-based analysis: We find that the changes in the country spread, both Facts 1 and 3, are not the effect of a more volatile business cycle but rather contribute to it.

Still, to complete the picture, we need to account for the change in ψ, the key financial friction in EME business cycles according to GPU. In conjunction with the increase in the debt-to-GDP ratio, it rationalizes, to a considerable extent, the increase in the country spread (Fact 1). The change in ψ is also essential for explaining the decline in the trade balance-to-output ratio for which we provide the decomposition based on counterfactual simulations in Figure 7. It turns out

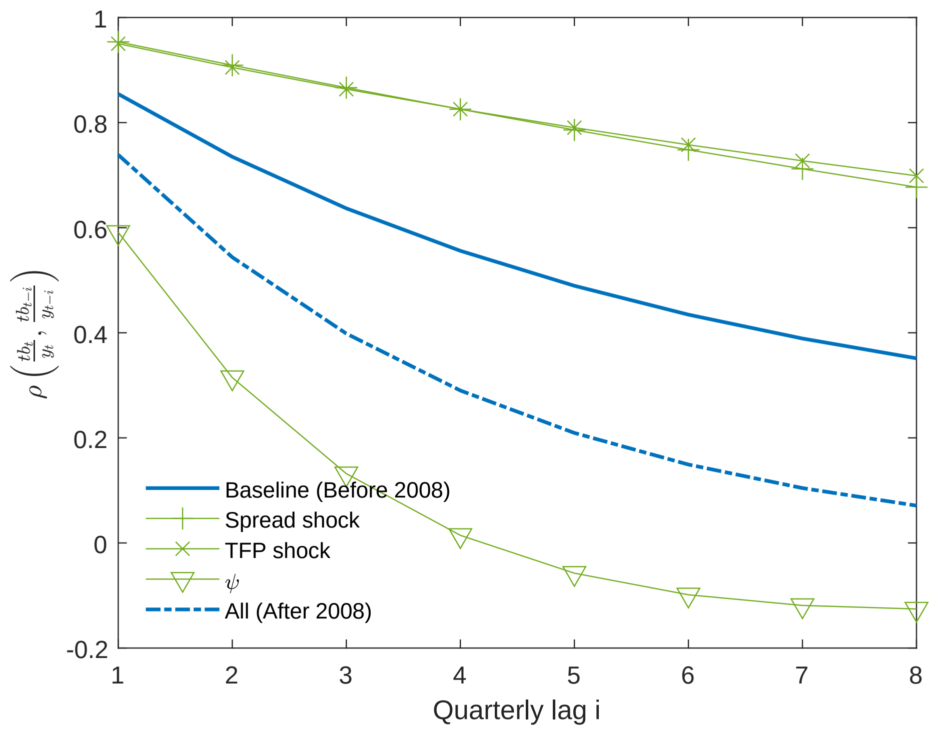

Figure 7: Counterfactual autocorrelation of the model trade balance-to-output ratio. Blue solid line: pre-2008 baseline model correlation; blue dashed line: post-2008 model correlation. Green solid line with triangular markers: baseline with ψ set to post-2008 value. Green solid line with plus markers: baseline with spread process set to post-2008 value. Green solid line with x markers: baseline with TFP process set to post-2008 value.

that the change in ψ is the only factor that lowers the autocorrelation of the trade balance. This is intuitive: A higher 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, which we estimate to have intensified after 2008. In effect, ψ determines how strongly the country spread responds to changes in the debt ratio. And because the GPU model assumes a linear relationship between the country spread and the debt ratio, it remains highly tractable. Yet it is well understood that spreads tend to increase non-linearly as debt goes up, see for instance, the discussion in Corsetti et al. (2013). Hence, we may also think of the increase of ψ as simply reflecting the build-up of debt (Fact 2). Under this interpretation, developments *within* AMEs contributed to the rise in spreads in two ways: As debt ratios went up, financial frictions became more prevalent, and country spreads increased not only because of higher debt levels but also because the debt elasticity of the spread went up.

In sum, while business cycles in AMEs have become more volatile since 2008 (Fact 4), this does not appear to be the primary reason for changes in spreads. Rather, the build-up of debt and the associated increase in financial frictions seem to be the main drivers of the changes that we document for country spreads (Facts 1 – 3). At the same time, AMEs have become more exposed to exogenous spread fluctuations, which, in turn, have driven up consumption fluctuations and, at the same time, reduced the autocorrelation of the trade balance to levels previously characteristic of EMEs (Facts 5 – 6).

4 Conclusion

Are business cycles in EMEs and AMEs no longer differently exposed to (global) financial markets? The answer to this question is a qualified yes. Comparing the period before and after the global financial crisis, we find that differences between AMEs and EMEs have narrowed considerably along several important dimensions—yet not completely. To synthesize these developments, we establish six facts and interpret them through the lens of a structural model.

In this way, we can identify three causes that drive the "unpleasant convergence" of AMEs toward EMEs. First, the AME business cycle has become more volatile because TFP shocks, which we interpret more broadly as a time-varying efficiency wedge, have become more persistent and volatile. This is also the main reason why consumption has become more volatile than output—a phenomenon previously specific to EMEs. But it is not the only reason. Consumption has also become more volatile because shocks to the country spread, too, have become more volatile and persistent. This means that AMEs have become more exposed to international financial markets in ways that were previously characteristic of EMEs. Finally, as debt levels have risen and the debt elasticity of the country spread has increased, spread levels have risen, and the autocorrelation of the trade balance-to-output ratio has declined—making AMEs resemble EMEs once again.

Taken together, these developments are hardly welcome. However, we conclude by stressing that our analysis is purely positive and does not allow us to confidently address questions of optimal policy—an issue we leave for future research.

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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-)

Table A.1: Sample coverage

Country	First obs.	Last obs.	Obs.	Missing
		AME		
Australia	2003Q1	2010Q3	27	4
Austria	1995Q1	2022Q3	111	0
Belgium	1995Q1	2022Q3	111	0
Czech Republic	2004Q1	2022Q3	72	3
Denmark	1995Q1	2022Q3	95	16
Finland	1992Q2	2022Q3	122	0
France	1999Q1	2022Q3	95	0
Germany	2004Q1	2022Q3	74	1
Greece	1995Q1	2022Q3	108	3
Ireland	1995Q1	2022Q3	111	0
Italy	1995Q1	2022Q3	111	0
Latvia	2006Q1	2022Q3	67	0
Lithuania	2005Q3	2022Q3	69	0
Netherlands	1999Q1	2022Q3	95	0
Portugal	1995Q1	2022Q3	111	0
Slovakia	2004Q1	2022Q3	75	0
Slovenia	2003Q1	2022Q3	78	1
Spain	1995Q1	2022Q3	111	0
Sweden	1993Q1	2022Q3	109	10
United Kingdom	1992Q4	2022Q3	120	0
United States	2007Q4	2022Q3	58	2
		EME		
Argentina	1993Q4	2022Q3	89	27
Brazil	1996Q1	2022Q3	107	0
Bulgaria	2007Q1	2022Q3	63	0
Chile	1999Q2	2022Q3	94	0
Colombia	1997Q1	2022Q3	103	0
Costa Rica	2008Q1	2022Q3	59	0
Croatia	2004Q1	2022Q3	75	0
Ecuador	1995Q1	2022Q3	102	9
El Salvador	2002Q2	2022Q3	80	2
Hungary	1999Q1	2022Q3	95	0
India	2019Q1	2022Q3	15	0
Indonesia	2004Q2	2022Q3	74	0
Malaysia	2000Q1	2022Q3	91	0
Mexico	1993Q4	2022Q3	116	0
Peru	1997Q1	2022Q3	101	2
Poland	1995Q1	2022Q3	111	0
Russia	2003Q1	2021Q3	75	0
South Africa	1994Q4	2022Q3	112	0
Thailand	1997Q2	2022Q2	101	0
Turkey	1998Q1	2022Q3	99	0
Uruguay	2001Q2	2022Q3	85	1

Notes: Observations for which both national accounts data and spread data are available. Default episodes have been excluded.

Table A.2: 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	0.60	0.36	55
Belgium	0.34	0.18	65	0.81	0.56	55
Czech Republic	0.09	0.04	16	0.65	0.37	52
Denmark	0.63	0.46	62	0.29	0.31	55
Finland	0.29	0.21	63	0.49	0.23	55
France	0.12	0.05	36	0.66	0.33	55
Germany	0.03	0.02	16	0.17	0.15	54
Greece	0.79	0.57	63	6.14	4.72	52
Ireland	0.31	0.22	65	1.96	2.15	55
Italy	0.48	0.28	76	2.14	1.02	55
Latvia	0.30	0.42	8	1.72	1.80	55
Lithuania	0.26	0.22	10	1.52	1.67	55
Netherlands	0.11	0.07	36	0.41	0.26	55
Portugal	0.21	0.10	59	3.09	2.73	55
Slovakia	0.10	0.04	16	1.18	0.96	55
Slovenia	0.18	0.19	19	1.66	1.49	55
Spain	0.28	0.19	62	1.78	1.19	55
Sweden	0.39	0.21	50	0.23	0.20	55
United Kingdom	0.34	0.20	61	0.37	0.26	55
United States	0.08	0.00	1	0.19	0.09	53
Average/Sum	0.27	0.18	857	1.27	1.01	1098

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.3: Descriptive statistics country spread: EMEs

	Before 2008			After 2008		
Country	Mean	Std. Dev.	Obs	Mean	Std. Dev.	Obs
Argentina	6.62	3.24	42	10.67	6.85	43
Brazil	7.33	4.23	55	2.90	0.79	55
Bulgaria	6.37	5.25	54	1.57	1.17	55
Chile	1.42	0.55	35	1.77	0.44	55
Colombia	4.47	2.23	44	2.44	0.83	55
Costa Rica	–	–	0	3.91	1.50	55
Croatia	0.43	0.20	16	2.16	1.23	55
Ecuador	11.74	7.02	48	9.15	5.74	51
El Salvador	2.64	0.77	23	6.33	4.56	53
Hungary	0.82	0.37	36	2.53	1.43	55
India	–	–	0	1.83	0.66	15
Indonesia	2.49	0.57	15	2.61	0.96	55
Malaysia	2.00	1.69	45	1.75	0.57	55
Mexico	4.21	2.86	57	2.97	1.02	55
Peru	4.28	1.98	42	1.98	0.57	55
Poland	2.12	1.62	53	1.28	0.81	55
Russia	6.84	12.04	33	5.61	17.42	54
South Africa	2.32	1.31	53	3.16	1.07	55
Thailand	1.41	1.10	43	0.91	0.47	55
Turkey	4.85	2.67	47	3.79	1.34	55
Uruguay	5.15	3.76	26	2.26	0.86	55
Average/Sum	4.08	2.81	767	3.41	2.40	1096

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: 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	0.92	0.85	0.92	1.30	2.42	1.87
Austria	0.99	0.73	0.74	2.48	2.77	1.12
Belgium	0.95	0.59	0.63	2.11	2.79	1.33
Czech Republic	1.65	0.86	0.52	2.19	2.41	1.10
Denmark	1.31	1.46	1.11	1.57	1.54	0.98
Finland	1.99	1.94	0.98	1.89	1.91	1.01
France	0.94	0.85	0.90	2.80	2.51	0.90
Germany	1.21	0.79	0.65	2.01	2.20	1.09
Greece	1.39	1.02	0.73	3.68	4.04	1.10
Ireland	2.40	2.02	0.84	3.83	3.85	1.01
Italy	1.04	0.87	0.83	2.98	3.16	1.06
Latvia	4.04	5.63	1.39	3.41	4.50	1.32
Lithuania	3.01	3.45	1.14	2.78	3.36	1.21
Netherlands	1.30	0.97	0.74	1.78	2.52	1.42
Portugal	1.06	1.15	1.09	3.20	3.22	1.01
Slovakia	2.30	1.84	0.80	1.94	1.78	0.92
Slovenia	1.58	1.59	1.01	2.64	3.69	1.40
Spain	0.99	1.28	1.28	3.66	4.01	1.10
Sweden	1.24	1.07	0.86	1.95	1.82	0.93
United Kingdom	1.02	0.83	0.82	3.76	4.35	1.16
United States	1.08	0.91	0.85	1.61	1.83	1.13
Mean	1.54	1.46	0.90	2.55	2.89	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.5: 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	4.00	5.32	1.33
Brazil	1.15	1.71	1.48	2.34	2.41	1.03
Bulgaria	1.85	2.81	1.52	1.72	1.63	0.95
Chile	1.72	2.22	1.29	3.10	4.91	1.59
Colombia	1.85	1.81	0.98	3.24	3.48	1.08
Costa Rica	1.62	1.56	0.96	2.08	2.52	1.21
Croatia	1.86	2.90	1.56	3.29	2.84	0.86
Ecuador	1.99	2.38	1.20	2.67	3.13	1.17
El Salvador	1.46	2.40	1.65	3.34	5.25	1.57
Hungary	1.20	1.92	1.59	2.63	2.12	0.81
India	1.35	2.04	1.52	4.10	4.89	1.19
Indonesia	0.62	0.48	0.78	1.42	1.57	1.11
Malaysia	1.47	1.81	1.23	3.07	3.44	1.12
Mexico	2.47	2.36	0.95	3.16	3.92	1.24
Peru	1.63	1.61	0.98	4.65	3.66	0.79
Poland	1.39	1.67	1.20	1.90	2.23	1.17
Russia	2.07	2.37	1.15	1.97	4.14	2.11
South Africa	1.02	1.63	1.59	2.58	3.14	1.22
Thailand	3.28	3.83	1.17	2.60	2.19	0.84
Turkey	3.59	3.78	1.05	3.44	4.58	1.33
Uruguay	3.77	5.69	1.51	2.36	2.52	1.07
Mean	1.99	2.48	1.26	2.84	3.33	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.6: Debt-to-GDP ratio: AMEs

Country	Mean	First obs.	T	Mean	Last obs.	T
	Before 2008			After 2008		
Australia	20.53	1989Q4	73	36.10	2021Q3	55
Austria	63.37	1988Q4	77	80.27	2021Q3	55
Belgium	115.48	1980Q4	109	103.63	2021Q3	55
Czech Republic	20.82	1995Q4	49	37.37	2021Q3	55
Denmark	55.27	1992Q4	61	39.58	2021Q3	55
Finland	32.67	1980Q4	109	61.66	2021Q3	55
France	46.81	1980Q4	109	95.78	2021Q3	55
Germany	56.76	1991Q4	65	70.22	2021Q3	55
Greece	78.02	1980Q4	109	175.79	2021Q3	55
Ireland	40.97	1995Q4	49	77.51	2021Q3	55
Italy	110.37	1988Q4	77	131.44	2021Q3	55
Latvia	13.20	1998Q4	37	40.05	2021Q3	55
Lithuania	21.01	1998Q4	37	37.90	2021Q3	55
Netherlands	61.65	1980Q4	109	58.08	2021Q3	55
Portugal	61.82	1990Q4	69	120.18	2021Q3	55
Slovakia	38.77	1995Q4	49	49.84	2021Q3	55
Slovenia	24.73	1995Q4	49	64.84	2021Q3	55
Spain	45.36	1980Q4	109	92.39	2021Q3	55
Sweden	56.50	1993Q4	57	39.74	2021Q3	55
United Kingdom	39.17	1980Q4	109	85.88	2021Q3	55
United States	61.35	2001Q4	25	105.66	2021Q3	55
Mean/Sum	50.70		1537	76.38		1155

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.7: Debt-to-GDP ratio: EMEs

Country	Mean	First obs.	T	Mean	Last obs.	T
	Before 2008			After 2008		
Argentina	59.54	1992Q4	61	61.15	2021Q3	55
Brazil	67.97	2000Q4	29	73.72	2021Q3	55
Bulgaria	49.72	1998Q4	37	20.04	2021Q3	55
Chile	15.65	1991Q4	65	19.37	2021Q3	55
Colombia	36.39	1996Q4	45	46.73	2021Q3	55
Costa Rica	37.34	1996Q4	45	43.36	2021Q3	55
Croatia	36.03	1998Q4	37	71.64	2021Q3	55
Ecuador	43.15	2001Q4	25	37.46	2021Q3	55
El Salvador	36.89	1991Q4	65	74.57	2021Q3	55
Hungary	61.52	1995Q4	49	75.50	2021Q3	55
India	76.62	1991Q4	65	72.39	2021Q3	55
Indonesia	55.14	2000Q4	29	29.17	2021Q3	55
Malaysia	42.59	1990Q4	69	56.33	2021Q3	55
Mexico	38.98	1996Q4	45	48.63	2021Q3	55
Peru	42.58	2000Q4	29	26.01	2021Q3	55
Poland	42.65	1995Q4	49	52.36	2021Q3	55
Russia	46.49	1997Q4	41	13.52	2021Q3	55
South Africa	31.51	2000Q4	29	46.23	2021Q3	55
Thailand	46.91	1996Q4	45	43.73	2021Q3	55
Turkey	57.86	2000Q4	29	33.49	2021Q3	55
Uruguay	60.72	1999Q4	33	53.74	2021Q3	55
Mean/Sum	46.96		921	47.58		1155

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
$\sigma_i^{hp}/\sigma_y^{hp}$	3.73	3.18	3.19	3.16	2.31	2.17	2.54	3.06
$\sigma_{tb/y}^{hp}$	1.94	1.30	1.26	0.45	1.77	0.87	1.98	1.19
$\rho^{hp}\left(\frac{tb_t}{y_t}, y_t\right)$	−0.34	−0.03	−0.24	−0.28	−0.15	−0.14	−0.11	−0.07
$\rho^{hp}(c_t, y_t)$	0.69	0.99	0.65	1.00	0.90	1.00	0.83	1.00
$\rho^{hp}(i_t, y_t)$	0.74	0.45	0.78	0.89	0.71	0.79	0.66	0.65

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 6. 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	5.3450	$h = 0.2$
$\bar{d}$	0.0748	Annual $D/Y = 50\%$
$\bar{S}$	0.1197	$S/Y = 20\%$
ψ_0	0.1363	Quarterly mean spread of 1.02%
β	0.9899	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	0.00898	0.00126
ρ_a	0.99044	0.98527
σ_{ε^a}	0.00879	0.01257
ρ_μ	0.99006	0.80783
σ_{ε^μ}	0.00393	0.00320

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