The Transformation and Performance of Emerging Market Economies Across the Great Divide of the Global Financial Crisis*

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The process of central bank (CB) evolution by emerging market economies (EMEs), including central bank independence (CBI) and transparency (CBT), converged towards that of the advanced economies (AEs) before the Global Financial Crisis (GFC) of 2007-2008. It was greatly aided by the adoption of inflation targeting. In this paper we evaluate this convergence process for a representative set of EMEs and AEs since the disruption of the GFC. We use several measures of institutional development (changes in CBI, changes in CBT, changes in a new index of institutional resilience and changes in a new measure of CB credibility). We then use panel VARs based on both factor models and observed data to ascertain the impact of global shocks, financial shocks, trade shocks and credibility shocks on the EMEs versus the AEs. We find that although some EMEs did maintain the levels of CBI and CBT that they had before the crisis, on average they experienced a decline in institutional resilience to shocks and in the quality of their governance. Moreover it appears that CB credibility in EMEs was more fragile than was the case for the AEs in the face of the global shocks (from the US) than was the case for the AEs.
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The Transformation and Performance of Emerging Market Economies Across the Great Divide of the Global Financial Crisis of 2007-2008[1]

1. Introduction

Before the Global Financial Crisis (GFC)[2], a drive towards greater central bank autonomy (CBI) and transparency (CBT), as part of the achievement of greater central bank credibility that began in the advanced economies (AE), spread to the emerging market economies (EME). This process was greatly enhanced by the adoption of inflation targeting (IT; Bordo and Siklos 2014). The adoption of IT and other best practice CB technologies was viewed as a way for EME countries especially to "tie their hands" to deliver lower and more stable inflation rates without undue fiscal and /or political influence.

The process of CB evolution was interrupted by the GFC, a largely advanced economy (trans-Atlantic) event (Tooze 2018, McCauley 2018). The fallout from the GFC in the AE elevated the objective of financial stability, which, unlike monetary policy, was less well-defined, and in the search for reliable instruments to achieve it. Many of the EMEs were affected by the fallout from the GFC but most were largely insulated from it. Many continued on the trajectory of convergence to best practice central banking and maintenance of the hard –won benefits in the fight against inflation.[3]

In this paper we compare the performance of a representative set of EMEs with a group of AEs before and after the GFC. We first consider institutional developments (e.g., changes in CBI, changes in CBT, changes in CB governance indicators). Because central banks do not operate in a vacuum we develop a

[1] For excellent research assistance we thank Humberto Martinez Beltran.
[2] 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 comptehensive timelines. Some prefer to call the period from 2007 on the 'Great Financial Crisis' (e.g., see Carstens 2018) but we retain the, arguably, more popular GFC expression.
[3] See Jasova, Moessner and Takats (2018) which provides evidence on exchange rate pass through to inflation for advanced and emerging economies since the GFC. They find that pass through for EMEs has declined since the GFC and converged on that of the AEs. This is perceived as a reflection of improved CB credibility.

new index of institutional resilience that combines institutional information which describes central banking operations as well as other political-economy style indicators. Next, we then extend an earlier measure of CB credibility based on our previous work (Bordo and Siklos 2015, 2016, 2017). The improved measure combines deviations of inflation from a CB's objective, monetary policy uncertainty, and a global factor that can impact CB 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 EMEs versus the AEs. We link our findings to our resilience indicator since resilience to economic shocks, both domestic and external, ought to reflect institutional resilience consistent with attempts to pursue best practices in monetary policy.

Section 2 provides a brief historical overview of the evolution of CB credibility and its correlates (CBI and CBT) in both AE and EME in the post Bretton Woods era. Section 3 outlines the data. Section 4 presents our institutional measures. Section 5 contains our econometric estimates. Section 6 concludes with some policy lessons.

2. Historical Background

The Great Inflation 1965 to 1983 was a defining moment for the central banks of the AE in the post-World War II era.[4] The post-war Bretton Woods period was one of relative macro stability seen in low inflation and inflation variability and high real growth and low real output variability for the advanced countries (Bordo 1993, and Bordo and Siklos 2015). 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 (stagflation; Bordo and Orphanides 2013). This performance was

[4] For a discussion of the history of central banks see Bordo and Siklos 2018, and Siklos 2002.

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 CBI. The story differed across countries. In the UK, 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 *de facto* had 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 2019, Bordo 2018).[6] 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 CB credibility, defined as the deviation of realized inflation from the stated objective, was at a low point (Bordo and Siklos 2015).

As is well known, the Volcker shock of 1979 in the U.S. and subsequent tight monetary policies and similar strategies in the UK, Canada, and other countries led to the Great Moderation period from the mid-1980s to before the GFC, and to the restoration of CB credibility (Bordo and Siklos 2015). In that period both CBI and CBT increased dramatically (Bordo and Siklos 2014, Dincer, Eichengreen, and Geraats 2019).

Along with the evolution described above of the CBs of the AEs, the EMEs followed a similar trajectory but with generally worse economic performance. These countries had a long history of high and volatile

[5] A similar experience describes the Bank of Japan's relationship with the Finance Ministry until 1997.
[6] For the UK, see Bordo, Bush and Thomas (2019). For France see Monnet (2019)
[7] Another important factor was accommodation of the oil price shocks. See Blinder and Rudd (2013)

inflation and of frequent currency crises (e.g., see Ha, Kose, and Ohnsorge 2019). The political economy in the EMEs combined with less developed financial institutions and markets made it difficult to establish an institutional framework for monetary and fiscal stability (for Latin America see Edwards 2012). 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 1983, Bordo and Schwartz 1998). The Great Inflation period for the EMEs was characterized by even worse macro performance than the AEs and the instability was not fully alleviated until the 1990s when many countries began adopting best practices in central banking and economic policy technology. [8] Bordo and Siklos (2014, 2017) present evidence that those countries that adopted IT converged more rapidly to the inflation levels of the AE countries than EMEs that did not. Moreover, their performance on measures of CBI and CBT also improved greatly relative to countries that did not adopt IT (e.g., see Siklos 2017).

The GFC 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: US 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 GFC began as an AE event, some EMEs were also hard hit, especially those in Eastern Europe with financial ties to Western Europe. Other EMEs were also impacted by the collapse of international trade and the spillovers from the AE credit crunch. But there were a number of countries which had developed the resilience to largely withstand the crisis (e.g., Chile; see Kose and Prasad 2010).

Since the GFC, CBs 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' (LAW) to withstand

[8] Chile was one of the first EME to follow New Zealand's lead in adopting IT.

future global imbalances. This strategic shift was manifest in the U.S. in the Dodd Frank bill of 2010 and in the international financial system with Basel III in 2011 (https://www.bis.org/bcbs/basel3.htm). Many EMEs 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 AEs so that their circumstances and vulnerabilities are different (BIS 2019).[9]

In this paper we examine evidence on the performance of a panel of EME central banks from Latin America, Asia, and Europe to ascertain how the GFC affected the trajectories that they had been following before the GFC in comparison to the experience of a panel of AEs. Our evidence suggests that several EMEs, 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 the record of AE and EME. 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 GFC 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 EME versus AE 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. In Appendix I, we present brief case studies for six countries; 3 AEs (US, Canada , Sweden) and 3 EMEs Chile, Colombia and Mexico) These studies examine in more detail their monetary policy performance and credibility from the Great Moderation through the GFC.

3. Data

[9] In LAW 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 a LAW policy while Filardo and Rungcharoenkitkul (2016) make the case for such a strategy.

Generally, the data for this study are from publicly available databases (e.g., national central banks, OECD Main economic Indicators, International Monetary Fund, Bank for International Settlements, Federal Reserve Economic Database (or FRED), and the World Bank. We have prepared a separate appendix available on request with detailed data sources. Some forward-looking variables (e.g., inflation and real GDP growth forecasts) are also publicly available (i.e., IMF's World Economic Outlook). 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, Eichengreen, and Geraats 2019). Other institutional data used include the World Bank's Governance indicators (https://info.worldbank.org/governance/wgi/#home), the KOF Swiss Economic Institute Globalisation indices (https://kof.ethz.ch/en/forecasts-and-indicators/indicators/kof-globalisation-index.html), exchange rate and crisis data from Reinhart and Rogoff (2009), and Ilzetzki, Reinhart and Rogoff (2019; http://www.carmenreinhart.com/), with other crisis data from Bordo and Meissner (2016), and the Chinn-Ito index of financial openness (http://web.pdx.edu/~ito/Chinn-Ito_website.htm; Chinn and Ito 2006).[10]

As discussed below we also propose an indicator of institutional resilience that partially depends on two other series, namely Baker, Bloom and Davis's (2016) economic policy uncertainty index (EPU; http://www.policyuncertainty.com/index.html), and Caldara and Iacoviello's (2018) geopolitical risk index (GPR; https://www2.bc.edu/matteo-iacoviello/gpr.htm).[11] More details about the proposed indicator follow.

[10] The Chinn-Ito index has since been updated to 2017. The previous vintage of the index is used in the present study.

[11] Country-specific EPU 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 EPU is used. Turning to GPR, 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.

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. Conversion of monthly data is done via arithmetic averaging while, in a few cases (e.g., some forecasts), semi-annual data are converted to the quarterly frequency via interpolation.[12] Most of the time series are in annualized growth rate form to ease interpretation. Some series, such as interest rates are already in percent.[13] 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 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, since 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 data set consists of 29 economies. They are shown in Table 1. By today's standards (i.e., in 2019) 12 are classified by the International Monetary Fund as advanced economies (AE) while the remaining 17 belong to the emerging market group of economies (EME).[14] By 2019, 23 economies explicitly target inflation, of which 9 are advanced economies while 14 are emerging market economies. The starting

[12] 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.

[13] 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 using other methods (e.g., Hamilton and Hodrick-Prescott) but these are not used in the econometric estimates presented in section 5. See, inter alia, Hamilton (2018), and Schüler (2019).

[14] Two countries (Czech Republic and Korea) were not considered AE at the beginning of the sample.

date for the adoption of inflation targets varies considerably (see Appendix II) and 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 data set are considered systemically important and advanced, that is, the US, 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 AE.[15]

Before proceeding we would be remiss if readers were not, once again, reminded of criticisms levelled 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 relies on a mix of *de jure* and *de facto* elements.

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 (e.g., see Frankel, Ma, and Xie 2019). 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 well adherence to a floating

[15] See, however, Chen and Siklos (2019) for such an exercise.

exchange rate regime, which is considered by some to represent a critical element of an IT policy strategy (e.g, see Brdo and Siklos 2017, and references therein).

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 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 (e.g., see Kurtz and Shrank 2007), as are the responses to most of them (Kaufmann, Kraay, and Mastruzzi 2007), but they remain useful since the indicators continue to be updated.[16]

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 EME that joined the European Union (EU), 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 question whether growth causes changes in governance (or any other institutional change) or voce-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.

[16] 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 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.

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 outperforms individual forecasts (e.g., see Timmermann 2006). Similarly, we believe that combining different institutional indicators can provide a more reliable of institutional resilience.

4. Institutional Developments: Some Stylized Facts

4.1 CBI, CBT, 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 (2014) overall index of central bank independence (CBI) for the available sample period, that is, 1998-2017.[17] The AE in our sample are shown to the right of the vertical dashed line while the EMEs are shown on the left. Only 3 EMEs experience a noticeable increase in CBI and that is almost the same number as among the group of AE. However, over the 1998-2017 period, CBI in the vast majority of economies in our sample is unchanged. CBI alone is unlikely to explain much of the great divide in the title of the 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 as a critical ingredient in good

[17] Dincer and Eichengreen's data begins in 1998 and ends in 2010. For convenience we extended the data by estimating a fixed effects panel model for the 29 economies using the overall indicator of the quality of the polity in each economy as a proxy for how CBI 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 data set obtained from http://www.systemicpeace.org/inscrdata.html.

governance. Therefore, one should not under-estimate the importance of this kind of institutional feature.[18]

Arguably, one of the most important institutional developments over the past two decades has been the rise in overall central bank transparency (CBT). Figure 2A displays average changes in central bank transparency over the 1998-2015 period.[19] Once again the vertical dashed line separates the AE from the EME economies in our dataset. Unlike CBI we observe progress in CBT in all economies although this is unevenly distributed. Indeed, improvements are greater in several EME (e.g., Thailand, Hungary) than in some of the best performers of among the AE (e.g., New Zealand, Czech Republic).[20]

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

[18] Indeed, the current Chair of the FOMC, Jerome Powell, has felt it necessary to remind the public of the importance of CBI. “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).

[19] The data from Dincer, Eichengreen and Geraats (2019) ends in 2015 and we made no attempt to extend their data set. The index is an update and improvement over the original Dincer and Eichengreen (2014) index of CBT. The indicator of CBT ranges from a minimum of 0 to a maximum of 15. CBT is an aggregation of scores based on 5 sets of characteristics. They are: political transparency, economic transparency, procedural transparency, policy transparency and operational transparency. See Dincer, Eichengreen and Geraats (2019, pp. 329-332).

[20] 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.

Although we cannot be certain, of course, there is a risk that the steady rise in CBT, together with the occasional increase in CBI, may come into conflict with an overall deterioration in institutional quality threatening 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[21] 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 CBT in the AE and EME against an average of the World Bank's indicator of governance indicators (WBGI).[22] 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.

Consider the AE 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 US, Hungary, Thailand, South Africa, Australia, Canada, and Brazil. When the governance indicators are combined as described above 7 of the 17 EMEs shown in Figure 3B experience an overall decline in governance quality. They

[21] This is a far more accurate description of the CBI index than the CBT indicator which is largely based on information made public by central banks.

[22] The WBGI consist of 6 characteristics of governance. They are: 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.

are: Argentina, Brazil, Hungary, Mexico, Philippines, Thailand, and South Africa.[23] In the case of the AE the Eurozone, the UK and the US contribute to reducing the AE's level of governance quality.

Turning to the data aggregated for the AE versus the EME, 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 GFC. This stands in contrast with the continued rise in CBT over time although there is a levelling off after the GFC. Turning to the EME 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 CBT shows no signs of abating by 2015.[24]

A few other institutional indicators are worthy of mention although we relegate to the appendix the details. First, despite the GFC, financial globalization continues to rise. This is not a phenomenon restricted to the AE 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 EMEs (e.g., Indonesia, Turkey, China and Malaysia) and even in a few AE (e.g., Canada, Norway, and New Zealand).[25] The Chinn-Ito indicator, over the 1998-2016 period, provides a similar interpretation at least as regards capital account openness with progress in several AE and EME although the message is again mixed for the EMEs with several countries becoming less open to capital flows (e.g., Argentina, Indonesia, Thailand, and Malaysia).[26] Finally, average changes in monthly indicators of the degree of exchange rate flexibility over the 1998-2019 period obtained from Ilzetzki, Reinhart and Rogoff's (2019) exchange rate regime classification also

[23] 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.
[24] The WBGI data are available until 2017 and the downward trend in governance in EME continues. Since the CBT data end in 2015 the governance indicators for 2016 and 2017 are not shown.
[25] 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, Haelg, Potrakke, and Sturm (2019). Our calculations are based on an average of index values over the 1996-2017 period.
[26] The Chinn-Ito index codifies the restrictions reported in the International Monetary Fund's Annual Report on Exchange Arrangements and Restrictions.

provide a mixed message with roughly half of the economies in our sample showing no regime changes while 5 EME economies' regimes are less flexible (e.g., Thailand, Colombia) while 3 demonstrate greater flexibility (Chile, Brazil, Turkey). Among the AE 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 AE versus EME since the late 1990s. Figure 4 plots the 'distance' between inflation in each economy over the 2000-2018 period vis-à-vis US inflation. One must take some care in drawing too strong conclusions from these calculations since it is not immediately evident that US inflation is always the benchmark for best practice in monetary policy.[27] 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 AE, EME inflation rates should be higher the distance measure is silent about whether estimates are higher than might be desirable.[28]

It is generally the case that distance remains highest between US inflation and inflation in EMEs though there are a few exceptions among AE including Japan, Norway and Israel. A concern for policy makers is how to think about best practice when it comes to monetary policy regimes and inflation when AE suffer from inflation rates persistently below their stated targets while several EME 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

[27] 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.

[28] 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 EME 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.

Consensus forecasts and forecasts from the IMF's World Economic Outlook (WEO).[29] A large gap signals the possibility that expectations have become unanchored. Of course, the precise source of the un-anchoring remains to be determined. The left-hand side plot compares the evidence for all 29 economies (ALL) against established IT economies (ITEST; defined previously), all AE that explicitly target inflation (ITAE; see Table 1), and AE that are not considered IT economies (NITAE). The right-hand side plot distinguishes between EME 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 IT 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 EME 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 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

[29] 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) using a simple transformation that is commonly used although it is, admittedly, somewhat *ad hoc.* See Siklos (2013) for more details.

does not prove that IT 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.

Global factors are shown in Figure 6 for observed and expected inflation.[30] To obtain an estimate of global inflation we estimate the first principal component for AE only (via maximum likelihood) since this is arguably one benchmark that can be used to evaluate inflation performance of EMEs. A sharp decline in global inflation expectations is noticeable in the early 2000s and there is, subsequently, relative stability although our estimates are persistently just below the 2% goal of central banks in the AE following the GFC. There is greater volatility in the global inflation factor based on observed CPI inflation especially since the GFC. Notice that the gap between observed and expected global inflation is positive in the immediate aftermath of the GFC and turns negative after 2014 (i.e., observed inflation is below expected inflation). More generally, expectations change more slowly than observed inflation and, if 2% is deemed an inflation rate that central banks around the world ought to aim for, then global expected inflation persistently under-performs since the GFC according to this metric.

Finally, to further illustrate differences in inflationary developments in AE versus EME 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 mid-point 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 EME and AE that we wish to highlight. In particular, while central banks in EME struggle with

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

inflation rates at the top of the target the opposite is often true for AE.[31] This phenomenon is particularly noticeable after the GFC but is also a feature of the years leading up to the end of the Great Moderation around 2006. The impact of the GFC on observed inflation relative to expected inflation is also striking with the latter seemingly not overly sensitive to changes in observed inflation. However, post-GFC, we observe inflation expectations remaining persistently above the target in South Africa while the opposite is true in Sweden's case. The Fed in the US, not considered an IT central bank, faces a comparable experience as shown in Figure 7B. Inflation is below a notional 2% medium-term objective for most years since 2008. Only at the end of the sample (i.e., 2016-18) does inflation exceed 2%.[32]

4.2 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 (inter alia, Acemoglu, Naidu, Restrepo, and Robinson (2019), Eichengreen and Leblang (2008), Rivera-Batiz (2002), and references therein).

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

[31] The South African Reserve Bank (SARB) has admitted to allowing inflation to drift to the upper limit of the band. See, for example, Reid, du Plessis and Siklos (2018), and references therein. The phenomenon wherein an IT central bank targets inflation from below has been studied by Ehrmann (2015).
[32] 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).

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.[33]

Our approach is straightforward. We aggregate 10 institutional indicators where each one is normalized first to generate values that range between 0 and 1.[34] We then aggregate the scores by summing the normalized scores to obtain our resilience indicator.[35] Out of the 10 institutional characteristics 7 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: CBI, CBT, the 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, capital account openness, financial and trade globalization. Three factors contribute to reduce resilience when their indicators increase. They are: greater economic policy uncertainty, higher geopolitical risks, and the incidence of financial crises.[36] As a result, the resilience index ranges from a minimum of -3 to a

[33] 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) though 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.

[34] 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 the maximum value in the sample.

[35] 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.

[36] The incidence of financial crises is the sum of the average annual number of banking, currency, domestic and external sovereign debt crises based on the Reinhart and Rogoff (2009) and Bordo and Meissner (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. They are: Russia (currency, 2014); 2011-15 (Eurozone, domestic sovereign debt); Argentina (currency and external sovereign debt, 2017-18); a table in the appendix provides additional details.

maximum of +7. We did not apply any weights to the individual components of the indicator as there is no theoretical guidance to suggest a plausible weighting scheme.

Figure 8 provides three different views of our resilience indicator. The top portion of the figure shows the range of estimates for AE; the middle portion for the EME in our data set while the bottom offers a direct comparison of resilience between AE and EME. Perhaps unsurprisingly there is considerable variation in resilience between the two country groups although mean levels of resilience in AE always exceed ones obtained for EME. Nevertheless, while resilience declined temporarily in AE in the aftermath of the GFC the opposite took place in EME. Unfortunately, the temporary rise in resilience after 2008 in EME did not last although the gap between the best and worst performers has narrowed since the GFC relative to the period between 1998 and 2008. In the case of the AE the impact of the GFC 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 EME is higher at the end of the sample relative to the period before the GFC. 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 AE and EME and, while we cannot assign any statistical significance to the results, one would hope that institutional resilience in EME can catch-up to levels reached in AE as is the case with some key indicators of central bank institutional quality (e.g., CBI, CBT, the adoption of IT).

We also examined the resilience indicators for each country in the sample (not shown; see the appendix). The scores for AE are consistently higher than in EME. However, scores appear more volatile in EME 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 EME, including Colombia, Indonesia and Mexico where improvements in resilience in the early 2000s have persisted.[37]

In sum, the resilience of institutions, including the central banks in EMEs, has not caught up with their counterparts in the AEs. This suggests that these countries remain more vulnerable to shocks.[38]

4.3 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 notion that best practice implies that central banks ought to be able to control inflation in the medium-term (e.g., over a 2 to 5 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 the formation of expectations. Perhaps the best that can be expected is that the aforementioned gap ought to be small.[39] Moreover, one might add, in view of growing evidence that macroeconomic uncertainty in general also has negative economic consequences (e.g., Bloom 2009, Jurado, Ludvigson and Ng 2015), that it is

[37] 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. t

[38] In her panel presentation at the same Conference Kristin Forbes uses our data but omits the last three elements, that is, EPU, GPR, 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 AE and EME resilience post-GFC remains. Interestingly, however, EME resilience dips temporarily in 2008 while there is hardly any change in AE resilience.

[39] 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 suggests considerable persistence. Notably, the period since the GFC only affects persistence in the Eurozone and New Zealand. Both experience a significant drop in persistence since 2008Q4 (results not shown).

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 (e.g., Forbes 2019).

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:

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

The first two lines in equation (1) define the credibility 'penalty' central banks suffer when they miss their targets. Since IT is typically defined somewhat more loosely in many EMEs 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 1% for AE and 2% for EME. This is indicated by the values taken by θ as shown in the third line 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. Finally, we consider three different proxies for the gap between expected inflation and the target. 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.[40]

[40] So far, the definition follows our earlier work although previously we were more conservative in some of our estimates for EMEs 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.

Next, we turn to estimates of the inflation target (π_t^*). In our earlier work we proxied each economy's IT using a moving average of past inflation (e.g., 5 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.[41] We proxy the *de facto* inflation target as the mean from 3 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 2 to 8 quarters and estimates from a one-sided Hodrick-Prescott filter.[42] These are applied to the full available span of the data.

The next two elements of our estimates of credibility represent the impact of monetary policy uncertainty and the global factor. These are given by the last two lines of equation (1). 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. To proxy monetary policy uncertainty (MPU) 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 (e.g., see Siklos 2013, 2019, and references therein) 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

[41] 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 IT, 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.

[42] We use a smoothing parameter of 1600 for the HP filter.

we are not able to generate reliable estimates of the distribution of inflation forecasts or forecast disagreement.

The global factor in credibility (last line in equation (1) is captured by deviations of observed inflation from an estimate of global inflation. 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.[43] 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, pass-through effects vary considerably across the economies in our sample.

We proxy the global inflation target, π_t^*, 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 IT 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, $\bar{\pi}_{t-1}^G$ is lagged one period to allow for a delay in collecting the data.[44]

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

[43] The addition of this element is partially inspired by Clarida (2018) who argues, 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.

[44] Using the contemporaneous measures of inflation and global inflation has little impact on the results.

$$\text{CRED}_{it} = \begin{cases} (\overline{\pi}^{f}_{i,t+1} - \pi^{*}_{it}), \text{ if } \pi^{*}_{it} - \theta \leq \overline{\pi}^{e}_{i,t+1} \leq \pi^{*}_{it} + \theta \\ (\overline{\pi}^{f}_{i,t+1} - \pi^{*}_{it})^2, \text{ if } \pi^{*}_{it} - \theta > \overline{\pi}^{e}_{i,t+1} > \pi^{*}_{it} + \theta \end{cases} + \text{MPU}_{it} + \text{GLOBAL}_{it} \quad (2)$$

where CRED is the estimate of monetary policy credibility for economy *i* at time *t* and all other terms were previously defined. Positive values for each component are seen as contributing to reduce credibility since 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 an individual's economy's monetary policy. 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 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.

Credibility falls sharply during the GFC 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 GFC 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 Argentina's central bank.

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 AE versus the EME. For the available sample the GFC stands out, not surprisingly, as signaling a large but temporary loss of credibility. Note, however, that the loss of credibility is comparatively greater for AE. Similarly, EME central banks regain credibility faster than their AE 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 EME central banks losing credibility for longer than in AE. Nevertheless, the latter were not immune to what are likely the spillovers from the Asian financial crisis on AE.[45] Central banks in EME also suffered credibility losses in the early to mid-1990s while credibility in the AE group improved perhaps due to the increasing number of countries that adopted the IT monetary policy strategy.

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 (CREDN4) or the one-year ahead mean inflation forecast is used (CREDN2). While the two sets of estimates are comparable there are the occasional differences. At least three of the four were at the centre of the GFC while Japan has long been mired in a low growth – low inflation or deflation environment. Clearly, the GFC stands out for the US, GB and the EZ, 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 BoJ to raise inflation[46] have led to substantial increases in credibility losses. Figure 10C

[45] Note that Japan and Korea are among the AE group of economies.
[46] Since 2012 the BoJ has raised the inflation target, introduced additional quantitative and qualitative easing measures. See, for example, Iwasaki and Sudo (2017).

focuses on the so-called BRICS, essentially the largest EME in our dataset. There are two aspects to note for these economies. First, unlike their AE 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 EMEs, most notably India where credibility losses tend to be larger when the forward-looking inflation data are used.

Next, we examine in Figure 10D credibility in AE countries that adopted IT earliest, namely, AU, CA, NZ, SE, and NO. While the GFC 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 LATAM countries in the dataset. In the former group of economies, the Asian Financial Crisis stands out in at least three of the 5 countries shown (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) reveals 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 AE with IT only the GFC really stands out in the data shown since the late 1990s.

To conclude EME central banks, with the exception of the BRICS economies, did not suffer the same credibility losses during the GFC as did central banks in AE. Moreover, a credibility gap remains as the EME central banks, on average, are less credible than their AE 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.

5. The Impact of Selected Shocks

5.1 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 AE and EME 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 centre stage since this seems like the most fruitful way to understand differences between AE and EME in how they respond to a variety of economic shocks. As noted in earlier sections many of the reforms in monetary policy adopted by EME originated in AE. Second, by virtue of their size, shocks emanating from AE are likely to be an important device to understand how resilient EME 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 US or a combined shock from three systemically important advanced economies, namely the US, the Eurozone and Japan. Each factor is labelled *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

$$\mathbf{X}_{ijt} = \boldsymbol{\alpha}_{ijt}\mathbf{F}_{ijt} + \boldsymbol{\varepsilon}_{it} \qquad (3)$$

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.[47] 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 GFC (i.e., US, 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 (ZLB).[48] 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.

[47] 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.

[48] 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, Lombardi, and Siklos (2019), and references therein. It is worth noting that the ZLB period begins before the GFC in Japan's case.

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.[49] 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.[50]

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 to generate factor loadings as well as ones that are consistent with economic theory.[51]

Many in the literature have proxied a global component by assuming that shocks emanating from the U.S. fulfills this role (e.g., Feldkircher and Huber 2016). 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 (e.g., Kose, Otrok, and Prasad 2012). 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 US, 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.

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

[50] See Chen and Siklos (2019), and references therein, for a more extensive discussion of the specification and impact of various filters for a data set that consists of four systemically important economies (i.e., including China).

[51] 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 AE 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, Hooper, Mishkin, Schoenholtz, and Watson (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.

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

$$\mathbf{X}_{ijt} = \boldsymbol{\gamma}_{ijt}\mathbf{F}^{G}_{it} + \boldsymbol{\lambda}_{ikt}\mathbf{F}^{D}_{ikt} + \boldsymbol{\nu}_{ijkt} \qquad (4)$$

where *i* is as previously defined, *k*= US, γ, λ are, respectively, the factor loadings for the global (i.e., $\mathbf{F}^{G}$; the US), and domestic factors ($\mathbf{F}^{D}$; 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[52]

$$\mathbf{P}_{ijt} = \boldsymbol{\Omega}_{ijt}(\mathrm{L})\mathbf{P}_{ijt-1} + \boldsymbol{\psi}_{jt}(\mathrm{L})\mathbf{F}_{jt} + \boldsymbol{\xi}_{jt} \qquad (5)$$

where $\mathbf{P}_{ijt} = \left[R_{jt}, T_{jt}, F_{jt}, M_{jt}\right]'$ and $\mathbf{F}^{G}$ 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 $\mathbf{F}^{G}_{jt}$ is also a time-varying element. Recall that the elements of **P** consist of the (domestic) Real, Trade (T), financial (F), and monetary (M) factors.

One issue that arises from estimation of any VAR is the ordering of the variables. While ordering the real factor first is unlikely to be controversial, as almost all empirical work of this variety suggest that real economic factors are the 'most' endogenous in a recursive or Cholesky decomposition, 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 since it is affected by all the other shocks while these same shocks only

[52] "Quasi" time varying because the factors scores are time-varying not because the coefficients in the PVAR are time-varying. See below.

impact M with a lag. This is also standard in almost all estimated macro-econometric 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 (e.g., see Canova and Ciccarelli (2013), and references therein) 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. 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 5 to 6 years in length in a rolling manner. The sample is rolled ahead two years at a time. This produces a series of overlapping samples.[53] 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 $\mathbf{P}_{jt}^{d'} = \left[y_j, f_j, \varepsilon_j, pr_j\right]'$ where y is real GDP growth, ε is the rate of change in the real exchange rate, f is credit growth, and pr

[53] The samples are 5 years long for the real and trade factors and 6 years 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.

represents monetary policy. Again, we also consider a version augmented with credibility where $\mathbf{P}_{jt}^{d'} = \left[y_j, f_j, \varepsilon_j, CRED_j, pr_j\right]'$.[54] Hence, the specification based on observable time series is written

$$\mathbf{P}_{jt}^{d} = \mathbf{\Omega}_j(L)\mathbf{P}_{jt-1}^{d} + \mathbf{\Psi}_j(L)\mathbf{P}_{jt}^{US} + \mathbf{\xi}_{jt} \qquad (6)$$

where all terms were defined previously. Note that $\mathbf{P}^{d}$, $\mathbf{P}^{US}$ are time invariant. We continue to assume that the global factor consists of US shocks alone.

We now turn to the data and estimation results.

5.2 Shocks to AE and EME

The panel VARs are estimated via GMM instrumented using 1 or 2 lags of the endogenous variables (i.e., as in Holz-Eakin, Newey, and Rosen (1988); also see Abrigo and Love (2005)). The VARs rely on 1 lag. Panel-specific fixed effects are removed via a Helmert transformation to reduce dimensionality.[55] All panel VARs 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 AE, where 11 cross-sections are included, this yields 649 observations or 68 observations per cross-section. For the EME, there are 16 cross-sections yielding 1088 observations.[56] Confidence intervals are also estimated via Monte Carlo and 68% 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% 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

[54] 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.

[55] 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).

[56] 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.

non-bank financial assets to GDP, the trade factor or real effective exchange rate growth, central bank credibility[57] and the monetary factor which is represented by the policy rate in both versions of the model. US 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 11) rely on observable time series; the second set of Figures (i.e., Figure 12) are 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 US (i.e., global shocks) on the remaining AE and EME. As argued above, our discussion focuses on the differential impact of central bank credibility, monetary policy, trade and financial conditions in AE versus EME.

We first examine the results for the AE. These are shown in Figures 11A through 11D. A positive credit shock fuels a rise in real GDP growth. Similarly, real exchange rate appreciations[58] improves 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[59] reduces credit growth but has a positive impact on real GDP growth. Since our indicator of credibility aggregates three components, either a rise inflation forecast errors, monetary policy uncertainty or global inflation divergences (which can also impact competitiveness) can combine to reduce credibility and may well prompt central banks in AE to raise the policy rate. All of these can explain the kinds of impulse responses reported in Figure 11A.

Dynamic multipliers in Figure 11B reveal that US 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

[57] CREDN4 is the label describing the normalized estimates of central bank credibility described earlier.
[58] The real exchange is defined here such that a rise signals an improvement in competitiveness.
[59] Recall that CRED is defined in a such a way so that a rise implies a fall in central bank credibility.

growth in AE. This occurs at first although it is eventually reversed beginning five quarters in the future. A rise in US competitiveness is seen as reducing real GDP growth in other AE, the policy rate temporarily, and central bank credibility. The latter result might be explained by the reduction in competitiveness when US 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 US real GDP growth improves central bank credibility in AE 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% of variation in real GDP growth, 18% of real exchange rate fluctuations as well as about 15% of variation in policy rates.[60] However, credibility shocks explain virtually none of the changes in credit growth (1% of the variation) while real exchange rate movements are not very sensitive to policy rate shocks (8% of the variation).

Turning to the same model now estimated using factor scores for the real, trade, and financial variables, Impulse Responses (IR) are shown in Figure 11C. Although the interpretation of many of the IR are 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 credn4) 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

[60] 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 IR from the real exchange rate and credit growth to central bank credibility are affected. All other IR are unchanged.

tf1 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 US monetary policy tightens monetary conditions in the remaining AE and improves their central banks' credibility. Second, a positive US real shock (i.e., a rise in us_rf1) improves competitiveness and real economic conditions in the other AE.[61] This is the case of a rising tide lifting all boats.

We now turn to the results for EME shown in Figures 12A through 12D when the variables are observable. Three results are worth highlighting. First 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 AE. Unlike the experience in AE, credit growth has no impact on real GDP growth. Otherwise, the results are broadly similar with the ones reported for AE.[62]

Variance decompositions (not shown) reveal that credibility shocks explain around 25% of variation in credit growth and 11% of the policy rate in EME after 10 quarters. The same shock explains only 2% of real GDP growth and 6% of real exchange rate changes. Policy rate changes explain a large portion of the real exchange rate variable (38%). Other than the impact of credibility shocks on the policy rate, which are comparable for AE and EME, central bank credibility in EME explains far less real GDP growth

[61] When the ordering of some of the variables is changed the link between credibility, trade, and financial conditions becomes insignificant. Other IRs 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 AE. As we shall see below, the same result is not obtained for the EME.

[62] 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.

developments and real exchange rate changes than in their counterparts in AE. By contrast policy rate shocks have a much bigger influence in real exchange rate developments in EME than in AE.

Turning to spillovers from US shocks shown in Figure 12B we find that, although a tightening of US monetary policy also leads to higher policy rates in EME and higher credit growth, central bank credibility in these economies also deteriorates slightly but only for one quarter. There is no impact on EME real GDP growth of a U.S. tightening of monetary policy. However, unlike for AE, rising US real GDP growth improves trade competitiveness and leads to a small decline, after 5 quarters, in policy rates in EME and not an increase as in AE.

Finally, Figures 12C and 12D plot the IR for the factor-based model applied to the EME. 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.[63] Only the impulse responses between credit growth (see 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 EME, both the impulse responses and dynamic multipliers behave similarly in EME and AE.

Variance decompositions (not shown) suggest that around 9% of credibility shocks explain monetary conditions which is considerably higher than in the case of AE but monetary shocks explain less of the variation in financial, real and trade factors than in AE (around 6 to 10%).[64] Moreover, greater US

[63] Changing the ordering of some of the variables (see above) in the model has no impact on the IR.
[64] Granger causality testing (not shown) also finds that, unlike AE, monetary policy shocks in EME are more responsive to the other variables in the model. Finally, dynamic multipliers (Figure 12D) suggest that US monetary policy shocks deliver a central bank credibility dividend in EME but at the expense of looser financial conditions.

competitiveness also leads to looser financial conditions in EME, 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 shock), between AE and EME. A summary of the results is provided in Table 3. The domestic response to a tightening shock is the same on both AE and EME and irrespective of whether observable or factor modelling used. In principle, this ought to make it easier for policy makers 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 AE 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 EME. 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 AE and EME.

The only sour note for EME 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 US dollars (e.g., see BIS 2019). Finally, even if the sign of the responses is often similar when AE and EME 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 AE and EME 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 EME 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 AE than in EME 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 at the very least more data before it is conclusive.

6. 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) on the performance of central banks in both advanced (AE) and emerging (EME) countries. Our focus is on the post Bretton Woods era. We document the progress made by the AE 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 (CBI), central bank transparency (CBT), and the adoption of inflation targeting. The apogee of this evolution was the Great Moderation from circa 1985 to 2006.

The EMEs 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, Eichengreen et al 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 EMEs (e.g., Chile and Korea) began to learn from their crisis experience and began following the lead of the AEs in developing sound fiscal, monetary and financial institutions. By the 1990s several EMEs began to tame their inflation problems and their inflation rates

converged to those of the AE. Those adopting IT were at the vanguard of this process (Bordo and Siklos 2014).

The GFC of 2007-2008 was a major global shock which had serious consequences for the AEs. Their central banks began to attach greater importance to financial stability while still following flexible IT policies. Many of the EMEs fared well but some with exchange rates pegged to the AEs 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 AE, especially those with original sin (i.e., foreign currency denominated debt, see Bordo, Meissner, and Stuckler (2012)).

Given this background we document what has happened since the GFC to central banking institutions and inflation performance in the EMEs relative to the AEs. We show that that some of the patterns observed before the GFC continued but some were significantly different. Our study shows that, although some EMEs did maintain the levels of CBI and CBT that they had before the GFC, 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 CB credibility. Indeed, it appears that CB credibility in EMEs is more fragile than in the AEs. Although the EMEs, as a group, avoided the worst of the direct effects of the credit shocks of the GFC a number are still struggling.

This we believe reflects both the impact of the global shock that was the GFC 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 economies of the EME to a greater degree than in the AE. Stated differently, credibility shocks appear to have more temporary effects in AE than in EME. Moreover, U.S. shocks, when viewed as representative of global shocks that hit all economies, range from being benign to beneficial for EME and more so than for the remaining AE in our dataset.

Two main policy lessons follow from our study.

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

Second, the problem of the post-GFC era is not just of the EMEs making. AE central banks following best practice have been unable to hit their IT from below (Ehrmann 2015). This impinges on their credibility just as the EMEs not being able to hit their IT from above. In particular, one difficulty faced by the EME but not the AE, at least over the past decade, is that explicit inflation targets and the permissible range of inflation rates, has changed on several occasions thereby giving the impression of a moving target. In contrast, among AE, there is a consensus that 1-3% 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 AEs after the GFC was because of the GFC – that all serious recessions with financial crises have slow recoveries (Reinhart and Rogoff 2009*).*[65] 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 CBs, and the fact that the Federal Reserve and the other CBs did not follow an expansionary monetary policy but a credit (carry trade) policy because of the payment of interest on excess reserves (Lombardi, Siklos, and St. Amand 2018, and references therein). Others focus on the supply side and see the deep fundamentals of globalization and TFP as keeping wages and prices down. Still others argue that CBs should raise their inflation targets to give them more cutting room for the next recession (Blanchard,

[65] 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 (Bordo and Haubrich 2017).

Dell'Ariccua, and Mauri 2010, Ball 2014). Although the fact that the CBs have up to now been unable to reach their two per cent targets casts doubts on this case. The implication of these issues is that it is difficult to urge the CBs of EMEs to follow the AEs best practice if our understanding of the concept it is in a state of flux.

The ongoing debate in the Federal Reserve over the monetary strategy it should follow illustrates this conundrum. The issues under consideration include: continuing to follow a form of IT, shifting to an average IT type 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 CBs of the EMEs to develop their catching up to the AEs.

Table 1 Economies in the Data Set

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

Note: Highlighted names belong to the Advanced Economies (AE) group while the remainder are Emerging market Economies (EME). The selections are based on the 2019 World Economic Outlook.

Table 2 Factor Estimation

CRED	REAL	TRADE	FINANCIAL	MONETARY	GLOBAL
CRED is the credibility indicator	Real GDP	Real exchange rate	Equity prices	Policy rate	US
	Inflation	Current account/GDP	Private non-bank financial assets to GDP[1]		or
	Real GDP growth forecast	Forex reserves	Housing prices		S3 = US, EZ, JP
	Inflation forecast		Yield curve (i.e., short less ling rate)		
			Interest rate differential (domestic less US short-term interest rate)		

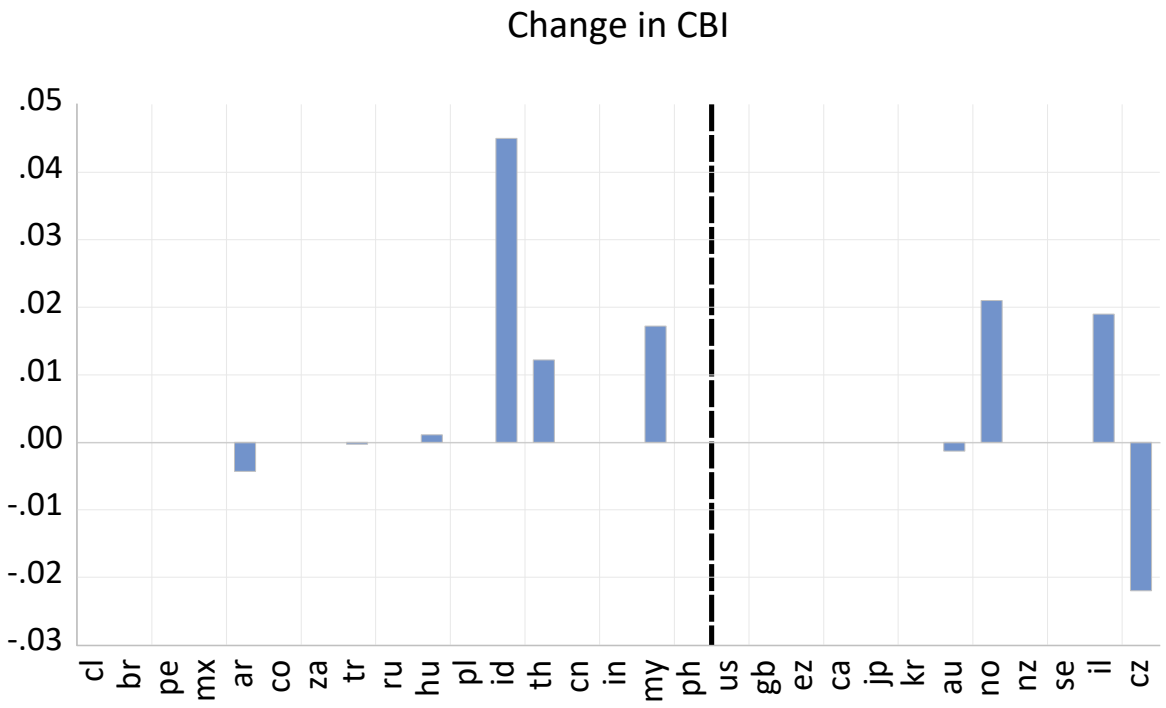
Note: the text also provides some details about the form in which the series enter the various factor models. Real GDP, the current account/GDP, interest rate differential, the yield curve, and the policy rate are in levels; (1) enter in first difference form. The remaining series are in annualized growth rate form (i.e., 100 times (log(X(t)-log(X(t-4))).

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*
CB Credibility worsens	Amplified	CB Credibility worsens	*No change*
FACTOR MODEL BASED PANEL VAR			
Impulse Responses	*Dynamic Multipliers*	*Impulse Responses*	*Dynamic Multipliers*
Tightening	Amplfied	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

Note: The interpretations refer to the accumulated impact of shocks after 10 quarters. When a term is underlined this means that the dynamic multipliers (i.e., a tightening monetary policy shocks from the U.S.) offsets 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.

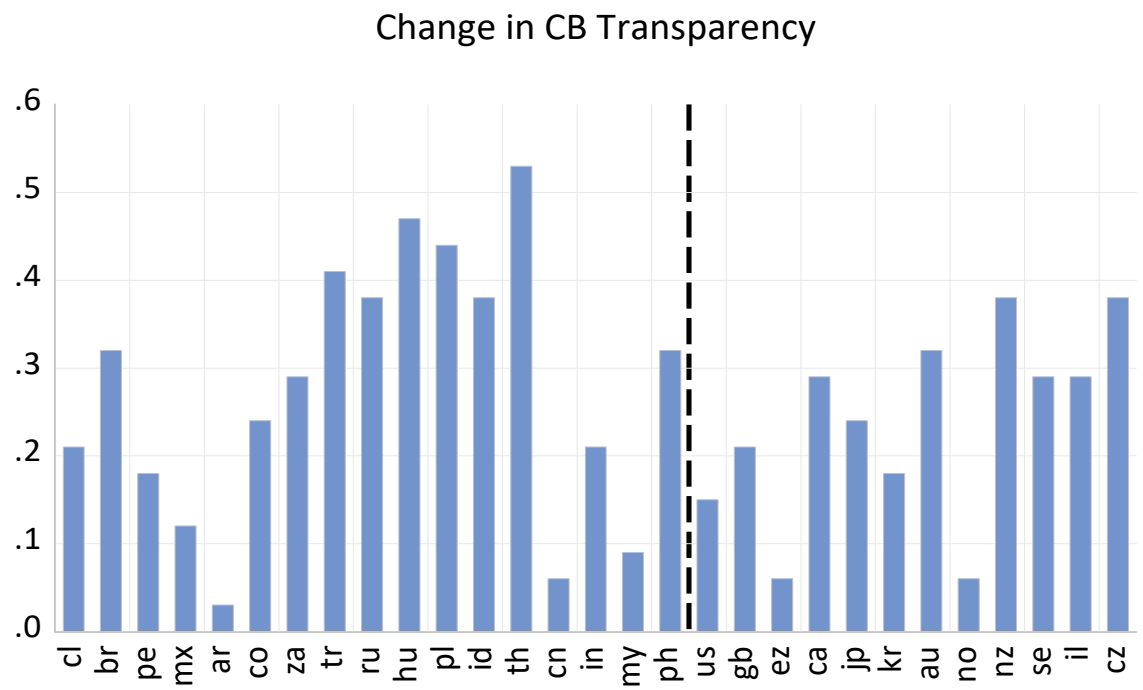
Figure 1 Changes in Central Bank Independence, 1998-2017



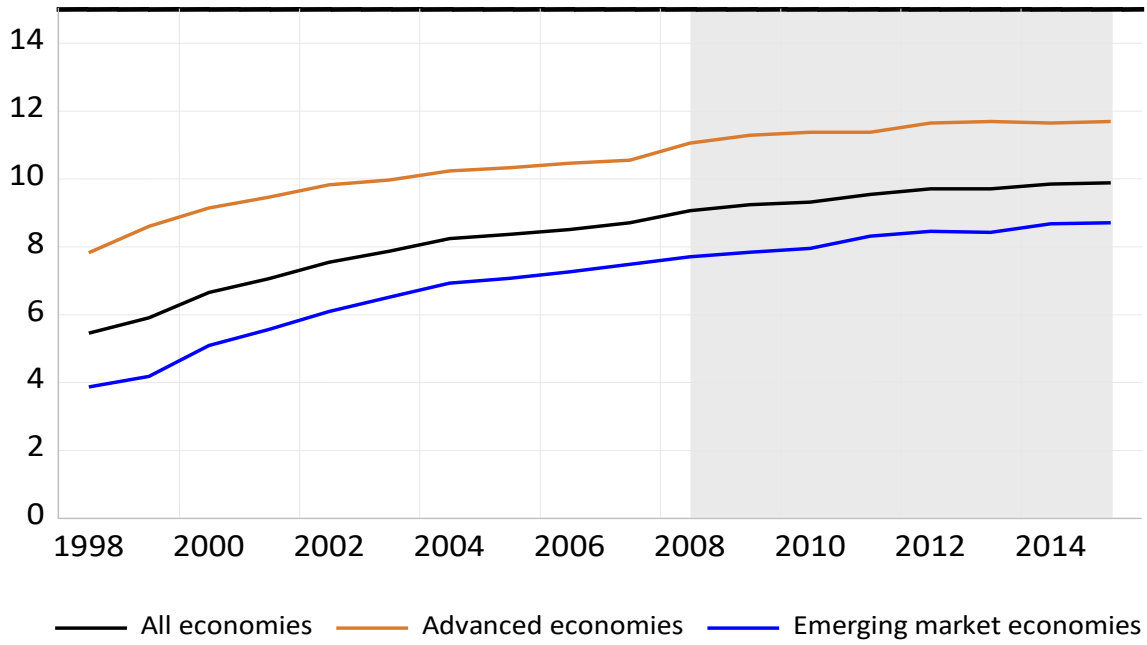
Note: See Table 1 for the ISO codes. The vertical dashed line divides the AE from the EME in the sample. See Table 1 for the list. The overall measure of central bank independence from Dincer and Eichengreen (2014) up to 2010 is used updated to 2017 as explained in the main body of the text. A positive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

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

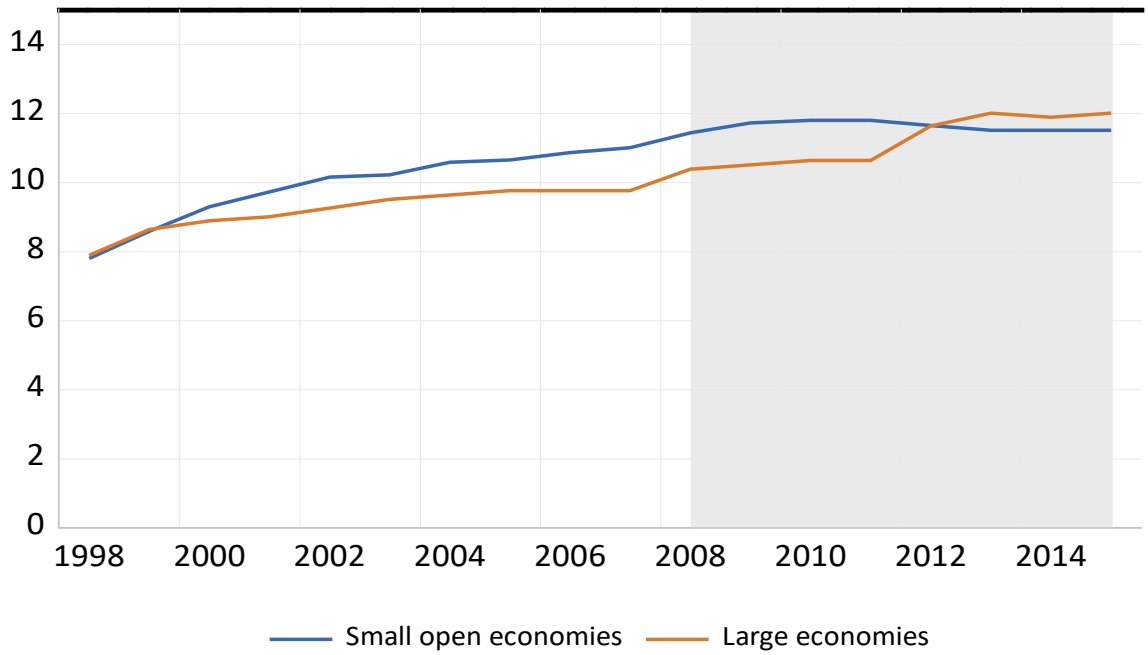
(A) Changes in Central Bank Transparency



(B) Levels of Central Bank Transparency Over Time



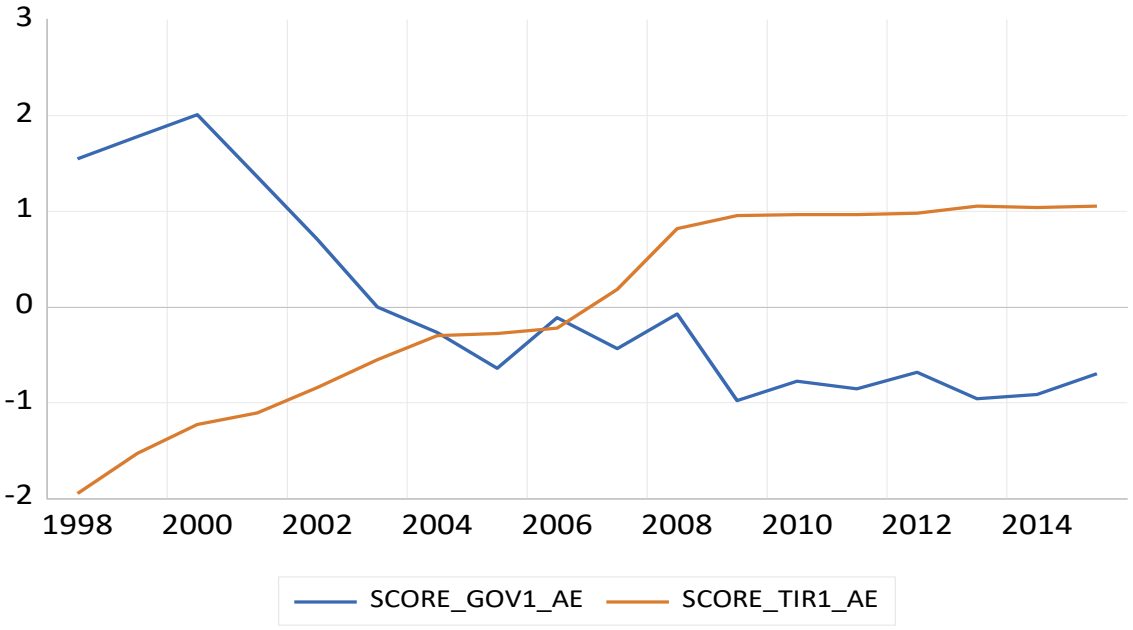
(C) Levels of Central Bank Transparency



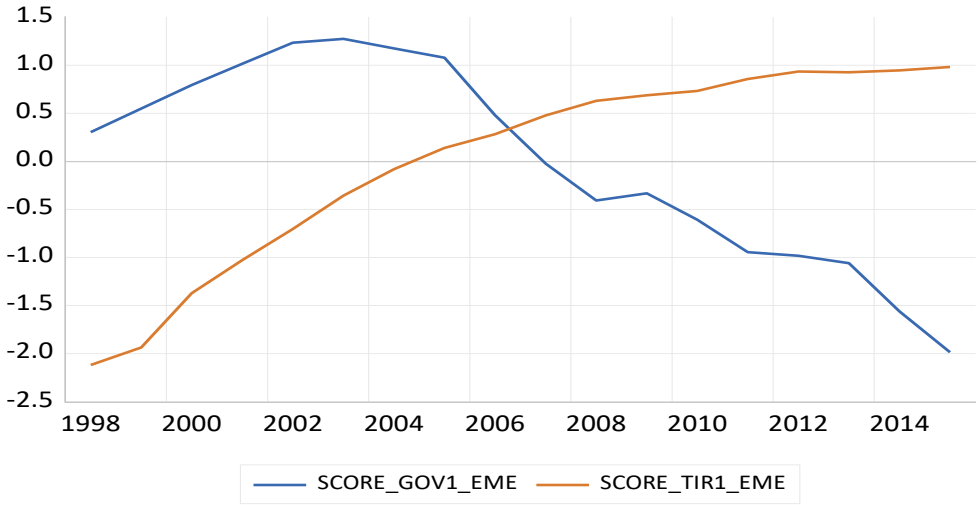
Note: Constructed from data in Dincer, Eichengreen, and Geraats (2019). Table 1 contains the ISO codes and the list of AE versus EME. Also, see Figure 1. CBT ranges from a minimum of 0 to a maximum of 15 as shown by the dashed line in part (B). Positive values signal more CBT or an improvement in CBT.

Figure 3 Central Bank Transparency and Governance, 1998-2015

(A) Advanced economies

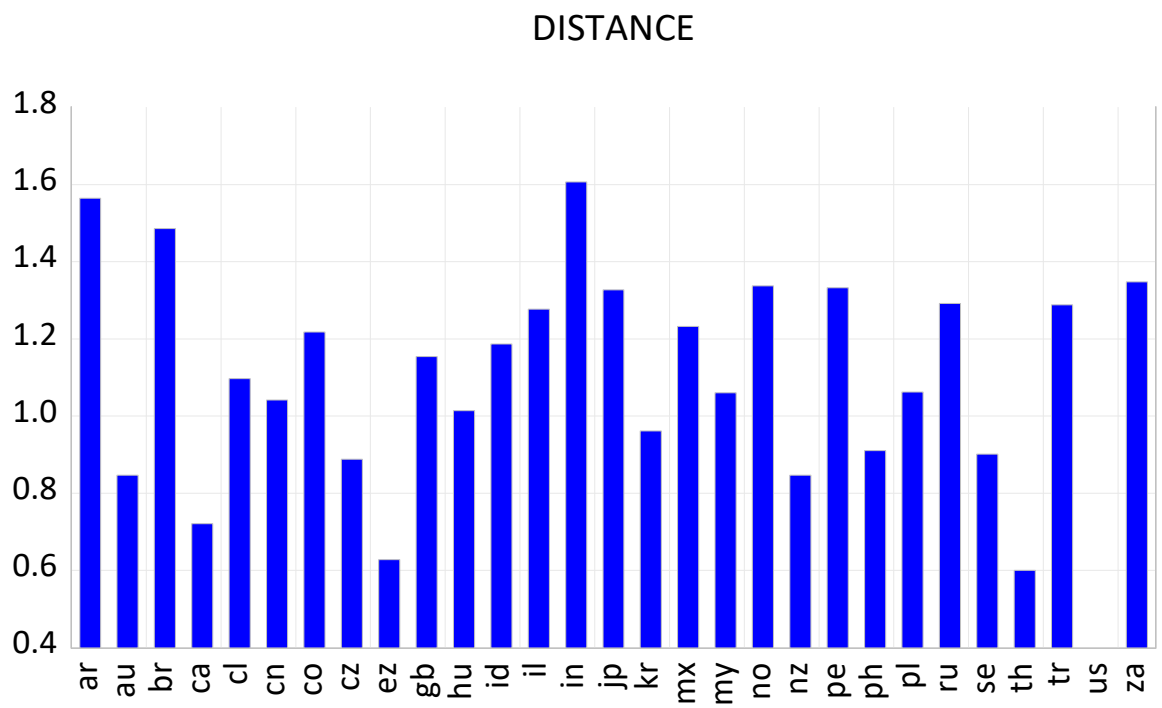


(B) Emerging Market Economies



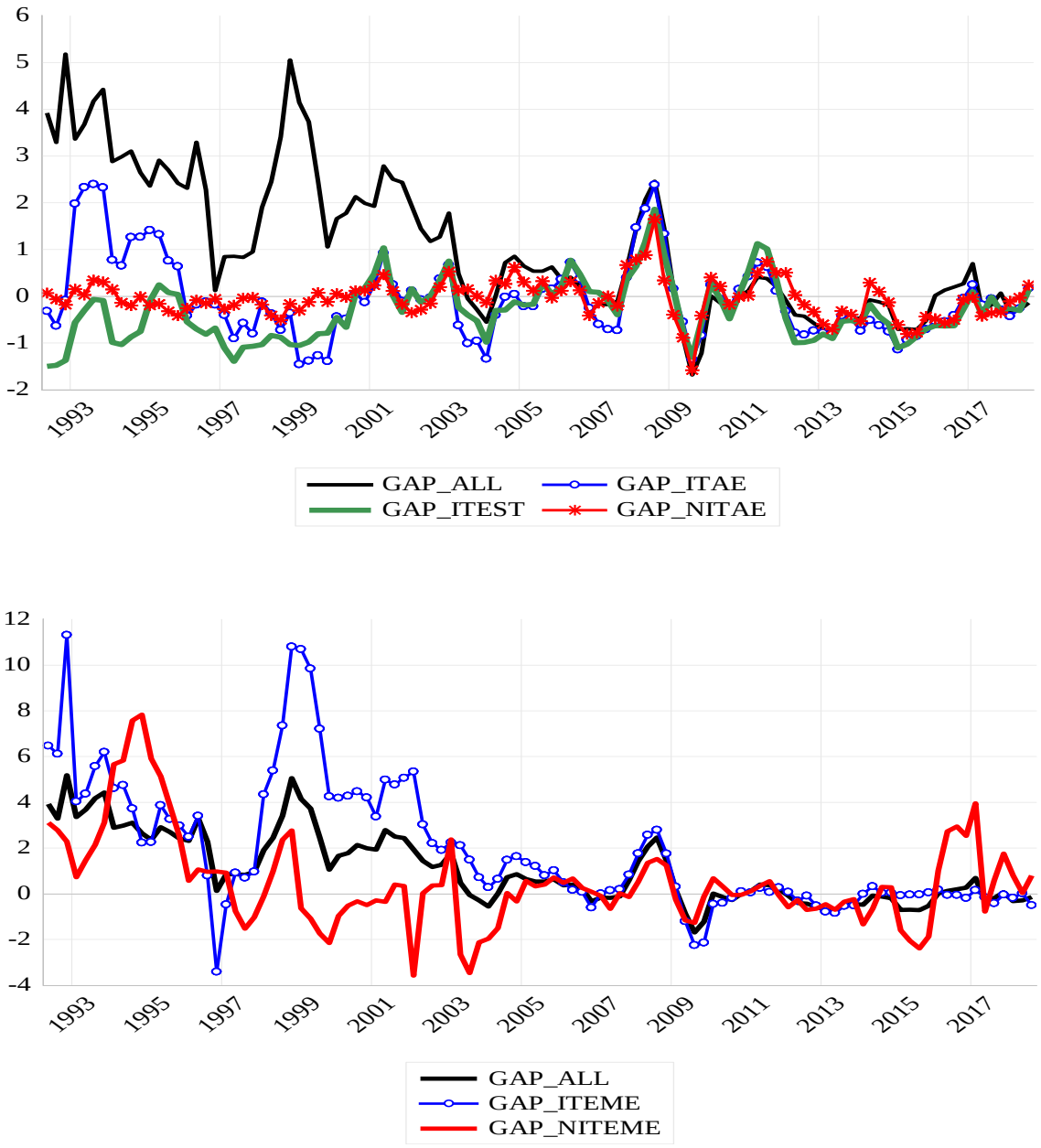
Note: GOV1 is the sum of the 6 components of governance: voice and accountability, rule of law, regulatory quality, government effectiveness, control of corruption and political stability. EME are emerging market economies, large economies are US, JP, EZ, GB, small open economies are CA, NO, SE, NZ,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

Figure 4 Inflation Distance from US Inflation



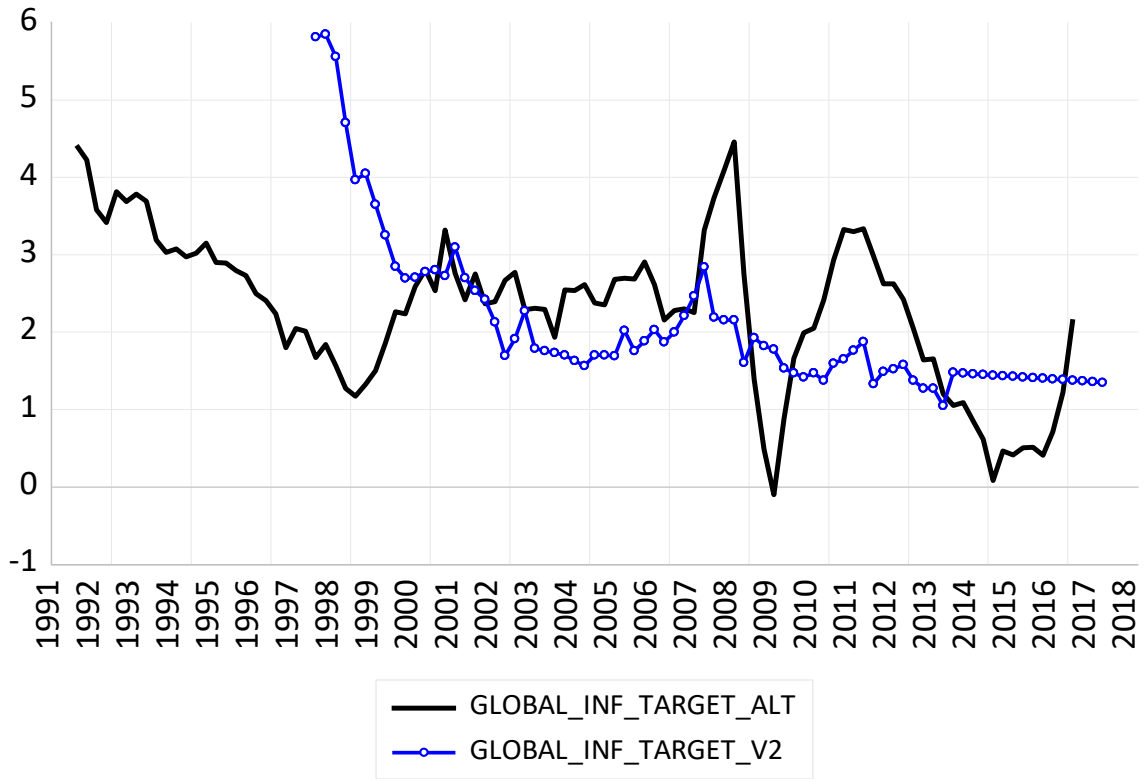
Note: Distance is $d_{ij} = \sqrt{2*(1-\rho_{ij})}$ where ρ_{ij} is the simple correlation between US inflation and inflation on the other economies considered. The sample is: 200Q1-2018Q3.

Figure 5 Gaps Between Inflation and Inflation Expectations, 1993-2018



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.

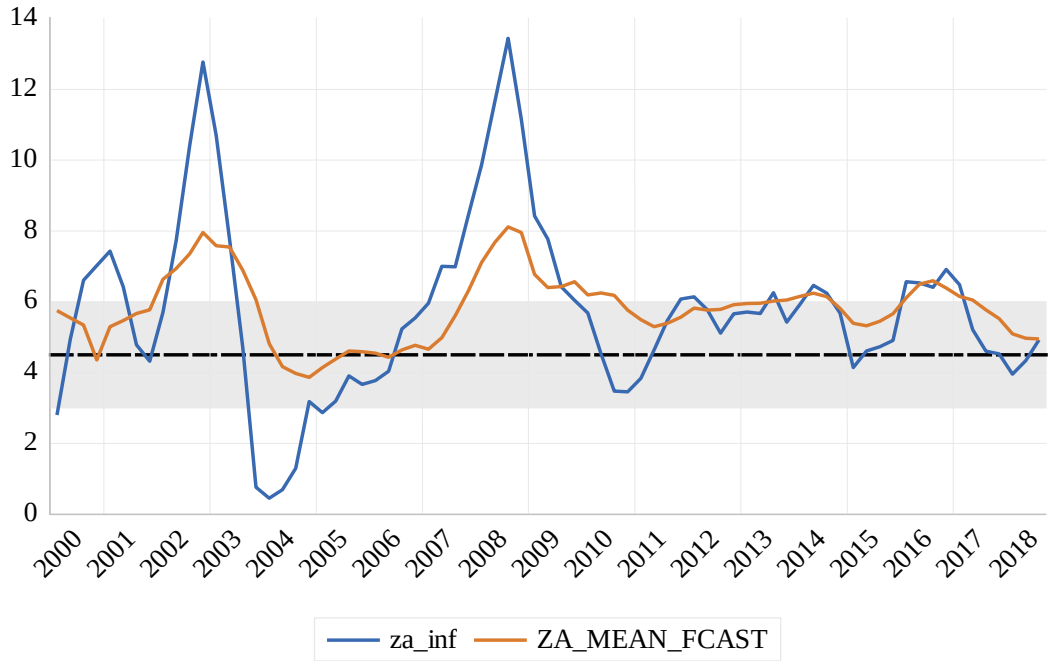
Figure 6 Estimates of Global Inflation



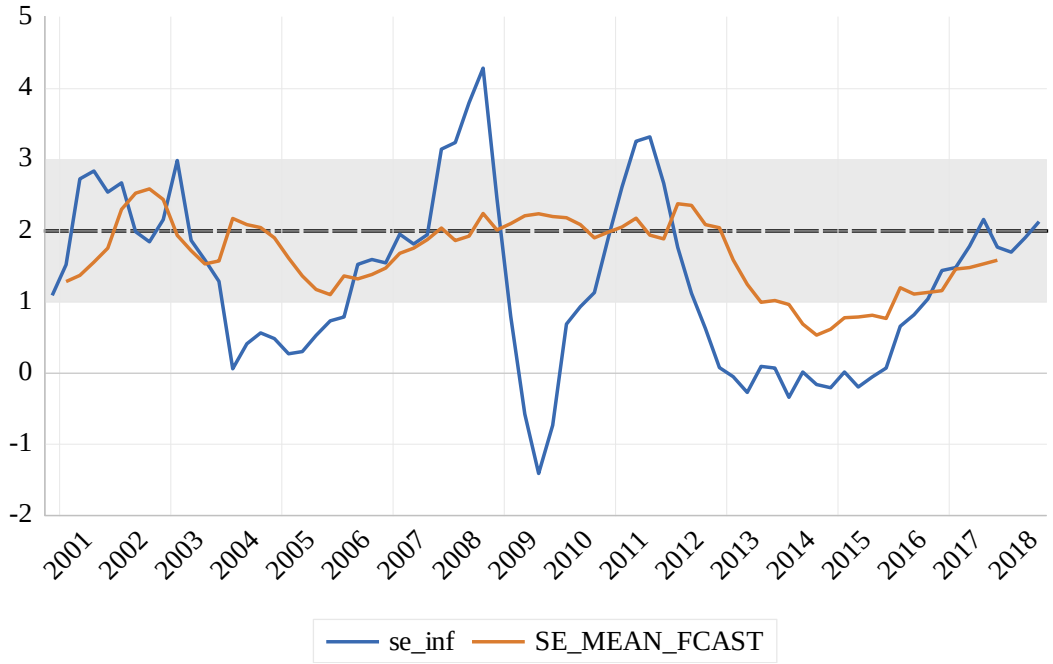
Note: Estimates of global inflation are used to proxy $\bar{\pi}^{G}$ in determining central bank credibility (CRED). V2 is obtained as the first principal component from average one year ahead expected inflation for AE. TARGET_ALT is obtained as the first principal component for AE for observed CPI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

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

(A) South Africa

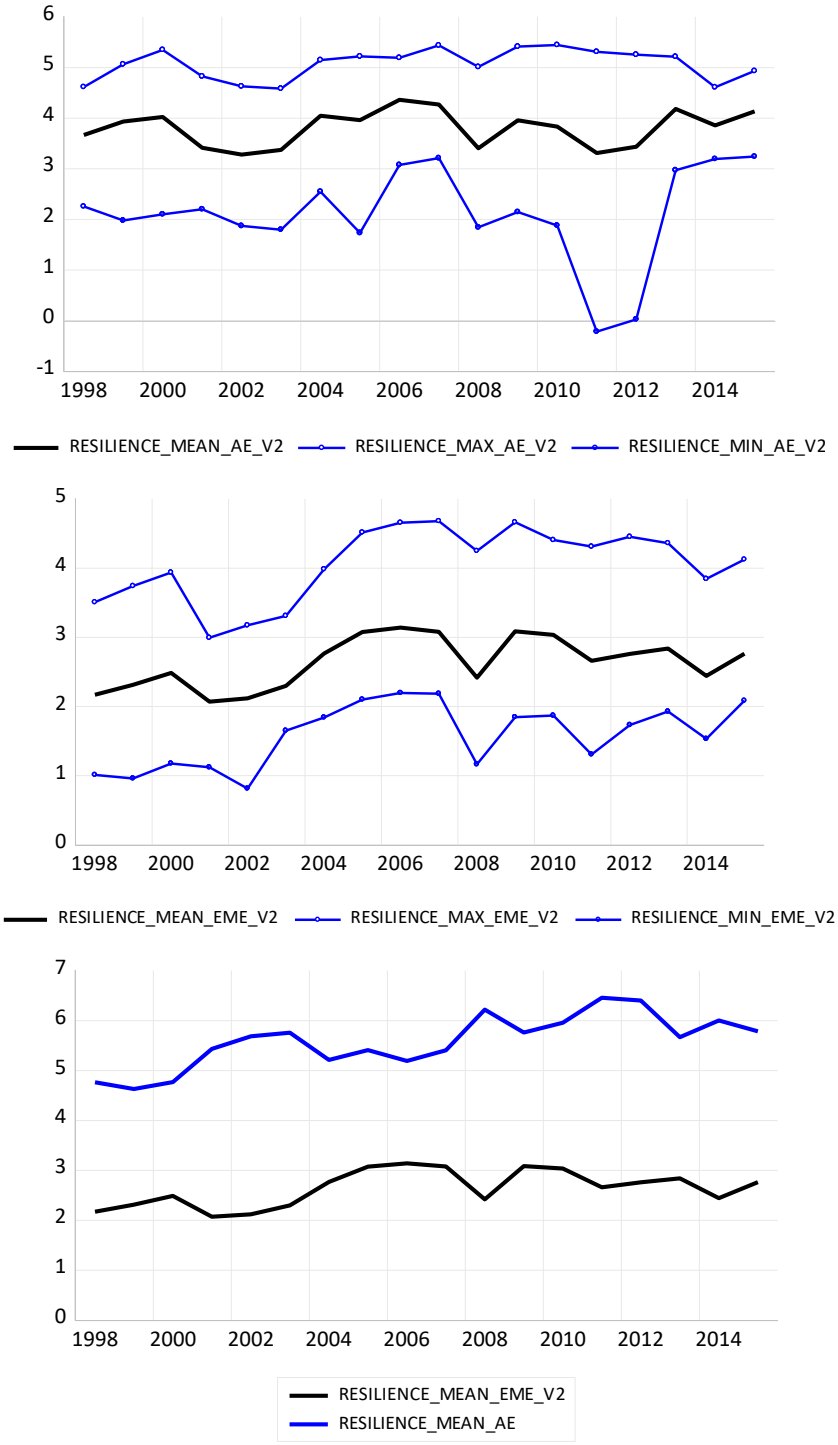


(B) Sweden



Note: inflation (inf) is the annualized quarterly CPI inflation rate. See the yexy 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.

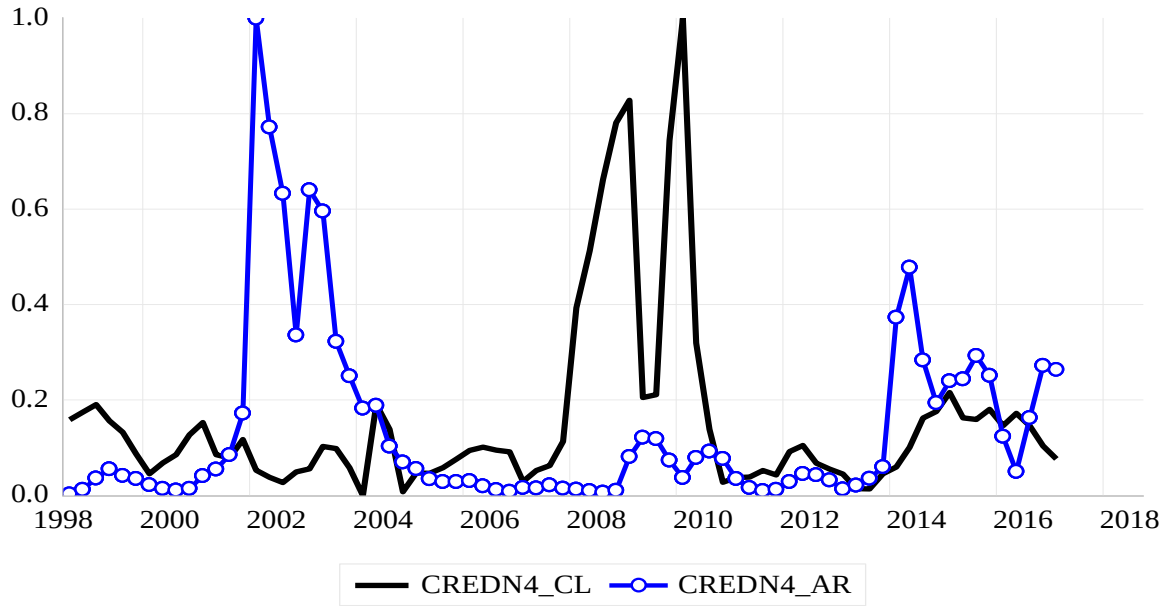
Figure 8 Three Views of Institutional Resilience



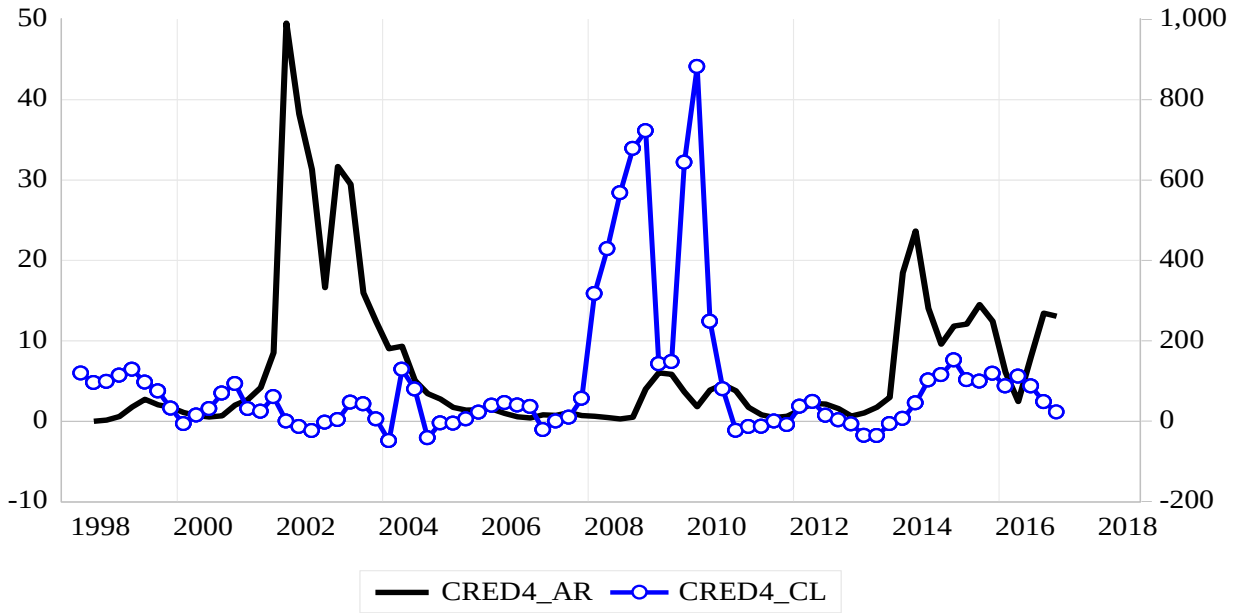
Note: Resilience is defined in the main body of the text and consists of the aggregation of 10 institutional characteristics. The mean, maximum (most resilient) and minimum (least resilient) are shown for AE and EME. See Table 1 for the ISO codes and classifications.

Figure 9 Illustrating Estimates of Central Bank Credibility: Chile Versus Argentina

(A) Normalized Scores



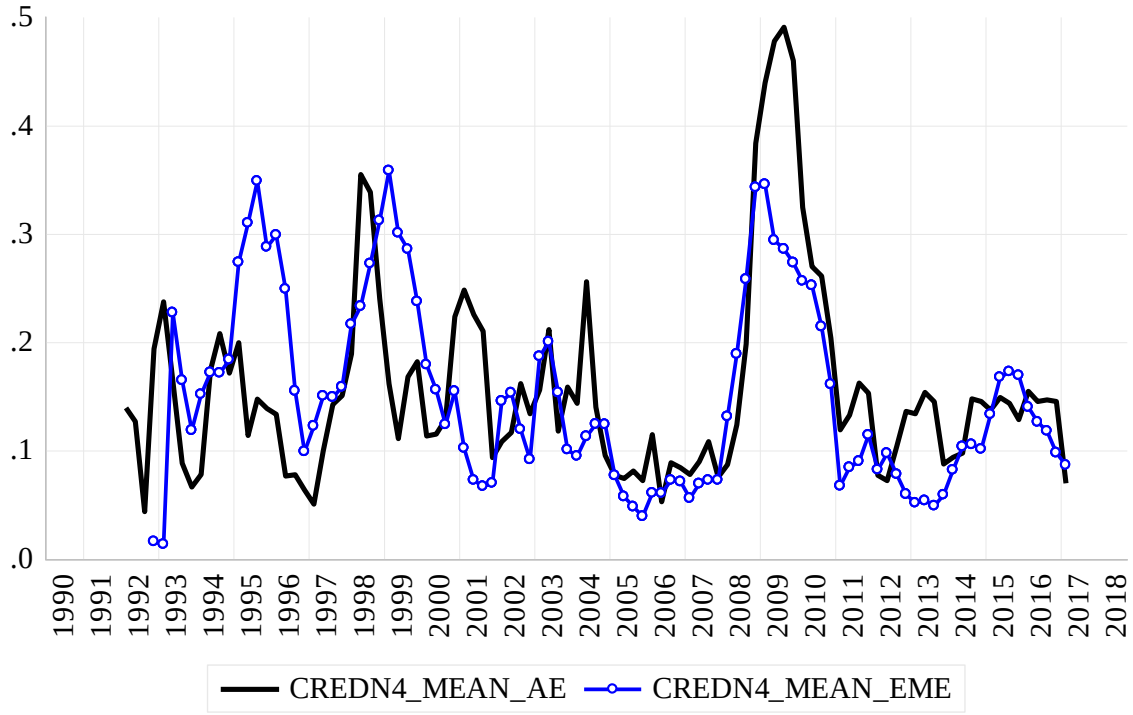
(B) Raw Scores



Note: CRED4 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. CRED4 is the version of credibility that uses inflation lagged one period relative to the first principle 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 $\bar{\pi}^{f}_{t+1}$ in equation (1).

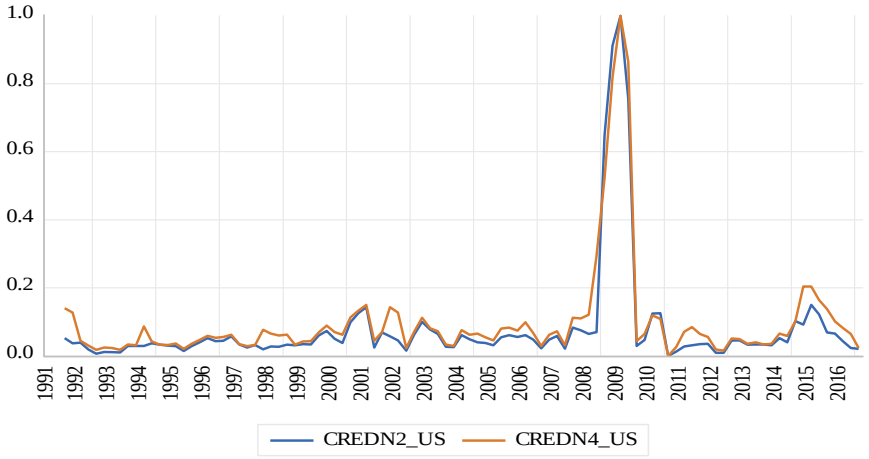
Figure 10 Credibility Estimates

(A) EME versus AE



Note: Equation (2) normalized so that CREDN4 ranges between [0,1]. CRED4 is the version of credibility that uses inflation lagged one period relative to the first principle component of observed inflation in AE. Mean estimates for AE and EME are shown. Also, see Table 1.

(B) Large AE


1.0
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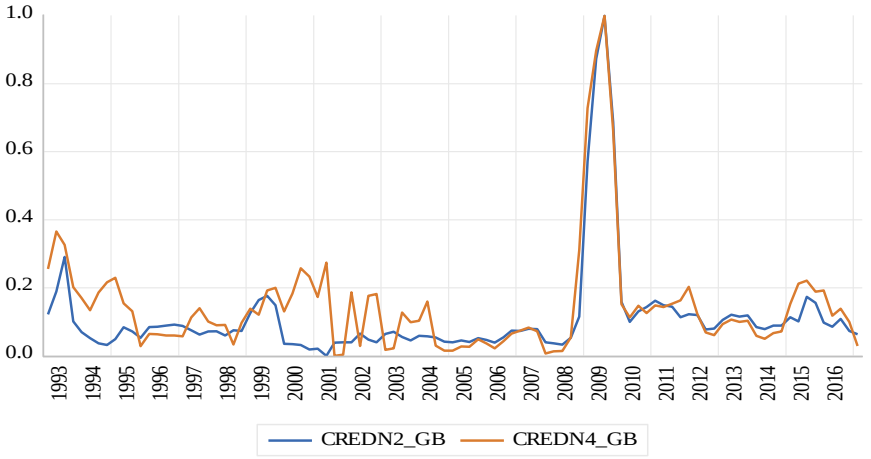
1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
CREDN2_US
CREDN4_US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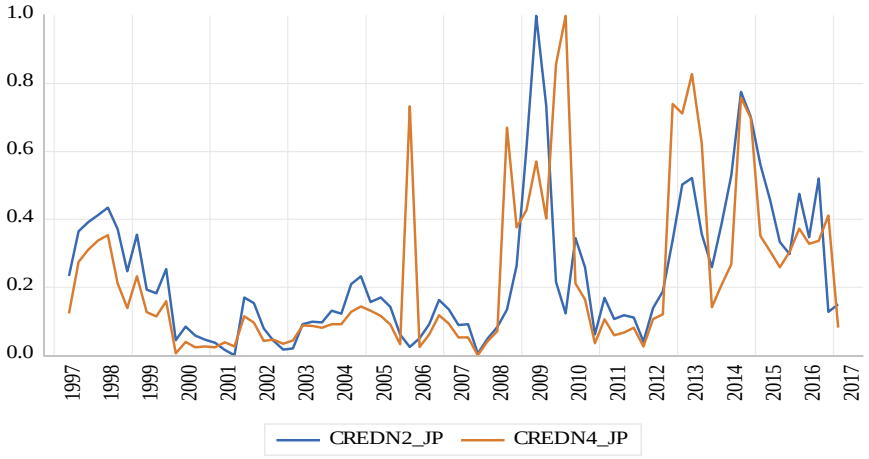
CREDN2_GB
CREDN4_GB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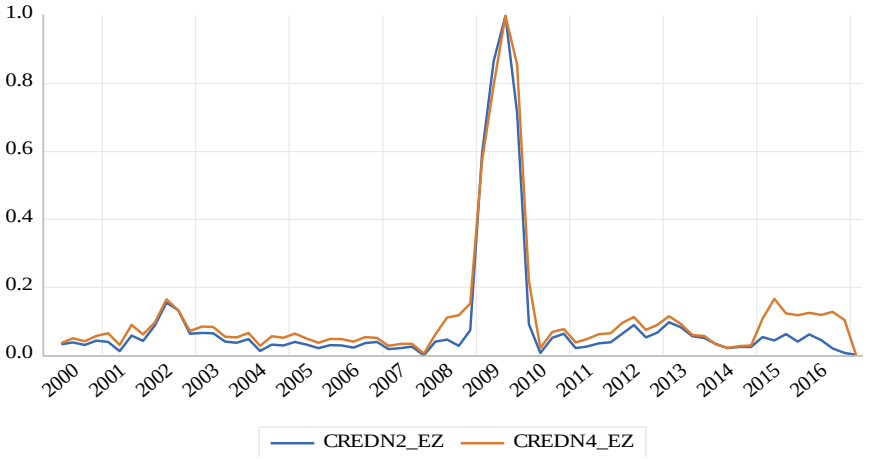
CREDN4_JP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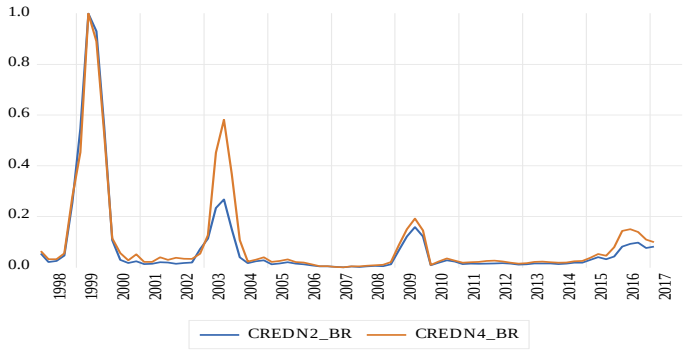
CREDN2_EZ
CREDN4_EZ

(C) BRICS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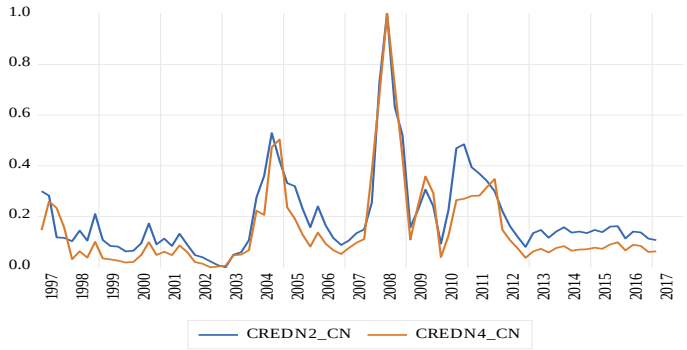
CREDN2_BR
CREDN4_BR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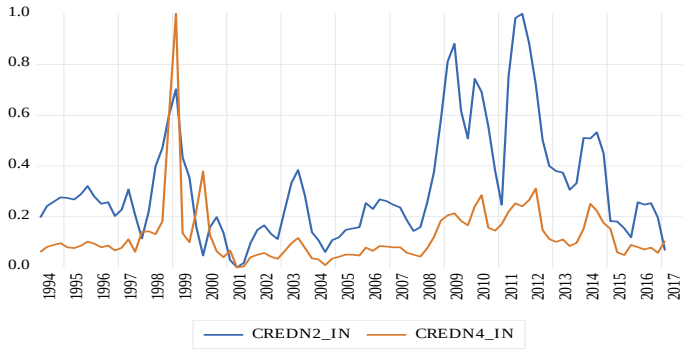
CREDN2_CN
CREDN4_CN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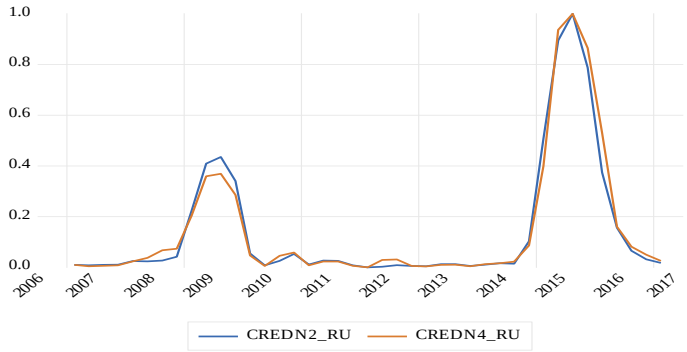
CREDN4_IN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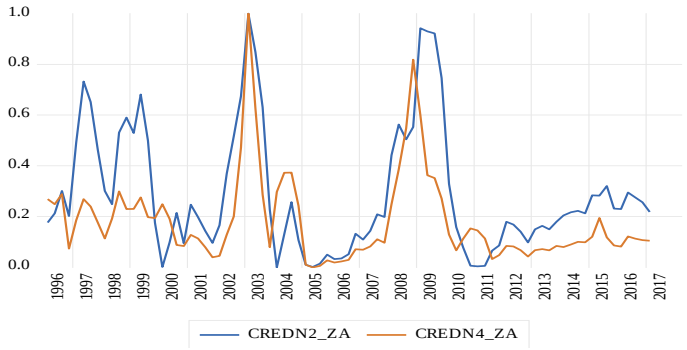
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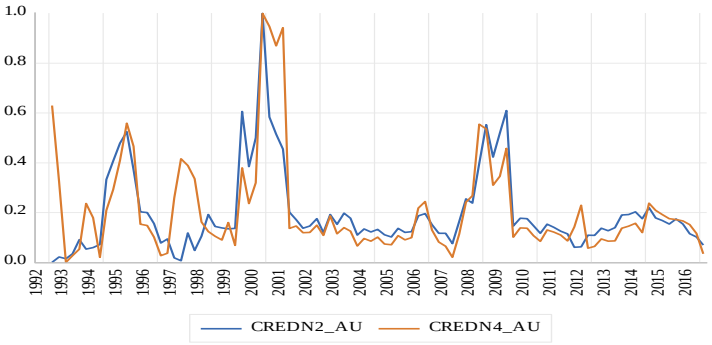
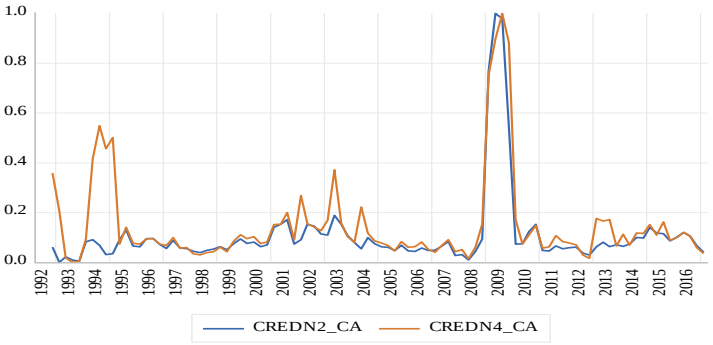
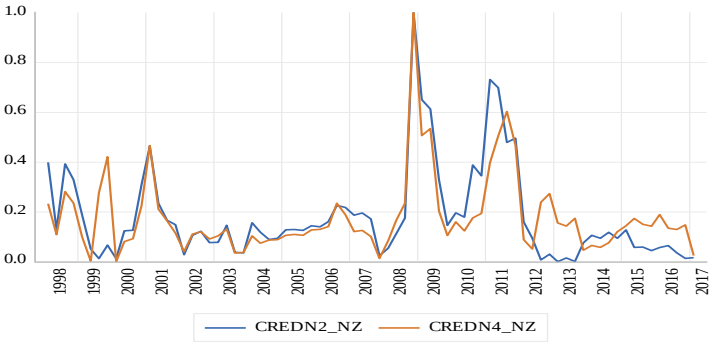
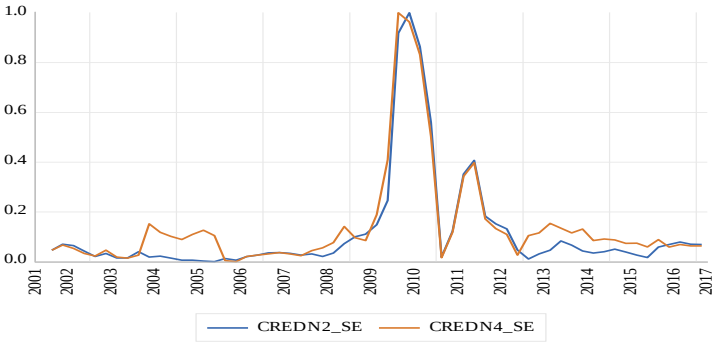
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
CREDN2_ZA
CREDN4_ZA

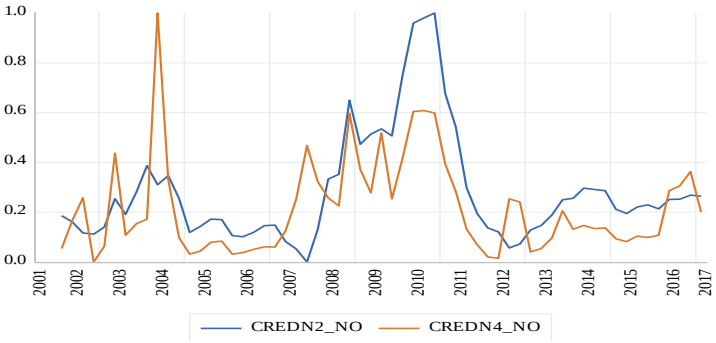
(D) IT in Selected AE



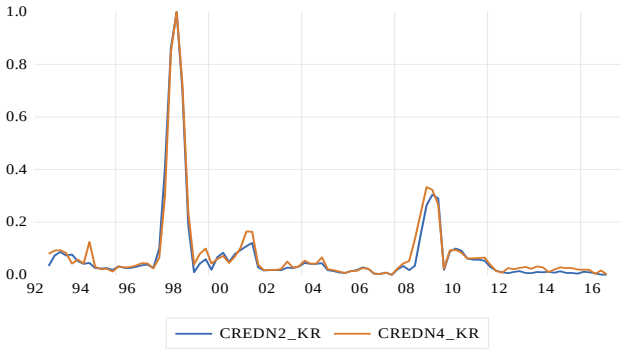








(E) Asia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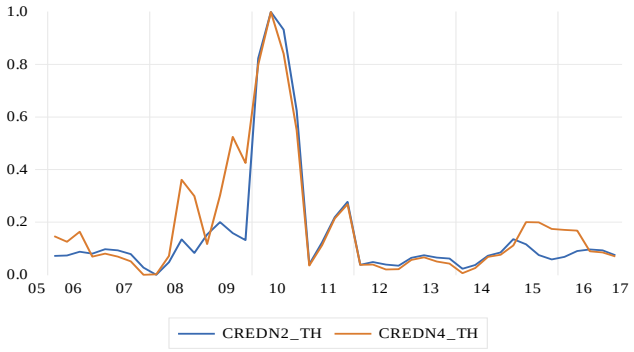
CREDN2_KR
CREDN4_KR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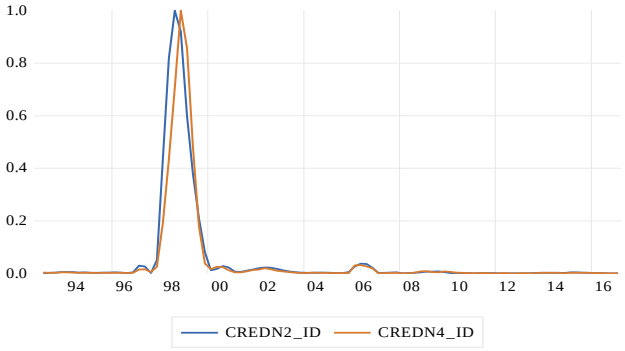
CREDN4_TH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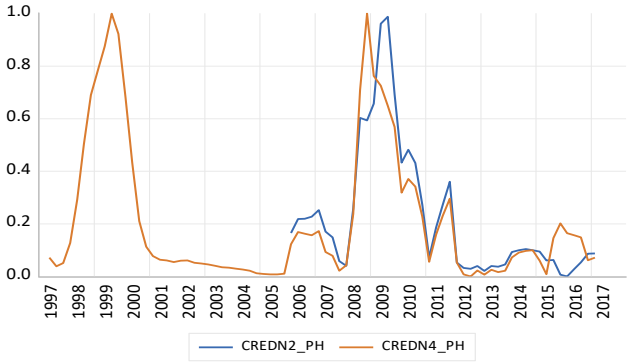
CREDN2_ID
CREDN4_ID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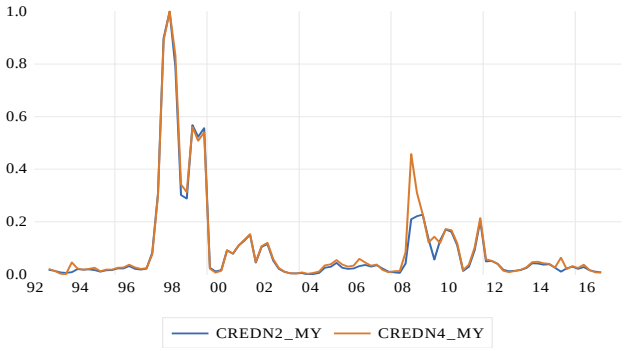
CREDN2_PH
CREDN4_PH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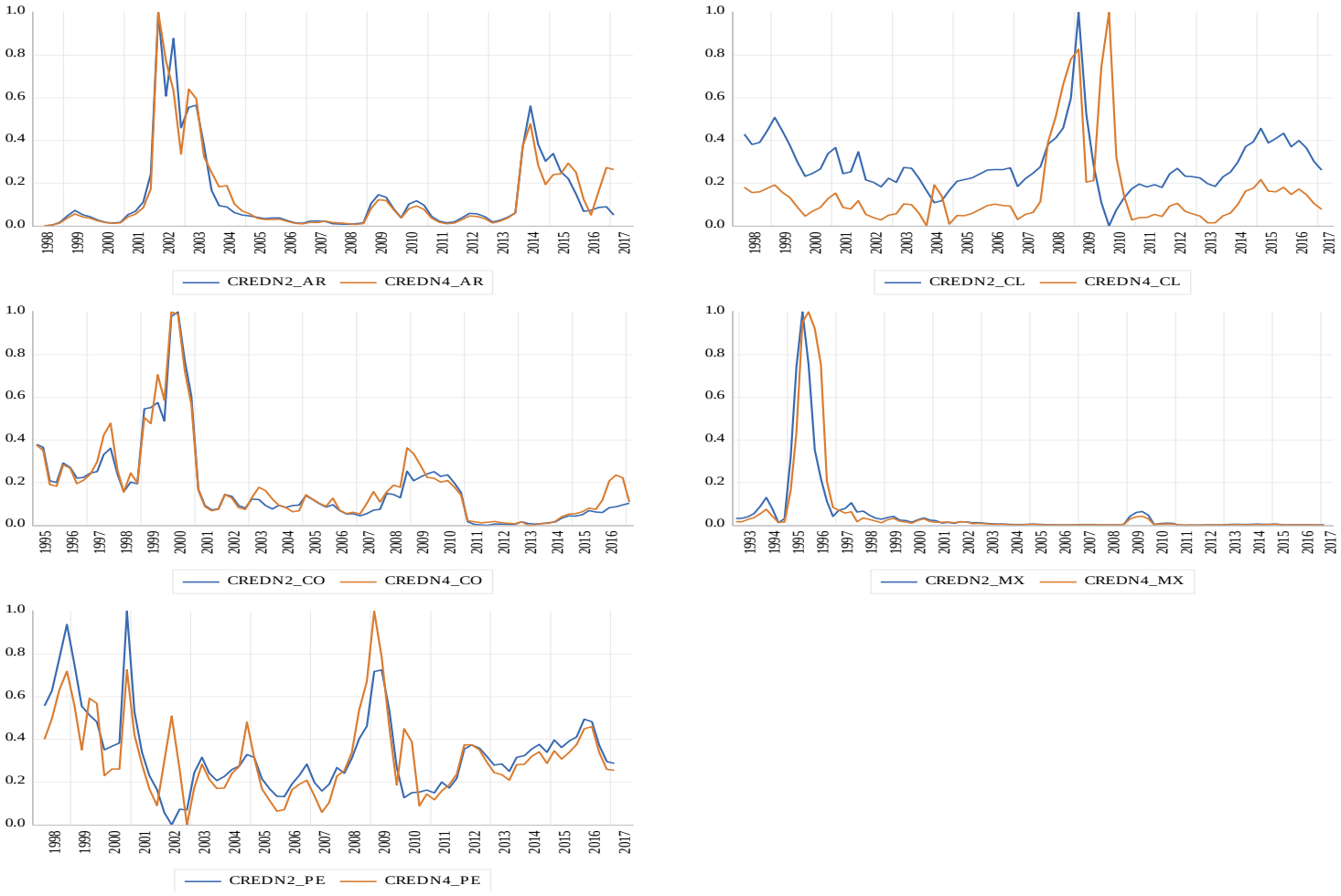
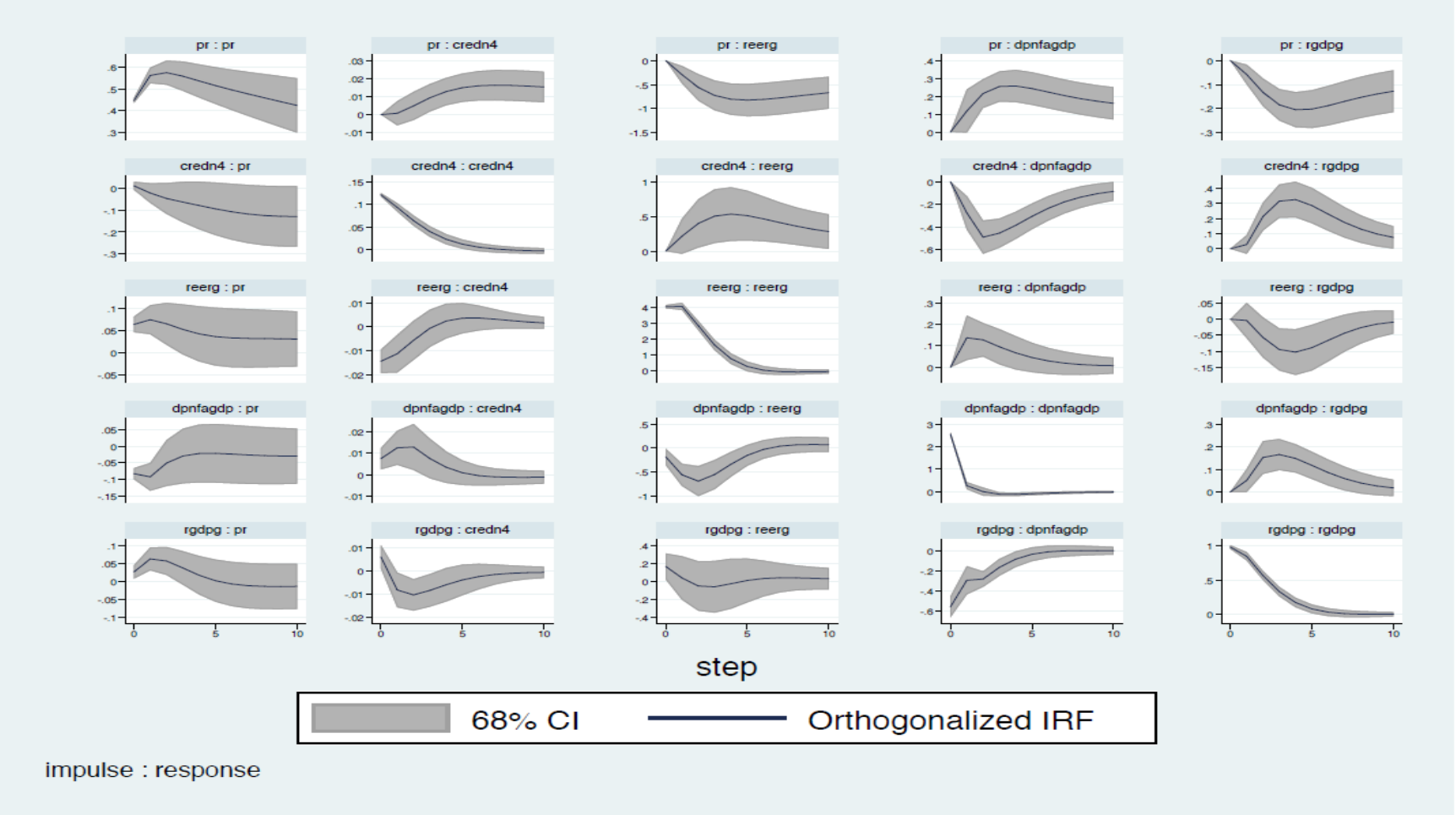
CREDN2_MY
CREDN4_MY

(F) LATAM Countries



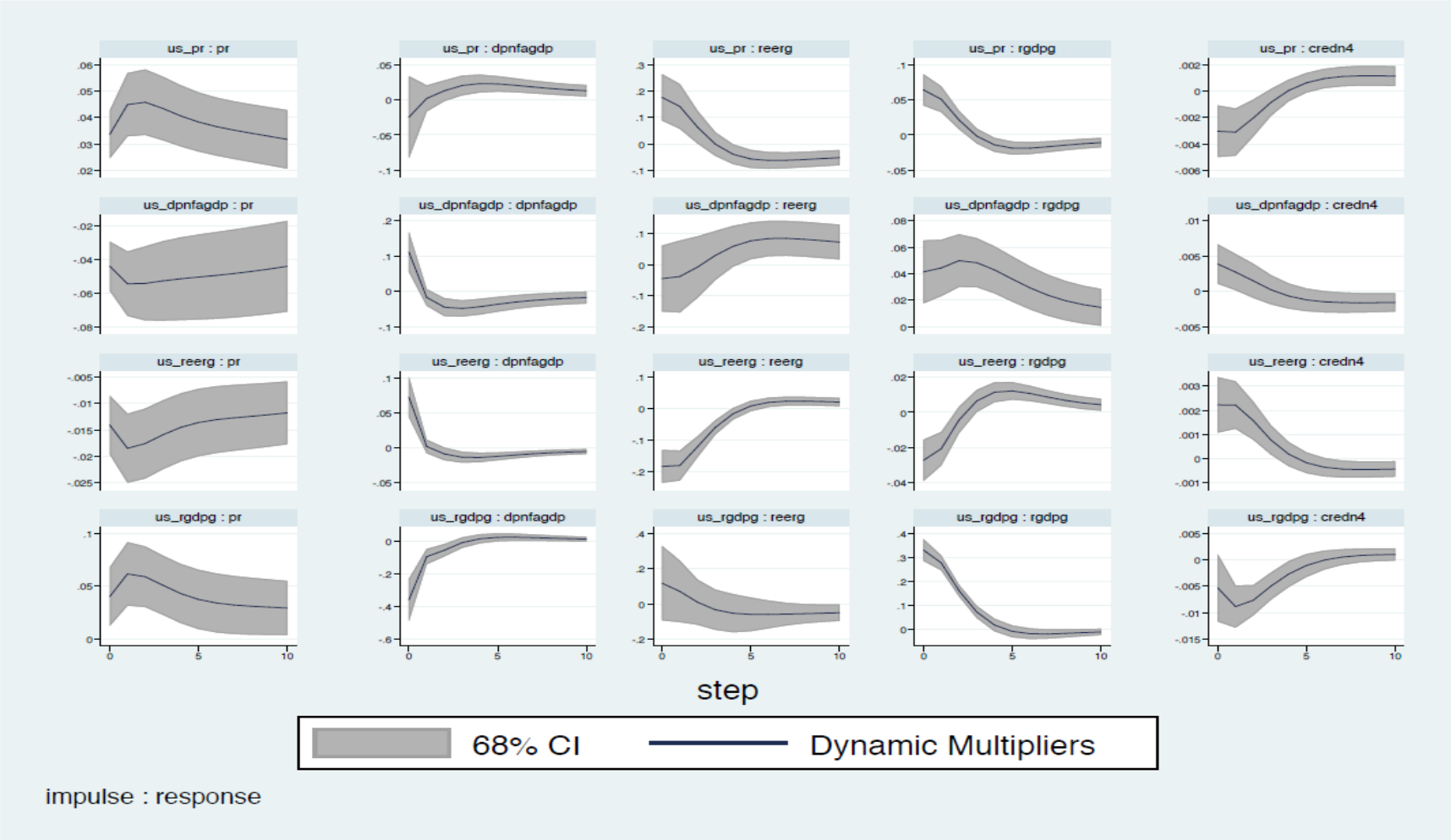
Note: See part A of this Figure. CREDN2 is the normalized version that uses the mean one-year ahead inflation forecast. See the main body of the text for more details.

Figure 11A Impulse Responses: AE Based on Observables



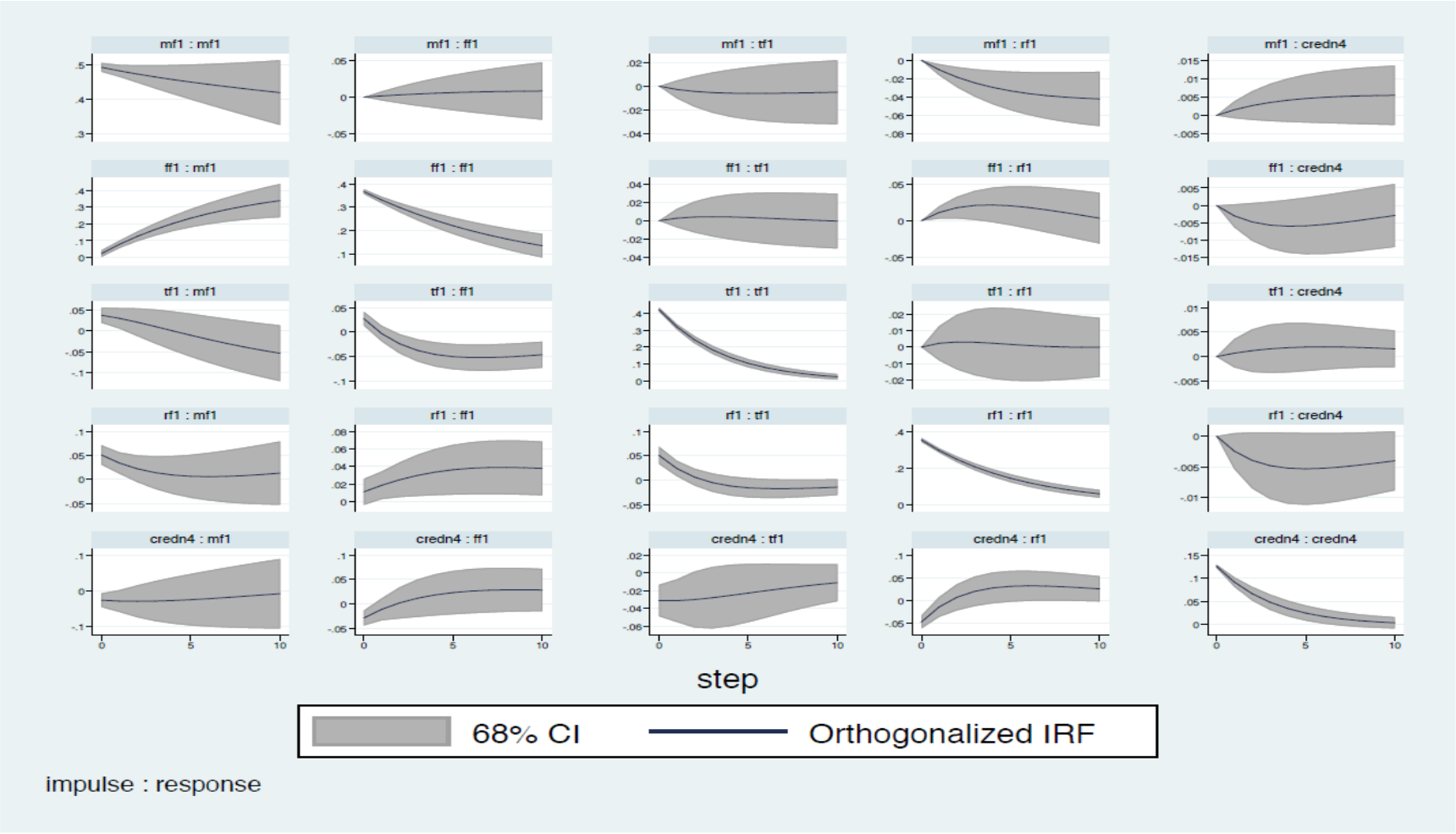
Note: See equations (4) to (6). Variables are defined in Table 2. The ordering of the Panel VAR is from the last row (first) to the first row (last). 1 lag used in the estimation. See the main body of the text for more details.

Figure 11B Dynamic Multipliers: AE Based on Observable Series



Note: Same panel VAR as in Figure 11A. US shocks are treated as exogenous.

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



Note: RF is the real factor, TF is the trade factor, FF is the financial factor. Factors are obtained from the 1st 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

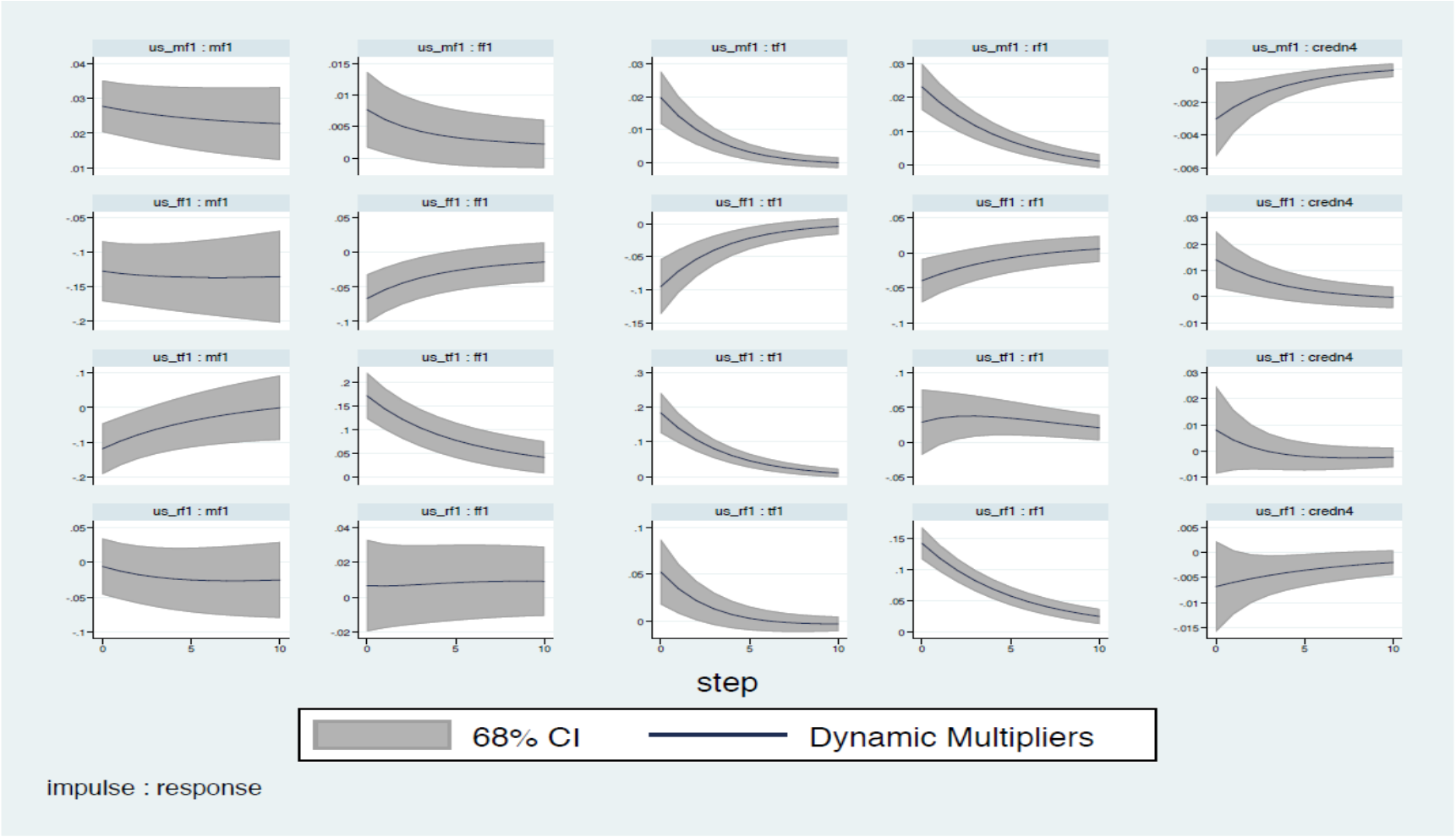
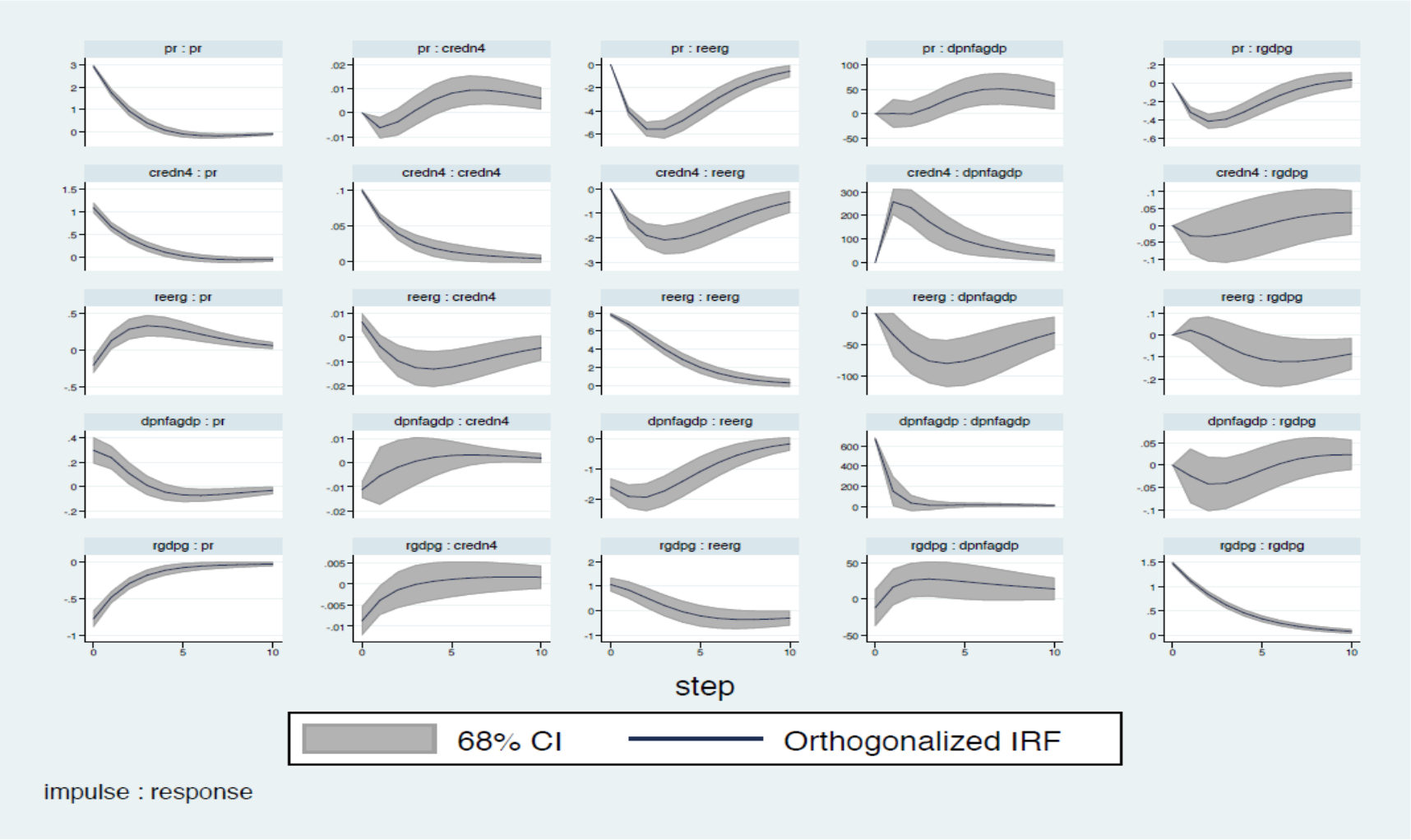


Figure 12A Impulse Responses: EME Based on Observables



Note: see the notes to Figure 11.

Figure 12B Dynamic Multipliers: EME based on Observables

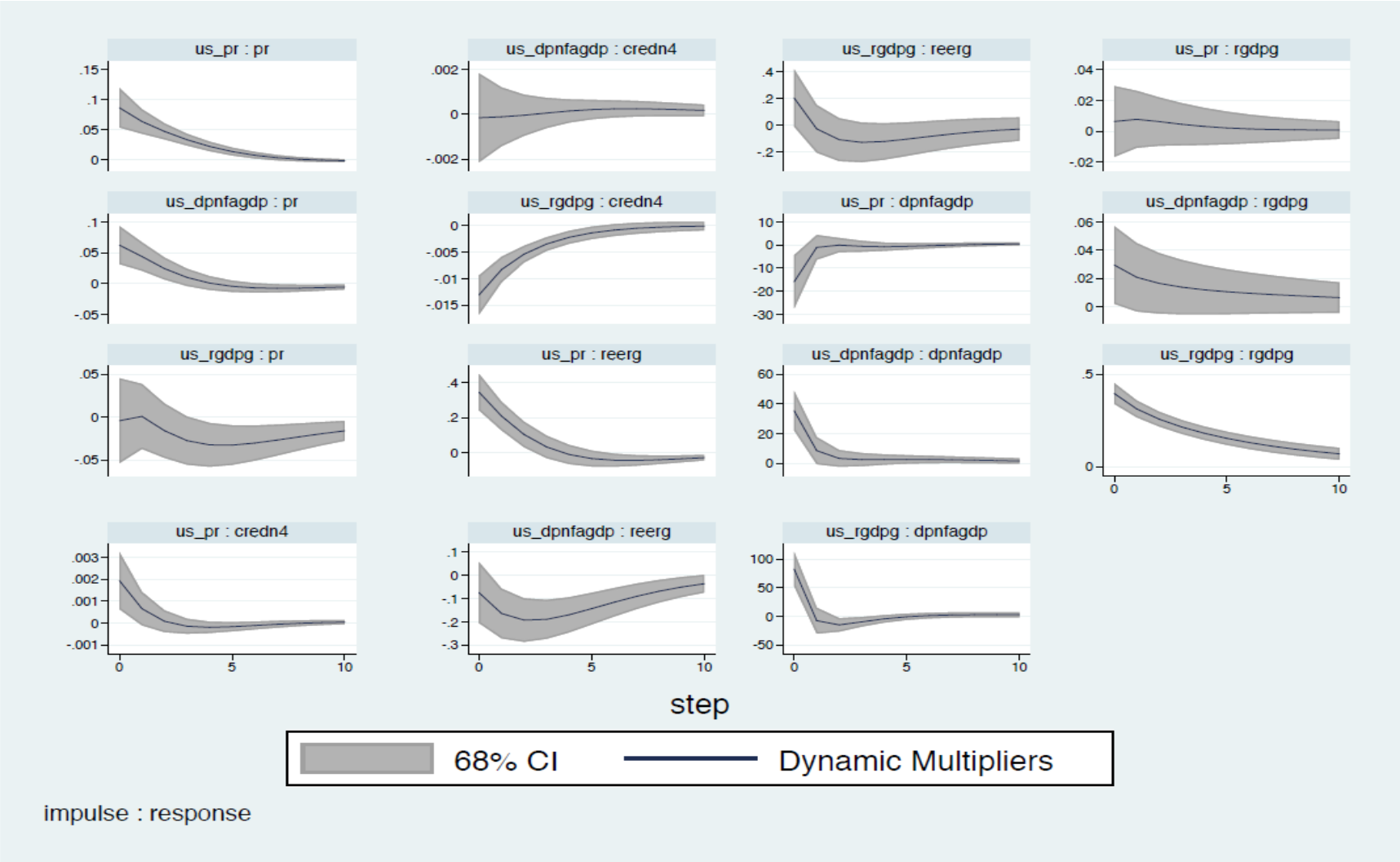


Figure 12C Impulse Responses: EME Based on Factor Model Estimates

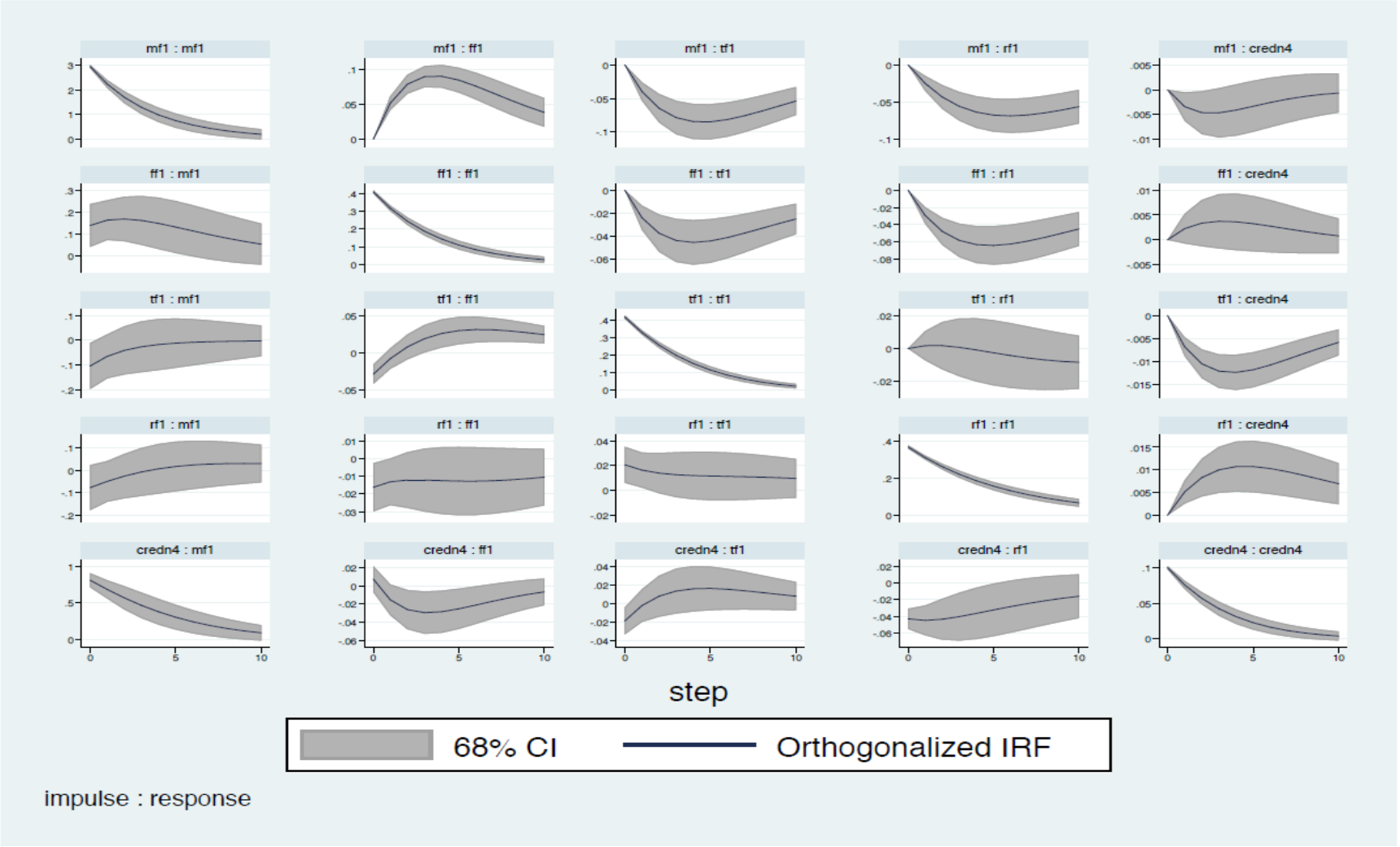
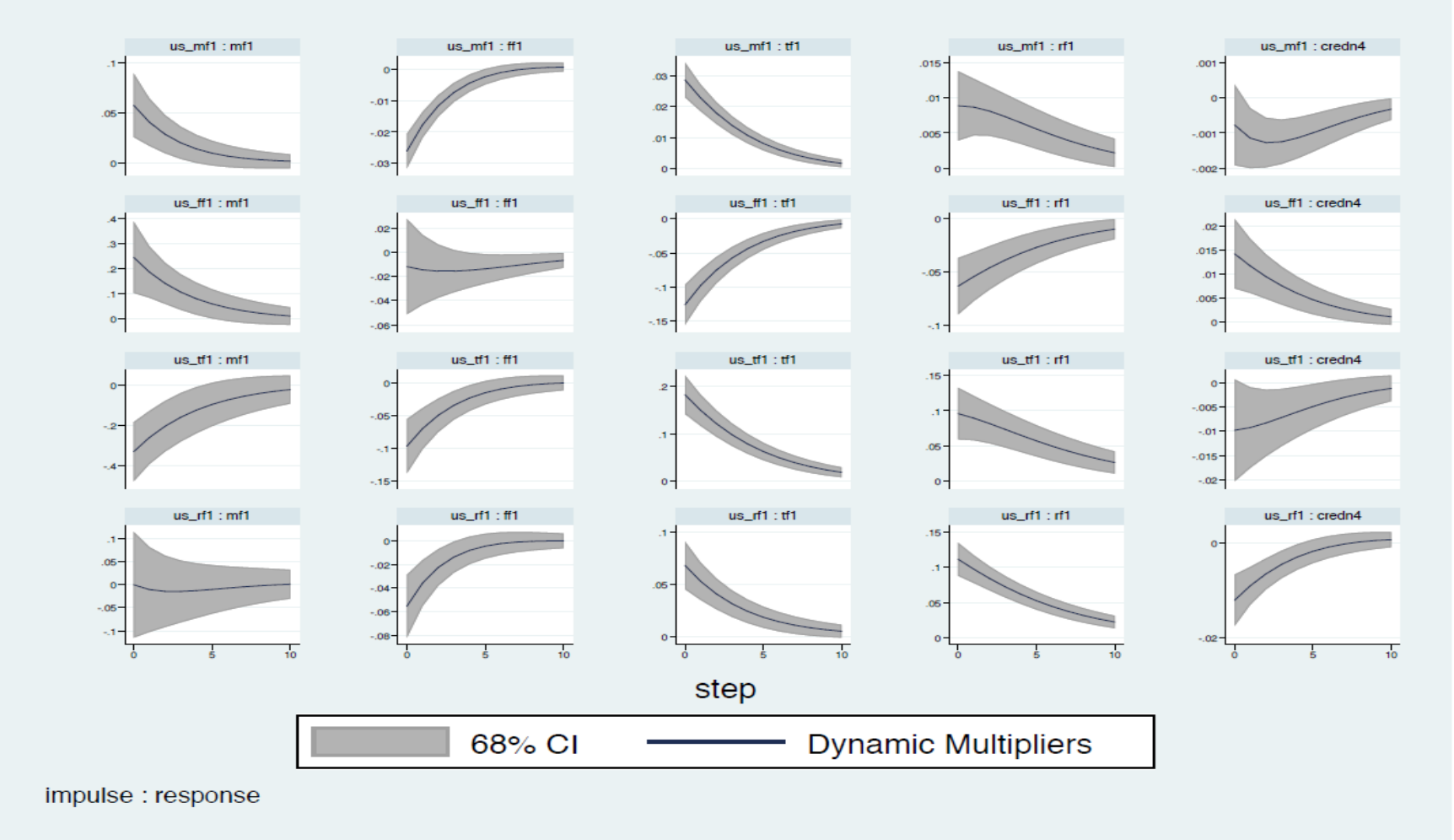


Figure 12D Dynamic Multipliers: EME Based on Factor Model Estimates



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