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Michael D. Bordo
Rutgers University
National Bureau of Economic Research

Pierre Siklos
Wilfrid Laurier University

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Ricardo Reis
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Michael D. Bordo
Rutgers University
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Pierre Siklos
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Before the Global Financial Crisis,[1] a drive towards greater central-bank autonomy and transparency, as part of the achievement of greater central-bank credibility that had begun in the advanced economies (AE), spread to the emerging market economies (EME). This process was greatly enhanced by the adoption of inflation targeting (IT), as analyzed in Bordo and Siklos (2014). Moreover, the adoption of best practices was viewed as a way for emerging market countries especially to "tie their hands" to deliver lower and more stable inflation rates without undue fiscal and/or political influence.

The process of central-bank evolution was interrupted by the Global Financial Crisis, a transatlantic event largely involving advanced economies (Tooze, 2018; McCauley, 2018). The fallout from the Global Financial Crisis in the advanced economies raised the objective of financial stability—which, unlike monetary policy, was

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1. There is no official chronology, but the ones published by the Federal Reserve Bank of St. Louis (https://www.stlouisfed.org/financial-crisis/full-timeline) and the Federal Reserve Bank of New York (https://www.newyorkfed.org/research/global_economy/policyresponses.html) provide useful and comprehensive timelines. Some prefer to call the period from 2007 onwards the "Great Financial Crisis" but we retain the arguably more popular "Global Financial Crisis" expression.

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less well-defined—, and boosted the search for reliable instruments to achieve it. Many of the emerging market economies were affected by the fallout from the crisis, but most were spared the turbulence experienced in the financial markets of advanced economies. Many continued on the trajectory of convergence to best-practice central banking and maintenance of the hard-won benefits in the fight against inflation.[2]

In this paper we compare the performance of a representative set of emerging market economies with a group of advanced economies before and after the Global Financial Crisis. We first consider institutional developments, e.g., changes in central-bank independence, changes in central-bank transparency, changes in central-bank governance indicators. Because central banks do not operate in a vacuum, we develop a new index of institutional resilience that combines institutional information describing central-banking operations as well as other political economy-style indicators. Next, we extend an earlier measure of central-bank credibility based on our previous work—Bordo and Siklos (2014, 2016, 2017). The improved measure combines deviations of inflation from a central-bank's objective, monetary-policy uncertainty, and a global factor that can impact central-bank credibility.

Finally, with these building blocks, we then use econometric methods (panel VARs based on both factor models and observed data) to ascertain the impact of global shocks, financial shocks, credibility shocks, and trade shocks on the emerging versus the advanced countries. The success of any policy regime needs to be underpinned by institutions able to withstand political and other pressures stemming from the impact of a variety of economic shocks that especially hit small open economies. Hence, institutional resilience ought to go hand in hand with resilience against these shocks. Our empirical results document significant improvements among emerging market economies in adopting the best practices followed by central banks in advanced economies. However, the Global Financial Crisis reversed some of the gains made pre-crisis and this highlights the fragility of emerging market economies to the economic shocks that constantly buffet them.

2. See Jasova and others (2018), which provides evidence on exchange-rate passthrough to inflation for advanced and emerging economies since the Global Financial Crisis. They find that, since the Global Financial Crisis, passthrough for emerging market economies has declined and converged on that of the advanced economies. This is perceived as a reflection of improved central-bank credibility.

Section 1 provides a brief historical overview of the evolution of central-bank credibility and its correlates (central-bank independence and central-bank transparency) in both advanced and emerging countries in the post-Bretton-Woods era. Section 2 outlines the data. Section 3 presents our institutional measures. Section 4 contains our econometric estimates. Section 5 concludes with some policy lessons.

1. Historical Background

The Great Inflation of 1965 to 1983 was a defining moment for the central banks of the advanced countries in the post-World War II era.[3] The postwar, post-Bretton-Woods period was one of relative macro stability, reflected in low inflation and inflation variability and high real growth and low real output variability for the advanced countries, as analyzed in Bordo (1993) and Bordo and Siklos (2014). The collapse of Bretton Woods between 1971 and 1973 was followed by accelerating inflation and increased inflation volatility along with declining real activity and rising unemployment (i.e., stagflation).[4] This performance was driven by the termination of the disciplining force of the Bretton-Woods nominal anchor, the Keynesian emphasis on full employment and the belief by central banks that the benefits of full employment outweighed the costs of rising inflation. A key factor in this period across countries was the absence *de facto* and, in some cases, *de jure* of central-bank independence. The story differed across countries. In Great Britain, the Bank of England was a *de facto* part of the Treasury.[5] In the U.S., although the Federal Reserve was *de jure* independent, and had *de facto* regained its independence from the Treasury in the 1951 Accord, under the tutelage of Chairman William McChesney Martin it was "independent within the government" and it increasingly coordinated monetary policy with the Treasury (Meltzer, 2010). Through a process called "even keel", the Fed indirectly monetized the fiscal deficits generated by the Johnson administration to finance the Vietnam War and the Great Society, and later by the Nixon administration (Humpage and Mukherfee, 2015; Bordo, 2020).[6]

3. For a discussion on the history of central banks, see Bordo and Siklos (2018), and Siklos (2002).

4. See Bordo and Orphanides (2013).

5. A similar experience describes the Bank of Japan's relationship with the Finance Ministry until 1997.

6. For Great Britain, see Bordo, Bush and Thomas (2019). For France see Monnet (2019).

The Fed's unwillingness to tighten monetary policy sufficiently to kill inflationary expectations led to a ratcheting up in inflation in the 1970s (Bordo and Orphanides, 2013).[7] This was also a period when central-bank credibility, defined as the deviation of realized inflation from the stated objective, was at a low point (Bordo and Siklos, 2016).

As is well known, the Volcker shock of 1979 in the U.S. and subsequent tight monetary policies and similar strategies in Great Britain, Canada, and other countries led to the Great Moderation period from the mid-1980s to before the Global Financial Crisis and to the restoration of central-bank credibility (Bordo and Siklos, 2015). In that period both central-bank independence and central-bank transparency increased dramatically (Bordo and Siklos, 2014; Dincer and others, 2019).

Along with the evolution described above of the central banks of the advanced countries, the emerging countries followed a similar trajectory, but with generally worse economic performance. These countries had a long history of high and volatile inflation and of frequent currency crises.[8] The political economy in emerging countries, combined with less developed financial institutions and markets, made it difficult to establish an institutional framework for monetary and fiscal stability.[9] Despite this, the Bretton-Woods regime did serve as a nominal anchor for these countries and macro performance was better than after its collapse (Edwards and Santaella, 1993; Bordo and Schwartz, 1998). The Great Inflation period for the emergers was characterized by even worse macro performance than in the advanced countries and the instability was not fully alleviated until the 1990s, when many countries began adopting best practices in central-banking and economic-policy technology.[10] Bordo and Siklos (2014, 2017) present evidence that those countries that adopted inflation targeting converged more rapidly to the inflation levels of the advanced countries than emergers that did not. Moreover, their performance on measures of central-bank independence and central-bank transparency also improved greatly relative to countries that did not adopt inflation targeting.[11]

7. Another important factor was accommodation of the oil-price shocks. See Blinder and Rudd (2013).

8. For example, see Ha and others (2019).

9. For Latin America, see Edwards (2012).

10. Chile was one of the first emerging economies to follow New Zealand's lead in adopting inflation targeting.

11. For example, see Siklos (2017).

The Global Financial Crisis changed the plot considerably. It was primarily an advanced-country transatlantic event (Tooze, 2018; McCauley, 2018), triggered by the collapse of the U.S. housing market. Its causes included: U.S. government policies to encourage home ownership (Rajan, 2011); lax financial regulation and oversight (Calomiris, 2017); financial innovation, especially in the unregulated shadow banking sector (Tooze, 2018), and loose monetary policy (Taylor, 2007). Although the crisis began as an advanced-country event, some emerging countries were also hard hit, especially those in Eastern Europe with financial ties to Western Europe. Other emerging countries were also impacted by the collapse of international trade and the spillovers from the advanced-country credit crunch. But there were a number of countries which had developed the resilience to largely withstand the crisis, including Chile.[12]

Since the crisis, central banks in the advanced countries have been heavily focused on financial stability and in developing the tools of macroeconomic policy and 'leaning-against-the-wind policies' to withstand future global imbalances. This strategic shift was manifest in the U.S. with the Dodd Frank act of 2010 and, in the international financial system, with Basel III in 2011.[13] Many emerging countries have been developing similar policy strategies as in the advanced countries, but their financial architecture and exposure through international trade and capital flows have prevented them from advancing to the level of the advanced countries because their circumstances and vulnerabilities are different.[14]

In this paper we examine evidence on the performance of a panel of emerging central banks from Latin America, Asia, and Europe to ascertain how the crisis affected the trajectories that they had been following before it in comparison to the experience of a panel of advanced countries. Our evidence suggests that several emerging countries, but not all, have developed the institutional resilience to keep them on track.

Our strategy consists in presenting a menu of evidence about institutional developments in monetary policy and beyond, contrasting

12. See Kose and Prasad (2010).

13. https://www.bis.org/bcbs/basel3.htm

14. In 'leaning against the wind,' monetary policy is tightened under some conditions as a way of maintaining financial stability. However, at least in theory, there is an ongoing debate about the wisdom of using policy-rate changes to forestall financial instability. See, for example, Svensson (2017), who warns against the risks of such a policy, while Filardo and Rungcharoenkitkul (2016) make the case for such a strategy.

the record of advanced and emerging countries. In doing so, we propose a new indicator of country-specific resilience for 29 economies that yields insights about the progress each country made before the crisis and the record since. We then augment this longer-run type evidence with some suggestive econometric evidence based on panel vector autoregressions. These provide evidence on the impact of various economic shocks on emerging versus advanced countries that supplement and parallel our findings based on the institutional evidence, as well as a series of narratives for a carefully selected group of economies, which we relegate to an appendix.[15] In appendix I, we present brief case studies for six countries—three advanced (U.S., Canada, Sweden) and three emerging (Chile, Colombia and Mexico). These studies examine in more detail their monetary-policy performance and credibility from the Great Moderation through the Global Financial Crisis.

2. Data

Generally, the data for this study are from publicly available databases, including the national central banks, the OECD Main Economic Indicators, the International Monetary Fund, the Bank for International Settlements, the Federal Reserve Economic Database (or FRED), and the World Bank. We have prepared a separate appendix with detailed data sources. Some forward-looking variables, such as inflation and real GDP growth forecasts, are also publicly available, i.e., from the IMF's World Economic Outlook (WEO). Only Consensus Economics forecasts are not available for distribution. Some institutional data are from databases made available by other researchers. These include data on central-bank independence (Dincer and Eichengreen, 2014), and central-bank transparency (Dincer and others, 2019). Other institutional data used include the World Bank's Governance Indicators,[16] the KOF Swiss Economic Institute Globalisation Indices,[17] exchange-rate and crisis data from Reinhart and Rogoff (2009) and Ilzetzki and others (2019),[18] with other crisis

15. Appendices and additional material (including data) are available at https://www.pierrelsiklos.com/research.html

16. https://info.worldbank.org/governance/wgi/#home

17. https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html

18. http://carmenreinhart.com/

data from Bordo and Meissner (2016), and the Chinn-Ito index of financial openness from Chinn and Ito (2006).[19]

As discussed below we also propose an indicator of institutional resilience that partially depends on two other series, namely, Baker and others' (2016) Economic Policy Uncertainty index (EPU),[20] and Caldara and Iacoviello's (2018) Geopolitical Risk index (GPR).[21,22] More details about the proposed indicator follow.

The sampling frequency of the raw data collected for this study ranges from monthly to annual, with most of the key time series usually obtained at the quarterly frequency. Typically, institutional variables are available at the annual frequency, while macroeconomic and financial data are generally available at the monthly and quarterly frequencies. Where required, we convert all data used in the subsequent econometric estimation to the quarterly frequency. Monthly data are converted via arithmetic averaging while, in a few cases—including some forecasts—, semi-annual data are converted to the quarterly frequency via interpolation.[23] Most of the time series are in annualized growth rate form to ease interpretation. Some series, such as interest rates are already in percent.[24] We collected data for the 1980–2018 period though because of missing or incomplete data; the actual sample used in some of the econometric exercises typically begins during the 1990s before any transformations are applied. However, for reasons explained below, panel VAR estimates shown

19. The Chinn-Ito index has since been updated to 2017. The previous vintage of the index is used in the present study from http://web.pdx.edu/~ito/Chinn-Ito_website.htm

20. http://www.policyuncertainty.com/index.html

21. https://www2.bc.edu/matteo-iacoviello/gpr.htm

22. Country-specific Economic Policy Uncertainty indices are available for all countries except AR, CZ, HU, ID, IL, MY, NO, NZ, PE, PH, PL, YH, TR, and ZA. For these cases, the global version of economic policy uncertainty is used. Turning to geopolitical risk, data are available for AR, BR, CN, CO, IL, IN, KR, MY, NO, PH, SE, TH, TR, and ZA. For the remaining economies, the overall GPR indicator is used. See table 1 for the country acronyms used.

23. The basic idea is to fill the gap due to missing observations by fitting a hypothetical function that links observations at both ends of the gap. Many algorithms to do so are available, including the so-called Chow-Lin method (Chow and Lin, 1971) that is used here.

24. Economists continue to debate the form in which macroeconomic and financial times series ought to be analyzed. The fact that this is an ongoing area of research indicates that a consensus has not yet been reached. Part of the difficulty is that some shocks are transmitted through the economy at a faster rate than others (e.g., monetary versus financial). We have generated series by using other methods (e.g., Hamilton and Hodrick-Prescott), but these are not used in the econometric estimates presented in section 4. See, *inter alia*, Hamilton (2018) and Schüler (2018a and 2018b).

are for samples that begin in 2000 (before any differencing or lags are applied). In the case of institutional variables, we also collected data since the 1980s but, as many of the institutional developments discussed in the paper begin during the 1990s, we limit the analysis to data over the past two decades or so.

Our dataset consists of 29 economies, which are shown in table 1. By today's standards (i.e., in 2019), 12 are classified by the International Monetary Fund as advanced economies, while the remaining 17 belong to the emerging market group of economies.[25] By 2019, 23 economies explicitly target inflation, nine of which are advanced economies and 14 are emerging market economies. The starting date for the adoption of inflation targets varies considerably (appendix II), so we also define a group of so-called 'established' inflation-targeting countries in recognition of the longevity of the policy regime in the chosen cases. They are: Australia, Canada, Great Britain, New Zealand, and Sweden. Three of the economies in our dataset are considered systemically important and advanced, that is, the U.S., Japan, and the Eurozone. Conceivably one might add China to the list, the lone emerging market economy in this category, but we elect not to for the present exercise in part because the last 'global' financial crisis originated in the advanced countries.[26]

Before proceeding we would be remiss if readers were not, once again, reminded of criticisms leveled at some of the data used in this study. A common refrain among critics of institutional variables, already noted in the case of measures of central-bank independence, is the degree to which they capture *de facto* as opposed to *de jure* performance of the institutions surveyed. Because the quality of the rule of law varies considerably across countries, while it is desirable to estimate a *de facto* measure, it is often only possible to obtain *de jure* indicators. Many, if not most, of the institutional data used below rely on a mix of *de jure* and *de facto* elements.

25. Two countries (Czech Republic and South Korea) were not considered advanced at the beginning of the sample.

26. See, however, Chen and Siklos (2019) for such an exercise.

Table 1. Economies in the Dataset

Countries and ISO Codes	*Name*
ar	Argentina
au	*Australia*
br	Brazil
ca	*Canada*
cl	Chile
cn	China
co	Colombia
cz	*Czech Republic*
ez	*Eurozone*
gb	*Great Britain*
hu	Hungary
id	Indonesia
il	*Israel*
in	India
jp	*Japan*
kr	*Korea (South)*
mx	Mexico
my	Malaysia
no	*Norway*
nz	*New Zealand*
pe	Peru
ph	Philippines
pl	Poland
ru	Russia
se	*Sweden*
th	Thailand
tr	Turkey
us	*United States of America*
za	South Africa

Source: International Standards Organization (ISO).
Note: Italicized names belong to the advanced economies group while the remainder are emerging market economies. The selections are based on the 2019 World Economic Outlook.

Even if the identification of *de facto* versus *de jure* elements is feasible, there is often disagreement about how to define what constitutes *de facto* performance. This is the case, for example, with exchange-rate regime classification schemes. Hence, over the years, several have been published and new ones proposed.[27] Other complaints raised about indicators of institutional performance include what some consider to be *ad hoc* thresholds when a classification regime is proposed. An example is the decision whether to classify a monetary-policy regime as consistent with inflation targeting. The difficulty is compounded because the commitment of the central bank and political authorities to meeting an inflation objective can vary, as can the adherence to a floating exchange-rate regime, which is considered by some to represent a critical element of an inflation-targeting policy strategy.[28]

Other complaints include the reliance on surveys and different and possibly not comparable sources, not to mention biases in the construction of certain indicators. An example is the World Bank's Governance Indicators. They remain arguably the most widely used proxies for the quality of governance worldwide and have come under criticism although possibly more so for some of the components of the indicators than others (e.g., indicator of corruption). The criticisms are long standing ones,[29] as are the responses to most of them (Kaufmann and others, 2007), but they remain useful since the indicators continue to be updated.[30]

Almost all institutional indicators also share the concern that they are endogenous, that is, they are not independent of current economic performance. While this is undoubtedly true, it is also the case that institutions change more slowly, in some cases far more slowly, than changes in macroeconomic conditions. In a few cases, such as the emergers that joined the European Union, institutional pre-conditions (e.g., central-bank autonomy) preceded the threshold required to join the single currency stated in terms of economic performance (i.e., inflation, exchange rates, interest rates, and debt). In any case, it is an empirical

27. For example, see Frankel and others (2019).

28. See Bordo and Siklos (2017) and references therein.

29. For example, see Kurtz and Shrank (2007).

30. Other indicators in this vein exist, e.g., the Polity IV Project provides a score for governments that range from the most to the least democratic (see https://www.systemicpeace.org/polity/polity4.htm). Another source is the Political Risk Services group (https://www.prsgroup.com/), but they are also subject to some of the same criticisms that have been levelled at the World Bank data.

question whether growth causes changes in governance (or any other institutional change) or *vice versa*. Generally, the evidence is quite clear, as noted above, that best practices in economic-policy making are necessary, if not sufficient, for better aggregate economic performance.

Finally, it should be noted that our strategy is to combine many existing indicators and not rely on a small selection of them. In doing so we follow an approach that has proved successful in other economic applications. For example, it has long been known that forecast combinations often outperform individual forecasts.[31] Similarly, we believe that combining different institutional indicators can provide a more reliable measure of institutional resilience.

3. Institutional Developments: Some Stylized Facts

3.1 Central-Bank Independence, Central-Bank Transparency, Inflation, and Inflation Expectations

In this section, we document a number of measures of institutional performance in our panel of central banks.

Figure 1 plots average changes in the Dincer and Eichengreen's (2014) overall index of central-bank independence for the available sample period, that is, 1998–2017.[32] The advanced economies in our sample are shown to the right of the vertical dashed line while the emerging economies are shown on the left. Only three emergers experience a noticeable increase in central-bank independence that is almost the same number as among the group of advanced economies. However, over the 1998–2017 period, central-bank independence in the vast majority of economies in our sample is unchanged. Central-bank independence alone is unlikely to explain much of the great divide in the title of this paper. Criticisms of *de jure* style indicators of central-bank independence are well known. However, it remains true that most observers regard a form of statutory autonomy of the central bank

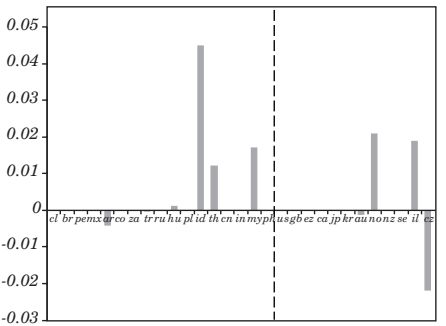
31. For example, see Timmermann (2006).

32. Dincer and Eichengreen's data begin in 1998 and end in 2010. For convenience we extended the data by estimating a fixed effects panel model for the 29 economies by using the overall indicator of each economy's polity quality as a proxy for how central-bank independence might have changed over time. We also considered an index of state fragility together with interactions effects (i.e., with the type of exchange-rate regime, central-bank transparency) to extend the sample from 2011 to 2017. The regression results are available on request. The policy data are from the Polity IV dataset obtained from http://www.systemicpeace.org/inscrdata.html

as a critical ingredient in good governance. Therefore, one should not underestimate the importance of this kind of institutional feature.[33]

Arguably, one of the most important institutional developments over the past two decades has been the rise in overall central-bank transparency. Figure 2A displays average changes in central-bank transparency over the 1998–2015 period.[34] Once again the vertical dashed line separates the advanced from the emerging economies in our dataset. Unlike central-bank independence, we observe progress in central-bank transparency in all economies although unevenly distributed. Indeed, improvements are greater in several emerging countries (e.g., Thailand, Hungary) than in some of the best performers of among the advanced countries (e.g., New Zealand, Czech Republic).[35]

Figure 1. Changes in Central-Bank Independence, 1998–2017



Source: Authors' research.
Note: See table 1 for the ISO codes. The vertical dashed line divides the AE from the EME in the sample. See table 1 for the list. The overall measure of central-bank independence from Dincer and Eichengreen (2014) up to 2010 is used updated to 2017 as explained in the main body of the text. A positive value means an improvement in central-bank independence.

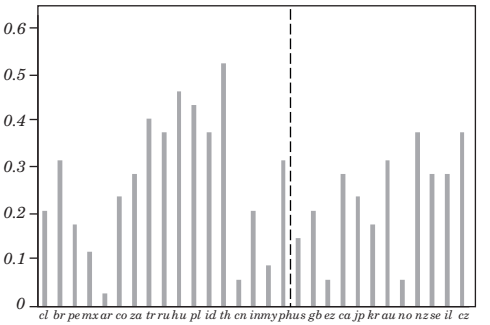
33. Indeed, the current Chair of the FOMC, Jerome Powell, has felt it necessary to remind the public of the importance of central-bank independence. "The Fed is insulated from short-term political pressures—what is often referred to as our 'independence'. Congress chose to insulate the Fed this way because it had seen the damage that often arises when policy bends to short-term political interests. Central banks in major democracies around the world have similar independence." (Powell, 2019).

34. The data from Dincer and others (2019) end in 2015 and we made no attempt to extend their dataset. The index is an update and improvement over the original Dincer and Eichengreen's (2014) index of Central Bank Transparency. The indicator of Central Bank Transparency ranges from a minimum of 0 to a maximum of 15. Central Bank Transparency is an aggregation of scores based on 5 sets of characteristics, namely, political transparency, economic transparency, procedural transparency, policy transparency, and operational transparency. See Dincer and others (2019).

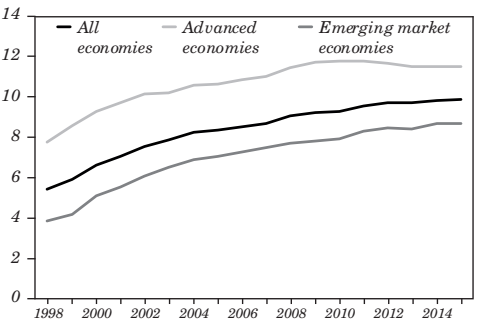
35. Improvements in central-bank transparency in Hungary (and Poland) are no doubt due in large part to the institutional pre-conditions required to join the European Union.

Figure 2. Two Views of Central-Bank Transparency, 1998–2015

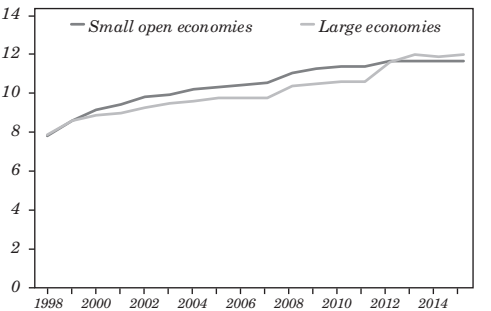
(A) Changes in Central-Bank Transparency



(B) Levels of Central-Bank Transparency over Time



(C) Levels of Central-Bank Transparency



Source: Authors' research.
Note: Constructed from data in Dincer, Eichengreen, and Geraats (2019). Table 1 contains the ISO codes and the list of AE versus EME. Also, see figure 1. CBT ranges from a minimum of 0 to a maximum of 15 as shown by the dashed line in part (B). Positive values signal more CBT or an improvement in CBT.

Figures 2B and 2C provide two other perspectives on central-bank transparency since 1998. Figure 2B highlights the steady rise in central-bank transparency in both advanced and emerging countries but there is little indication that the gap in central-bank transparency between advanced and emerging countries is narrowing substantially. Figure 2C, however, shows that, whereas central-bank transparency in small open advanced economies exceeded levels in large advanced economies, the latter caught up and have slightly overtaken the former group of economies since the Global Financial Crisis. Whether the financial crisis pushed central banks in some advanced countries that were most affected by the crisis to become even more transparent is open to debate; however, it is notable that the small open economies all explicitly target inflation, while only Great Britain is considered an inflation targeter in the group of large economies.

Although we cannot be certain, of course, there is a risk that the steady rise in central-bank transparency, together with the occasional increase in central-bank independence, may come into conflict with an overall deterioration in institutional quality. This would threaten the resilience of central banks in the face of political pressure and, thereby, resilience in the face of shocks. We return to this point below.

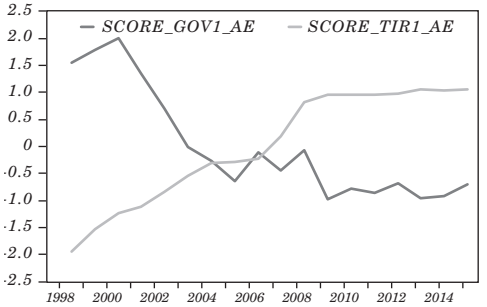
The preceding two indicators suffer from at least two drawbacks. First, as noted already, they tend to rely on *de jure* indicators[36] and they also ignore the wider pressures on monetary policy from overall governance in the countries and economies concerned. Figures 3A and 3B, respectively, display average levels of central-bank transparency in the advanced and the emerging countries against an average of the World Bank's Governance Indicators.[37] To generate the results shown in figures 3A and 3B we estimated, for each group of economies, the first principal component (using the principal factors method) of the overall governance indexes to obtain the scores shown. Hence, we allow the data to determine the relative weight of the constituents of governance quality. However, we do not assign weights to each country's contribution to average governance quality.

36. This is a far more accurate description of the Central Bank Independence index than the Central Bank Transparency indicator, which is largely based on information made public by central banks.

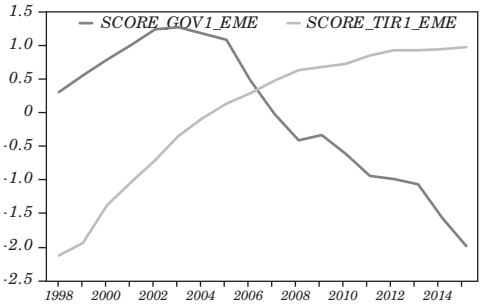
37. The World Bank's Governance Indicators consist of 6 characteristics of governance, namely, voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption. We summed the scores of the 6 characteristics and took the mean as our overall indicator of governance. A rise in the indicator signals improved governance.

Figure 3. Central-Bank Transparency and Governance, 1998–2015

(A) Advanced Economies



(B) Emerging Market Economies



Source: Authors' research.
Note: GOV1 is the sum of the 6 components of governance: voice and accountability, rule of law, regulatory quality, government effectiveness, control of corruption, and political stability. EME are emerging market economies; large economies are US, JP, EZ, GB; small open economies are CA, NO, SE, NZ, KR, IL, AU.

Consider the advanced countries shown in figure 3A. The following economies show a trend deterioration in at least half of the characteristics defined by the World Bank. They are: the Eurozone, the U.S., Hungary, Thailand, South Africa, Australia, Canada, and Brazil. When the governance indicators are combined as described above, seven of the 17 emergers shown in figure 3B experience an overall decline in governance quality. They are: Argentina, Brazil,

Hungary, Mexico, Philippines, Thailand, and South Africa.[38] In the case of the advanced countries, the Eurozone, Great Britain, and the U.S. contribute to reducing the AEs' level of governance quality.

Turning to the data aggregated for the advanced versus the emerging countries, we find that, following a drop in the quality of governance from 1998 to 2004, the indicator remains relatively stable, although a small additional drop is observed following the crisis. This stands in contrast with the continued rise in central-bank transparency over time, although there is a leveling off after the crisis. Turning to the emergers, there is a steady drop in the overall quality of governance beginning in 2005 that continues until the end of the sample, while the steady rise in central-bank transparency shows no signs of abating by 2015.[39]

A few other institutional indicators are worthy of mention although we relegate the details to the appendix. First, despite the crisis, financial globalization continues to rise. This is not a phenomenon restricted to the advanced countries but is global in nature. In contrast, the message is far more mixed when it comes to trade globalization, with signs of retreat in several emergers (e.g., Indonesia, Turkey, China and Malaysia) and even in a few advanced countries (e.g., Canada, Norway, and New Zealand).[40] The Chinn-Ito indicator, over the 1998–2016 period, provides a similar interpretation at least as regards capital account openness, with progress in several advanced and emerging countries, although the message is again mixed for the emerging countries with several countries becoming less open to capital flows (e.g., Argentina, Indonesia, Thailand, and Malaysia).[41] Finally, average changes in monthly indicators of the degree of exchange-rate flexibility over the 1998–2019 period obtained from Ilzetzki and others' (2019) exchange-rate regime classification also provide a mixed message: Roughly half

38. This inference is based on a simple regression of the time series of various components of governance on a time trend. Hungary has the distinction of a decline in all categories of governance. The Eurozone indicator is proxied here by the average governance indicators for Germany, France, and Italy.

39. The World Bank's Governance Indicator data are available until 2017 and the downward trend in governance in emerging countries continues. Since the central-bank transparency data end in 2015 the governance indicators for 2016 and 2017 are not shown.

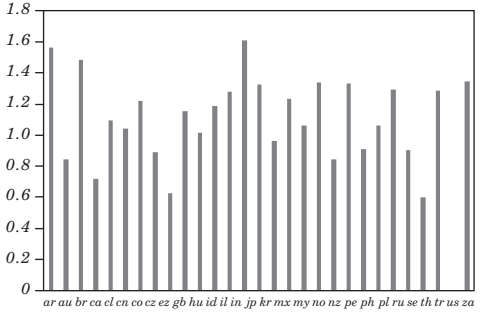
40. The indexes are based on an aggregation, via principal components analysis, of several indicators of trade and financial openness (both de *jure and de facto*; e.g., export and imports to GDP, tariffs, capital account openness). See Gygli and others (2019). Our calculations are based on an average of index values over the 1996–2017 period.

41. The Chinn-Ito index codifies the restrictions reported in the International Monetary Fund's Annual Report on Exchange Arrangements and Restrictions.

of the economies in our sample show no regime changes, five emerging economies' regimes are less flexible (e.g., Thailand, Colombia), and three demonstrate greater flexibility (Chile, Brazil, Turkey). Among the advanced countries, the tendency is in the direction of greater flexibility, but half are unchanged since 1998.

Next, we turn to some evidence on inflation and inflation expectations in advanced versus emerging countries since the late 1990s. Figure 4 plots the 'distance' between inflation in each economy over the 2000–2018 period *vis-à-vis* U.S. inflation. One must take some care in drawing too strong conclusions from these calculations, since it is not immediately evident that U.S. inflation is always the benchmark for best practice in monetary policy.[42] Moreover, the estimates of distance are not conditioned on other variables that might affect cross-country inflation differentials. Finally, if one believes that, in the process of catching up to the advanced economies, emerging country inflation rates should be higher, the distance measure is silent about whether estimates are higher than might be desirable.[43]

Figure 4. Inflation Distance from U.S. Inflation



Source: Authors' calculations.
Note: Distance is $d_{ij} = \sqrt{2^*(1 - \rho_{ij})}$ where ρ_{ij} is the simple correlation between U.S. inflation and inflation on the other economies considered. The sample is: 200q1–2018q3.

42. Among the 29 economies in our sample, Japan (0.1%), Sweden (1.2%), and the Eurozone (1.7%) achieved substantially lower inflation rates over the period considered. Canada, China, Great Britain, Israel, Norway, and New Zealand achieved very similar average CPI inflation rates, again over the same period.

43. Relevant to this discussion is the so-called Balassa-Samuelson effect (B-S) which relies on productivity differences to partially explain inflation differentials. Due to the requirements of the Maastricht Treaty, many applications focus on the emergers of Central and Eastern Europe (CEE). Égert (2002) is an example of a study finding that while the B-S is present it is not sufficiently strong to create excessively high inflation differentials between CEE countries and advanced Europe.

It is generally the case that distance remains highest between U.S. inflation and inflation in emergers, although there are a few exceptions among advanced countries including Japan, Norway and Israel. A concern for policymakers is how to think about best practice when it comes to monetary-policy regimes and inflation, when advanced countries suffer from inflation rates persistently below their stated targets while several emerging countries suffer from the opposite challenge. We return to this issue below.

Figure 5 plots the gap between observed CPI inflation and an average of expected inflation rates in selected groups of economies. Expected inflation is the mean of one-year-ahead inflation rates for Consensus forecasts and forecasts from the IMF's World Economic Outlook.[44] A large gap signals the possibility that expectations have become unanchored. Of course, the precise source of the unanchoring remains to be determined. The upper plot compares the evidence for all 29 economies (ALL) against established IT economies (ITEST; defined previously), all advanced economies that explicitly target inflation (ITAE; see table 1), and those that are not considered IT economies (NITAE). The plot below distinguishes between emergers that target inflation (ITEME) and ones that do not (NITEME) as well as the 'global' record (ALL).

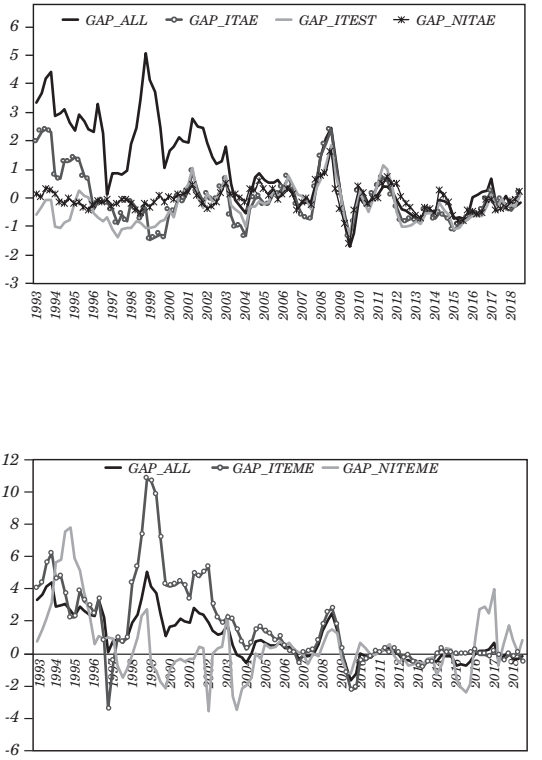
During the early 1990s, even the ITEST economies were in the early days of operating under such a regime and the gap between observed and one-year-ahead inflation is larger than for all remaining inflation-targeting central banks, many of which had not yet formally adopted the regime. Similarly, the gap for the NITAE economies also appears smaller during this period. By the mid-2000s there is little to distinguish the record of all economies, regardless of whether they formally target inflation or not. However, there is also apparently greater volatility in the gap, at least among the NITAE, while volatility in the same measure for the ITEST is largely unchanged.

In contrast, differences in the gap are more noticeable for the emerging economies in our dataset. They remain more volatile for the NITEME group of economies relative to ones that target inflation (ITEME). Nevertheless, what is striking is the shrinking of the gap for the ITEME beginning in the mid-2000s, that is, once the economies

44. The former forecasts are monthly, the latter are semi-annual. See above for a discussion of conversion to the quarterly frequency. In addition, both forecasts are fixed-event forecasts, that is, calendar-year forecasts. These were converted to fixed-horizon forecasts (i.e., one year ahead) by using a simple transformation that is commonly used although it is, admittedly, somewhat *ad hoc*. See Siklos (2013) for more details.

in the dataset had formally adopted the regime. Gaps not only hover around zero after approximately 2005, but they are also much lower than in the 1993–2004 period. While this does not prove that inflation targeting is the cause of the improvement since, as we shall see, global factors, to which we now turn, are also likely to have played a role, it is hard to think of other explanations.

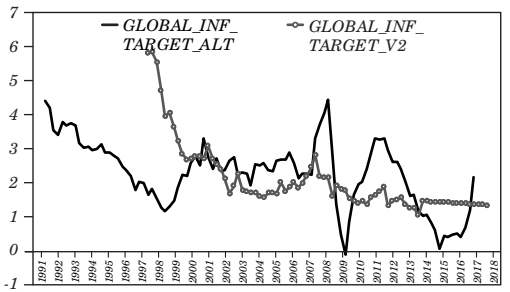
Figure 5. Gaps between Inflation and Inflation Expectations, 1993–2018



Source: Authors' calculations.
Note: GAP is the difference between inflation (time t) and one-year-ahead expected inflation (at time t). Sources and methods of calculations are described in the main body of the text. ALL refers to the 29 economies in the dataset; IT refers to inflation-targeting economies; NIT to non-inflation-targeting economies; AE and EME are defined in table 1.

Global factors are shown in figure 6 for observed and expected inflation.[45] To obtain an estimate of global inflation, we estimate the first principal component for the advanced countries only (via maximum likelihood), since this is arguably one benchmark that can be used to evaluate inflation performance of the emerging countries. A sharp decline in global-inflation expectations is noticeable in the early 2000s and there is, subsequently, relative stability, although our estimates following the Global Financial Crisis are persistently just below the two-percent goal of central banks in the advanced countries. There is greater volatility in the global-inflation factor based on observed CPI inflation especially since the crisis. Notice that the gap between observed and expected global inflation is positive in the immediate aftermath of the crisis and turns negative after 2014 (i.e., observed inflation is below expected inflation). More generally, expectations change more slowly than observed inflation and, if two percent is deemed an inflation rate that central banks around the world ought to aim for, then global expected inflation persistently underperforms since the crisis, according to this metric.

Figure 6. Estimates of Global Inflation



Source: Authors' estimation.
Note: Estimates of global inflation are used to proxy $\bar{\pi}^G$ in determining central-bank credibility (*CRED*). V2 is obtained as the first principal component from average one-year-ahead expected inflation for AE. TARGET_ALT is obtained as the first principal component for AE for observed CPI inflation. Estimation of the first PC is via maximum likelihood. See also table 1 for the list of AE.

45. We have a shorter sample for expected inflation because Consensus data were not available before the late 1990s for most emerging market economies. WEO data are available for a longer sample. We estimate the separate contribution of Consensus and WEO forecasts in generating a global estimate for expected inflation and not the first principal component of average inflation forecasts. Factor loadings are available on request.

Finally, to further illustrate differences in inflationary developments in advanced versus emerging countries, we present some evidence relying on two case studies, namely Sweden and South Africa. Both are inflation-targeting countries. Shaded areas indicate the inflation-target band. The midpoint of the target, that is, the inflation target is also shown by a dashed line. Observed and average inflation expectations are both plotted.

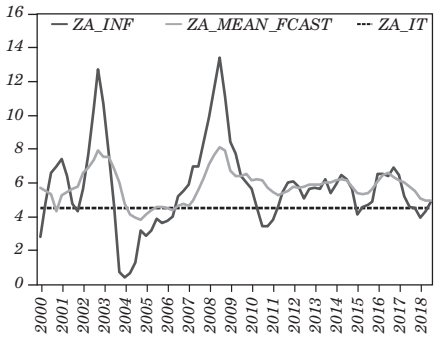
Inflation rates in these countries illustrate one of the features of the inflation record applicable to several emerging and advanced countries that we wish to highlight. In particular, while central banks in emerging countries struggle with inflation rates at the top of the target, the opposite is often true for advanced countries.[46] This phenomenon is particularly noticeable after the Global Financial Crisis, but is also a feature of the years leading up to the end of the Great Moderation around 2006. The impact of the crisis on observed inflation relative to expected inflation is also striking, with the latter seemingly not overly sensitive to changes in observed inflation. However, post crisis, we observe inflation expectations remaining persistently above the target in South Africa, while the opposite is true in Sweden. The Federal Reserve, not considered an inflation-targeting central bank, faces a comparable experience as shown in figure 7B. Inflation is below a notional two-percent medium-term objective for most years since 2008. Only at the end of the sample (i.e., 2016–18) does inflation exceed two percent.[47]

46. The South African Reserve Bank (SARB) has admitted to allowing inflation to drift to the upper limit of the band. See, for example, Reid and others (2018) and references therein. The phenomenon wherein an inflation-targeting central bank targets inflation from below has been studied by Ehrmann (2015).

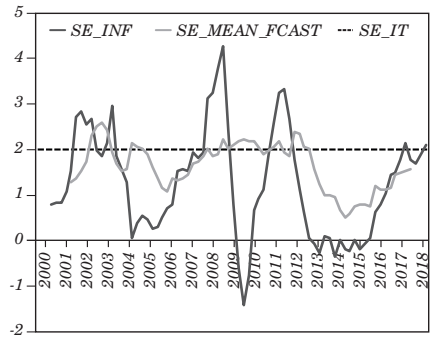
47. The sample ends with 2018Q3. CPI inflation has since dipped below 2%, the Fed's medium-term objective, in 2019 (not shown, but see https://www.bls.gov/charts/consumer-price-index/consumer-price-index-by-category-line-chart.htm).

Figure 7. Case Studies of Inflation and Expected Inflation: South Africa and Sweden

(A) South Africa



(B) Sweden



Source: Authors' calculations.
Note: Inflation (inf) is the annualized quarterly CPI inflation rate. See the text for details. MEAN_FCAST is the average one-year-ahead expected inflation constructed from Consensus Economics and World Economic Outlook forecasts. See the text for other details.

3.2 Resilience

The tension between rising central-bank independence and transparency and weak political institutions may well threaten the ability of an economy to remain resilient to a series of economic shocks. There exists a rich literature linking economic performance (e.g.,

economic growth) to the quality of governance and the latter is often thought to be a function of the strength of democratic institutions.[48]

We exploit the fact that a rich and growing number of datasets have become available over the years to explore how developments in central banking combine with other institutional developments to provide resilience to economic shocks. Stated differently, we collect variables that provide indications of the overall quality of its institutions. No matter how autonomous or transparent a central bank is, it is not an island. The monetary authority cannot deliver best practices without the support of other strong institutions. The higher the overall quality of domestic institutions, the greater the resilience to economic shocks of the domestic and external varieties. Of course, even if theory suggests a positive relationship between institutional quality and resilience, there is still no consensus on the composition of the former concept. Our aim, however, is merely to suggest that it is likely reasonably measured by a combination of the institutional characteristics discussed in earlier sections.[49]

Our approach is straightforward. We aggregate ten institutional indicators, and first normalize each one to generate values that range between 0 and 1.[50] We then aggregate the scores by summing the normalized scores to obtain our resilience indicator.[51] Out of the ten institutional characteristics, seven are defined such that an increase in their value raises resilience; the remaining three serve to reduce resilience. The elements that improve resilience when the relevant indicator increases are: central-bank independence, central-bank transparency, flexibility of the exchange-rate regime (greater exchange-rate flexibility improves resilience), governance quality as measured by the entire collection of World Bank indicators previously examined,

48. See, *inter alia*, Acemoglu and others (2019), Eichengreen and Leblang (2008), Rivera-Batiz (2002), and references therein

49. We leave it to subsequent research to determine whether there are any statistical links between the proposed indicator of resilience and economic performance (e.g., inflation or growth), although we suspect, based on other evidence to be provided below, that greater institutional resilience is likely to contribute to ensuring that a monetary-policy regime adheres to best practices. We previously discussed criticisms of widely used measures of institutional performance.

50. Each indicator for each country or economy is normalized as follows: $(X_t - \min(X_t))/(\max(X_t - \min(X_t))$ where X is the value of an indicator, min is its minimum value in the sample, and max is the maximum value in the sample.

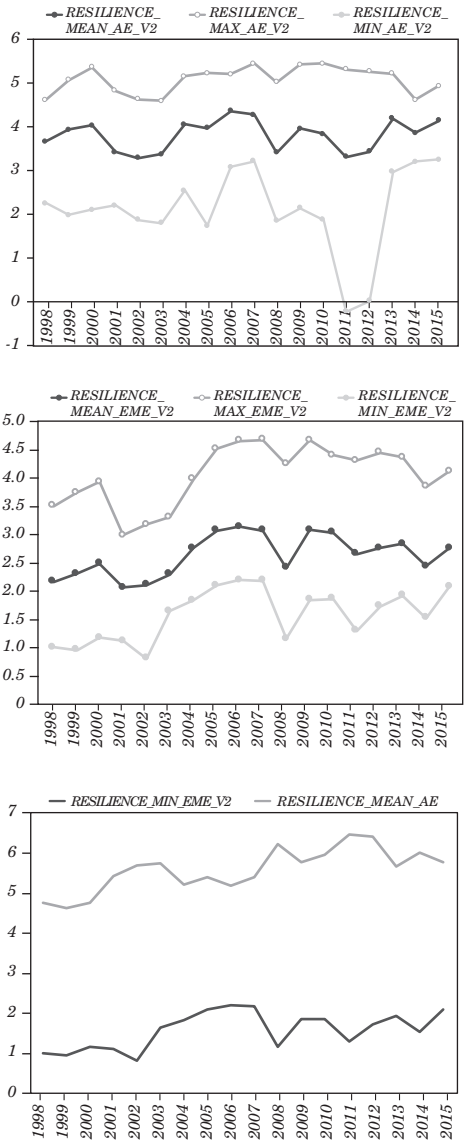
51. Hence, each component of the indicator has equal weight. In practice this is unlikely to be the case. However, absent a theory or empirical guidance about how to aggregate the individual institutional characteristics, we leave it for future research to consider the impact of different weighting schemes.

capital account openness, financial and trade globalization. Three factors contribute to reduce resilience when their indicators increase, namely: greater economic policy uncertainty, higher geopolitical risks, and the incidence of financial crises.[52] As a result, the resilience index ranges from a minimum of -3 to a maximum of +7.

Figure 8 provides three different views of our resilience indicator. The top portion of the figure shows the range of estimates for advanced countries; the middle portion, for the emerging countries in our dataset; and the bottom portion offers a direct comparison of resilience between the two. Perhaps unsurprisingly, there is considerable variation in resilience between the two country groups although mean levels of resilience in advanced countries always exceed the ones obtained for emergers. Nevertheless, while resilience declined temporarily in the advanced countries in the aftermath of the Global Financial Crisis, the opposite took place in the emerging countries. Unfortunately, the temporary rise in resilience after 2008 in emerging countries did not last, although the gap between the best and worst performers has narrowed since the crisis relative to the period between 1998 and 2008. In the case of the advanced countries, the impact of the crisis is most clearly seen in the rising gap between the best (i.e., "MAX") and worst performers (i.e., "MIN") that lasts until 2013, when the gap narrows substantially. It is somewhat comforting that resilience in emerging countries is higher at the end of the sample relative to the period before the crisis. However, as shown in the bottom of figure 8, there is no evidence of a narrowing of the mean values of the resilience indicator after 2008. If anything, there is a slight widening of differences in resilience between the advanced and emerging countries and, while we cannot assign any statistical significance to the results, one would hope that institutional resilience in emergers can catch up to levels reached in the advanced countries, as is the case with some key indicators of central-bank institutional quality (e.g., central-bank independence, central-bank transparency, adoption of inflation targeting).

52. The incidence of financial crises is the sum of the average annual number of banking, currency, domestic and external sovereign-debt crises based on Reinhart and Rogoff's (2009) and Bordo and Meissner's (2016) chronologies of financial crises. The maximum value this indicator can take is, therefore, 4. The original data end in 2013. The following financial crises were added to extend the sample to 2018, although other data limitations mean that the resilience indicator is fully calculated only until 2015: Russia (currency, 2014); Eurozone (domestic sovereign debt, 2011–15); Argentina (currency and external sovereign debt, 2017–18); a table in the appendix provides additional details.

Figure 8. Three Views of Institutional Resilience



Source: Authors' calculations.
Note: Resilience is defined in the main body of the text and consists of the aggregation of 10 institutional characteristics. The mean, maximum (most resilient), and minimum (least resilient) are shown for AE and EME. See table 1 for the ISO codes and classifications.

We also examined the resilience indicators for each country in the sample (not shown; see the appendix). The scores for advanced countries are consistently higher than in emerging countries. However, scores appear more volatile in emergers with more frequent reversals in resilience. For example, resilience in Argentina generally trends down since the late 1990s. Similarly, other than some improvements in the early and late 2000s, resilience in Russia remains no higher at the end of the sample than at the beginning. Approximately the same interpretation applies to the resilience scores for Turkey. Nevertheless, there are also a few bright spots among the emerging countries, including Colombia, Indonesia, and Mexico, where improvements in resilience in the early 2000s have persisted.[53]

In sum, the resilience of institutions, including central banks in emerging economies, has not caught up with their counterparts in the advanced countries. This suggests that these countries remain more vulnerable to shocks.[54]

3.3 Credibility

Next, we return to a central feature used to identify the success of monetary policy, namely credibility. As noted earlier, there is no unique definition of credibility. However, all versions have, at their core, the notions that best practice implies that central banks ought to be able to control inflation in the medium term (e.g., over a two- to five-year horizon), that policy surprises should be used as a tool of last resort or only when necessary, and, in order to anchor expectations, that the gap between observed and expected inflation ought to be as close to zero as practical. Since, as former and current prominent central bankers have frequently observed, we do not yet have a complete understanding of how expectations are formed, perhaps the best that can be expected is

53. However, since the sample ends in 2015, recent changes that might have taken place globally (e.g., in governance, central-bank independence, economic policy uncertainty) will not be reflected in the data.

54. In her panel presentation at the same Conference, Kristin Forbes uses our data but omits the last three elements, that is, economic policy uncertainty, geopolitical risk, and the incidence of financial crises. The reason is that the remaining seven components are more exclusively focused on domestic institutional quality, while the last three contain a global or external element. The mild upward trend shown at the bottom of figure 8 is more pronounced in Forbes' version, but the increasing gap between advanced and emerging resilience post-crisis remains. Interestingly, however, emerging country resilience dips temporarily in 2008, while there is hardly any change in advanced-country resilience.

for the aforementioned gap to be small.[55] Moreover, one might add, in view of growing evidence that macroeconomic uncertainty in general also has negative economic consequences,[56] that it is plausible that this can translate into less monetary-policy credibility. Finally, there is also a body of evidence that global factors also play a role in explaining inflation dynamics.[57]

We build and improve on our earlier estimates of monetary-policy credibility (Bordo and Siklos, 2015, 2017) by combining three elements of credibility, two of which are new. We, therefore, write:

$$
\begin{aligned}
&(\overline{\pi}^{f}_{t+1} - \pi^{*}_{t}), \text{ if } \pi^{*}_{t} - \theta \leq \overline{\pi}^{e}_{t+1} \leq \pi^{*}_{t} + \theta && \text{(a)} \\
&(\overline{\pi}^{f}_{t+1} - \pi^{*}_{t})^{2}, \text{ if } \pi^{*}_{t} - \theta > \overline{\pi}^{e}_{t+1} > \pi^{*}_{t} + \theta && \text{(b)} \\
&\theta^{AE} = 1; \theta^{EME} = 2 && \text{(c)} \\
&MPU = (\pi^{f1}_{t+1} - \pi^{f2}_{t+1})^{2} + (\dot{y}^{f1}_{t+1} - \dot{y}^{f2}_{t+1})^{2} && \text{(d)} \\
&GLOBAL = \pi_{t-1} - \overline{\pi}^{G}_{t-1} && \text{(e)}
\end{aligned}
\qquad (1)
$$

The first two lines in equation (1), that is, (a) and (b), define the credibility 'penalty' central banks suffer when they miss their targets. The penalty is defined as the difference between a forward-looking measure of inflation, such as the one-year-ahead average inflation forecast ($\overline{\pi}^{f}_{t+1}$) relative to an inflation objective (i.e., a target or π^{*}_{t}). The connection between the gap just defined and credibility is a function of how large the difference is between an inflation forecast and its target. This is shown by the right-hand-side inequalities in the first two lines of equation (1). The forward-looking inflation measure is a proxy for mean inflation expectations ($\overline{\pi}^{e}_{t+1}$) which defines the inequalities in the first two lines of equation (1). Once inflation expectations exceed the tolerance band—shown by the inequality in the first two lines of equation (1)—, the penalty becomes a quadratic in line with most definitions of central-bank loss functions. We treat positive and negative misses symmetrically, so that credibility is defined in terms of the absolute value of the level of misses when these are inside the tolerance range.

55. One could add a lack of persistence in deviations between observed and expected inflation, but there is already a voluminous literature that rejects this view. Indeed, AR(1) regressions of the gap referred to in figure 5 suggest considerable persistence. Notably, the period since the crisis only affects persistence in the Eurozone and New Zealand. Both experience a significant drop in persistence since 2008Q4 (results not shown).

56. For example, see Bloom (2009), and Jurado and others (2015).

57. For example, see Forbes (2019).

Since IT is typically defined somewhat more loosely in many EME via a more liberal tolerance band around an inflation target, our measure of credibility also takes this into account. Specifically, the tolerance level around the target is set at one percent for advanced and two percent for emerging countries. This explains the values taken by θ as shown in the third line of equation (1), that is (c), $\theta = 1$ for advanced and $\theta = 2$ for emerging economies. Finally, we consider three different proxies for the gap between expected inflation or its forecast and the target (i.e.,$(\overline{\pi}^{f}_{t+1} - \pi^{*}_{t})$). One proxy is the average one-year-ahead inflation expectations; a second proxy consists in using last year's observed inflation; finally, for a third proxy, we also use a two-year moving average of inflation.[58]

Next, we turn to estimates of the inflation target (π^{*}_{t}). In our earlier work we proxied each economy's inflation target by using a moving average of past inflation (e.g., five years). In the present study we allow for the possibility that, since the announced target is not meant to be met every period, a distinction can be made between *de jure* and *de facto* inflation targets. The latter is, to some extent, unobserved.[59] We proxy the *de facto* inflation target as the mean from three different filters applied to observed inflation. They are: a 5-year moving average of inflation, the inflation obtained by a band pass filter for frequencies ranging from two to eight quarters, and estimates from a one-sided Hodrick-Prescott filter.[60] These are applied to the full available span of the data.

The next two elements of our estimates of credibility, defined in the last two lines of equation (1), that is (d) and (e), represent the impact of monetary policy uncertainty (MPU) and the global factor (GLOBAL). Given the wide range of economies considered, we were only able to rely on two sets of comparable estimates of expected inflation, that is, Consensus Economics and WEO forecasts. Hence, π^{f1}_{t+1}, π^{f2}_{t+1}, $\dot{y}^{f1}_{t+1}$, $\dot{y}^{f2}_{t+1}$ are, respectively, the two one-year-ahead inflation forecasts and real GDP growth forecasts. To proxy monetary policy

58. So far, the definition follows our earlier work, although previously we were more conservative in some of our estimates for EME where the tolerance range was set at 1% for some estimates, and we try three different proxies for the gap between inflation and the target instead of just two.

59. Stated differently, the *de facto* target is expected to be a series that fluctuates around the announced inflation objective. For IT economies, replacing the moving average estimates with the mid-point of the announced inflation target, once the regime is adopted, did not impact the conclusions. In general, an inflation target, even if one is announced, is expected to be met over the medium term.

60. We use a smoothing parameter of 1600 for the HP filter.

uncertainty, we sum the squared differences between the two forecasts of inflation and real GDP growth. This effectively amounts to capturing a form of disagreement between forecasters. It is plausible to assume that greater monetary policy uncertainty translates into larger differences in the outlook for the economy. There are, of course, other proxies for forecast disagreement[61] and forecast uncertainty. However, absent a greater variety of available comparable forecasts across 29 economies, we cannot generate a useful estimate of, say, the kurtosis or some other indicator of forecast uncertainty. Our information set is sufficiently limited that we are unable to generate reliable estimates of the distribution of inflation forecasts or forecast disagreement.

The global factor in credibility—GLOBAL, last line in equation (1)—is captured by deviations of observed inflation in a country, lagged one period, from an estimate of average global inflation also lagged one period ($\pi_{t-1} - \overline{\pi}^{G}_{t-1}$). We chose to use the levels of the respective series because higher inflation relative to some global estimate likely translates into currency depreciation, among other economic consequences.[62] However, it is also questionable whether deviations from global inflation are seen as penalizing central-bank credibility in the same manner as misses in domestic inflation *vis-à-vis* an inflation target. Part of the reason is that global inflation is not as readily observed as domestic headline inflation. Moreover, it is difficult to know how much weight a central bank might attach to the global component, especially since, as noted earlier, passthrough effects vary considerably across the economies in our sample.

We proxy the inflation target, π^{*}_{t}, by using the two estimates shown in figure 6 and described earlier. Other proxies, such as a moving average of observed or expected inflation, or the mid-point of the inflation-target bands in countries that target inflation, do not appreciably impact the results (results not shown). Note that, in estimating the deviation from global inflation, $\overline{\pi}^{G}_{t-1}$ is lagged one period to allow for a delay in collecting the data.[63]

61. For example, see Siklos (2013, 2019) and references therein.

62. The addition of this element is partially inspired by Clarida (2018), who argues that, to the extent global inflation has declined (see figure 6), this might yield substantial benefits and may reflect a form of international monetary-policy coordination. Nevertheless, alongside any benefits there are challenges that depend on the differences between domestic observed and targeted inflation, and the same differential for the foreign benchmark inflation rate.

63. Using the contemporaneous measures of inflation and global inflation has little impact on the results.

Once the individual components of credibility are estimated they are aggregated to obtain the credibility proxy (*CRED*). We calculate both raw estimates as well as normalized estimates. Therefore, our proxy for credibility is defined as:

$$CRED_{it} = (\overline{\pi}^{f}_{i,t+1} - \pi^{*}_{it}),\ \text{if}\ \pi^{*}_{it} - \theta \le \overline{\pi}^{e}_{i,t+1} \le \pi^{*}_{it} + \theta \quad (2a)$$
$$+ MPU_{it} + GLOBAL_{it}$$

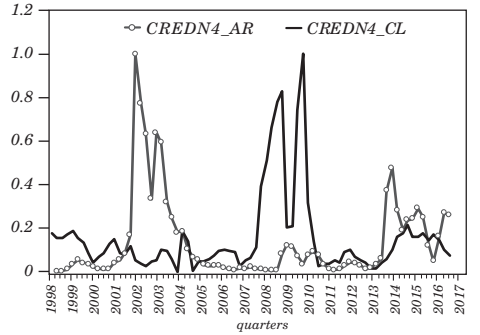
$$CRED_{it} = (\overline{\pi}^{f}_{i,t+1} - \pi^{*}_{it})^{2},\ \text{if}\ \pi^{*}_{it} - \theta > \overline{\pi}^{e}_{i,t+1} > \pi^{*}_{it} + \theta \quad (2b)$$
$$+ MPU_{it} + GLOBAL_{it}$$

where *CRED* is the estimate of monetary-policy credibility for economy i at time t, and all other terms were previously defined. The actual value of the credibility indicator, as previously explained, is dictated according to whether gaps between inflation expectations and the target are within the tolerance zone or not, thereby giving rise to equations (2a) and (2b). Positive values for each component are seen as contributing to reduce credibility, because as the gap between observed and expected inflation widens, there is more monetary policy uncertainty, and domestic inflation is higher than a measure of global inflation. Estimates of *CRED* are unweighted since it is not obvious, in theory, how much relative importance ought to be attached to any one of the three components.

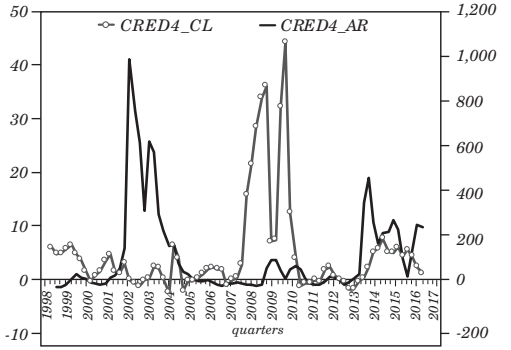
We also estimate and focus on a normalized estimate of *CRED*, since this transforms the raw estimates into ones that range from 0 (perfect credibility) to 1 (no credibility), based on the historical credibility of the monetary policy of an individual economy. It is useful to compare the two different estimates. As an illustration, consider figure 9 which plots *CRED* in both raw and normalized forms for Argentina and Chile. Normalized estimates are shown in the top of figure 9, while raw estimates are plotted at the bottom. Estimates for Chile are on the left-hand-side scale, while *CRED* for Argentina are scaled on the right. Both convey essentially the same message. However, raw *CRED* estimates indicate that credibility losses in Argentina, when they occur, are as much as 20 times larger than in Chile, as seen by comparing the two scales in the plot at the bottom of figure 9.

Figure 9. Illustrating Estimates of Central-Bank Credibility: Chile versus Argentina

(A) Normalized Scores



(B) Raw Scores



Source: Authors' calculations.
Note: *CREDN*4 is the credibility estimate in equation (2) estimated on a normalized scale, part (A), and in raw form, as n equation (2), part (B). N indicates normalized estimates. *CRED*4 is the version of credibility that uses inflation lagged one period relative to the first principal component of observed inflation in AE. AR is Argentina; CL is Chile. The set of AE and EME are listed in table 1. The global inflation target is TARGET_ALT (see figure 6), while π_{t-1} proxies π^{f}_{t+1} in equation (1).

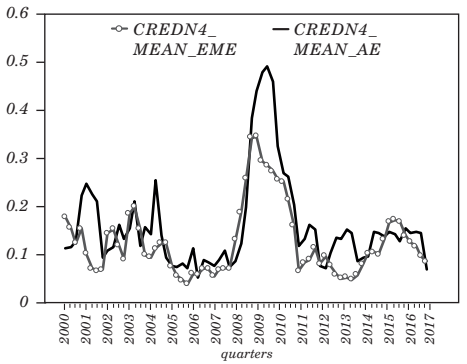
Credibility falls sharply during the Global Financial Crisis but is volatile. Credibility recovers quickly but begins to decline once again toward the end of the sample. Indeed, Argentina suffers large losses as the currency board collapses in early 2002 and large losses reappear once again after 2014, when sovereign-debt problems and rising inflation return. However, the credibility loss is less noticeable in Argentina during the Global Financial Crisis than in Chile. Hence, normalizing the scales does not change the fact that the credibility of

the Central Bank of Chile is more often than not higher than for the Central Bank of the Argentine Republic.

As explained earlier, our preferred estimates of credibility—equation (2)—are normalized to range between [0,1]. Several estimates for different country groupings are shown in figures 10A through 10F. Figure 10A provides the most general picture, since it pits mean credibility for the advanced versus the emerging countries. For the available sample, the Global Financial Crisis stands out, not surprisingly, as signaling a large but temporary loss of credibility. Note, however, that the loss of credibility is comparatively greater for advanced countries. Similarly, emerging central banks regain credibility faster than their advanced counterparts once the crisis peaks. Credibility in both groups of economies does not recover until 2011. The tables are turned around the time of the Asian financial crisis of 1997–1998, with emerging central banks losing credibility for longer than in advanced economies. Nevertheless, the latter were not immune to what are likely the spillovers from the Asian financial crisis on the advanced countries.[64] Central banks in emerging countries also suffered credibility losses in the early to mid-1990s, while credibility in the advanced group improved, perhaps due to the increasing number of countries that adopted the inflation-targeting monetary-policy strategy.

Figure 10. Credibility Estimates

(A) EME versus AE

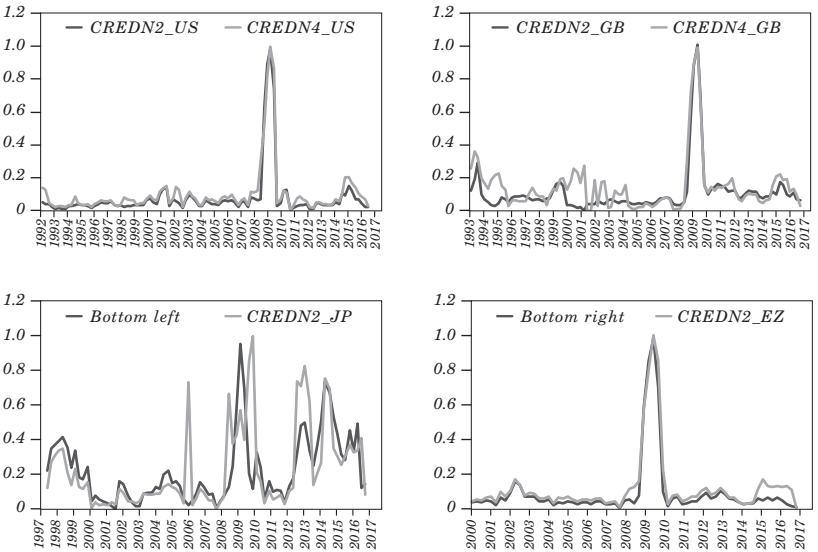


Source: Authors' calculations.
Note: Equation (2) normalized so that *CREDN*4 ranges between [0,1]. *CRED*4 is the version of credibility that uses inflation lagged one period relative to the first principal component of observed inflation in AE. Mean estimates for AE and EME are shown. Also, see table 1.

64. Note that Japan and South Korea are among the advanced-economy group of economies.

Figure 10. Credibility Estimates (continued)

(B) Large AE



Source: Authors' calculations.

The remaining figures (figure 10B through 10F) show credibility estimates for other economies or regions of the globe. Figure 10B, for example, shows two different estimates of credibility for four 'large' economies that depend on whether lagged observed inflation (*CREDN*4) or the one-year-ahead mean inflation forecast is used (*CREDN*2). While the two sets of estimates are comparable, there are the occasional differences. At least three of the four were at the center of the crisis, while Japan has long been mired in a low-growth, low-inflation or deflation environment. Clearly, the crisis stands out for the U.S., Great Britain and the Eurozone, as well as Japan. However, Japan experiences more bouts of credibility losses than any of the other three economies shown. Indeed, based on our indicators, it appears that the latest attempts by the Bank of Japan to raise inflation[65] have led to substantial increases in credibility losses. Figure 10C focuses on the so-called BRICS[66],

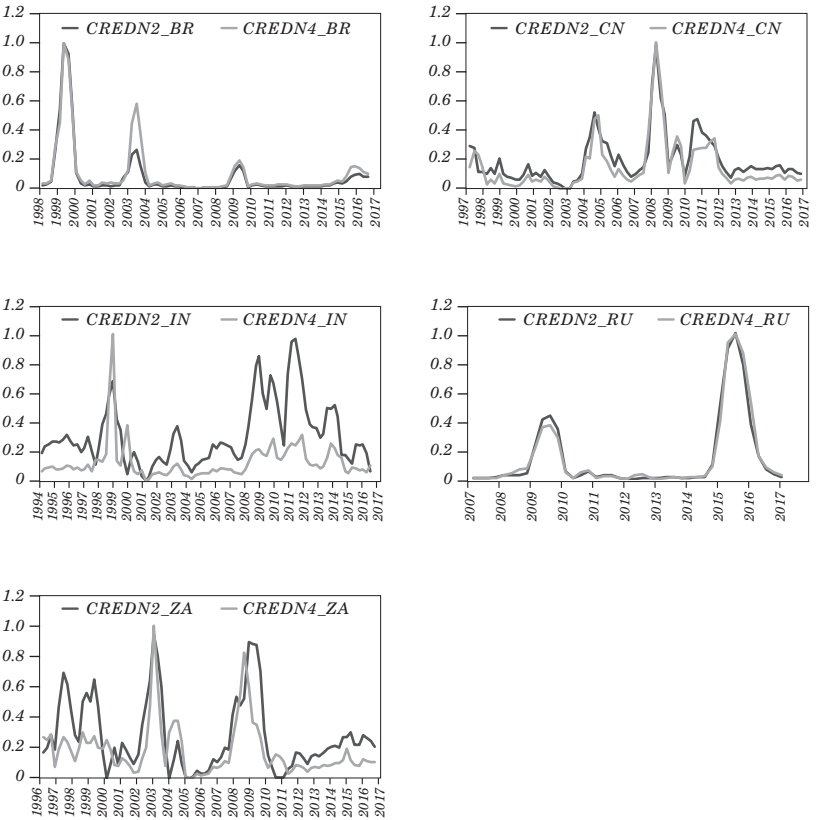
65. Since 2012 the Bank of Japan has raised the inflation target, introduced additional quantitative and qualitative easing measures. See, for example, Iwasaki and Sudo (2017).

66. Brazil, Russia, India, China, South Africa.

essentially the largest emerging market economies in our dataset. There are two aspects to note for these economies. First, unlike their advanced counterparts, there tend to be more frequent credibility losses. Brazil, India, China, and South Africa stand out. Second, differences between the two credibility proxies are more apparent for some of these emergers, most notably India, where credibility losses tend to be larger when the forward-looking inflation data are used.

Figure 10. Credibility Estimates (continued)

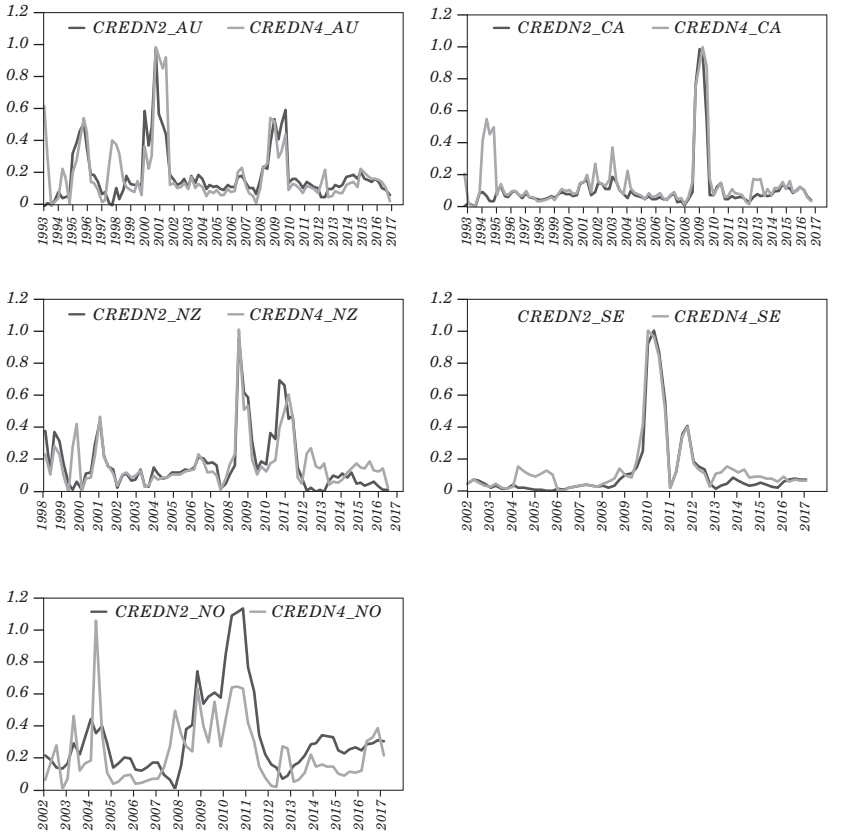
(C) BRICS (Brazil, Russia, India, China, South Africa)



Source: Authors' calculations.

Figure 10. Credibility Estimates (continued)

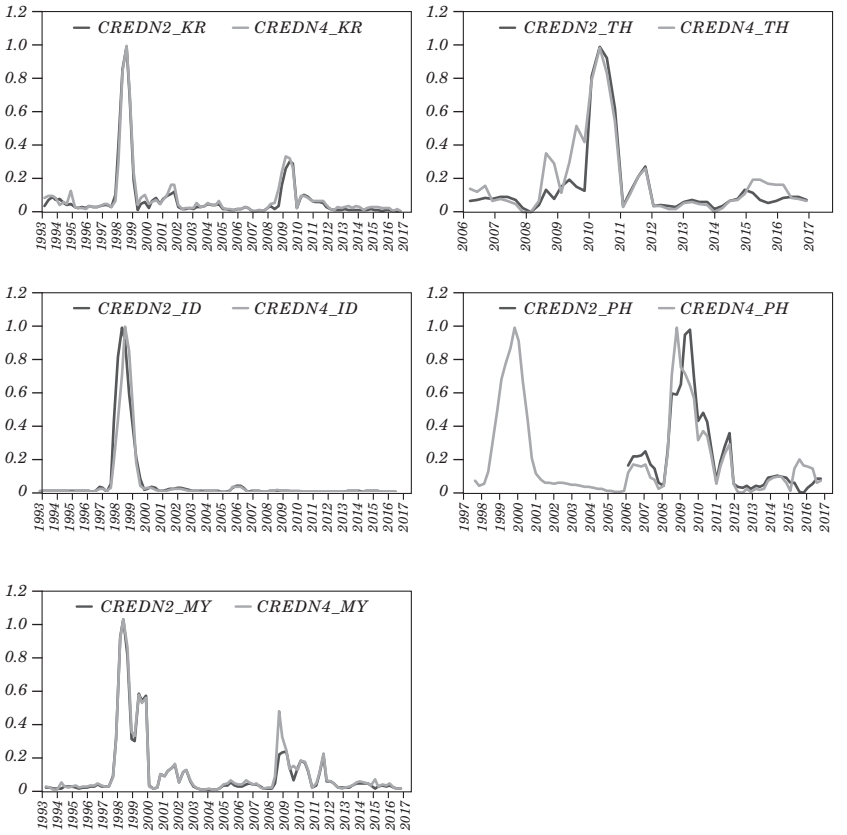
(D) IT in Selected AE



Source: Authors' calculations.

Figure 10. Credibility Estimates (continued)

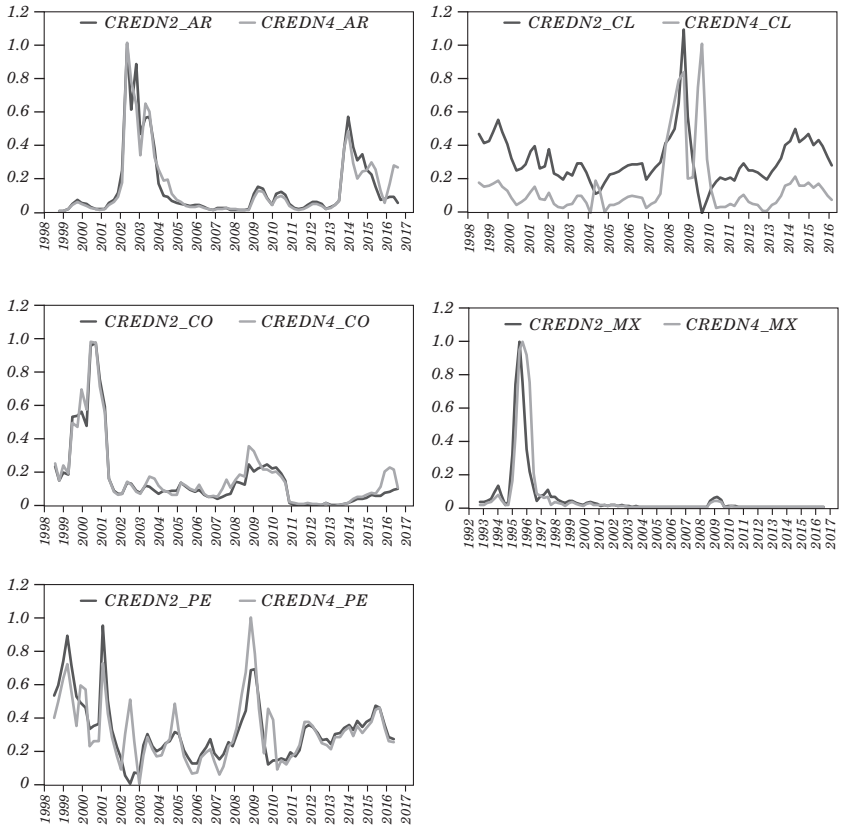
(E) Asia



Source: Authors' calculations.

Figure 10. Credibility Estimates (continued)

(F) LATAM Countries



Source: Authors' calculations.
Note: See part A of this figure. *CREDN*2 is the normalized version that uses the mean one-year-ahead inflation forecast. See the main body of the text for more details.

Next, in figure 10D we examine credibility in advanced countries that adopted inflation targeting earliest, namely, Australia (AU), Canada (CA), New Zealand (NZ), Sweden (SE), and Norway (NO). While the crisis led to a reduction of credibility everywhere, the size of the loss is historically smaller in AU and NO than in SE, NZ, and CA. Indeed, NZ and SE were hit twice, once in 2008–9 and again in 2011. In NZ's case the earthquake in Canterbury and the increase in the Goods and Services tax in 2010 likely provide the explanation.

Figure 10E plots our credibility measures for Asian economies, while figure 10F shows the results for the Latin American (LATAM) countries in the dataset. In the former group of economies, the Asian financial crisis stands out in at least three of the five countries shown, namely, i.e., Indonesia (ID), Korea (KR), and Malaysia (MY). Even in the Philippines (PH) 1998 stands out and is not far from levels reached in 2008–9. Data for Thailand (TH) reveal that the financial crisis of 1997–1998 leads to a loss of credibility as large as in 2009–2010 (not shown). A similar story is repeated for many of the LATAM economies with more than one episode of large losses of credibility. Chile stands out because, while credibility levels do not match the ones in the advanced countries with inflation targeting, only the Global Financial Crisis really stands out in the data shown since the late 1990s.

To conclude, emerging central banks, with the exception of the BRICS economies, did not suffer the same credibility losses during the crisis as did central banks in advanced countries. Moreover, a credibility gap remains as the emerging central banks, on average, are less credible than their advanced counterparts. Once lost, credibility can be regained reasonably quickly. However, the recovery period appears to be a function of the size of the crisis central banks must confront.

4. The Impact of Selected Shocks

4.1 Econometric Model

Institutions impact economic performance slowly and their effects are not always straightforward to identify. Hence, serious differences of opinion exist concerning the effect of central-bank independence and governance, to name but two examples. Even if there is agreement on best practices in institutional arrangements, economic shocks can thwart best laid plans. Therefore, we augment our institutional resilience results by examining how advanced and emerging economies

fared through the lens of a more conventional econometric approach that considers the impact of unexpected changes in key macroeconomic variables. To be sure, just as there are different views about the impact of institutional factors, similarly there are differences of opinion about how to identify certain types of economic shocks, not to mention the model that is most appropriate under the circumstances. In what follows then we adopt an eclectic approach that permits readers to make their own judgment about our findings while conducting extensive sensitivity tests.

We focus on three shocks, as these highlight the potential sources of the great divide in the title of the paper. They are: financial, trade, and credibility shocks. We choose a technique where cross-border effects are center stage, since this seems like the most fruitful way to understand differences between advanced and emerging countries in how they respond to a variety of economic shocks. As noted in earlier sections, many of the reforms in monetary policy adopted by emerging countries originated in the advanced economies. Moreover, by virtue of their size, shocks emanating from advanced countries are likely to be an important device to understand how resilient emergers are to such shocks.

Consider first the case of an individual economy j. We assume that economic shocks can be sub-divided into five factors. Although factors, as such, are not observed (we return to this issue below), they have the advantage that this approach can deal with the "curse of dimensionality" when one is seeking to model dynamic relationships. This approach permits us to greatly enrich the number and types of variables included in our estimated model.

Estimated factors are as follows: a real economic factor, a financial factor, a trade factor, a monetary factor, and a global factor. The global factor is either a shock from the U.S. or a combined shock from three systemically important advanced economies, namely, the U.S., the Eurozone, and Japan. Each factor is labeled i. Each economy is identified by j. If X denotes the vector of variables used to estimate each one of these factors i, we can write

$$X_{ijt} = \alpha_{ijt} F_{ijt} + \varepsilon_{it} \tag{3}$$

where X are vectors of observable time series from which factors F are estimated, α are the factor loadings, and $i = R, F, T, M, G$ denote respectively the real, financial, trade, monetary, and global factors.

We extract the first principal component which then serves as the proxy for each factor for R, T, G, but not M.[67] For the monetary factor we use the policy rate, since this remains the principal instrument of monetary policy throughout in most of the economies in our dataset. Of course, this is not the case for the major economies since the beginning of the Global Financial Crisis (i.e., U.S., GB, and EZ) as well as Japan. For these four economies, we replace the observed policy rate with a shadow rate once the policy rate reaches the zero lower bound.[68] Separately, we also add our estimates of central-bank credibility (*CRED*), thereby adding one more element to i. After all, resilience to economic shocks is also likely to be directly impacted by the credibility of the monetary authority as discussed above.

Since it is unlikely over the sample period considered that the factors loadings are constant, we allow these to vary with time in a manner described below. All series in X are assumed to be stationary.[69] After extensive testing we use the annualized (*log*) first difference for many series, the first difference, or the levels for others in the results to be reported in the following section. Other filters were considered (see above), including a one-sided HP filter, a band-pass filter, and Hamilton's (2018) filter, but some experimentation led us to conclude that our main results would remain unchanged.[70]

In estimating (3) we collect series that are typically thought to be representative of each one of the factors listed. Table 2 presents a listing of series that are available for all economies in the study. We proceed in this manner in part because it is a more intuitive way

67. Owing to the short sample, we elected not to include more than one principal component, although the first component explains the majority of the variation in the series included (results not shown). A disadvantage of this approach is that we are unable to identify whether the estimated shocks are primarily driven, say, by supply or demand factors. This is left for future research.

68. We use Krippner's dataset (https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/comparison-of-international-monetary-policy-measures), since these are constructed in a similar manner for all four economies. Other methodologies to estimate have, of course, also been proposed. See, for example, Howorth and others (2019) and references therein. It is worth noting that the zero-lower-bound period begins before the Global Financial Crisis in Japan's case.

69. We conduct a series of panel unit root test. The series, as described below, were found to be stationary (results not shown).

70. See Chen and Siklos (2019) and references therein for a more extensive discussion of the specification and impact of various filters for a dataset that consists of four systemically important economies, including China.

to generate factor loadings as well as ones that are consistent with economic theory.[71]

Table 2. Factor Estimation

Cred	*Real*	*Trade*	*Financial*	*Monetary*	*Global*
CRED is the credibility indicator	Real GDP	Real exchange rate	Equity prices	Policy rate	U.S.
	Inflation	Current account/ GDP	Private non-bank financial assets to GDP1		or
	Real GDP growth forecast	Forex reserves	Housing prices		S3 = U.S., EZ, JP
	Inflation forecast		Yield curve (i.e., short less long rate)		
			Interest rate differential (domestic less U.S. short-term interest rate)		

Source: Authors' calculations.
Note: The text also provides some details about the form in which the series enter the various factor models. Real GDP, the current account/GDP, interest rate differential, the yield curve, and the policy rate are in levels; (1) enter in first difference form. The remaining series are in annualized growth rate form, i.e., 100 times ($\log(X(t)$-$\log(X(t-4))$.

71. A criticism of our approach is that factor models often rely on a larger number of variables than are being used. Nevertheless, as discussed above (also see the appendix), once a dataset moves beyond the advanced economies, the number of available and comparable time series over a reasonable span of time becomes difficult to compile. Moreover, the total number of series used in our study does not differ much from, for example, Stock and Watson (2018), or Hatzius and others (2010). More importantly perhaps, many studies of this kind, regardless of the number of variables that enter the factor model, end up finding that only a small handful of variables dominate all others in terms of their explanatory power in the factor model.

Many in the literature have proxied a global component by assuming that shocks emanating from the U.S. fulfills this role.[72] We follow this approach. However, others have also created large cross-country datasets to derive a common factor that is interpreted as the global factor.[73] Therefore, we also identify the global component for R, T, F, and M, again via factor model estimation. This time we specify a panel consisting of the data from the U.S., the Eurozone, and Japan as our second proxy for the source of global shocks. Since the main findings of our study are unchanged, we do not discuss this case further.

The modified factor model specification with the addition of the global factor can then be written as follows:

$$X_{ijt} = Y_{ijt} F_{it}^{G} + \lambda_{ikt} F_{ikt}^{D} + V_{ijkt} \tag{4}$$

where i is as previously defined, $k = US$, γ, λ are, respectively, the factor loadings for the global (i.e., F^G; the U.S.), and domestic factors (F^D; real, financial, trade, and monetary), and ν is the residual term. As before, the factor loadings are time-varying in a manner described later. Equation (4), therefore, makes clear that there is a global component for each of the factors named earlier.

To exploit the cross-sectional dimension, we then estimate the dynamic relationship between the factors in a panel setting. This gives rise to the following (quasi) time-varying panel factor or factor-augmented vector autoregression model (PFVAR) written as[74]

$$P_{jt} = \Omega_{jt}(L) P_{jt-1} + \psi_{jt}(L) F_{jt} + \xi_{jt} \tag{5}$$

where $P_{jt} = \left[R_{jt}, T_{jt}, F_{jt}, M_{jt}\right]'$ and F^G is exogenous. The latter, as we shall see, can include a set of observable variables or factors. As mentioned previously, the factors are time-varying which, in effect, implies that F_{jt}^{G} is also a time-varying element. Recall that the elements of P consist of the (domestic) real (R), trade (T), financial (F), and monetary (M) factors.

One issue that arises from estimation of any VAR is the ordering of the variables. Ordering the real factor first is unlikely to be

72. For example, see Feldkircher and Huber (2016).

73. For example, see Kose and others (2012).

74. "Quasi" time-varying because the factors scores are time-varying, not because the coefficients in the PVAR are time-varying. See below.

controversial, as almost all empirical work of this variety suggests that real economic factors are the 'most' endogenous in a recursive or Cholesky decomposition. However, the rest of the ordering is less clear-cut with the possible exception of the monetary (M) factor, which is traditionally seen as the 'least' endogenous because it is affected by all the other shocks, while these same shocks only impact M, with a lag. This is also standard in almost all estimated macroeconometric models. Accordingly, we estimate versions of the panel VARs where the real factor is placed first, followed by the financial and trade factors, with credibility and monetary factors last. In a separate exercise, we place credibility first and switch the order of the trade and financial factors.

Alternatively, one might also consider identifying more precisely the structural shocks either by imposing long-run or short-run restrictions, or even sign restrictions. Such extensions are feasible[75] but create additional challenges with the net benefits unclear. In the present context the most important drawback is that the economic development of the various countries in our dataset is quite diverse. This makes it difficult to impose common structural restrictions across the four economies considered (U.S., Great Britain, Eurozone, Japan). The same challenge arises when sign restrictions are considered. There is a real risk that such identification schemes can distort the results.

Finally, we discuss how the time-varying factor scores are obtained. First, we estimate factor models for the full available sample. Next, we estimate the same factor models for samples that range from five to six years in length in a rolling manner. The sample is rolled ahead two years at a time. This produces a series of overlapping samples.[76] The estimated factor scores are averaged when samples overlap to produce a unique factor estimate that is time varying.

Specifications such as equation (5) are based on unobservable factors. To gauge the sensitivity of our results, we also consider a version of (5) relying on observable time series. Define $P_{jt}^{d'} = \left[y_j, f_j, \varepsilon_j, pr_j \right]'$ where y is real GDP growth, ε is the rate of change in the real exchange rate, f is

75. For example, see Canova and Ciccarelli (2013) and references therein.

76. The samples are 5 years long for the real and trade factors, and 6 years long for the financial factor. The slightly longer span for the financial factors is inspired by the finding that the phase length of the financial cycle is longer than for business cycle (e.g., see Borio, 2012). Ideally, we would have liked to estimate the financial factor for an even longer sample (e.g., 7 to 10 years) but data limitations prevented us from doing so.

credit growth, and *pr* represents monetary policy. Again, we also consider a version augmented with credibility where $P_{jt}^{d'} = \left[y_j, f_j, \varepsilon_j, CRED_j, pr_j \right]'$.[77] Hence, the specification based on observable time series is written

$$P_{jt}^{d'} = \Omega(L) P_{jt-1}^{d} + \psi_j(L) P_{jt}^{US} + \xi_{jt} \tag{6}$$

where all terms were defined previously. Note that P^d, P^{US} are time invariant and *d* indicates the domestic portion, while *US* represents U.S. spillovers into the other economies *j*. We continue to assume that the global factor consists of U.S. shocks alone.

We now turn to the data and estimation results.

4.2 Shocks to Advanced and Emerging Economies

The panel VARs are estimated via GMM instrumented by using one or two lags of the endogenous variables.[78] The VARs rely on one lag. Panel-specific fixed effects are removed via a Helmert transformation to reduce dimensionality.[79] All panel VAR results shown here are estimated for a balanced sample that can vary depending on how the factor scores are estimated and the economies considered. When all economies are considered, the sample is 2001Q4–2018Q3 before lags. For the advanced countries, where 11 cross-sections are included, this yields 649 observations or 68 observations per cross-section. For the emerging countries, there are 16 cross-sections yielding 1088 observations.[80] Confidence intervals are also estimated via Monte Carlo and 68 percent significance levels are used (i.e., equivalent to ± 1 s.e.), which is fairly typical in the relevant literature, although none of the highlighted results are greatly affected when, say, an 80-percent confidence interval is used. In all the panel VARs, the ordering is as follows: real or real GDP growth, financial conditions or the change in the ratio of private non-bank financial assets to GDP, the trade factor

77. For completeness, another version where *CRED* is placed first and the ordering of *y* and ε is reversed is also estimated. Technically, *CRED* is not observed but it seems important nevertheless to examine the role and impact of credibility when the shocks are to observable variables.

78. See Holtz-Eakin and others (1988); also see Abrigo and Love (2015).

79. It is a transformation used in instrumental variable estimation even if the label itself is not always used. See, for example, Arellano and Bover (1995).

80. The Philippines are omitted because we could not obtain a long enough sample for enough of the series in the factor model version of the panel VAR.

or real effective exchange-rate growth, central-bank credibility,[81] and the monetary factor which is represented by the policy rate in both versions of the model. U.S. shocks are deemed exogenous. Where the results are affected by the ordering of some of the variables, this is noted below.

Results are shown in figures 11 and 12. The first set of figures (i.e., figure 11A to 11D) relies on observable time series; the second set of figures (i.e., figure 12A to 12D) contains the estimates based on factor models. Figures 11A and 12A plot the impulse responses (IR) to shocks in the endogenous variables, while figures 11B and 12B show the dynamic multipliers of exogenous shocks from the U.S. (i.e., global shocks) on the remaining advanced and emerging countries. As argued above, our discussion focuses on the differential impact of central-bank credibility, monetary policy, trade, and financial conditions in advanced versus emerging countries.

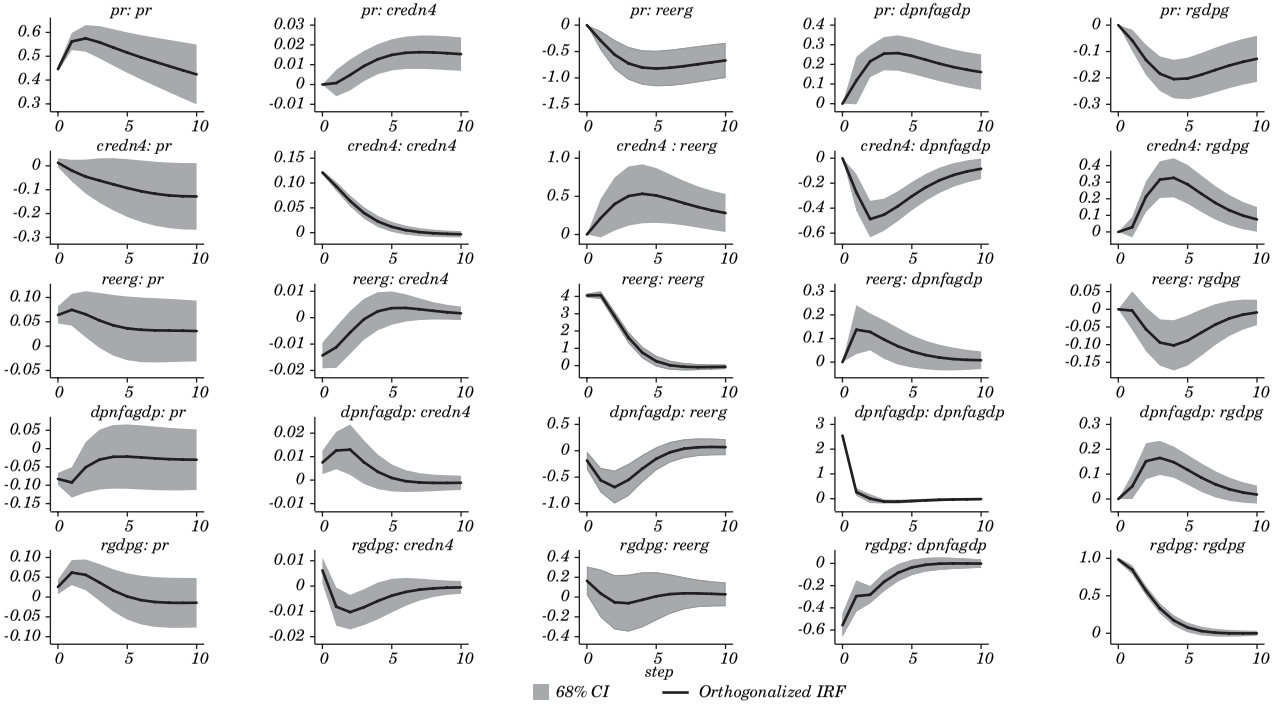
We first examine the results for the advanced countries. These are shown in figures 11A through 11D. A positive credit shock fuels a rise in real GDP growth. Similarly, real exchange-rate appreciations[82] improve central-bank credibility and raise policy rates. A positive policy rate shock reduces central-bank credibility and the real exchange rate. Policy rate shocks also have a negative impact on real GDP growth. Finally, a reduction in central-bank credibility[83] reduces credit growth but has a positive impact on real GDP growth. Since our credibility indicator aggregates three components, a rise in inflation forecast errors, monetary policy uncertainty, or global inflation divergences (which can also impact competitiveness) can combine to erode credibility and may well prompt advanced-country central banks to raise the policy rate. All of these can explain the kinds of impulse responses reported in figure 11A.

81. *CREDN*4 is the label describing the normalized estimates of central-bank credibility described earlier.

82. The real exchange is defined here such that a rise signals an improvement in competitiveness.

83. Recall that *CRED* is defined in a such a way so that a rise implies a fall in central-bank credibility.

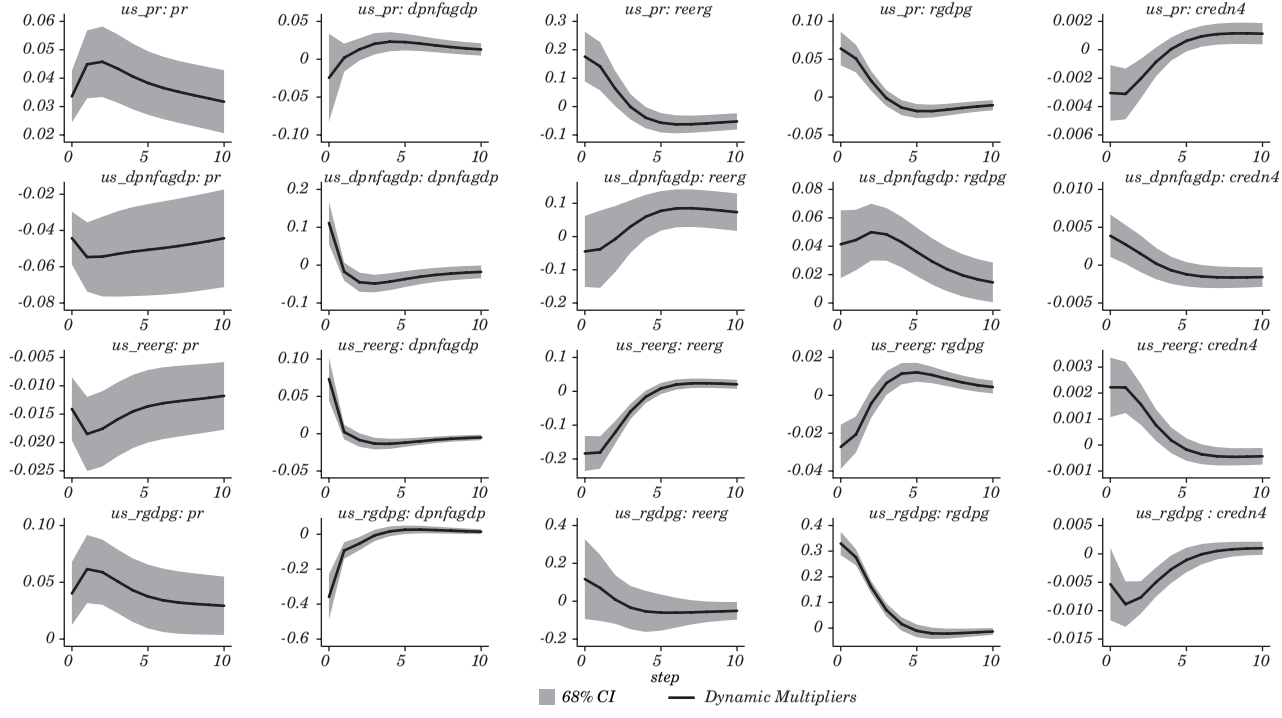
Figure 11A. Impulse Responses: AE Based on Observables



Source: Authors' calculations.

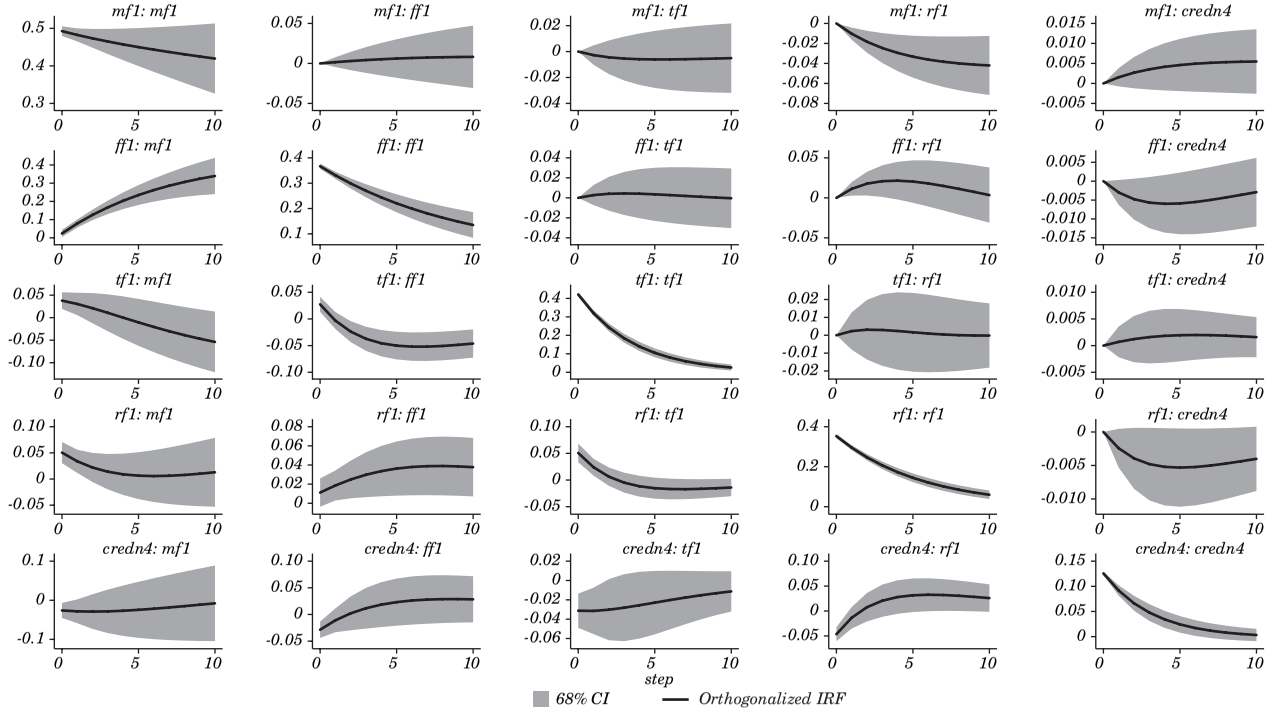
Note: See equations (4) to (6). Variables are defined in table 2. The ordering of the Panel VAR is from the last row (first) to the first row (last). 1 lag used in the estimation. See the main body of the text for more details. See figure 9 for the definition of *CREDN*4.

Figure 11B. Dynamic Multipliers: AE Based on Observable Series



Source: Authors' calculations.
Note: Same panel VAR as in figure 11A. U.S. shocks are treated as exogenous.

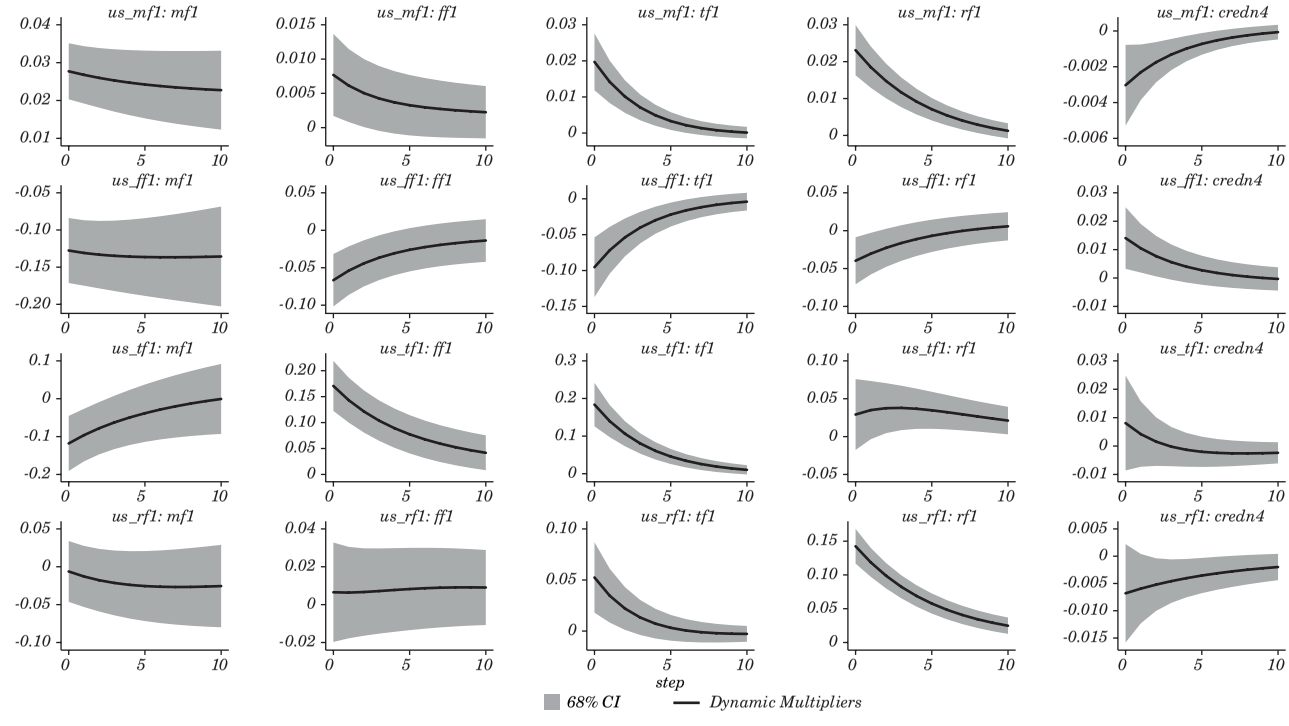
Figure 11C. Impulse Responses: AE Based on Factor Model Estimates



Source: Authors' calculations.

Note: RF is the real factor, TF is the trade factor, FF is the financial factor. Factors are obtained from the first principal component of the series shown in table 2. 1 lag used in estimation. See the main body of the text for more details and the note to figure 11A.

Figure 11D. Dynamic Multipliers: AE Based on Factor Model Estimates



Source: Authors' calculations.

Dynamic multipliers in figure 11B reveal that U.S. shocks, in the form of a higher policy rate (fed funds) have spillover effects by raising credit growth and improving central-bank credibility and real GDP growth in the advanced countries. This occurs at first, but it is eventually reversed beginning five quarters in the future. A rise in U.S. competitiveness is seen as reducing real GDP growth in other advanced countries, the policy rate temporarily, and central-bank credibility. The latter result might be explained by the reduction in competitiveness when U.S. competitiveness improves. This can be interpreted as having negative consequences on some, or all, of the elements that make up our indicator of credibility. Indeed, higher U.S. real GDP growth improves central-bank credibility in the advanced countries in part because domestic competitiveness also improves. Finally, it is worth noting that central-bank credibility stands out as a variable that explains up to 16 percent of variation in real GDP growth, 18 percent of real exchange-rate fluctuations, as well as about 15 percent of variation in policy rates.[84] However, credibility shocks explain virtually none of the changes in credit growth (one percent of the variation), while real exchange-rate movements are not very sensitive to policy rate shocks (eight percent of the variation).

Turning to the same model now estimated by using factor scores for the real, trade, and financial variables, impulse responses are shown in figure 11C. Although the interpretation of many of the IR is compatible with the version that relies on observables, there are a few differences. First, a tighter monetary-policy factor (i.e., higher mf1) has no impact on central-bank credibility. However, a reduction in credibility (i.e., a higher *CREDN*4) leads to reduced real economic activity (i.e., rf1 declines). This contradicts the result shown in figure 11A. However, it is worth adding that the real factor contains forward-looking elements, whereas the observed proxy for real economic performance does not. Hence, it is possible that a credibility shock (i.e., a reduced credibility) creates expectations of negative economic outcomes that translate into lower real economic activity. Finally, a trade shock (i.e., a rise in tf1

84. We also examined the variance decompositions and performed Granger causality tests (results not shown). Not surprisingly, all models suggest that own shocks matter most. This is a common finding in the literature and captures the strong persistence property found in macroeconomic and financial time series. Granger causality tests confirm the chosen ordering in the sense that, whereas the policy rate Granger-causes the other variables in the system, it is only Granger-caused by central-bank credibility. Nevertheless, when the ordering is changed as discussed earlier, only the size—not the sign—of the impulse responses from the real exchange rate and credit growth to central-bank credibility are affected. All other impulse responses are unchanged.

which translates into greater competitiveness) leads to temporarily tighter monetary-policy and financial conditions.

The dynamic multipliers shown in figure 11D suggest that global shocks (i.e., shocks from the U.S.) impact all the variables in the model. However, two are worth highlighting. First, tighter U.S. monetary policy tightens monetary conditions in the remaining advanced economies and improves their central banks' credibility. Second, a positive U.S. real shock (i.e., a rise in us_rf1) improves competitiveness and real economic conditions in the other advanced countries.[85] This is the case of a rising tide lifting all boats.

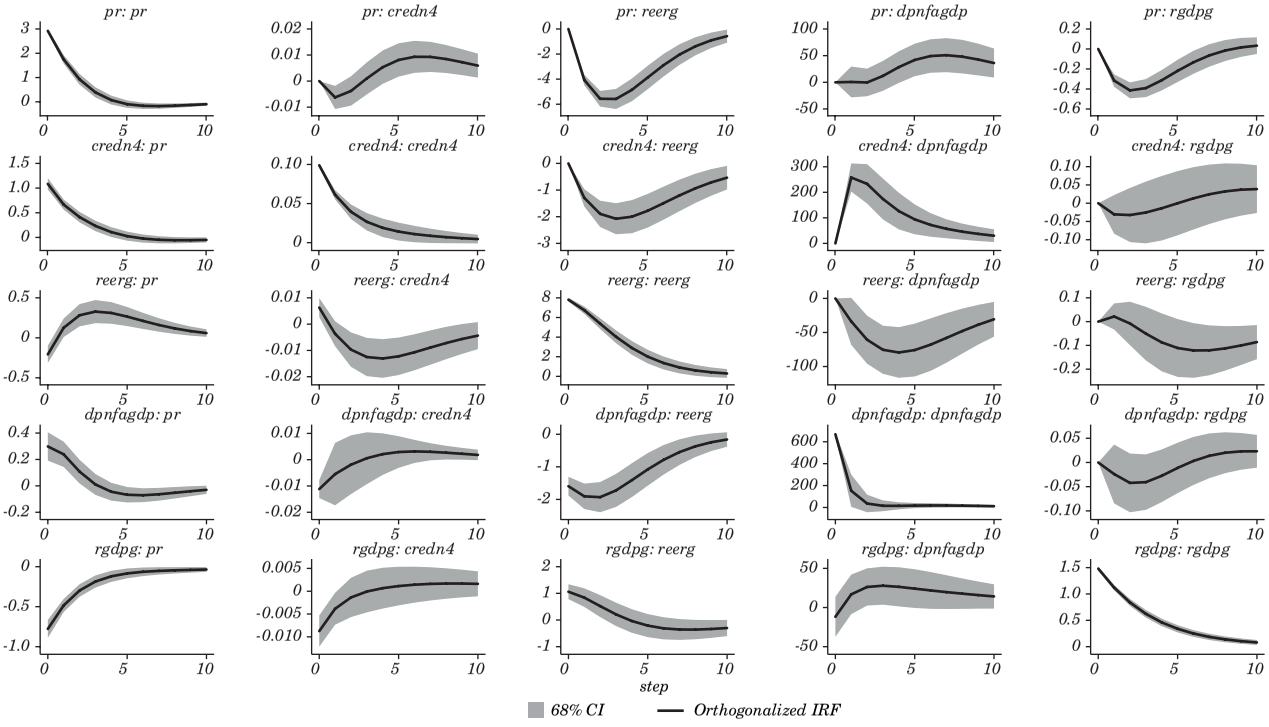
We now turn to the results for the emerging countries shown in figures 12A through 12D when the variables are observable. Early policy rate increases improve central-bank credibility, but this is more than offset in later quarters. The same shock reduces real GDP growth. The former result is consistent with the ones shown in figure 11A for the advanced economies. Unlike the experience in the advanced countries, credit growth has no impact on real GDP growth. Otherwise, the results are broadly similar with the ones reported for them.[86]

Variance decompositions (not shown) reveal that credibility shocks explain around 25 percent of variation in credit growth and 11 percent of the policy rate in the emerging countries after ten quarters. The same shock explains only two percent of real GDP growth and six percent of real exchange-rate changes. Policy rate changes explain a large portion of the real exchange-rate variable (38 percent). Other than the impact of credibility shocks on the policy rate, which are comparable for both sets of countries, central-bank credibility in emerging countries explains far less real GDP growth developments and real exchange-rate changes than in their counterparts in the advanced economies. By contrast policy rate shocks have a much bigger influence in real exchange-rate developments in emerging than in advanced countries.

85. When the ordering of some of the variables is changed, the link between credibility, trade, and financial conditions becomes insignificant. Other impulse responses are unaffected. The only noteworthy results from the variance decompositions (not shown) when factors are used is the finding that almost 20% of the variation in monetary conditions is explained by changes in financial conditions. Hence, the nexus between financial markets and monetary policy is significant and cannot be ignored in advanced countries. As we shall see below, the same result is not obtained for the emergers.

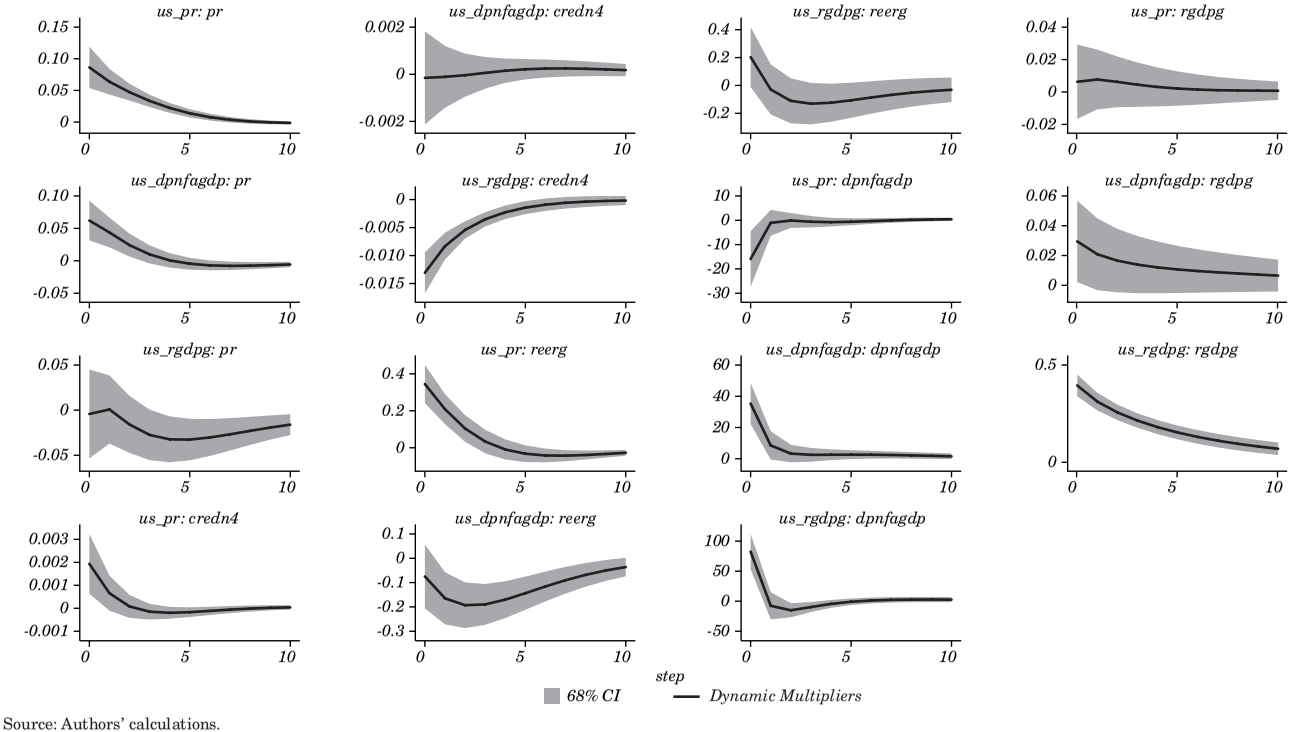
86. Changing the ordering of the variables renders insignificant the links between credit growth and credibility, and real GDP growth and central-bank credibility. Otherwise the other conclusions are unchanged.

Figure 12A. Impulse Responses: EME Based on Observables



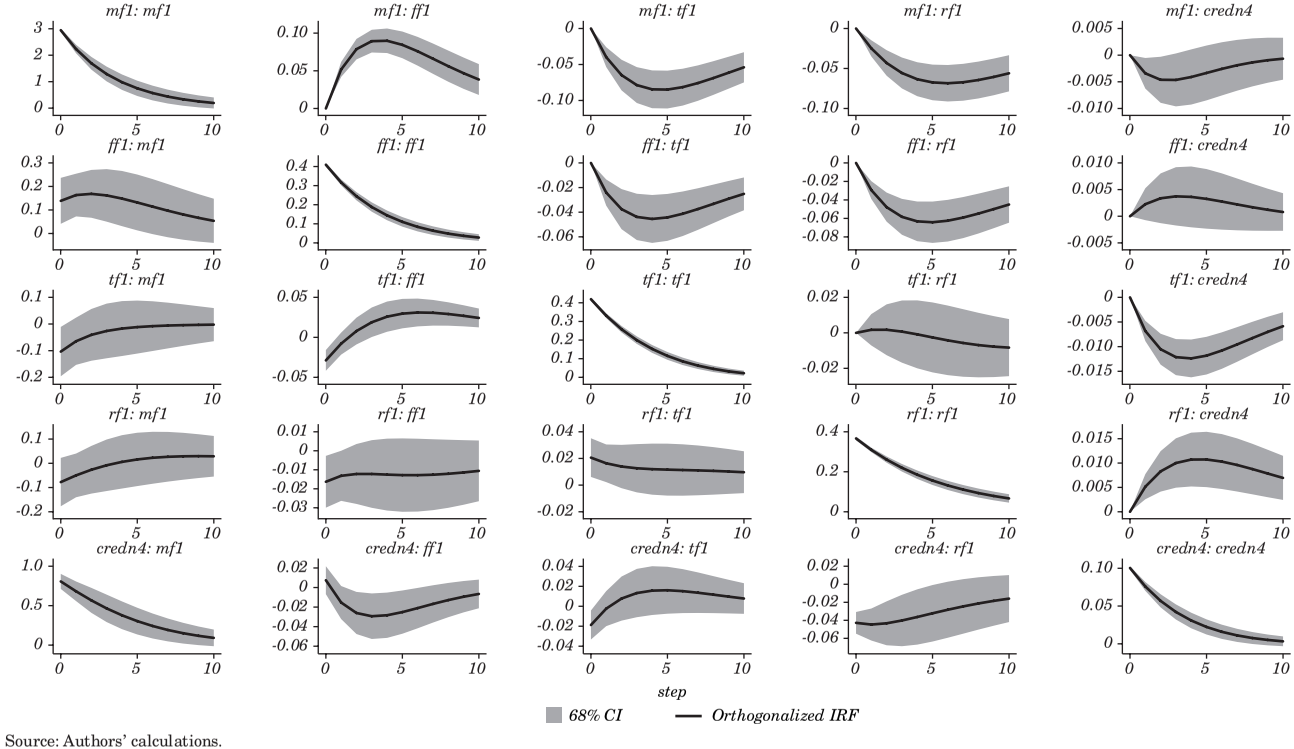
Source: Authors' calculations.
Note: See the notes to figure 11.

Figure 12B. Dynamic Multipliers: EME based on Observables



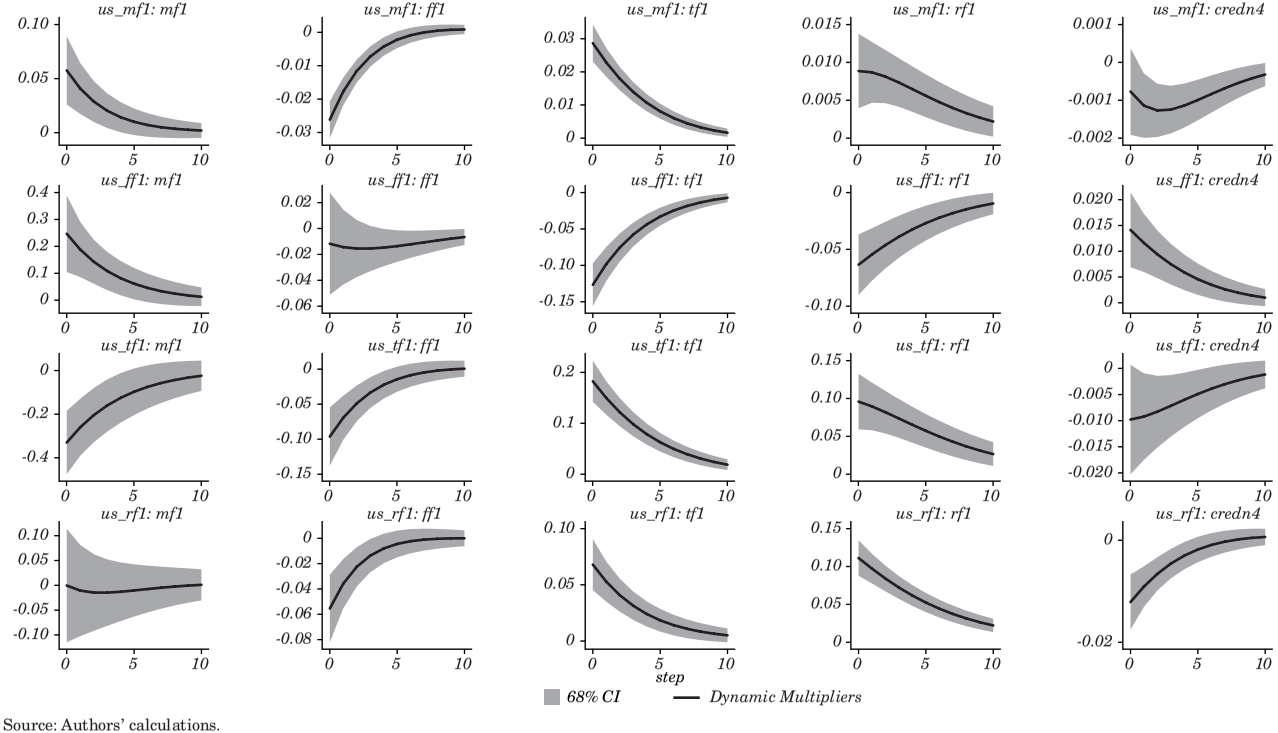
Source: Authors' calculations.

Figure 12C. Impulse Responses: EME Based on Factor Model Estimates



Source: Authors' calculations.

Figure 12D. Dynamic Multipliers: EME Based on Factor Model Estimates



Source: Authors' calculations.

Turning to spillovers from U.S. shocks shown in figure 12B, we find that, although a tightening of U.S. monetary policy also leads to higher policy rates in emerging countries and higher credit growth, central-bank credibility in these economies also deteriorates slightly but only for one quarter. There is no impact on emerging real GDP growth of a U.S. tightening of monetary policy. However, unlike for the advanced countries, rising U.S. real GDP growth improves trade competitiveness and leads to a small decline, after five quarters, in policy rates in emerging countries and not an increase as in the advanced countries.

Finally, figures 12C and 12D plot the IR for the factor-based model applied to the emerging countries. Tighter financial conditions lower real economic outcomes and have no effect on central-bank credibility. An improved trade factor, which is akin to an improvement in trade competitiveness, improves central-bank credibility. Finally, a loss of central-bank credibility produces a tightening of monetary policy, looser financial conditions, and poorer real economic outcomes.[87] Only the impulse responses between credit growth (figure 12A) and credibility or real GDP growth differ from the factor model results shown in figure 12C. Other than the finding that a competitiveness shock does not lead to tighter monetary conditions in the emerging countries, both the impulse responses and dynamic multipliers behave similarly in both sets of countries.

Variance decompositions (not shown) suggest that around nine percent of credibility shocks explain monetary conditions, which is considerably higher than in the case of advanced. However, monetary shocks explain less of the variation in financial, real, and trade factors in the emerging countries than in the advanced countries (around six to ten percent).[88] Moreover, greater U.S. competitiveness also leads to looser financial conditions in emerging countries, as well as improved central-bank credibility and improvements in the trade factor.

Given the large number of results, it may be useful to contrast the impact of a single shock—a tightening of domestic monetary policy—, for each country including the U.S. (which itself serves as the global

87. Changing the ordering of some of the variables (see above) in the model has no impact on the impulse responses.

88. Granger causality testing (not shown) also finds that, unlike in the advanced countries, monetary-policy shocks in emerging countries are more responsive to the other variables in the model. Finally, dynamic multipliers (figure 12D) suggest that U.S. monetary-policy shocks deliver a central-bank credibility dividend for emergers but at the expense of looser financial conditions.

shock), between advanced and emerging countries. A summary of the results is provided in table 3. The domestic response to a tightening shock is the same on both and irrespective of whether observable or factor modeling used. In principle, this ought to make it easier for policymakers to agree on the response to conventional monetary-policy actions. Turning to the spillover effects from the U.S., our stand-in for a global shock, these amplify the domestic response in advanced countries based on observable data with one exception. The U.S. tightening shock offsets what would otherwise be a deterioration in trade competitiveness. The same result holds for the emergers. Equally important, spillovers from a U.S. tightening shock are benign for credit growth, real GDP growth, and central-bank credibility. Turning to factor model-based estimates, global shocks are, in the main, beneficial for both sets of countries.

The only sour note for the emerging countries is that the negative real impact of a tightening of monetary policy is amplified when global shocks are added. The beneficial impact on trade competitiveness from the global shock is interesting in view of recent discussions about whether exchange-rate appreciations can be blunted because so much of trade is invoiced in U.S. dollars. Finally, even if the sign of the responses is often similar when the two groups are compared, this need not imply that the total impact of a monetary-policy shock will be the same in both groups of economies.

How then do the econometric findings relate to the institutional developments previously discussed? First, the fact that the response to many shocks are common to both suggests that the parallel changes in some critical elements of institutional change (e.g., central-bank transparency, monetary-policy regime strategy) are broadly reflected in how the two types of economies respond to selected economic shocks. In contrast, the finding that emerging countries are far more sensitive to monetary-policy shocks (i.e., based on variance decompositions) while credit growth is also more responsive to central-bank credibility shocks in advanced than in emerging countries, may also provide part of the explanation for the divergence in resilience between the two groups of economies in recent years. Clearly, this conclusion is preliminary and will require more data before it is conclusive.

Table 3. Comparing the Response to a Tightening Shock: AE versus EME

Advanced Economies		*Emerging Market Economies*	
Observables Panel Var			
Impulse Responses	*Dynamic Multipliers*	*Impulse Responses*	*Dynamic Multipliers*
Tightening	Amplified	Tightening	Amplified
Credit Growth rises	Amplified	Credit Growth rises	No change
Trade competitiveness worsens	Improves	Trade competitiveness worsens	Improves
Real GDP growth declines	Amplified	Real GDP growth declines	No change
Factor Model Based Panel Var			
Impulse Responses	*Dynamic Multipliers*	*Impulse Responses*	*Dynamic Multipliers*
Tightening	Amplified	Tightening	Amplified
Financial conditions: no change	Looser	Looser	Amplified
Trade competitiveness: no change	Improves	Improves	Amplified
Real economic factor declines	Improves	Real economic factor declines	Amplified
CB credibility: no change	Improves	CB credibility: no change	Improves

Source: Authors' calculations.
Note: The interpretations refer to the accumulated impact of shocks after 10 quarters. When a term is underlined, it means that the dynamic multipliers (i.e., a tightening monetary-policy shock from the U.S.) offset the domestic shock. When a term is in italics, the impact (domestic- or U.S.-based) differs between AE and EME. Interpretations are based on the results reported in figures 11 and 12.

5. Conclusions and Policy Lessons

In this paper we present some empirical evidence, based on a panel of 29 countries (with the euro area treated as a country, the Eurozone), on the performance of central banks in both advanced and emerging countries. Our focus is on the post-Bretton-Woods era. We document the progress made by the advanced countries since the end of the Great Inflation in the early 1980s. Most of these countries achieved credibility for low inflation by adopting the major institutional changes of central-bank independence, central-bank transparency, and inflation targeting. The apogee of this evolution was the Great Moderation from circa 1985 to 2006.

The emerging countries started with a less favorable track record. For them, the 1980s into the 1990s was characterized by macroeconomic and financial instability exhibited in frequent currency, banking, and twin crises (Bordo and others, 2001). Many of these countries had fiscally dominant regimes and problems establishing constitutional representative democracies, rule of law, and sound governance of fiscal, monetary, and financial institutions. They also had limited financial development and financial repression.

Beginning in the 1980s, a number of emergers (e.g., Chile and Korea) began to learn from their crisis experience and began following the lead of the advanced countries in developing sound fiscal, monetary, and financial institutions. By the 1990s several emergers began to tame their inflation problems and their inflation rates converged to those of the advanced countries. Those adopting inflation targeting were at the vanguard of this process (Bordo and Siklos, 2014).

The Global Financial Crisis of 2007–2008 was a major global shock, which had serious consequences for the advanced countries. Their central banks began to attach greater importance to financial stability while still following flexible inflation-targeting policies. Many of the emerging countries fared well but some with exchange rates pegged to the advanced countries were hard hit (e.g., Hungary). Also, many were hit by the collapse of global trade and commodity markets in 2009–2011, and by the spillover effects of the credit crunches in the advanced countries, especially those with original sin (i.e., foreign currency denominated debt).[89]

89. See Bordo and others (2010).

Given this background we document what has happened since the Global Financial Crisis to central-banking institutions and inflation performance in the emerging countries relative to the advanced countries. We show that some of the patterns observed before the crisis continued, but some were significantly different. Our study shows that, although some emergers did maintain the levels of central-bank independence and central-bank transparency that they had before the crisis, they experienced a decline in our measure of institutional resilience to shocks, as well as a reduction in the quality of their governance. They also exhibited a reduction in our measures of central-bank credibility. Indeed, it appears that central-bank credibility in the emerging countries is more fragile than in the advanced countries. Although the emergers, as a group, avoided the worst of the direct effects of the credit shocks of the crisis, a number are still struggling.

This we believe reflects not only the impact of the global shock, but also deep structural flaws that made them vulnerable, such as less developed financial institutions and markets, and exposure to original sin. For example, it is noteworthy that credibility shocks reverberate through the emerging economies to a greater degree than in the advanced countries. Stated differently, credibility shocks appear to have more temporary effects in advanced than in emerging countries. Moreover, U.S. shocks, when viewed as representative of global shocks that hit all economies, range from being benign to beneficial for emerging countries and more so than for the remaining advanced countries in our dataset.

Two main policy lessons follow from our study:

First, that the emerging countries should "carry on," to paraphrase a British World War II slogan, and continue improving their financial institutions, financial markets, and governance, so that they can grow up to the advanced countries as some earlier emergers (e.g., Israel and Korea) have done. This is likely the best strategy to improve institutional resilience.

Second, the problem of the post-crisis era is not just of the emerging countries' making. Advanced central banks following best practice have been unable to hit their inflation targets from below (Ehrmann, 2015). This impinges on their credibility just as the emerging countries not being able to hit their inflation targets from above. In particular, one difficulty faced by the emergers but not the advanced countries, at least over the past decade, is that explicit inflation targets and the permissible range of inflation rates have changed on several occasions, thereby giving the impression of a moving target. In contrast, among

advanced countries, there is a consensus that one to three percent is the range of CPI inflation rates they ought to be targeting (Siklos, 2017).

The reasons for this are complex and not fully understood. Some argue that the slow recoveries observed in the advanced countries after the crisis were because of the Global Financial Crisis—that all serious recessions with financial crises have slow recoveries(Reinhart and Rogoff, 2009).[90] Some argue it is because of the zero lower bound and the use of quantitative easing and forward guidance by the Federal Reserve and other major Central Banks, and of the fact that the Federal Reserve and the other central banks did not follow an expansionary monetary policy but a credit (carry-trade) policy because of the payment of interest on excess reserves.[91] Others focus on the supply side and see the deep fundamentals of globalization and total factor productivity as keeping wages and prices down. Still others argue that central banks should raise their inflation targets to give them more cutting room for the next recession (Blanchard and others, 2010; Ball, 2014). However, the fact that central banks have up to now been unable to reach their two-percent targets casts doubts on this case. The implication of these issues is that it is difficult to urge the central banks of emerging countries to follow the advanced-countries best practice if our understanding of the concept is in a state of flux.

The ongoing debate in the Federal Reserve and the European Central Bank over the monetary strategy that should be followed illustrates this conundrum. The issues under consideration include: continuing to follow a form of inflation targeting, shifting to an average inflation-targeting strategy or price-level targeting; nominal GDP targeting; keeping the central bank's balance sheet large along with forward guidance or returning back to a "bills only" doctrine; and central-bank digital currency and negative policy rates (Bordo and Levin, 2019). Until these issues are resolved, it will be difficult for the central banks of the emerging countries to develop their catching up to their counterparts in the advanced countries.

90. Not all serious recessions accompanied by financial crises have slow recoveries. Research for the U.S. suggests that, following Friedman's plucking model, recessions with financial crises recover faster (See Bordo and Haubrich, 2017).

91. See Lombardi and others (2018) and references therein.

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