

INTERNATIONAL MONETARY FUND

Currency Crises in the Post-Bretton Woods Era

A New Dataset of Large Depreciations

Alexander Culiuc and Hyunmin Park

WP/25/221

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**2025
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WORKING PAPER

IMF Working Paper

Strategy, Policy, and Review Department

Currency Crises in the Post-Bretton Woods Era: A New Dataset of Large Depreciations**Prepared by Alexander Culiuc and Hyunmin Park***

Authorized for distribution by Martin Čihák

October 2025

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ABSTRACT: We introduce a novel dataset of large depreciations worldwide since 1971. First, we use a multi-step approach to accurately pinpoint large depreciation events on monthly data. We then construct large depreciation episodes that cover 24 months after the initial depreciation event. The monthly data allows for a granular characterization of the dynamics of large depreciations across multiple metrics, including maximum and equilibrium depreciations, overshooting, and number of depreciation events within a single episode. We then present stylized facts on episodes across various characteristics (income, REER trajectory, number of events, exchange rate flexibility, and IMF-supported program status). Among these: (i) a few months into an episode, REER tends to appreciate unless there is an “aftershock” depreciation, (ii) attempts to peg following the initial depreciation event are associated with a higher likelihood of “aftershocks”, and (iii) equilibrium REER depreciations are largest when an IMF-supported program is put in place after the initial depreciation takes place.

The Large Depreciations Dataset is available at culiuc.com/LargeDepreciations.

RECOMMENDED CITATION: Culiuc, A. and Park, H., 2025. Currency Crises in the Post-Bretton Woods Era: A New Dataset of Large Depreciations. IMF Working Paper No. 25/221.

JEL Classification Numbers:	E31, F31, F32
Keywords:	exchange rate; crisis; inflation; real exchange rate; overshooting; equilibrium depreciation
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* The authors would like to thank Martin Čihák and Rishi Goyal for their support and encouragement and Anil Ari, Firmin Ayivodji, Jaime Guajardo, Mahmoud Harb, La-Bhus Fah Jirasavetakul, Emmanouil Kitsios, Robin Koepke, Andrea Manera, Marialuz Moreno Badia, Faezeh Raei, Belen Sbrancia, Ken Teoh, and participants of the IMF External Sector Seminar and SPRNL internal presentation for their valuable comments and suggestions. Pragyana Deb contributed to early thinking on the subject, while Donal McGettigan and Nathan Porter supported earlier related research. Helen Zheng provided excellent research assistance for extending the Klein and Shambaugh database on base country.

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Let it go, let it go / Can't hold it back anymore
(Queen Elsa in Disney's *Frozen*)

I'm afraid of what I'm risking if I follow you / Into the unknown
(Queen Elsa in Disney's *Frozen II*)

Introduction

Policymakers are typically averse to large depreciations,² sometimes at all costs, as few economic events can be as disruptive and consequential as a currency crisis.³ Virtually overnight, it can decimate the value of large swaths of real and financial assets, trigger insolvencies—including by banks and the sovereign—and shred the credibility of the central bank. The ensuing economic turmoil can push an entire decile of the population below the poverty line,⁴ spark civil unrest and precipitate a government change.⁵ Beyond the initial shock, currency crises can lead to prolonged recessions, public debt restructurings and messy financial sector cleanups. The ‘fear of floating’ documented by Calvo and Reinhart (2002) is a more generalized version of this aversion.

This aversion is not costless. A large and swift depreciation is often the starting point of resolving a balance-of-payments (BoP) problem. Delaying the depreciation only increases the damage incurred when some unanticipated—though often unsurprising—shock triggers the inevitable.⁶ Dornbusch, Goldfajn, and Valdes (1996) were among the first to document the perils of procrastination in the run-up to a crisis—often justified by rationalizing the preceding real appreciation as an equilibrium development—using the 1994 Mexico peso crisis and the 1982 Chile crisis as examples; similar views have been voiced about many other currency crises since then. While 1982 Chile and 1994 Mexico may feel like remote history, large depreciations continue occurring regularly: over the last decade, there have been 131 large depreciation events, with 24 countries registering two or more, according to our dataset. In other words, the topic remains as pertinent as ever, with policymakers around the world continuing to ponder the benefits and costs of engineering—or, more often, giving way to—an abrupt exchange rate adjustment.

This paper, along with the accompanying dataset (available at culiuc.com/LargeDepreciations), aims to facilitate research that can help policymakers decide if, when, and how to let the currency depreciate. This

² The economic profession has a variety of terms to denote a sudden weakening of the value of the domestic currency: it is a *devaluation* under a fixed exchange rate regime and a *depreciation* under a floating regime. A drop in the value of the currency following a shift in the exchange regime from fixed to floating is referred to as both *de-pegging* and *floating*. For parsimony, the term *depreciation* is used to denote all episodes analyzed in this paper.

³ Conceptually, the terms “large depreciation” and “currency crisis” can have distinct meanings: not all large depreciations are triggered by market panic or involve disorderly market conditions, which the term “currency crisis” may suggest. Nevertheless, the empirical literature commonly uses the terms interchangeably, by defining “currency crashes” or “currency crises” as large depreciations exceeding certain thresholds (Frankel and Rose 1996, Cavallo and others 2005, Laeven and Valencia 2013 and 2020, Reinhart and Rogoff 2014).

⁴ Following the 2001 Argentina crisis, poverty increased from 31 to 44 percent between 2001 and 2002 using World Bank’s \$6.85 a day threshold (in 2017 PPP dollars).

⁵ Cooper (1971) found that governments were twice more likely to fall within 12 months of a devaluation. Frankel (2005) revisited the statistics with three decades of additional data, finding that it broadly held, especially over shorter horizons (6 months) and particularly for ministers of finance and central bank governors.

⁶ The tendency to kick the can down the road is not limited to exchange rate adjustment. For instance, the “too little, too late” assessment of many sovereign debt restructurings stems from a similar approach to policymaking. The adage “never let a good crisis go to waste” is the corollary of the same phenomenon, since it implicitly recognizes that major reforms cannot occur for as long as the system is in some—however precarious—equilibrium.

decision is difficult because of significant uncertainties surrounding large depreciation episodes. Even when the need for exchange rate adjustment becomes obvious, there is often a reluctance to “let it go,” stemming from the fear of the unknown, the inability to plan with any degree of confidence beyond the moment of depreciation. First, if the currency is floated, how much will the maximum depreciation be, and when will this occur? Will there be an overshooting? How large will it be? Where will the exchange rate—both nominal and particularly the real one—settle eventually? Second, in a repeg—where the fixed exchange rate regime is maintained, but there is a one-time devaluation—the questions are somewhat different, but equally daunting. What’s the minimum devaluation that the central bank can get away with? How likely is it that a follow-up devaluation will be needed? What will be the impact on the real exchange rate of a given nominal devaluation? Regardless of whether the currency is floated or repegged, what will be the inflationary impact? How soon will the contractionary impact (e.g., due to balance sheet effects) dissipate and make way to expansionary effects?

The economic profession cannot yet provide definitive answers to these questions.⁷ The theoretical literature on currency crises (and BoP crises more generally)—going back to Krugman (1979) and Flood and Garber (1980)—offers a rich picture on the outcomes depending on various starting conditions and policy decisions. But even small differences in country-specific and external factors, in policy responses or even the way policy responses are communicated can produce different outcomes, as first discussed by Obstfeld (1986).⁸ Even without attempting to provide definitive answers, one can help address the fear of the unknown by characterizing the universe of all large depreciations to date, providing policymakers a plausible range of outcomes, and offering researchers a unified dataset that they can use to investigate the issue further. That’s exactly what this paper sets out to do.

Our objective is twofold: define and identify large depreciation events with monthly precision and then provide a rich characterization of the depreciation episodes that follow these events. We also provide some stylized facts that are meant to suggest avenues for future research. The dataset covers the entire post-Bretton Woods era (1971–2024) and every country included in IMF’s International Finance Statistics (except the United States, since event identification is based on bilateral exchange rates vis-à-vis the US dollar (USD)).^{9 10}

We put together a new dataset of large currency depreciations, summarizing key parameters, including “policy-relevant” measures of overshooting and stability. The identification of the start of depreciation episodes, subsequent stability or lack thereof, and the size and timing of overshooting are calculated in an objective manner. We then compare how these parameters differ across various circumstances and scenarios, and identify some stylized facts. For instance, more developed countries are less prone—though far from being immune—to large depreciations. Real exchange rate overshooting is present in most episodes though, again,

⁷ Like in all such questions, if economists knew exactly how a crisis would play out, they would have been better off as market participants, not observers and advisors.

⁸ Obstfeld focused on the multiple equilibria surrounding the onset of the crisis. But such forks in the road also occur *during* crises, and the outcomes can be influenced by minute details. For example, while the December 28, 2017 press conference announcing the increase in the inflation target precipitated the 2018 Argentina crisis (Sturzenegger, 2019), the situation took a turn for the worse on August 29, 2018, when the President made a public address to bolster market confidence by indicating that the IMF would support Argentina with frontloaded disbursements under its recently-approved Stand-By Arrangement. However, the speech—with some observers singling out the acknowledgement of “lack of confidence in the markets, specifically over our financing capacity in 2019”—unsettled financial markets, triggering a 14 percent exchange rate depreciation that day (IMF, 2021).

⁹ Many consider the Nixon shock on August 15, 1971, as the beginning of the end for the Bretton Woods system. We start tracking exchange rates from January 1970, earlier than the Nixon shock, to include the pre-trend of the exchange rate series for depreciation events that happened around the Nixon shock. The earliest large depreciation episode in our dataset is in 1971.

¹⁰ See footnote 16 for identification of episodes in the United States using the Nominal Effective Exchange Rates (NEER).

is less prominent among advanced economies. Once the dust settles, in a plurality of cases the real exchange rate settles at a depreciated level. However, a significant share of large depreciations has no lasting effect on the real exchange rate: sometimes because the nominal depreciation reverses, but more likely because inflation rapidly erodes the initial real depreciation shock.

This paper follows in the footsteps of Frankel and Rose (1996), who proposed what is still a widely used approach to identifying currency crises. Using annual data, they identify country-years where the bilateral exchange rate data vis-à-vis the USD exhibits large and accelerating depreciation. Laeven and Valencia (2013, 2020) apply the same approach when identifying currency and dual banking-currency crises; Reinhart and Rogoff (2014) and IMF (2015) use a similar strategy. Our work uses a conceptually similar approach using monthly data for more precise identification of depreciation events, and to allow for a richer description of developments following the onset of the depreciation (e.g., the overshooting phase typically last only a few months, so is “averaged” out when looking at annual data). In that sense, this work is closest to Cavallo and others (2005), who use a similar approach for crisis identification and measurement of equilibrium and overshooting. However, we make substantial improvements in the identification strategy, as well as in the richness of the statistical characterization of the depreciation episode. This work also builds on Culiuc (2020), where an earlier (unpublished) version of the dataset was used to analyze the drivers and consequences of exchange rate overshooting in large depreciation episodes.

The next section explains the identification of large depreciation *events*, the construction of large depreciation *episodes*, and the parameters we use to characterize them. We then compare these characteristics across various dimensions (such as income level, presence of an IMF program, and presence of multiple events within a single episode). Based on these comparisons, we identify several stylized facts, which are then summarized in the conclusion.

Constructing Large Depreciation Episodes

First, we identify large depreciation events using bilateral exchange rates vis-à-vis the USD. Following this, we build large depreciation episodes encompassing a period of 24 months. Any events occurring within this 24-month window are classified as aftershocks and integrated into the episode.

Data

Our dataset is derived from the IMF's International Financial Statistics (IFS) database. The dataset covers 163 countries and territories from 1970M1 to 2024M12. Territories that use the sovereign country's currency as their legal tender are included in the dataset but excluded from the stylized facts. We focus on four monthly series which, as a group, provide a comprehensive picture of exchange rate and price developments: end-of-period local currency per USD (ENDE¹¹), nominal effective exchange rate (NEER), consumer price index (CPI), and CPI-based real effective exchange rate (REER).¹² The ENDE and CPI series are available for the entire period. The NEER and REER series are available starting in 1979M1. For countries that changed their official currency to the USD or the euro after 1970, we use the exchange rate between the original currency and the USD or the euro, respectively, at the time of adoption to build a continuous ENDE series going back to 1970.¹³ Throughout the paper, all exchange rate series—ENDE, NEER, and REER—are expressed such that increases denote depreciations.¹⁴

Choice of Exchange Rate Series

We define large depreciations as large and accelerating increases in the ENDE. The use of the bilateral exchange rate vis-à-vis the USD to identify large depreciations was introduced by Frankel and Rose (1996) and has since been adopted with variation, by Cavallo and others (2005), Laeven and Valencia (2013, 2020), Reinhart and Rogoff (2014), IMF (2015), De Gregorio (2016) and many others.

Two points are worth expanding on: why focus not just on large, but also *accelerating* depreciation, and why the identification is done on the ENDE series. The accelerating part is necessary—as pointed out by Frankel and Rose (1996)—to discard periods where the nominal exchange rate depreciates at a rapid clip month-after-month (and sometimes year-after-year) in countries that are going through prolonged periods of high inflation. The use of the bilateral exchange rate series, which follows the literature, is based on both practical and conceptual reasons. Practically, the end-of-month bilateral series exhibit more discrete changes than trade-weighted indices that are computed as monthly averages (NEER, REER), which simplifies the timing of

¹¹ ENDE is the IFS series code, which stands for “Exchange rate, National currency per Dollar, End of period”.

¹² While the unit labor costs-based REER may be more directly related to a country's competitiveness, it is not available in many countries. Therefore, we use the more widely available CPI-based REER.

¹³ These are Ecuador, El Salvador, San Marino, and Euro Area countries.

¹⁴ While this is standard for quoting nominal exchange rates (most of the time expressed as local currency per USD), REER and NEER indices are often (including in the IFS) provided such that an increase indicates a strengthening. To harmonize, we take the reciprocal of NEER and REER first and then renormalize.

episodes.^{15 16} Conceptually, the literature on dominant currency pricing suggests that the U.S. dollar has a special place in international trade (Gopinath 2015), which would not be fully captured by NEER since a significant share of trade between non-dollar countries is invoiced in USD (De Gregorio 2016). Beyond trade, dollar-denominated transactions dominate the financial account and constitute a large share of central bank international reserves, and therefore the bilateral exchange rate vis-à-vis the dollar attracts greater attention than any other one.

Identifying Large Depreciation Events

The large depreciation events are first identified on a three-month rolling basis.¹⁷ An event must meet four criteria. The first and the fourth criteria confirm that the large depreciation is large on both quarterly and annual scale. The second and the third criteria ensure that the large depreciation is accelerating relative to the previous quarter and year.

Let E_t denotes the ENDE in month t and $e_t := \ln(E_t)$. There was a large depreciation event in the three-month window between month $t-3$ and month t if all the following four criteria are satisfied.

1. *The depreciation must be large.* The three-month (quarter-on-quarter) growth must be above a threshold. This ensures that the depreciation is significant enough in magnitude to be considered “large”.

$$e_t - e_{t-3} > \bar{e}_q$$

2. *The depreciation must accelerate relative to the previous period.* The quarter-on-quarter acceleration in depreciation must be above a threshold. This eliminates cases where a sustained depreciation is business as usual, for instance, in a high inflation environment.

$$(e_t - e_{t-3}) - (e_{t-3} - e_{t-6}) > \bar{e}_{qq}$$

3. *The depreciation must accelerate relative to the average in the preceding year.* The quarter-on-year acceleration in depreciation must be above a threshold. This eliminates cases where depreciation resumes following a short-lived period of stability.

$$(e_t - e_{t-3}) - (e_{t-3} - e_{t-15})/4 > \bar{e}_{qy}$$

4. *The depreciation must be significant on an annual basis.* The year-on-year depreciation must exceed a threshold in at least one month within the period from two months before to five months after t . This primarily targets to exclude rebounds following short-lived appreciations.

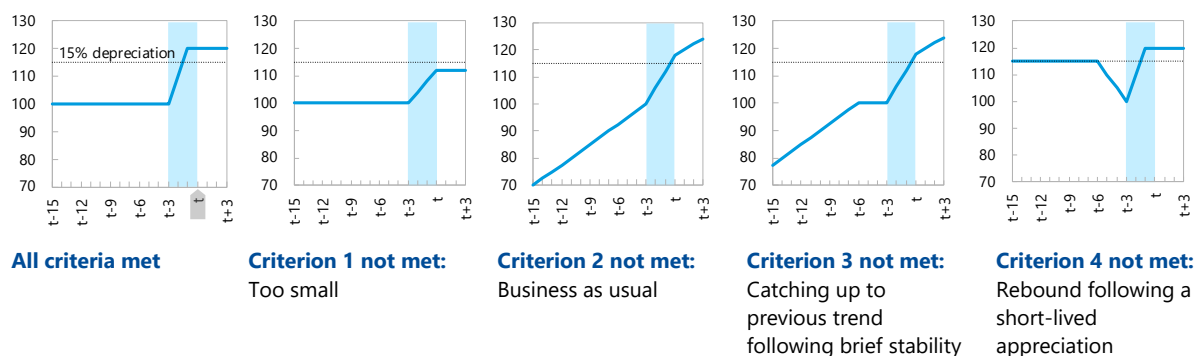
$$e_s - e_{s-12} > \bar{e}_{yy} \text{ for at least one } s \in [t-2, t-1, \dots, t+5]$$

¹⁵ In the exploratory phase, the authors also looked at identification based on *average* monthly bilateral exchange rate (IFS's ENDA series). While the overall number of results was virtually identical, the intra-month averaging made it more difficult to accurately pinpoint the starting month of the episode. Identification based on NEER or REER series (both of which are constructed by using ENDA) was also discarded because that would have: (i) reduced the analyzed universe (the two series are not available pre-1980 and, for some countries, until much later), (ii) introduced a potential source of measurement error, as CPI measurements in the early days of a large depreciation are likely to be less reliable.

¹⁶ One criticism for using ENDE is that it, by definition, rules out the possibility of large depreciations of the USD. When using the NEER series for identifying large depreciations, the USD registers no large depreciation episodes using default thresholds (calibrated for the NEER series) but does record an AE-only episode for April 2009. However, this episode looks more like a rebound from the sharp appreciation in 2008 (the dollar stayed appreciated long enough to satisfy criterion 4.)

¹⁷ We use the three-month rolling series instead of month-on-month series, since the month-on-month changes in exchange rates are volatile. After applying the four thresholds, we use another algorithm to pinpoint the month of the large depreciation event within the three-month window.

Figure 1. Visual Illustration of Identification Criteria

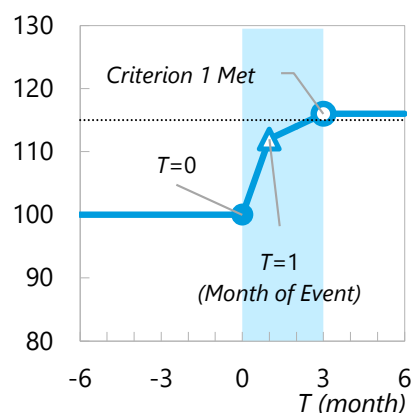


Note: The shaded area in light blue shows the three-month window where a large depreciation event is detected. The light blue line depicts ENDE series normalized to 100 at $t-3$, the beginning of the three-month window.

Figure 1 illustrates the role played by each criterion in identifying large depreciation events. In the leftmost chart, where all criteria are met, the quarter-on-quarter depreciation from month $t-3$ to month t (shaded in light blue) is substantially large and accelerating relative to the previous quarter and year. Moreover, the year-on-year depreciation from month $t-12$ to month t is also substantially large. The next four charts illustrate cases where each criterion is not met.

This algorithm so far only identifies a three-month window in which a large depreciation has occurred (between month $t-3$ and month t , area shaded in light blue in Figure 2). Within that window, the month of the event is pinpointed based on the size of the monthly depreciation and whether the abandonment of a peg is detected (Annex III).

Figure 2. Pinpointing the Month of Event



Thresholds

The thresholds used for the four criteria are presented in Table 1. We provide two sets of thresholds. The default thresholds are applied to all countries. For advanced economies (AEs), the users of the dataset have an option to apply the AE-specific thresholds to capture large depreciation events that are widely recognized but do not satisfy the default thresholds, such as the 1976 sterling crisis. Previous literature has also used different thresholds for AEs, as AE currencies tend to be less volatile than those of emerging markets (EMs) or developing markets (DMs). When using our dataset, researchers can choose whether to apply to AEs

Table 1. Thresholds

(In Percent)	Default	AE-Specific
$\bar{e}_q$	15	10
$\bar{e}_{qq}$	10	10
$\bar{e}_{qy}$	10	9
$\bar{e}_{yy}$	20	15

the default thresholds or the AE thresholds.¹⁸ The stylized facts are based on the default thresholds, to ensure fair comparison.

The default thresholds are informed by the distribution of the associated series (quarterly growth, quarter-on-quarter acceleration, quarter-on-year acceleration, and year-on-year growth) among EMs (Annex II). The AE only thresholds are informed by the distribution of the series among AEs.

The quarterly ($\bar{e}_q$) and quarter-on-quarter ($\bar{e}_{qq}$) default thresholds are somewhat tighter than Cavallo and others (2005), where 10 percent is used for both. The annual default threshold ($\bar{e}_{yy}$) is comparable to the literature that identifies currency crises using annual data: Frankel and Rose (1996) used 25 percent and IMF (2015) used 13 percent for AEs, and 20 percent for EMs and DMs.

Constructing Large Depreciation Episodes

A large depreciation episode covers 24 months starting from the month of a large depreciation event (months T=1 through T=24). Many countries record multiple depreciation events a few months apart, so the 24-month period following one event may also include other ones. However, we do not treat them as the start of separate episodes; instead, they are viewed as “aftershocks” and are documented separately. This is because the presence of multiple large depreciation events over the course of two years contains useful information.¹⁹

If the maximum NEER depreciation over the 24-month period starting from the month of an event is smaller than 10 percent, we do not count it as a large depreciation episode.²⁰ This excludes cases where the appreciation of the USD led to a sharp depreciation of the local currency against the USD but not against the currencies of the main trading partners.

For each episode, we preserve four years of monthly data: two years of large depreciation episode and two years prior to the episode (months T=-23 through T=0). For this 48-month period, we keep track of monthly data series for the ENDE, NEER, REER, and CPI, with all series normalized to 100 at T=0.

Comparison with Previous Studies

Except for Cavallo and others (2005) and De Gregorio (2016), the previous studies identified episodes based on annual exchange rate series (Frankel and Rose 1996, Laeven and Valencia 2013/2020, Reinhart and Rogoff 2014, IMF 2015). By using monthly data, we can have a richer characterization of depreciation episodes, tracking the high-frequency movements of the ENDE, NEER, CPI, and REER. Additionally, the use of monthly data allows us to utilize information from a combination of year-on-year, quarter-on-quarter, and month-on-month changes in exchange rates to precisely pinpoint the large depreciation events.

¹⁸ If they want to apply the default thresholds to AEs, they can exclude events (or episodes) where the variable *eventAeOnly* (or *episodeAeOnly*) is equal to one. The variable equals one for large depreciations in AEs that satisfy the AE thresholds but not the default thresholds; it equals zero otherwise.

¹⁹ There could be a series of large depreciation events covering a period longer than 24 months where each consecutive pair is less than 24 months apart. Our algorithm starts a new episode once the 24-month window has passed from the initial event. However, depending on the research question, the users of the dataset may want to consider them as one long episode, covering more than 24 months.

²⁰ However, NEER data is available starting in 1979M1. Therefore, the filter is not applied to large depreciation episodes that started in 1979M1 or before.

The process for identifying large depreciation events is closest to Cavallo and others (2005), who also use monthly data and filters that analyze three-month windows. However, our dataset improves on their method in three dimensions. First, by using additional criteria 3 and 4, we exclude cases where the large depreciation was a catch-up or a rebound. Second, our algorithm for pinpointing the specific month within the three-month window that marks the large depreciation event results in more accurate dating of the large depreciation events. Finally, our dataset covers 905 events and 582 episodes²¹, whereas Cavallo and others (2005) include 24 episodes. De Gregorio (2016) also used monthly data but identified large depreciation episodes based on the deviations the exchange rate from its trend. The start of each episode was determined using the minimum value of the exchange rate, which resulted in earlier dating than is commonly recognized; the starts of the large depreciation episodes are also not identified with monthly precision.²²

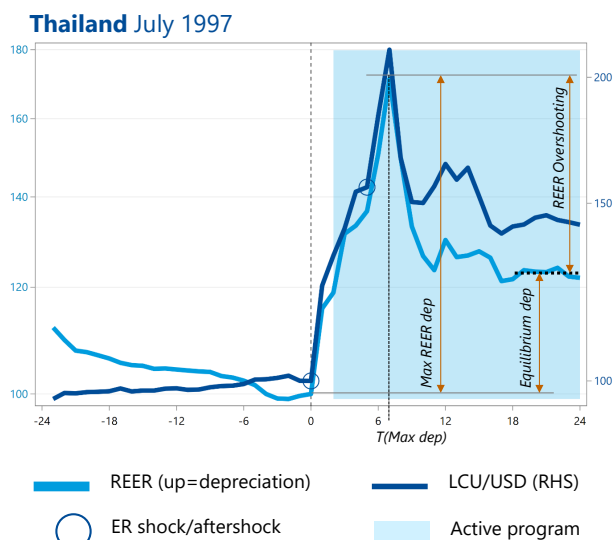
Defining Key Concepts for Large Depreciation Episodes

The movements of the three exchange rate series—ENDE, NEER, and REER—within each large depreciation episode are characterized by the maximum depreciation, month of maximum depreciation, equilibrium depreciation, overshooting, and overall depreciation. The *maximum depreciation* is defined as the difference between the highest (weakest) level of the exchange rate within the episode and the exchange rate at $T=0$. We also record the month of maximum depreciation, as it is informative of when the exchange rate starts to stabilize. The post-shock *equilibrium exchange rate* is defined as the average exchange rate between $T=19$ and $T=24$. The *equilibrium depreciation* is then this equilibrium exchange rate minus the exchange rate at $T=0$.²³ The *overshooting* is defined as the difference between the maximum depreciation and the equilibrium depreciation. All these concepts are illustrated in Figure 3 for REER.

In general, maximum depreciation can be identified unambiguously, but there is less certainty as to what constitutes equilibrium depreciation (with overshooting being the difference between the two).

We therefore provide alternative approaches to measuring these key concepts, which may be more suitable for analyzing some types of large depreciation episodes (Annex I). Having said that, we are partial to the baseline specification, which is informed by decades of IMF-supported adjustment programs. It is generally assumed that the stabilization part of an IMF program lasts about 18–24 months (hence the large number of 18- and 24-month Stand-By Arrangements). So, it's reasonable to think of those outer months in our two-year analysis window as the point in time by which the exchange rate (and particularly the *real* exchange rate) at least *should* have reached equilibrium.

Figure 3. Illustrative Example for REER



²¹ Among these, 82 AE events and 48 AE episodes satisfy the AE-specific thresholds but not the default thresholds.

²² For instance, the large depreciation episodes in Korea and Thailand associated with the Asian crisis are dated 1995, not 1997.

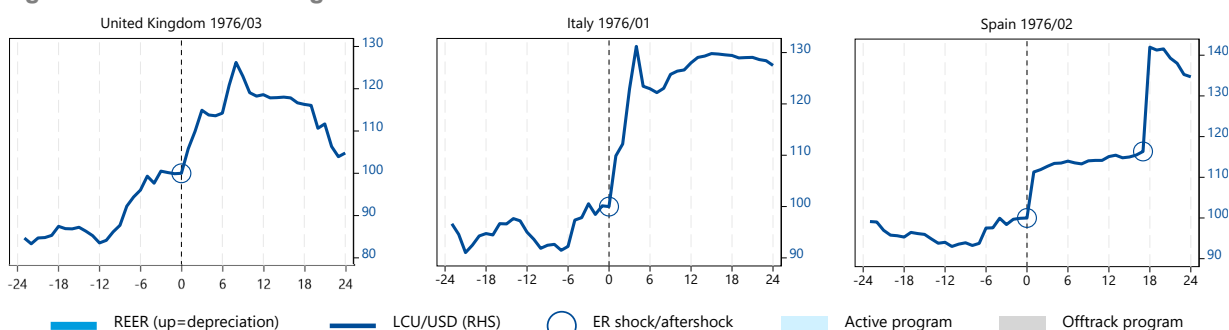
²³ Since the exchange rate at $T=0$ is normalized to 100, equilibrium depreciation = equilibrium exchange rate – 100.

Large Depreciations Through Half a Century

Before launching into a systematic analysis of all 582 episodes in the dataset, it's worth briefly going over some high-profile cases, while at the same time explaining how our dataset sheds new light on them. Some of these cases remain fresh in memory despite the intervening decades, some have prompted deep economic transformations (though some other ones, maybe even more surprisingly, haven't), some spurred economic research (starting with Dornbusch 1976), and many have featured on the front page of the Financial Times. The subset of cases illustrated below inform the more formal analysis in the next section, and many of the characteristics that we tried to codify (e.g., stable vs. unstable depreciation episodes) were conceived while perusing these cases. Our consistent approach to characterizing large depreciations—ENDE, REER and CPI evolution over a 4-year window centered on the onset of the episode—allows for easy comparisons.²⁴

Virtually no one is safe from a large depreciation. While generally associated with less advanced economies, long-industrialized and financially sophisticated economies have experienced large depreciations as well. Not even reserve currencies were spared: Switzerland had two in rapid succession (1988 and 1991), Japan had three (1982, 2012, 2022), and the United Kingdom had four, all in different decades (1976 sterling crisis, the 1992 ERM crisis, the 2008 Global Financial Crisis and the 2016 Brexit).²⁵ With the exception of the Brexit, the United Kingdom's other large depreciations were part (or even at the center) of multi-country crises. Interestingly, despite the attention the 1976 Sterling crisis often receives in historical accounts, the British pound's depreciation in 1976 does not meet the default thresholds and is only captured under the less-stringent AE-specific thresholds. Figure 4 also illustrates one of the limitations of the underlying data: absence of the REER series pre-1979.

Figure 4. The 1976 Sterling Crisis

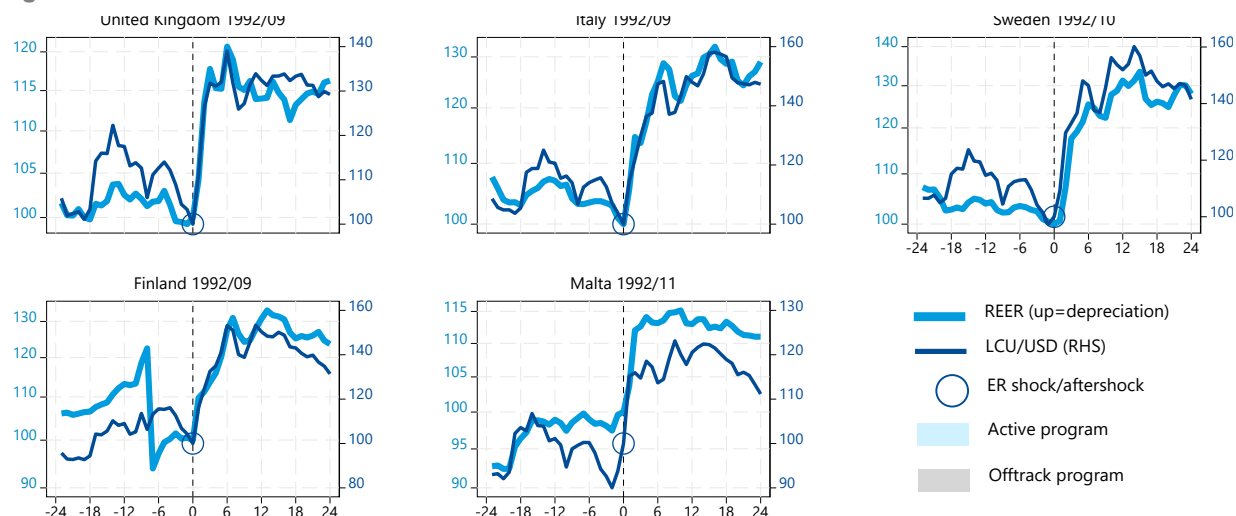


The European Exchange Rate Mechanism (ERM) crisis marks another multi-country wave, with the United Kingdom and four other AEs experiencing large depreciations between September and November 1992. A notable feature of the ERM is that most currencies stabilized at new levels (both in nominal and real terms) with little overshooting.

²⁴ CPI is not plotted in the charts presented in this section to reduce clutter, but CPI dynamics can be easily inferred from the joint dynamics of the other two series.

²⁵ Only two meet the default thresholds: United Kingdom 1992 and United Kingdom 2008; the rest are only captured under AE-specific thresholds.

Figure 5. The 1992 ERM Crisis



The Global Financial Crisis (GFC) saw 39 large depreciations, split between 9 AEs (Figure 6), 18 EMs (Figure 7 showing a subset) and 12 DMs. Figure 6 features the rare AE episode with an IMF program, Iceland's 2008 SBA. The GFC exposes a drawback of using ENDE for event identification, as widespread depreciations could be more accurately viewed as a large dollar *appreciation* triggered by a flight to safety. But this drawback is partly offset by the additional check on the nominal effective exchange rate: while Euro's depreciation meets AE-specific thresholds (e.g., peak 3-month ENDE depreciation was 20 percent), the dominance of intra-euro area trade meant that member countries' NEER moved insufficiently to satisfy this additional condition.

Figure 6. The Global Financial Crisis – Advanced Economies

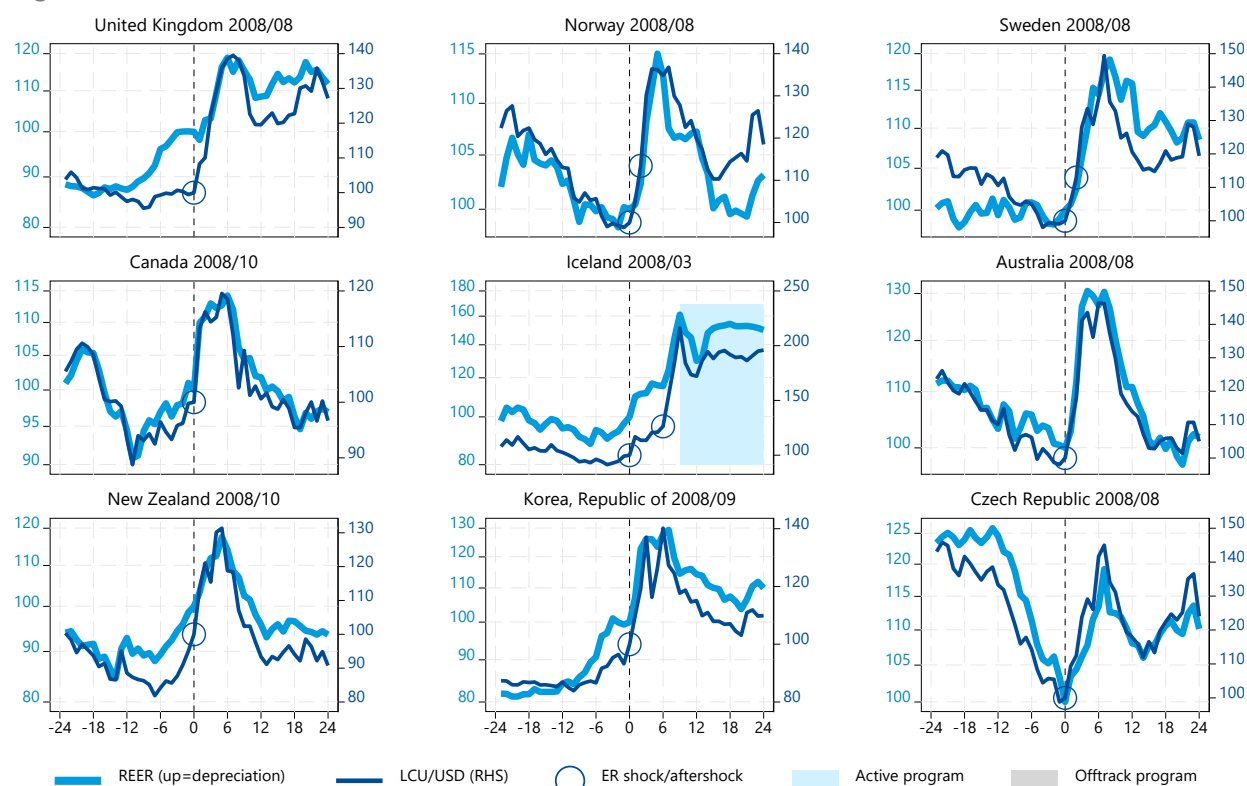
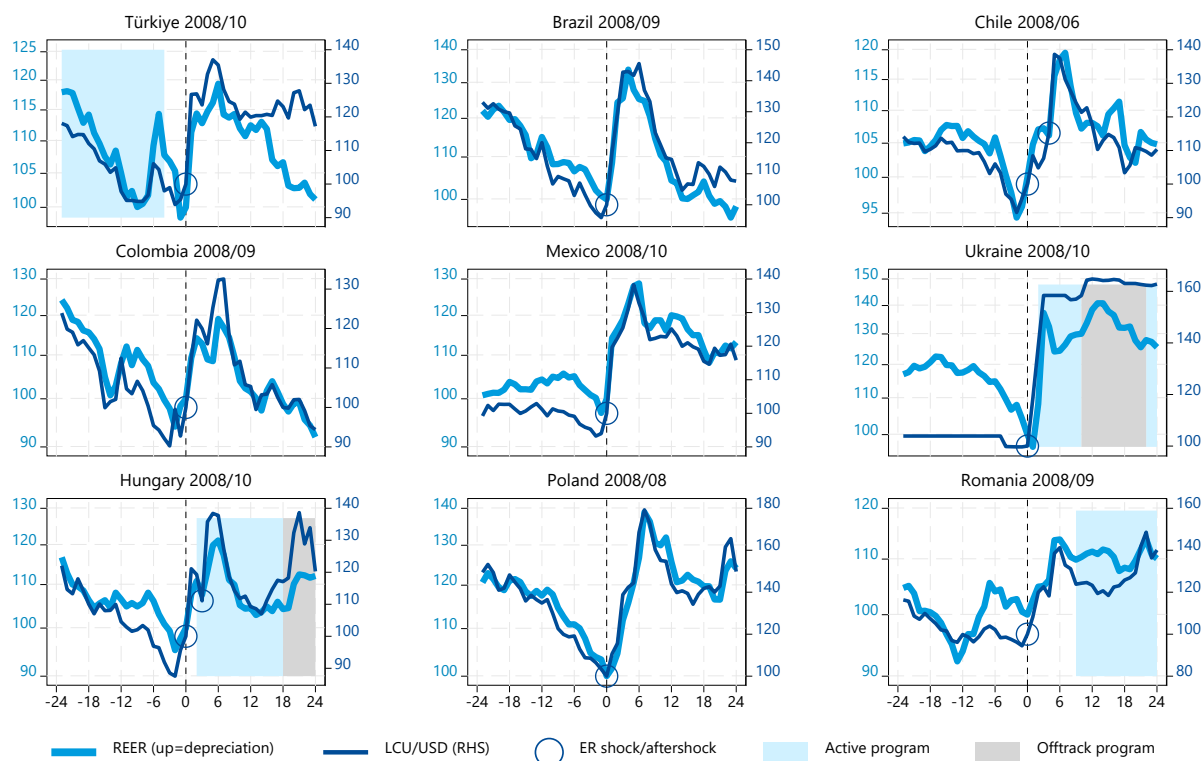


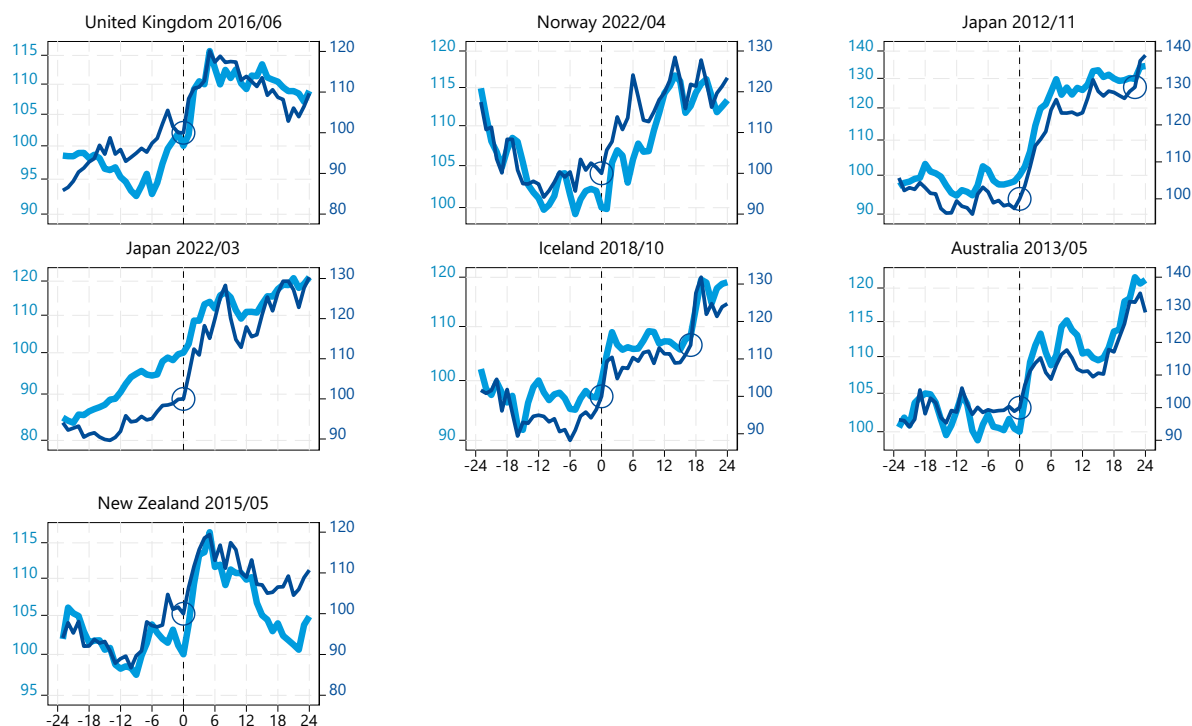
Figure 7. The Global Financial Crisis – Emerging Economies



Note: All remaining charts in this section use the same legend as this figure (not reproduced for brevity).

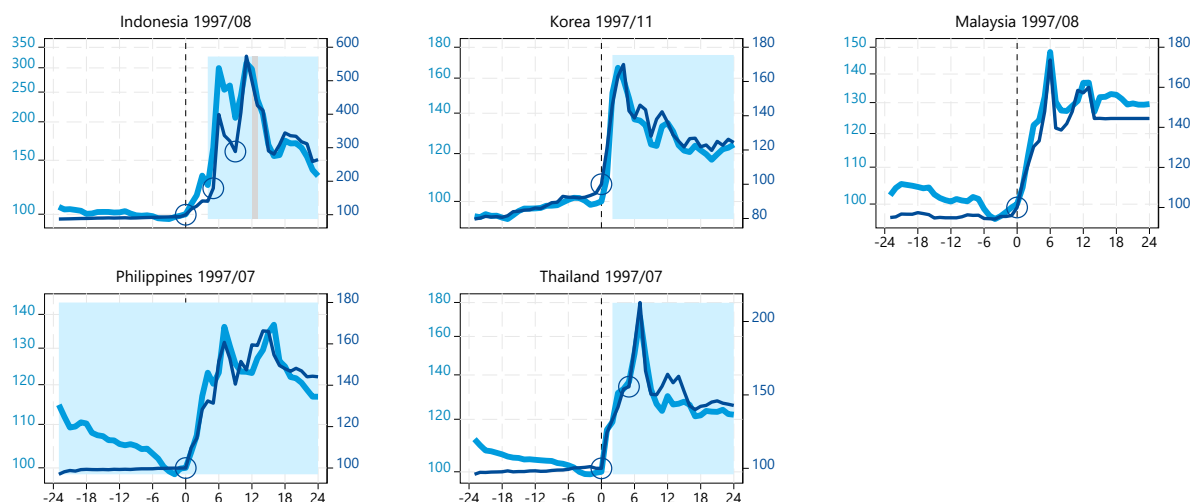
The experiences of EMs in the GFC (Figure 7) fall into two broad groups. In Colombia, Brazil and Chile, the GFC had a transitory effect on both nominal and real exchange rates. In others—Mexico and much of Central and Eastern Europe—real depreciations were more persistent, suggesting that the crisis precipitated the resolution of pre-existing imbalances. Türkiye falls in between: the nominal exchange rate stabilized, but relatively high inflation has gradually eroded the real depreciation. The figure also illustrates the start-stop dynamics of some IMF-supported programs. Ukraine's 2008 SBA (light blue shading starting in month 3) quickly went off track after the first review (gray area). The 2010 SBA (the thin strip of blue shading at the very end of the analysis window marks its beginning) also managed to get through a single quarterly review. The programs in Hungary and Romania fared somewhat better.

Six AEs had large depreciations since the GFC, Japan accounting for two of them (Figure 8). Again, apart from New Zealand's 2015 episode, these cases do not exhibit prominent exchange rate overshooting.

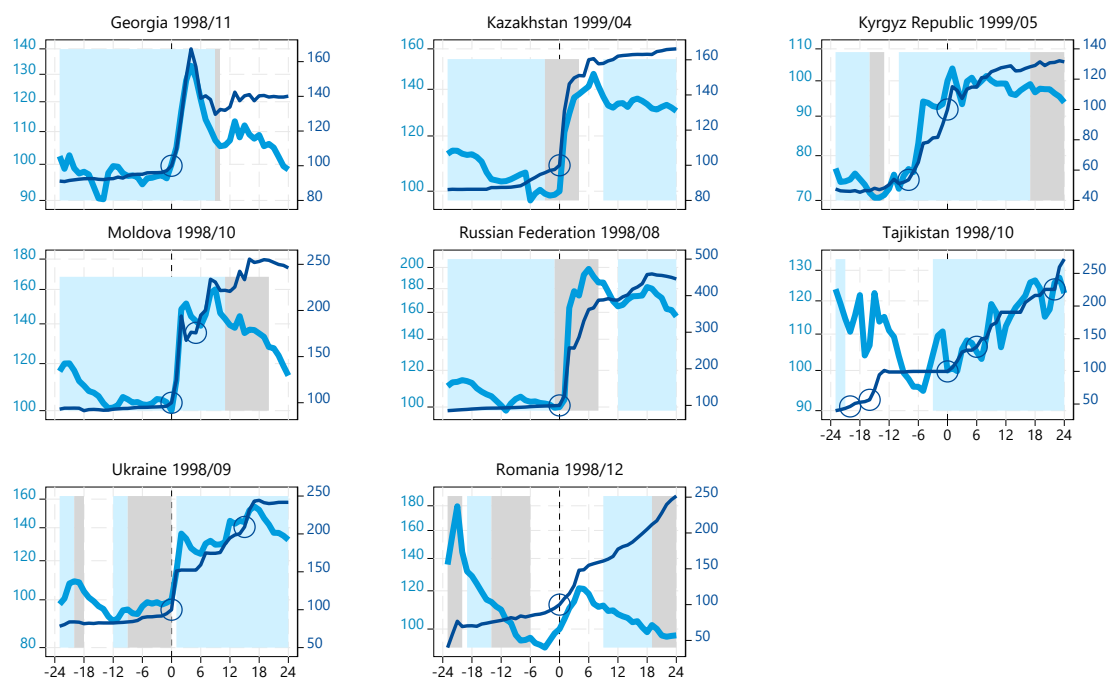
Figure 8. Recent large depreciation in advanced economies

For “textbook” currency crises, we need to turn to EMs, with the 1997 Asian crisis providing some of the most well-known examples.²⁶ Figure 9 compares the journeys of the five countries through the crisis. Korea had a “one and done” experience, with a single event, a single (though very large) overshooting episode, and a significant equilibrium real depreciation. Also note that while the paths of ENDE and REER overlap in most countries, only in Korea this is not a charting artifact: the scales for the left (REER) and right (ENDE) axes are virtually identical (contrast with Indonesia, where the ENDE scale extends much higher than the REER one despite all series being normalized to 100 in the month preceding the event). This suggests a successful suppression of inflation, allowing the nominal depreciation to translate into real depreciation nearly one-for-one. Thailand’s experience is broadly similar, though it did not avoid a second event relatively early in the crisis. Malaysia’s path starts similarly, but the 1998 bout of volatility prompted the pegging of the currency. Importantly, this did not lead to a rapid real appreciation (as happened in other EM discussed below), allowing the country to lock in the competitiveness gain. Indonesia had the bumpiest ride, with the original shock and two aftershocks causing the nominal exchange rate to depreciate nearly five-fold. The first IMF-supported program went off track within a year (thin gray area) and was quickly replaced by a new one.

²⁶ The literature on the Asian financial crisis is vast; Hunter, Kaufman, Krueger (Eds.) (2001) provides a rich collection of articles discussing the origins, implications and lessons learned.

Figure 9. The Asian Financial Crisis

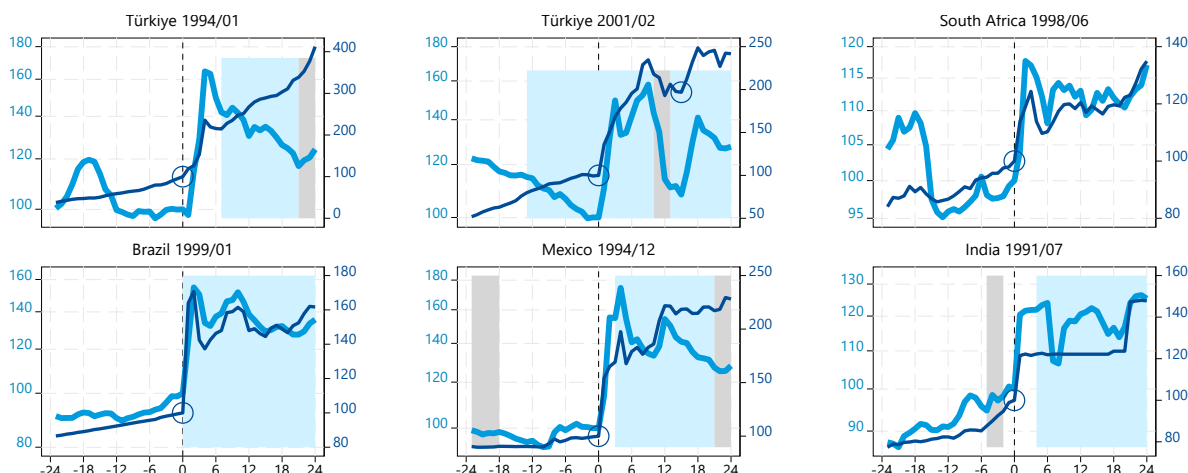
The Asian crisis was succeeded by the 1998 Russian default, triggering another multi-country wave of depreciations (Figure 10). We again see diverging paths: a textbook float in Georgia (with large nominal and real depreciations) vs. multiple devaluations in Ukraine and Tajikistan (some large enough to register as aftershocks) vs. the no-overshooting managed depreciation in Russia. The interaction with IMF-supported programs also varies: In Russia, the depreciation occurred immediately after the program went off track, whereas in Ukraine the new program was put in place at the onset of the episode.

Figure 10. Russia's 1998 crisis and its regional repercussions

Other big EM crises of the 1990s (Figure 11) exhibit less overshooting than the Asian crisis, but it's still there in most episodes. Türkiye 2001 shows how a bout of inflation rapidly eroded the initial real depreciation (see the rapid ENDE-REER diversion around month 10), prompting a new IMF-supported program (the gray-shaded

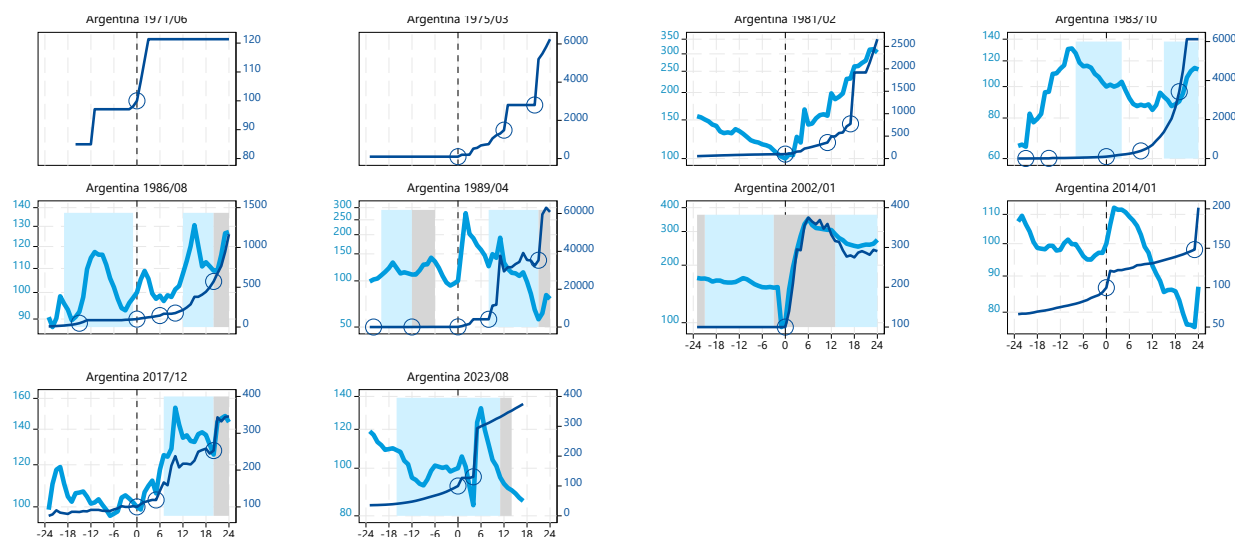
area shows the months when the 2000 SBA went off track) and a second depreciation (the aftershock in month 16). In the 1991 crisis, India's first attempt at repegging was not fully successful, requiring another step devaluation around month 20 (barely below the threshold, hence it doesn't register as an aftershock).

Figure 11. Other large EM crises



Argentina's 25 large depreciation events—a record among EMs—are spread across ten episodes (Figure 12). Many episodes were repegings or successions of repegings punctured by aftershocks; a typical pattern for Latin America in the 1980s. Of the eight episodes for which REER data is available, half did not sustain real depreciations: 1983, 1989, 2014 and 2023.²⁷ The 2002 crisis is special in multiple respects: (i) it's Argentina's only "textbook" depreciation (both ENDE and REER overshot a lot and then settle at new, higher levels), (ii) the only one in which the nominal depreciation translated into real one virtually one-for one (note that the left—REER—and right—ENDE—scales are identical in magnitude), and (iii) the only one without aftershocks.

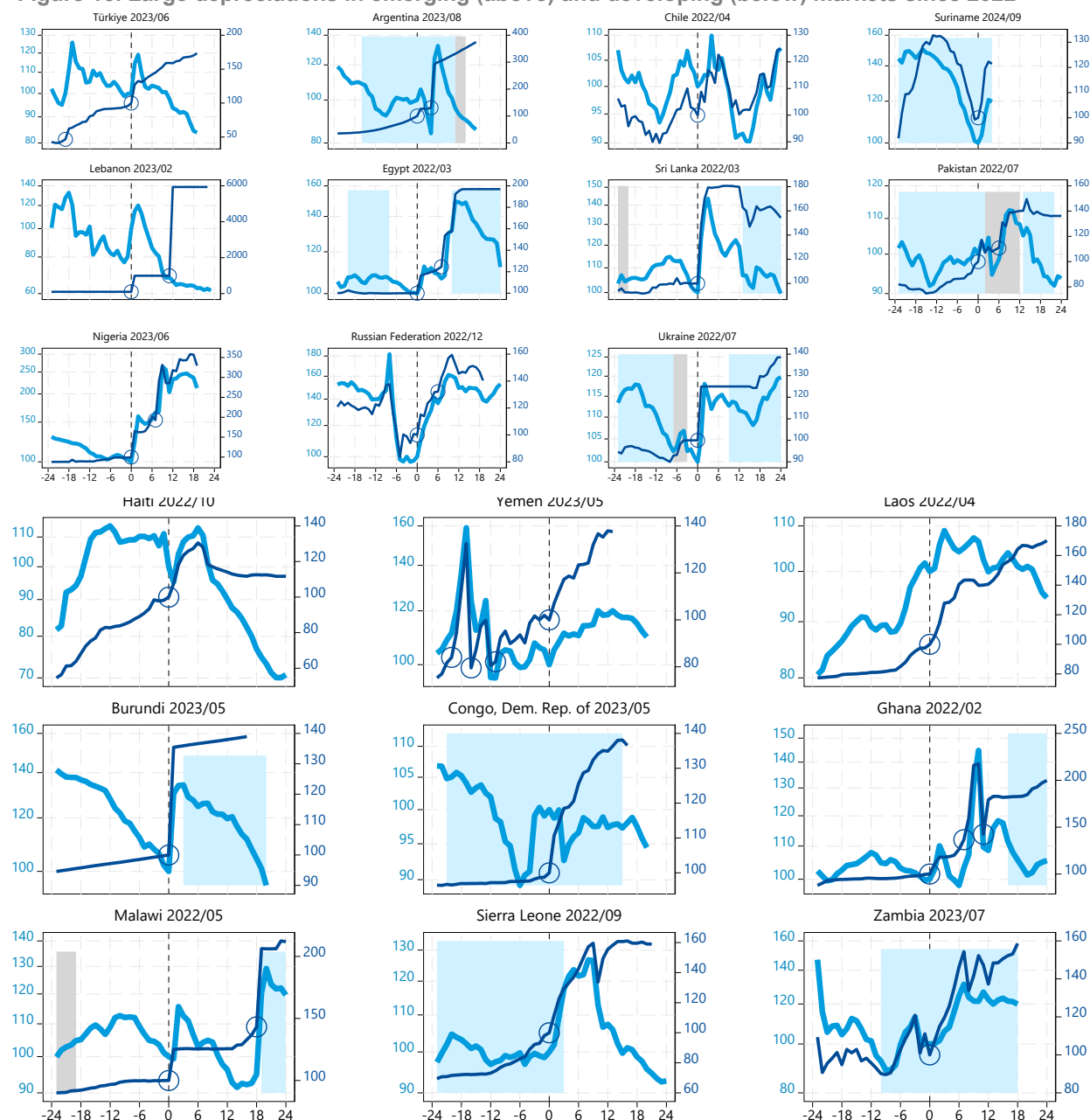
Figure 12. Large depreciation episodes in Argentina



²⁷ "Sustained" real depreciation is defined in section "Stylized Facts" when discussing REER trajectory groups. The 2023 episode is assessed through December 2024, the last observation in the dataset, but the REER remained above pre-shock levels into 2025.

Covid triggered large depreciations across the spectrum, including in 3 of the 5 BRICS countries (Brazil, South Africa, and Russia), other major EMs (Mexico, Colombia, and Türkiye), and some tourist destinations (e.g., Seychelles). There have also been many large depreciations *since* the pandemic. Figure 13 focuses on 20 episodes for which REER is available; exactly half of them saw prolonged periods of rapid and continuous real *appreciations* following initial depreciation shocks. In most of them, the REER at the end of the episode was more appreciated than prior to the large depreciation (Argentina, Burundi, Haiti, Lebanon, Pakistan, Sri Lanka, Sierra Leone, and Türkiye). Short-run REER appreciation could signal success, for example if it reflects the return of international capital. However, the large diversion of ENDE and REER lines in most of these cases suggest that these real appreciations were due to elevated inflation, which is rarely viewed as a sign of success; we will analyze this phenomenon in more details in the next section.

Figure 13. Large depreciations in emerging (above) and developing (below) markets since 2022



Stylized Facts

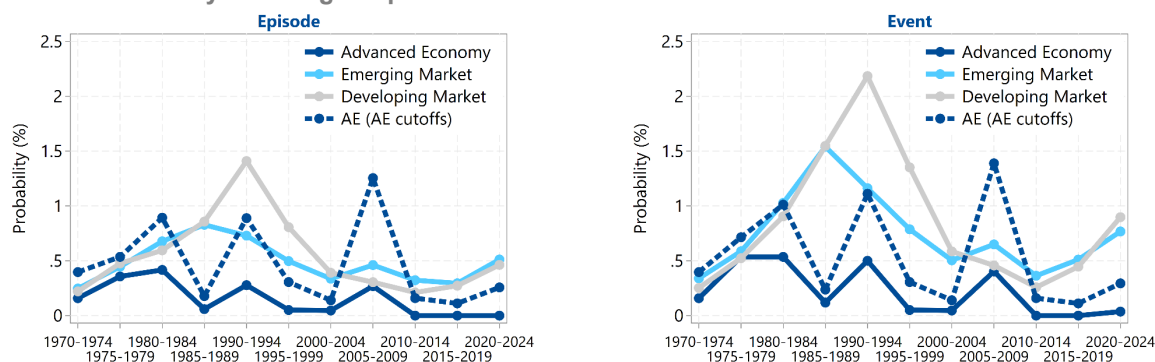
To uncover patterns, we classify large depreciation episodes into groups based on the country's income, REER trajectory, existence of aftershocks, exchange rate flexibility (before/after the event), and IMF-supported program status around the initial event. Then we explore how the prevalence of large depreciation in each group evolved over time, how the median REER, ENDE, NEER, and CPI paths over the episode differed by group, and how the groups correlate with each other.²⁸ For consistency, we apply the default cutoffs that are the same across income groups, unless otherwise specified. Territories that use the sovereign country's currency as their legal tender are included in the dataset but excluded from the analyses in this section.

Income Groups

The episodes are divided into three groups—advanced economies (AEs), emerging markets (EMs), and developing markets (DMs)—according to the income level of the countries they relate to. The list of AEs follows the contemporaneous classification in IMF's World Economic Outlook.²⁹ Countries are classified as DMs if they are eligible for IMF's concessional financing under the Poverty Reduction and Growth Trust (PRGT).³⁰ Countries that are neither AEs nor DMs are classified as EMs.

Large depreciations are more prevalent in countries with lower income levels. On average, a large depreciation episode happened once every 64 years in AEs, once every 17 years in EMs, and once every 15 years in DMs, using the default cutoffs for identification (Figure 14). A large depreciation event occurred every 50 years to AEs, every 11 years to EMs and every 10 years to DMs. When using the lower AE-specific cutoffs, AEs experienced large depreciation episodes every 19 years and events every 16 years.

Figure 14. Probability of a Large Depreciation



Note: The left chart shows the probability that a large depreciation episode will begin each month by income group. The right chart shows similar probabilities for events. The probabilities are averaged over 5-month intervals. Dotted lines in dark blue denote the probabilities for AEs when using the AE specific cutoffs (Table 1), which are lower than the baseline cutoffs.

Several countries stand out. Among AEs, Iceland leads with seven episodes in the analyzed period (1971–2024), which is more than double the number of episodes recorded by the second-highest countries: Israel,

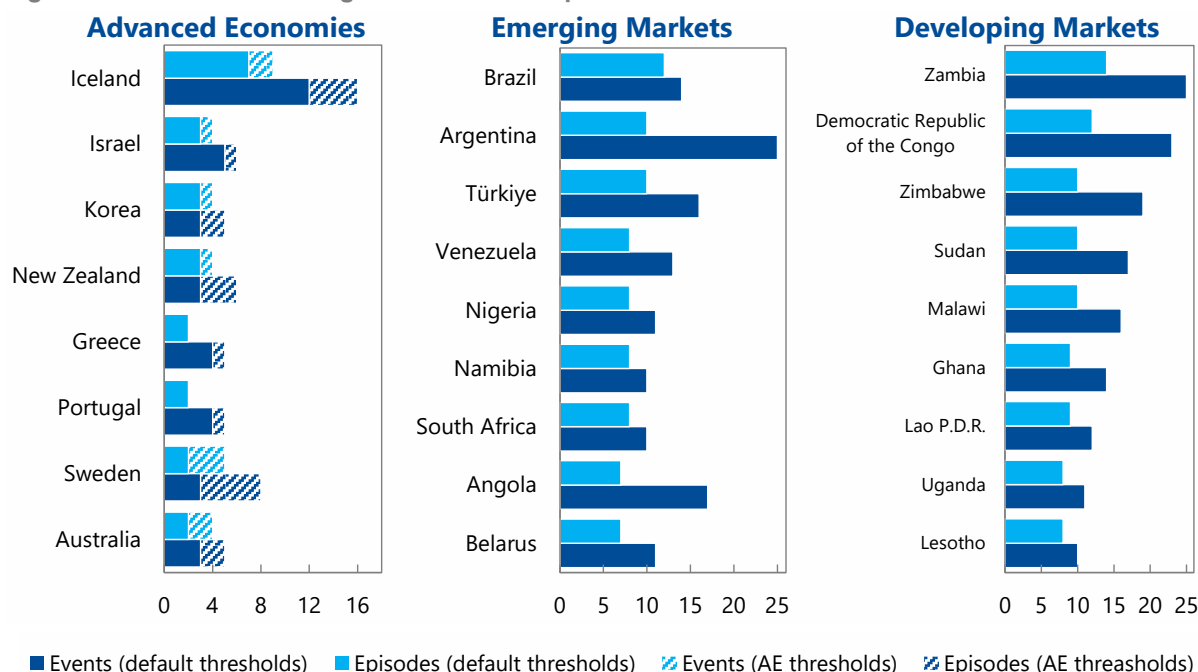
²⁸ The discussion in this section is restricted to selected combinations of groups. We include the full cross-tabulation of groups in Annex IV.

²⁹ From December 1979 until May 1997, these are the set of countries classified as “industrial countries” in WEO. For the period before December 1979, we use the same classification as the one adopted by the IMF in December 1979.

³⁰ We use the list of PRGT-eligible countries from PRGT eligibility reviews 2010–20.

Korea, and New Zealand, each with three episodes (Figure 15). Even when using the AE-specific thresholds, which are lower than the default thresholds, Iceland maintains its top position with nine episodes, followed by Australia with five. Among EMs, Brazil has the highest number of episodes at 12, followed by Argentina and Türkiye, each with 10 episodes. In DMs, Zambia takes the lead with 14 episodes, followed by the Democratic Republic of Congo with 12. While the rankings based on the number of events are generally consistent with those based on the number of episodes, within EMs, Argentina has the highest number of events at 25 (see discussion in the previous section), followed by Angola at 17 and Türkiye at 16.

Figure 15. Countries with Highest Number of Episodes and Events

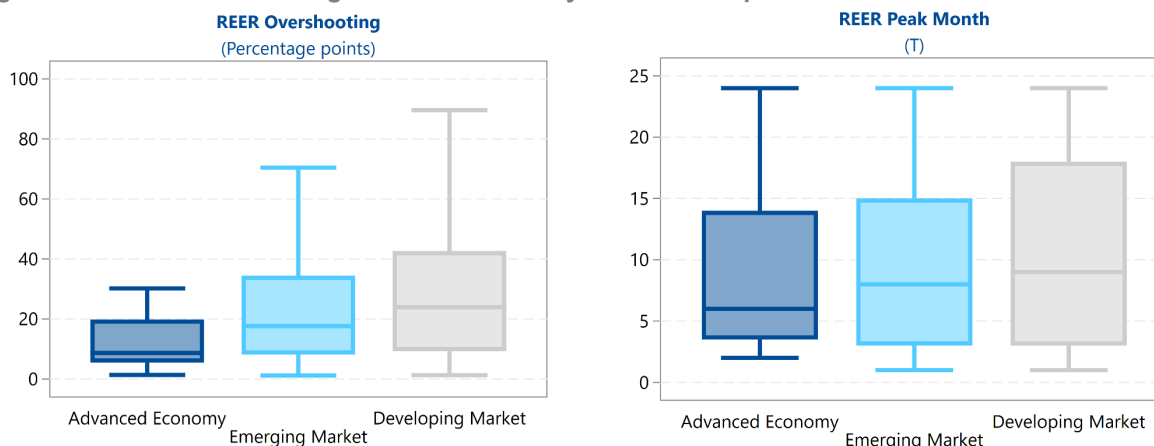


Note: The income group classification in this figure is based on each country's income group in December 2024.

While there is heterogeneity within the income groups, REER tends to overshoot more and peak later in countries with lower income levels. We measure median overshooting at 9 percentage points for AEs, 18 percentage points for EMs, and 23 percentage points for DMs (Figure 16). The distributions are skewed to the right: mean overshooting was larger at 13 percentage points for AEs, 27 percentage points for EMs, and 41 percentage points for DMs. Even when accounting for the fact that the equilibrium REER depreciation also tends to be larger for countries with lower income levels—with median values of 10 percent for AEs and 15 percent for EMs and DMs—REER overshooting is negatively correlated with income. The *relative* overshooting—defined as the overshooting divided by the post-crisis equilibrium³¹—is 8 percent for AEs, 15 percent for EMs and 17 percent for DMs. The results are also similar when focusing on stable episodes (stability is defined in the next subsection) or using alternative methods of measuring overshooting (Annex Figure 16, Annex Figure 17). Meanwhile, lower-income countries take a longer time to reach maximum real depreciation, with median peak months at T=6 for AEs, T=8 for EMs, and T=9 for DMs; mean values are T=9 for AEs, T=10 for EMs, and T=11 for DMs.

³¹ As discussed earlier, we define the post-crisis equilibrium REER to be $\text{mean}(E_T)$ for $T \in [19, 24]$ where E_T denotes the REER normalized to 100 for the pre-crisis month ($T=0$) (Annex I). In reality, REER may not converge to the steady-state equilibrium level, as defined in previous research such as Goldfajn and Valdes (1999), by the end of the episode.

Figure 16. REER Overshooting and Peak Month by Income Group



Note: The charts do not plot outside values that lie beyond the whiskers. The box is drawn from the 25th percentile to the 75th percentile, with a horizontal line drawn inside it to denote the median. The lower whisker is extended to the 25th percentile minus 1.5 times the interquartile range. The upper whisker is extended to the 75th percentile plus 1.5 times the interquartile range.

REER Trajectory Groups

Although we identify large depreciation episodes using the ENDE³², our main variable of interest is the REER, as it is the relevant metric for assessing evolution of the external balance. The REER trajectory following the initial shock is of great policy interest (if not anxiety). If the cause of the large depreciation episode is an initially overvalued REER, the policymaker is likely prefer a trajectory of the REER with as little overshooting as possible, followed by a stabilization at a level that is consistent with fundamentals (akin to what the United Kingdom, Italy and Sweden have experienced in the ERM 1992 crisis; see Figure 5). The alternatives are not appealing. On one hand, a REER that continues to depreciate significantly throughout 24 months after the initial large depreciation event would suggest a failure to find a new external equilibrium and prolonged economic uncertainty. A substantial real revaluation of the currency following the initial large depreciation event would be equally problematic, as it would negate the effects of the earlier depreciation.

In this spirit, episodes are divided into three groups according to their REER trajectories: “stable depreciation”, “unstable depreciation”, and “depreciation not sustained”.³³ If overall REER depreciation over the course of the episode is 5 percent or more,³⁴ the depreciation in that episode is considered sustained. The episodes with sustained depreciations are further divided into *stable* depreciations and *unstable* depreciations based on whether the REER stabilizes by the end of the episode or continues to depreciate.³⁵ It is worth noting that in

³² We explain why we choose to use the ENDE to identify the large depreciation episodes in section “Constructing the Large Depreciation Episodes.”

³³ REER groups are defined for episodes where we observe REER for all months between $T=-23$ and $T=24$. Since REER data is available for 1979M1–2024M12, REER groups are available for episodes that began in 1981–2022.

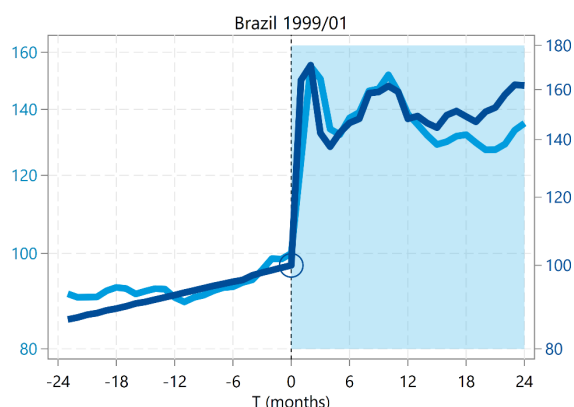
³⁴ The *overall depreciation* is defined as the difference between the average exchange rate between $T=19$ and $T=24$ and the average exchange rate between $T=-5$ and $T=0$. Although the overall depreciation is similar in concept to the equilibrium depreciation, it can be more reliable if the exchange rate fluctuated a lot around the *onset* of the large depreciation episode, making the exact timing of the onset difficult to pinpoint.

³⁵ Specifically, a stable depreciation needs to satisfy two criteria. First, the month of maximum depreciation must be $T=18$ or earlier. Second, the trend must have “stabilized” by the end of the episode, which can be satisfied either by reaching the maximum trend before $T=24$ or having the trend appreciate or depreciate by 2.5 percent or less in the 6-month period between $T=19$ and $T=24$ (equivalent to 5 percent annual). The trend is calculated using two-sided Hodrick-Prescott filter with $\lambda=400$.

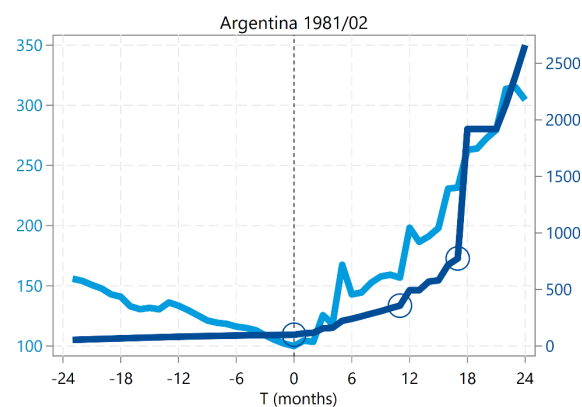
cases of unstable depreciation, measures of overshooting are less meaningful, since the REER usually continues to depreciate after the episode rather than reaching a peak within the episode. If the overall depreciation is less than 5 percent, the depreciation in that episode is considered *not sustained*.

Figure 17. Examples of REER Trajectory Groups

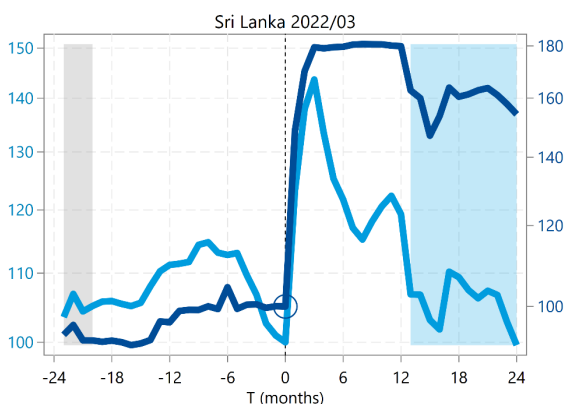
Stable Depreciation



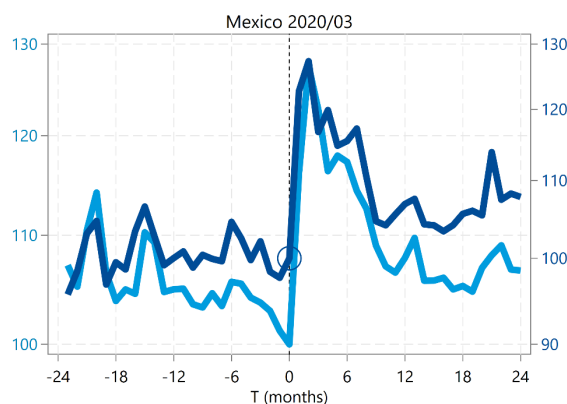
Unstable Depreciation



Depreciation Not Sustained (1)



Depreciation Not Sustained (2)



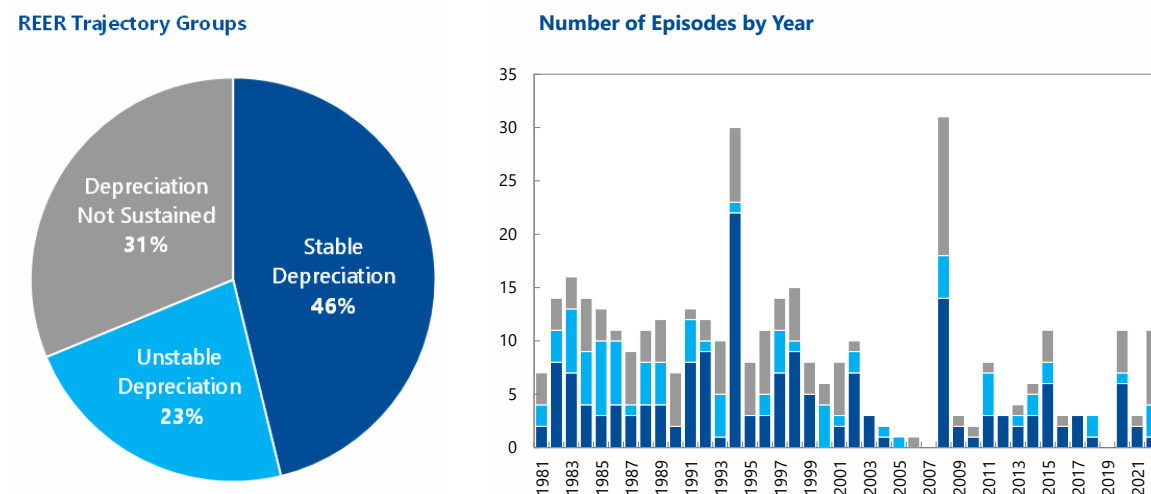
— REER (up=depreciation) — LCU/USD (RHS) ○ ER shock/aftershock
 Active program Offtrack program

Note: All series are normalized to 100 at T=0.

Figure 17 illustrates that “depreciation not sustained” can happen either because the initial nominal depreciation is eroded by rapid inflation (e.g., Sri Lanka 2002) or because the nominal exchange rate appreciates again (e.g., Mexico 2020). The second scenario is more likely when the depreciation episode is caused by a transitory external shock, rather than pressure to correct a misalignment of the real exchange rate.

Stable depreciations are common, but not the rule, accounting for just under half of all episodes (Figure 18). But it’s notable that nearly a third of all depreciations were not sustained. There are no noticeable time trends, but some years stand out. In 1994, when the CFA franc was devalued, all 14 countries using the currency had stable depreciations, so the share of episodes with stable depreciation was unusually high at 73 percent. During the GFC, many countries experienced large but short-lived depreciations vis-à-vis the USD; so, the share of episodes where depreciation was not sustained was high at 43 percent.

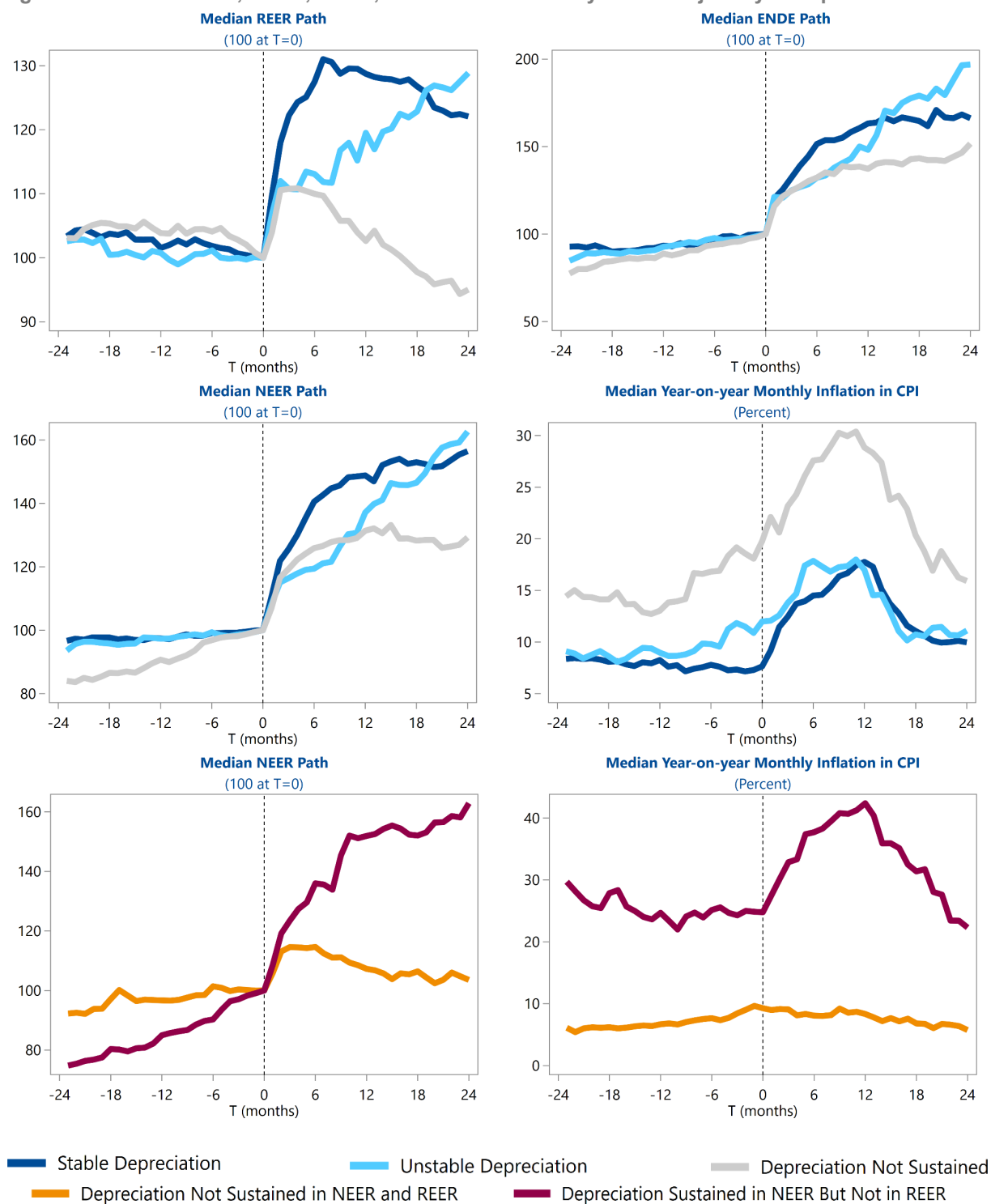
Figure 18. Share of each REER group



Large and sharp nominal depreciations are more likely to be stable, provided inflation is kept in check. In a “stable” depreciation, the median REER depreciates some 31 percent by $T=7$, whereas the other two groups exhibit much smaller initial depreciations of around 11–12 percent (Figure 19). What drives the difference in REER trajectory between the “stable depreciation” group and “unstable depreciation” group was how large and front-loaded the nominal depreciation was, rather than the differences in inflation; the median year-on-year monthly inflation paths are similar for the two groups, with a moderate increase following the onset of the depreciation episode. But high inflation is the defining feature of “depreciation not sustained” episodes: the median case in this group experienced higher inflation both before and after the onset of the episode. Contrasting the REER and NEER median paths for this group also suggests that the typical episode in this group is closer to Sri Lanka 2022 than to Mexico 2000 from Figure 17—the real appreciation following soon after the initial depreciation is accompanied by a nominal *depreciation*. To confirm the finding, we further divide the “depreciation not sustained” group into “depreciation not sustained in NEER and REER” and “depreciation sustained in NEER but not in REER”, based on whether the overall depreciation in NEER during the episode was less than 15 percent.³⁶ The group “depreciation not sustained in NEER and REER”, which includes Mexico 2000, is characterized by moderate NEER depreciation and low and stable inflation during the 48-month period surrounding the initial event. In contrast, the group “depreciation sustained in NEER but not in REER,” which includes Sri Lanka 2022, is characterized by large and continuing depreciation in NEER, accompanied by high inflation both before and after the initial event. The median inflation in this group also accelerates substantially right after the onset of the episode. As anticipated, the majority (67 percent) of the “depreciation not sustained” REER trajectory group belongs in the latter subgroup, characterized by a sustained depreciation in NEER but not in REER, indicative of depreciation-inflation spirals. Overall, we conclude that a significant real appreciations following a large depreciation event is more likely to constitute a sign of failure than of success.

³⁶ *Overall depreciation* is defined in footnote 34. 15 percent corresponds to the 75th percentile of the year-on-year depreciation in NEER among EMs in 1970–2024, rounded to the nearest multiple of 5.

Figure 19. Median REER, ENDE, NEER, and Inflation Paths by REER Trajectory Group

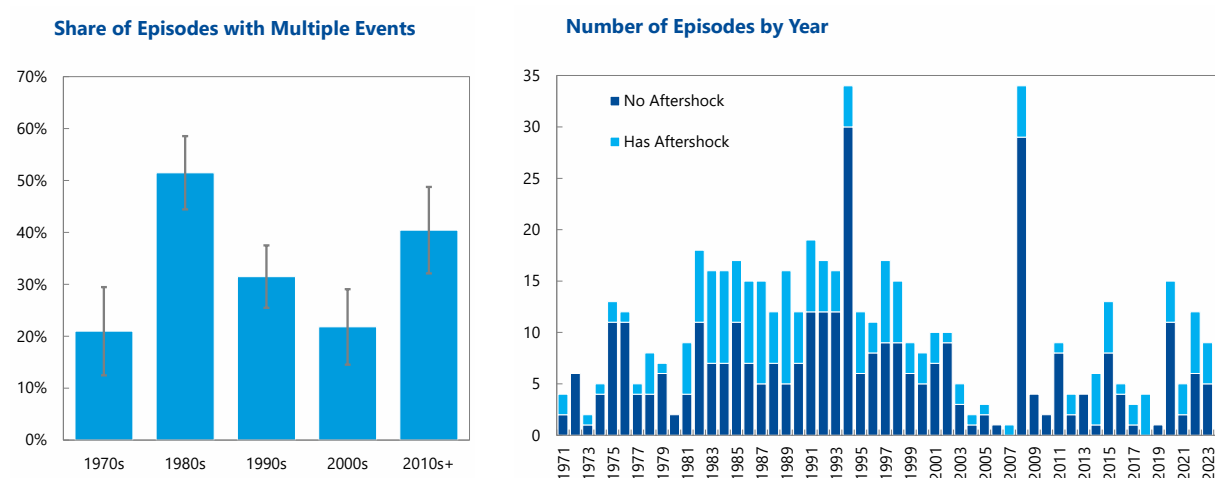


Note: Annex V has charts illustrating the interquartile ranges and medians for ENDE, NEER, inflation, and REER for each group.

Aftershock Groups

As discussed earlier, within the 24-month window after a large depreciation event, there can be other depreciation events meeting the four criteria. Instead of marking them as starting points for new large depreciation episodes (which would have resulted in overlapping episodes), we tag them as “aftershocks” of the initial large depreciation event. Based on the presence of one or more aftershocks following the initial event, the episodes are divided into two groups, “no aftershock” and “has aftershock”. Overall, 36 percent register at least one aftershock, but this share varies over time (Figure 20). In the 1970s, only 21 percent had aftershocks. The share rose sharply in the 1980s to 51 percent but came down to 32 percent in the 1990s and further down to 22 percent in the 2000s.³⁷ However, since 2010, the share rose again to 40 percent.

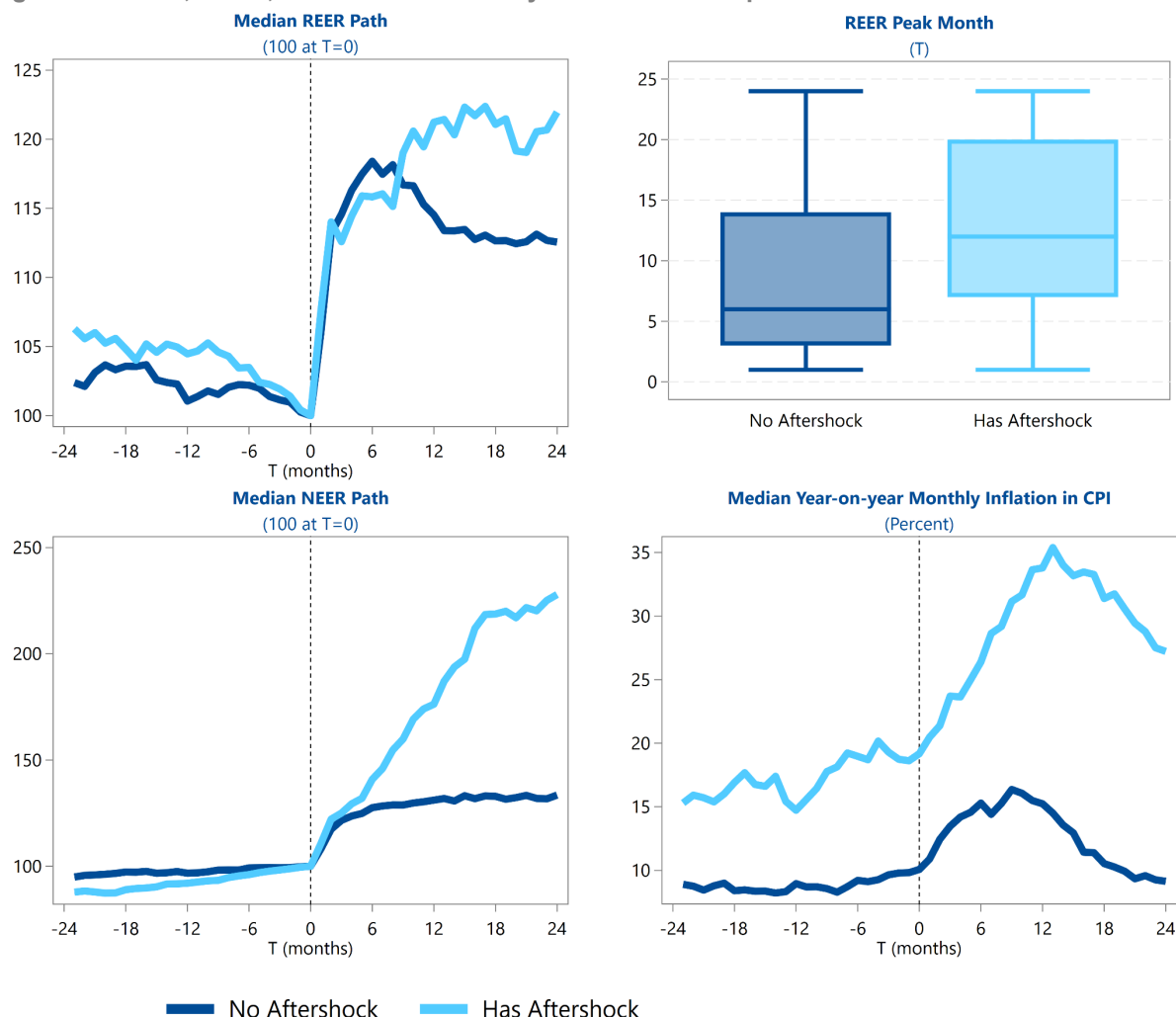
Figure 20. Time Trend of Aftershock Groups



Aftershocks are generally associated with worse outcomes and starting conditions. A few months into an episode, REER typically appreciates, but that is not the experience for the median episode with aftershocks, as shown in the first chart in Figure 21. Charts in the same figure also show that aftershocks delay peak REER depreciation and lead to much larger nominal depreciations (as illustrated by NEER) and significantly worse inflation dynamics. High-inflation countries are also more prone to aftershocks: the median country had an average year-on-year inflation of 17 percent over the 24 months prior to the onset of the large depreciation episode, compared to 9 percent for episodes without aftershocks.

Real exchange rate overshooting is not a sign of failure, but its absence might be. Unless the currency experienced an aftershock, the REER tends to appreciate a few months into the episode. It is mostly in cases with aftershocks—usually destabilizing and confidence-sapping events—that we see REER continue depreciating throughout the 24-month period. In light of this, it’s probably unfair to treat overshooting as a sign of policy failure.

³⁷ 37 percent in the 1990s excluding the year 1994. 27 percent in the 2000s excluding the year 2008.

Figure 21. REER, NEER, and Inflation Paths by Aftershock Group

Note: Annex V has charts illustrating the interquartile ranges and medians for ENDE, NEER, inflation, and REER for each group. The box-and-whisker chart does not plot outside values that lie beyond the whiskers. The lower whisker is extended to the 25th percentile minus 1.5 times the interquartile range. The upper whisker is extended to the 75th percentile plus 1.5 times the interquartile range.

Exchange Rate Flexibility Groups

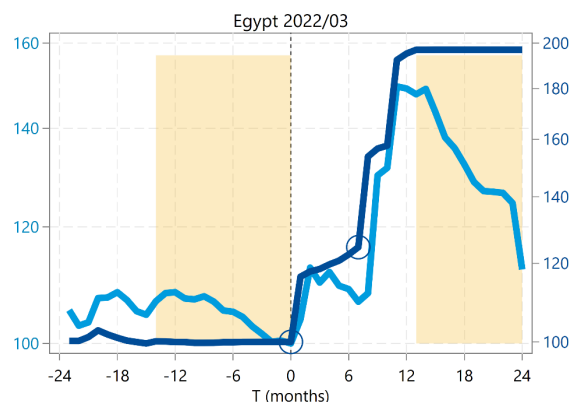
Large depreciations often trigger a rethinking of the exchange rate arrangements. The United Kingdom left the ERM following the 1992 crisis, Argentina's currency board ended in 2001, Ecuador dollarized following the 1998–99 crisis, Brazil repegged in 1993 but floated in 1999.

To analyze this, the episodes are divided into four groups based on the detection of a de-facto peg or a crawl in the 24-month period before and after the initial event: "fixed → fixed", "fixed → flexible", "flexible → fixed", and "flexible → flexible". If either a peg or a crawl is detected within the 24-month window before the initial event, we consider the exchange rates "fixed" in the "before" period. Similarly, if either a peg or a crawl is detected within the 24-month window after the initial event, we consider the exchange rates "fixed" in the "after" period. Figure 22 provides examples for each exchange rate flexibility group.

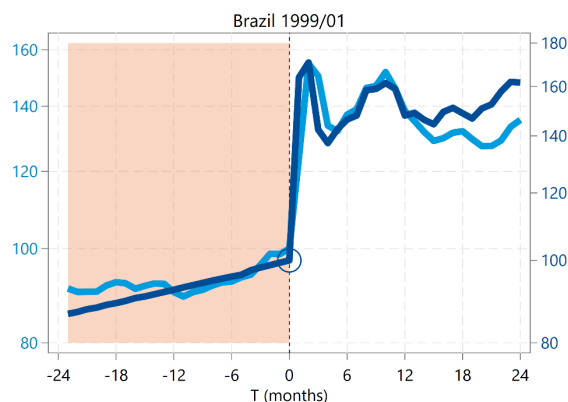
To detect pegs and crawls, we adopt the concept of base currency country from Shambaugh (2004) and Klein and Shambaugh (2015), which is “the economy to which a country is pegged, or, for non-pegged countries, the economy to which they would peg if they did so.”³⁸ A peg is detected when the end-of-period bilateral exchange rate against the base country’s currency is stable for 3 months, *except* for cases where the country adopted the base currency as the official currency. A crawl is detected if the change in this exchange rate is stable for 3 months. The formulas for detecting pegs and crawls are described in Annex III.

Figure 22. Examples of Exchange Rate Flexibility Groups

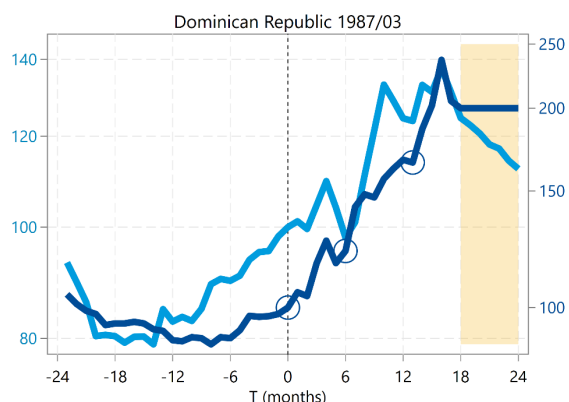
Fixed → Fixed



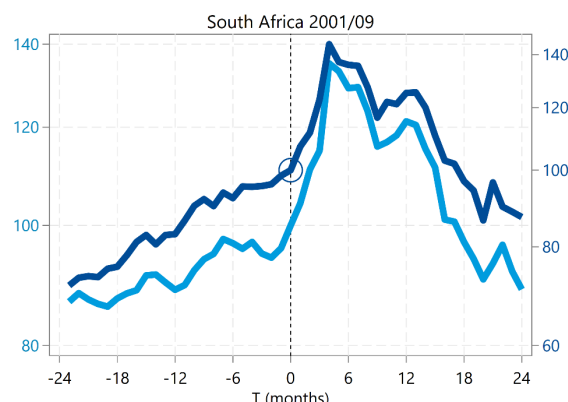
Fixed → Flexible



Flexible → Fixed



Flexible → Flexible



— REER (up=depreciation) — LCU/USD (RHS) ○ ER shock/aftershock
 ■ Peg ■ Crawl

Note: All series are normalized to 100 at T=0.

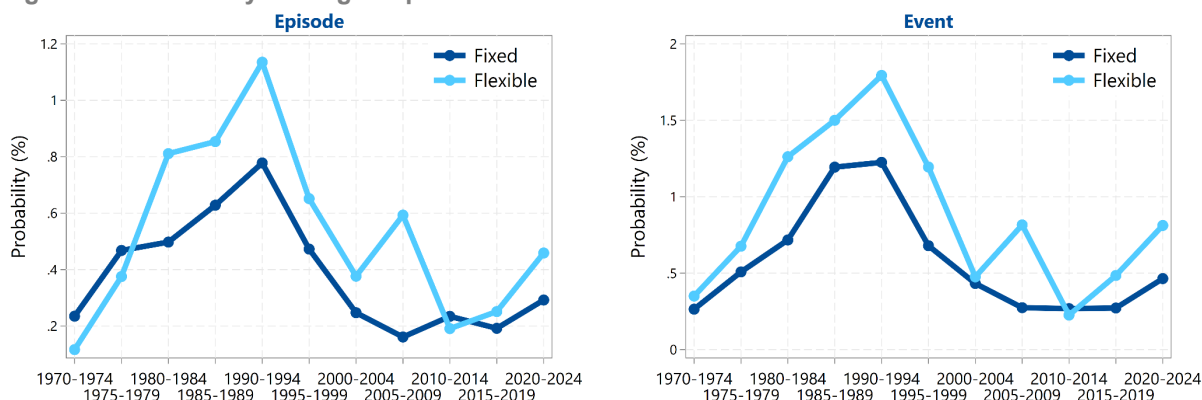
While IMF’s Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) offers a comprehensive database of exchange rate regimes within a standardized framework, its usefulness is limited when assessing exchange rate flexibility around large depreciation episodes. First, the AREAER classifications are annual, which may not be granular enough to capture the changes in exchange rate arrangements that happen around a large depreciation episode. Second, the large depreciation event itself can disrupt the exchange rate arrangement and make the classification more difficult for the year. Third, the AREAER online

³⁸ We extend the Klein and Shambaugh (2015) dataset to cover more countries and years.

data starts in 1999 whereas our dataset starts in 1971.³⁹ By distinguishing between periods of fixed and flexible exchange rates within a calendar year, we can better analyze the conditions under which large depreciations occur and the subsequent policy responses. However, it is important to note that the pegs and crawls identified by our algorithm do not encompass all types of fixed exchange rate arrangements. For instance, those with large fluctuation bands may not be captured.

The probability of a large depreciation is slightly lower for countries with fixed exchange rates. A key potential benefit of a fixed exchange rate is the reduction in trading costs associated with frequent changes in exchange rates (Casiraghi and others 2022). Our dataset shows that countries with fixed exchange rates experience not only fewer small changes but also less frequent substantial swings. On average, a large depreciation episode/event occurred once every 22/15 years to countries with fixed exchange rates and every 16/10 years to countries with flexible exchange rates (Figure 23). The results also hold when using the previous year's exchange rate arrangement according to the AREAER classification, instead of our algorithm (Annex Figure 18).

Figure 23. Probability of Large Depreciation



Note: The left chart shows the probability that a large depreciation episode will begin each month by whether the exchange rate was fixed (either a peg or a crawl was detected, as defined in Annex II) in any month in the last 12 months. The right chart shows similar probabilities for events. The probabilities are averaged over 5-month intervals.

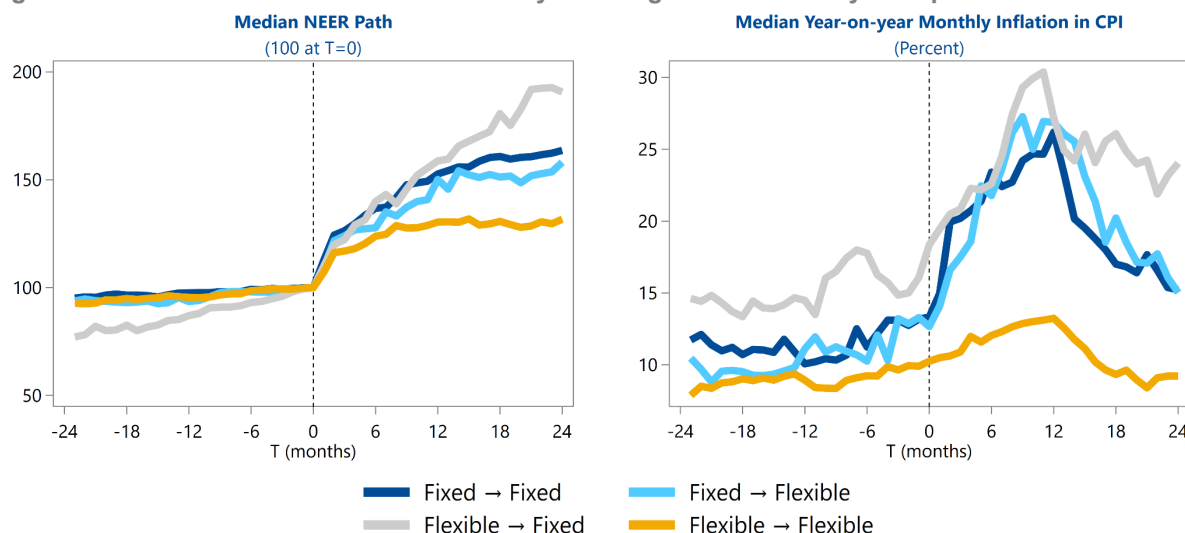
However, when there were large depreciation episodes, countries maintaining flexible exchange rates before and after the initial event generally experienced milder shocks. In the first month, the median NEER in the “flexible → flexible” group exhibits a more moderate initial depreciation of 7 percent in contrast to 13 percent in the “fixed → fixed” group, 9 percent in the “fixed → flexible” group, and 10 percent in the “flexible → fixed” group (Figure 24). By the end of the episode, the median NEER in the “flexible → flexible” group depreciates the least; by 32 percent (compared to 64 percent for “fixed → fixed”, 58 percent for “fixed → flexible” and 90 percent for “flexible → fixed”). Furthermore, the median inflation⁴⁰ for the “flexible → flexible” group accelerated less after the initial event compared to the other groups (right chart in Figure 24). The lower inflation observed in the “flexible → flexible” group prior to the large depreciation episode suggests potentially stronger monetary institutions in countries committed to a flexible exchange rate regime. The causal relationship could go either direction: adoption of flexible exchange rates contributed to the establishment of more robust institutions and greater credibility, or better control of inflationary expectations thanks to greater credibility and better

³⁹ Whenever we use the AREAER exchange rate classification in this paper, we augment the AREAER Online data with IMF's internal template for Assessing Reserve Adequacy, whose exchange rate regime data goes back to 1990. But 1990 is still not far back enough compared to the start of our dataset.

⁴⁰ Average monthly inflation, annualized.

institutions reduced the exchange rate passthrough and therefore let the central bank tolerate greater exchange rate volatility.

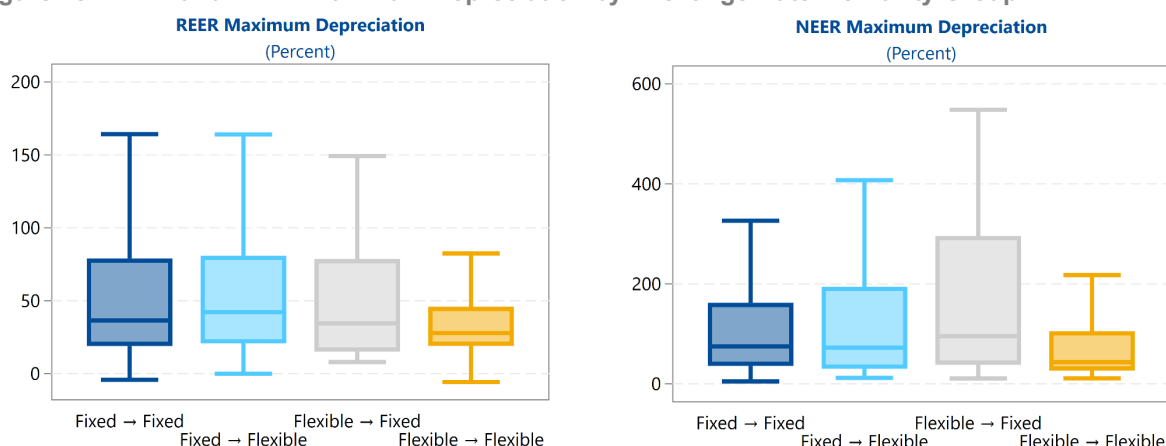
Figure 24. Median NEER and Inflation Paths by Exchange Rate Flexibility Group



Note: Annex V has charts illustrating the interquartile ranges and medians for ENDE, NEER, inflation, and REER for each group.

Moreover, episodes with flexible exchange rates before and after the initial event exhibit smaller dispersions in maximum REER and NEER depreciations, possibly indicating lower volatility in exchange rates during a time of crisis. The median maximum REER depreciation for the “flexible → flexible” group is 28 percent (compared to 37 percent for “fixed → fixed”, 46 percent for “fixed → flexible”, and 34 percent for “flexible → fixed”; Figure 25); this group also exhibits a much tighter interquartile range (27 percentage points vs. 56 to 61 percent for the other three groups). The same patterns—smaller and less dispersed depreciations—are observed when looking at the median and interquartile range for NEER (right chart in Figure 25).

Figure 25. REER and NEER Maximum Depreciation by Exchange Rate Flexibility Group



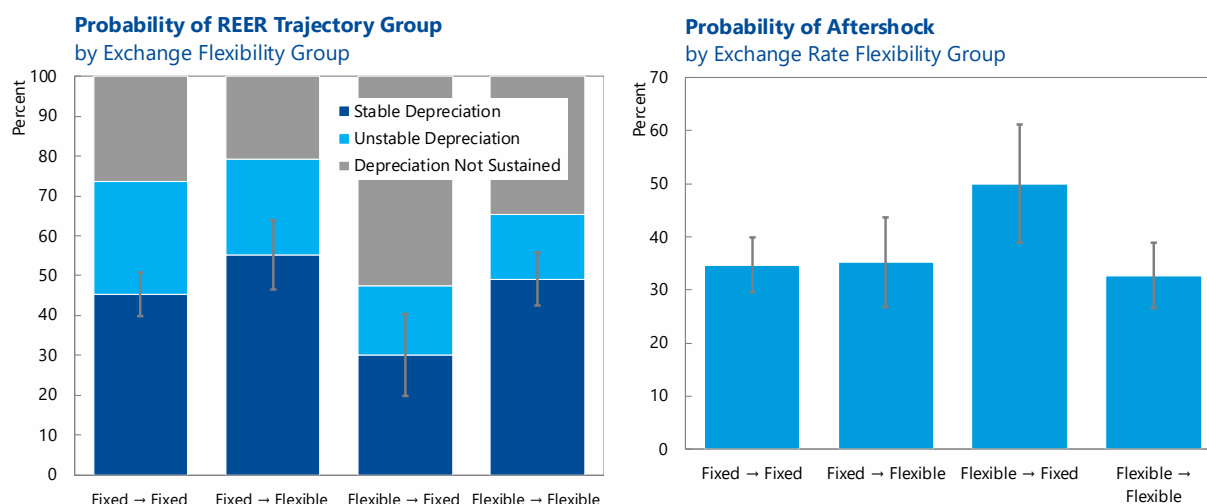
Note: The charts do not plot outside values that lie beyond the whiskers. The lower whisker is extended to the 25th percentile minus 1.5 times the interquartile range. The upper whisker is extended to the 75th percentile plus 1.5 times the interquartile range.

Keeping the exchange rate flexible after the onset of the large depreciation is associated with stable depreciation. Among episodes where the exchange rate was fixed prior to the initial event, 55 percent of cases

where the exchange rate became flexible experienced stable REER depreciation, compared to 45 percent of those who reverted to a fixed exchange rate (left chart in Figure 26). Among episodes where the exchange rate was flexible before the initial event, 49 percent of those whose exchange rate continued to be flexible had a stable REER depreciation, in contrast to only 30 percent of those whose exchange rate became fixed after the initial event.

Attempts to peg are associated with a higher likelihood of aftershocks. Among episodes whether the exchange rate was flexible before the initial event but fixed afterwards, 50 percent had aftershocks (right chart in Figure 26). In contrast, 35, 35, and 33 percent of the episodes in “fixed → fixed”, “fixed → flexible”, and “flexible → flexible” groups, respectively, had aftershocks. The high likelihood of aftershocks in the “flexible → fixed” group possibly comes from insufficient adjustment in REER following the initial event, as this group was also the most likely to have a REER depreciation that was not sustained.

Figure 26. Probabilities of REER Trajectory and Aftershock by Exchange Flexibility Group

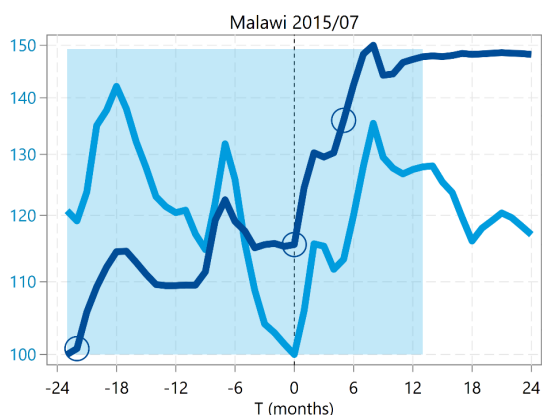
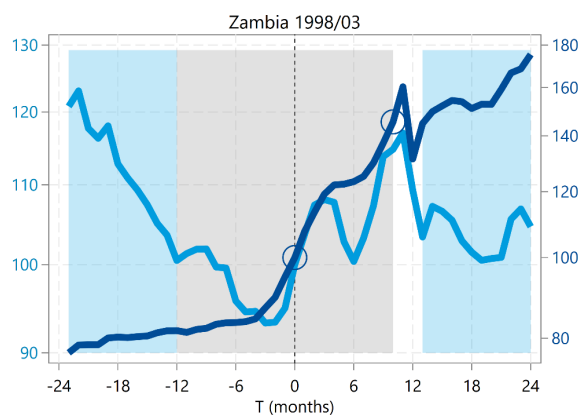
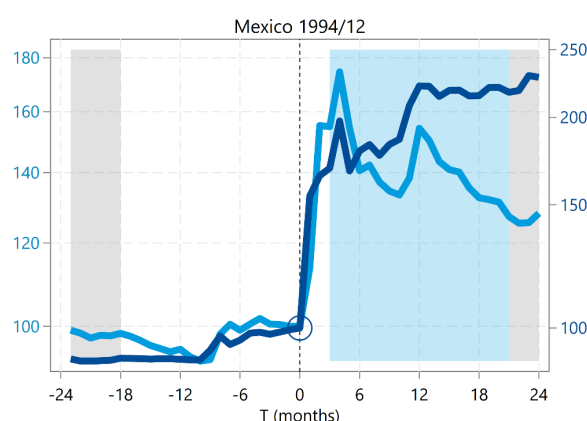
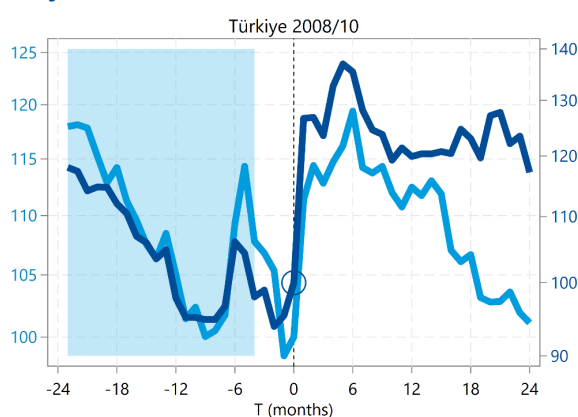
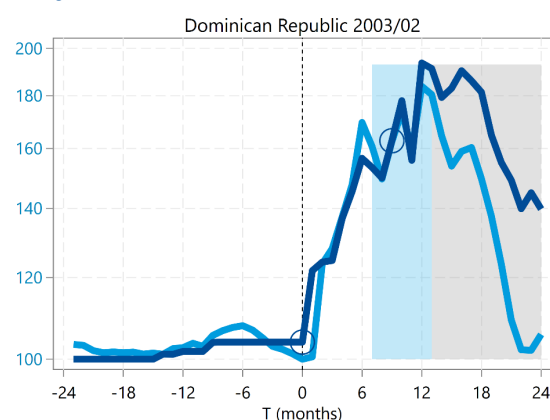
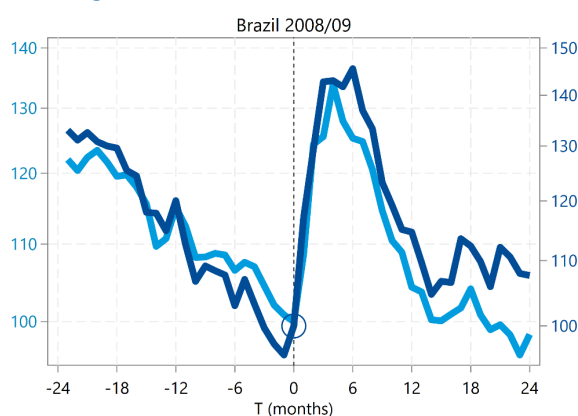


Note: The error bars denote 90 percent confidence intervals.

IMF-supported Program Status Groups

A large depreciation can represent an early step in the resolution of an unsustainable external balance position, but it is rarely the only one. To commit to credible adjustments and to finance it, countries often enter IMF-supported programs. IMF-supported programs can also be helpful after a large depreciation event, as they can restore investor confidence and help stabilize the economy. However, as discussed earlier, the timing of the program differs from case to case: a program can predate the depreciation, can be put in place soon after the depreciation occurs, and even be disrupted by the depreciation. In this section, we categorize the various scenarios.

Figure 27. Examples of IMF-supported program Status Groups

On-track at T=1**Off-track at T=1****Before & After****Only Before****Only After****No Program**

REER (up=depreciation)

LCU/USD (RHS)

○ ER shock/aftershock

Active program

Offtrack program

Note: All series are normalized to 100 at T=0.

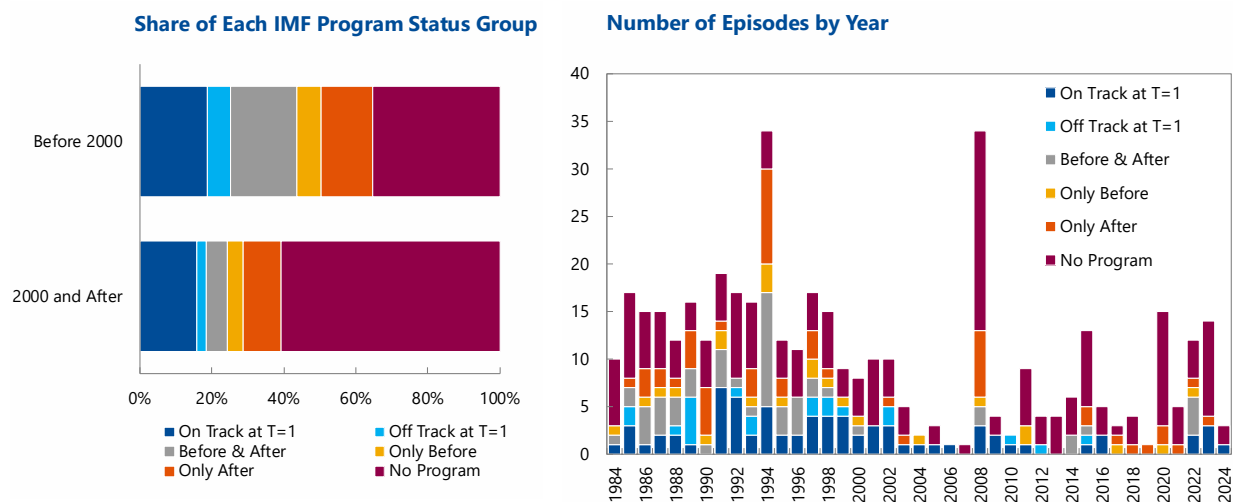
We determine program status based on information from IMF's internal database of "Fund Arrangements Since 1952", the publicly available Monitoring of Fund Arrangements (MONA), and the [IMF Financial Data Query Tool](#). We exclude non-financing instruments, arrangements that are precautionary at approval, and the

Resilience and Sustainability Facility. A program is considered off-track between the date of the last completed review and the actual end date.⁴¹ Otherwise, it is considered on-track.

We divide the episodes into six groups based on IMF-supported program status: “on-track at T=1”, “off-track at T=1”, “before & after”, “only before”, “only after”, and “no program”. Specifically:

- If there was a program at T=1, the episode will be classified as either “on-track at T=1” or “off-track at T=1,” based on the program’s status at T=1.
- Conversely, if no program existed at T=1, the episodes fall into one of the following categories: “before & after”, “only before”, “only after” or “no program”:
 - If a program was present at any point between T=-23 and T=0 and again between T=2 and T=24, the episode falls into the “before & after” group.
 - If there was a program between T=-23 and T=0 but none between T=2 and T=24, the episode is categorized as “only before.” If no program occurred between T=-23 and T=0 but a program was present between T=2 and T=24, the episode belongs to the “only after” group.
 - Finally, if there was no program at any point from T=-23 to T=24, the episode is classified as “no program.” Figure 27 illustrates examples of the IMF-supported program groups.

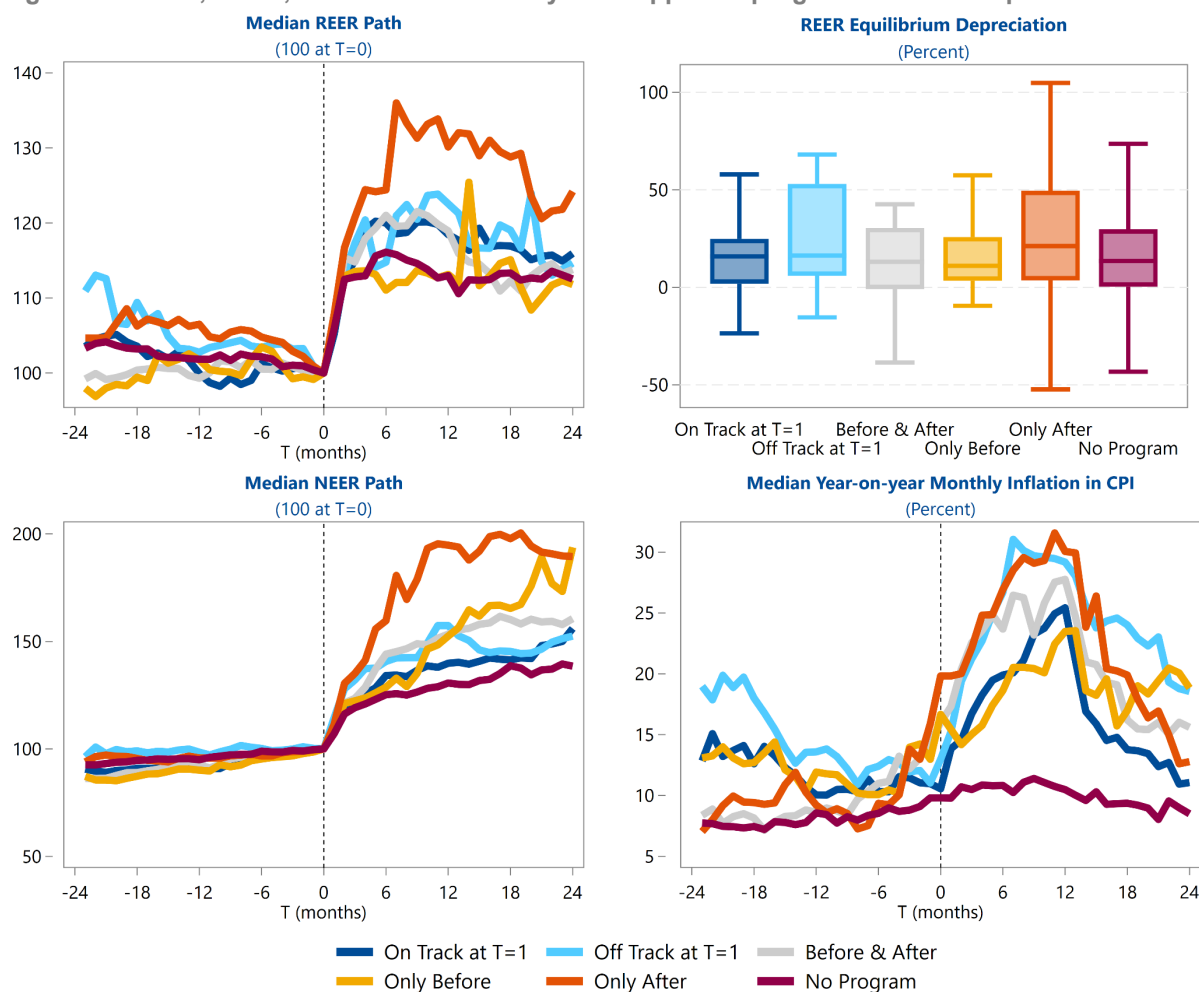
Figure 28. Time Trend of IMF-supported program Status Groups



The share of episodes with an IMF-supported program before or during the episode decreased substantially: from 65 percent before 2000 to 39 percent afterwards. Although the high percentage of episodes with an IMF-supported program in 1994 and the low percentage of episodes without a program in 2008 and 2020 influenced these statistics, the overall downward trend is measurable even when excluding these outlier years: from 61 percent before 2000 to 42 percent since 2000.

⁴¹ This is a definition adopted by the authors and does not reflect the view of the IMF. The MONA database has information about review dates starting on March 31, 1992. The IMF Financial Data Query Tool has information about disbursements starting on May 1, 1984. So, between May 1984 and March 1992, we use the IMF Financial Data Query Tool's date of last disbursement as a proxy for the data of last completed review. Before May 1984, we cannot tell between on-track and off-track programs. So, the IMF-supported program status groups are defined for episodes that began in or after May 1984.

Figure 29. REER, NEER, and Inflation Paths by IMF-supported program Status Group



Note: Annex V has charts illustrating the interquartile ranges and medians for ENDE, NEER, inflation, and REER for each group. The box-and-whisker chart does not plot outside values that lie beyond the whiskers. The lower whisker is extended to the 25th percentile minus 1.5 times the interquartile range. The upper whisker is extended to the 75th percentile plus 1.5 times the interquartile range.

Equilibrium REER depreciations were largest when an IMF-supported program is put in place *after* the initial depreciation takes place. The median equilibrium depreciation of the REER for the “only after” group is 21 percent, substantially higher than other groups (Figure 29). The large REER depreciation is driven by large NEER depreciation, which is only partially offset by high inflation. The median NEER for the “only after” group depreciates sharply in the first year, rising almost to double its initial level by T=12 before stabilizing. This large NEER depreciation in the first few months compared to other groups suggests that IMF-supported programs are more likely to be put in place after larger shocks to the nominal exchange rate. The median year-on-year inflation for this group averages 10 percent during the 24 months prior to the initial event, rises to a peak of 32 percent around one year after the initial event, and then rapidly declines to 13 percent by the end of the episode. Although these descriptive statistics do not establish causal relationships regarding the impact of IMF-supported programs, they align with the narrative that many countries with IMF-supported programs manage to contain inflation pass-through effects despite experiencing more acute nominal depreciation.

Conclusions

This paper introduces a new worldwide dataset of large depreciation events and episodes from 1971 to 2024. It aims to help deepen the understanding of the dynamics, characteristics, and policy implications of currency crises by identifying large depreciation events with monthly precision and analyzing the evolution of exchange rates and price levels in the aftermath of these events.

The large depreciation episodes are grouped by income, REER trajectory, the existence of aftershocks, exchange rate flexibility, and IMF-supported program status. These groups help identify patterns within the dataset.

- Countries with lower income levels are more likely to experience large depreciations. In these countries, REER tends to overshoot more and peak later in large depreciation episodes.
- Stable depreciations are common, but not the rule. Large and sharp nominal depreciations are more likely to result in REER stabilizing by the end of the analysis window, provided inflation is kept in check.
- More often than not, significant real *appreciations* following the initial depreciation event are likely to be associated with inflation-depreciation spirals (i.e., inflation quickly eroding the initial real depreciation) and can thus be viewed as a sign of failure than success.
- Aftershocks are generally associated with worse outcomes and starting conditions. REER tends to appreciate a few months into an episode unless there is an aftershock, suggesting that real exchange rate overshooting is not a sign of failure, but its absence might be.
- The probability of a large depreciation is slightly lower for countries with fixed exchange rates. However, when they do experience large depreciations, countries that maintain exchange rate flexibility before and after the initial event generally experience milder shocks and have smaller dispersions in maximum REER and NEER depreciations. Keeping the exchange rate flexible after the onset of the large depreciation is associated with stable depreciation. Attempts to peg are associated with a higher likelihood of aftershocks.
- The share of episodes with an IMF-supported program before or during the episode decreased substantially over the last four decades. Interestingly, equilibrium REER depreciations are largest when an IMF-supported program is introduced *after* the initial depreciation.

Although the stylized facts presented may in themselves attract the attention of researchers and policymakers, this paper does not establish causal relationships and leaves many areas open for further investigation. We anticipate that this dataset will encourage future research aimed at deepening the understanding of large depreciation episodes and supporting policymakers in making informed decisions.

References

- Calvo, G.A. and Reinhart, C.M., 2002. Fear of floating. *The Quarterly journal of economics*, 117(2), pp.379-408.
- Casiraghi, M., Habermeier, K. and Harjes, T., 2022. Choice of exchange rate arrangement. *Monetary and Capital Markets Department Technical Assistance Handbook*.
- Cavallo, M., Kisselev, K., Perri, F. and Roubini, N., 2005. Exchange rate overshooting and the costs of floating. *FRB of San Francisco Working Paper*, (2005-07).
- Cooper, R., 1971. Currency Devaluation in Developing Countries. *Essays in International Finance*, Nr. 86.
- Culiuc, A., 2020. Real Exchange Rate Overshooting in Large Depreciations: Determinants and Consequences. IMF Working Paper No. 20/60.
- De Gregorio, J., 2016. Large Depreciations: Recent Experience in Historical Perspective. *Peterson Institute for International Economics Working Paper*, (16-8).
- Dornbusch, R., 1976. Expectations and exchange rate dynamics. *Journal of political Economy*, 84(6), pp.1161-1176.
- Dornbusch, R., Goldfajn, I., Valdés, R.O., 1995. Currency crises and collapses. *Brookings papers on economic activity*, 1995(2), pp.219-293.
- Flood, R.P. and Garber, P.M., 1980. An economic theory of monetary reform. *Journal of Political Economy*, 88(1), pp.24-58.
- Frankel, J.A., 2005. Mundell-Fleming lecture: contractionary currency crashes in developing countries. *IMF staff papers*, 52(2), pp.149-192.
- Frankel, J.A. and Rose, A.K., 1996. Currency crashes in emerging markets: An empirical treatment. *Journal of international Economics*, 41(3-4), pp.351-366.
- Goldfajn, I. and Valdes, R.O., 1999. The aftermath of appreciations. *The Quarterly Journal of Economics*, 114(1), pp.229-262.
- Gopinath, G., 2015. *The international price system* (No. w21646). National Bureau of Economic Research.
- International Monetary Fund (IMF), 2015, Exchange Rates and Trade Flows: Disconnected? in *World Economic Outlook – October 2015*, International Monetary Fund.
- , 2021. Ex-Post Evaluation of Exceptional Access Under the 2018 Stand-By Arrangement.
- Klein, M.W. and Shambaugh, J.C., 2015. Rounding the corners of the policy trilemma: sources of monetary policy autonomy. *American Economic Journal: Macroeconomics*, 7(4), pp.33-66.
- Krugman, P., 1979. A model of balance-of-payments crises. *Journal of money, credit and banking*, 11(3), pp.311-325.
- Laeven, L. and Valencia, F., 2013. Systemic banking crises database. *IMF Economic Review*, 61(2), pp.225-270.
- , 2020. Systemic banking crises database II. *IMF Economic Review*, 68(2), pp.307-361.
- Obstfeld, M., 1986. Rational and Self-Fulfilling Balance-of-Payments Crises. *The American Economic Review*, 76(1), pp.72-81.

- Reinhart, C.M. and Rogoff, K.S., 2014. This Time is Different: A Panoramic View of Eight Centuries of Financial Crises, *Annals of Economics and Finance*, Society for AEF, vol. 15(2), pages 1065-1188.
- Shambaugh, J.C., 2004. The effect of fixed exchange rates on monetary policy. *the Quarterly Journal of economics*, 119(1), pp.301-352.
- Sturzenegger, F., 2019. Macri's Macro: The meandering road to stability and growth. *Brookings Papers on Economic Activity*, pp.336-436.

Annex I. Depreciation Episode Concepts

Annex Table 1. Concepts for characterizing depreciation episodes and various approaches to measure them

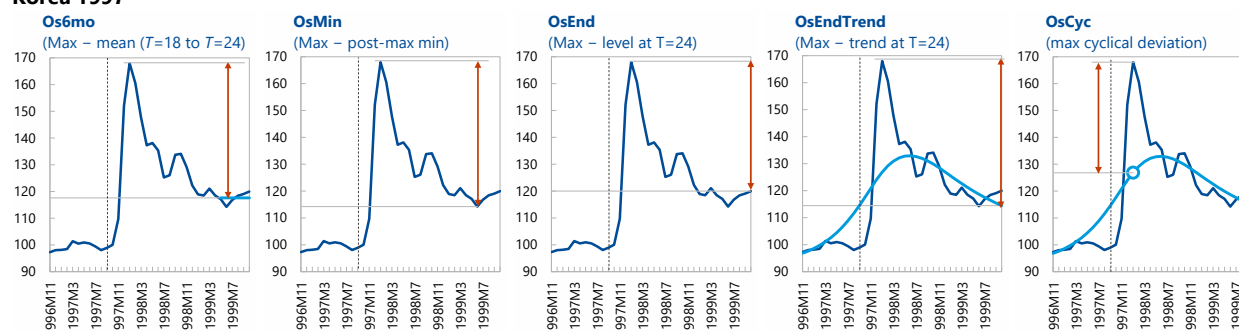
Peak level	Peak month	Peak depreciation	Post-crisis equilibrium	Equilibrium depreciation	Absolute overshooting	Relative overshooting
Max $\max(E_T)$ for $T \in [1, 24]$	MaxT T^* where $E_{T^*} = \max(E_T)$ for $T \in [1, 24]$	MaxDep $(\text{Max} - 100)$	Eq6mo $\text{mean}(E_T)$ for $T \in [19, 24]$	EqDep6mo $\text{Eq6mo} - 100$	Os6mo $\text{Max} - \text{Eq6mo}$	OsRel6mo $\text{Os6mo}/\text{Eq6mo} \times 100$
			EqMin $\min(E_T)$ for $T \in [\text{MaxT}, 24]$	EqDepMin $\text{EqMin} - 100$	OsMin $\text{Max} - \text{EqMin}$	OsRelMin $\text{OsEnd}/\text{EqMin} \times 100$
			EqEnd E_{24}	EqDepEnd $\text{EqEnd} - 100$	OsEnd $\text{Max} - \text{EqEnd}$	OsRelEnd $\text{OsEnd}/\text{EqEnd} \times 100$
			EqEndTrend $\hat{E}_{24}$	EqDepEndTrend $\text{EqEndTrend} - 100$	OsEndTrend $\text{Max} - \text{EqEndTrend}$	OsRelEndTrend $\text{OsEndTrend}/\text{EqEndTrend} \times 100$
MaxCyc E_T where $\max(E_T - \hat{E}_T)$ for $T \in [1, 24]$	OsCycT T^* where $E_{T^*} - \hat{E}_{T^*} = \max(E_T - \hat{E}_T)$ for $T \in [1, 24]$	MaxDepCyc $\text{MaxCyc} - 100$	EqCyc $\hat{E}_T$ at T where $\max(E_T - \hat{E}_T)$	EqDepCyc $\text{EqCyc} - 100$	OsCyc $\text{MaxCyc} - \text{EqCyc}$	OsRelCyc $\text{OsCyc}/\text{EqCyc} \times 100$

Notes: Measures are computed for all three exchange rate measures (ENDE, NEER, REER), which are included as a prefix in the variable name. For instance, REER series corresponding to the first row are named reerMax, reerMaxDep, reerEqEnd, reerEqDepEnd, reerOsEnd and reerOsRelEnd. E_T denotes the exchange rate series normalized to 100 for the pre-crisis month ($T=0$). $\hat{E}_T$ denotes the trend normalized to 100 for the pre-crisis month ($T=0$), computed using two-sided Hodrick-Prescott filter with $\lambda=400$. The filter is applied to the log-transformed data series, and the exponential of the resulting trend is taken to obtain $\hat{E}_T$.

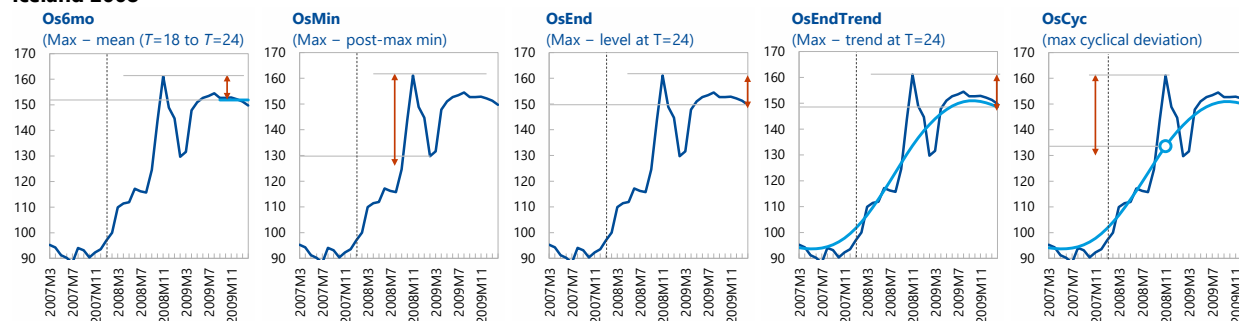
Annex Figure 1 illustrates how different approaches to measure overshooting (and, by extension, equilibrium depreciation) produce similar (or divergent) results depending on the paths of the exchange rate series. In “textbook” episodes, like Korea 1997, the measured overshooting will not vary much across definitions. In volatile episodes (like Iceland 2008) the choice of definition matters more, and even more so in unstable depreciations (like South Africa 2010). In particular, computing REER overshooting as deviation from trend at $T=24$ (OsEndTrend, 4th column of charts) can produce negative measurements for some unstable depreciation episodes (South Africa 2010, shown here, is a “near miss” in that sense). Therefore, OsEndTrend is least suitable when analysis includes unstable depreciations.

Annex Figure 1. Illustration of Different Approaches to Determining Overshooting

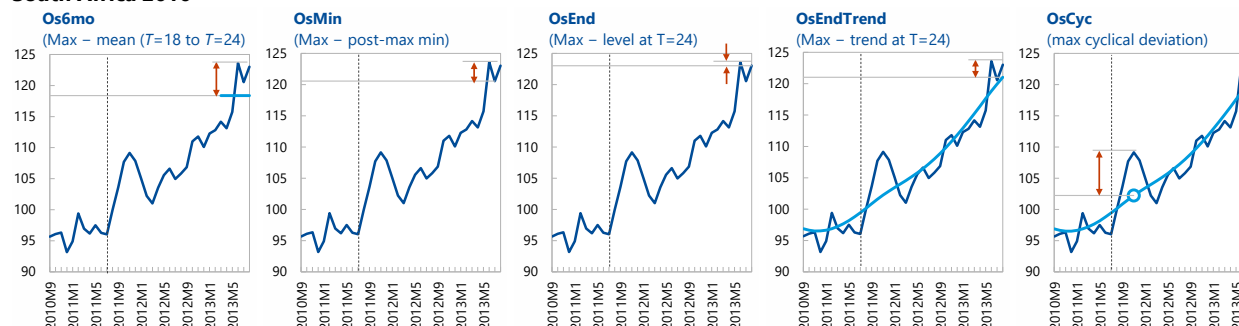
Korea 1997



Iceland 2008



South Africa 2010



Annex II. Thresholds

To calculate the default thresholds (Table 1, Annex Table 3), we take the percentiles of the EMs and round them to the nearest multiple of 5, to avoid a false sense of precision. The AE-specific thresholds are calculated in a similar manner using the percentiles of the AEs, except the quarter-on-year acceleration threshold is set at 9 percent instead of 10 percent—ensuring the 1976 Sterling Crisis is included among large depreciation episodes. Annex Table 2 presents the 90th percentiles of the quarterly growth (e_q^{90th}), quarter-on-quarter acceleration (e_{qq}^{90th}), and quarter-on-year acceleration (e_{qy}^{90th}) and the 75th percentile of the year-on-year growth (e_{yy}^{75th}) for different income groups over the sample period. The income groups here are based on the WEO classification during the 1990s, when the world experienced the ERM crises (1992), the devaluation of the CFA Franc (1994), the Mexican peso crisis (1994) the East Asian financial crisis (1997), and the Russian financial crises (1998). For countries whose income group was reclassified during the 1990s, the most frequent (modal) group was selected.

Annex Table 3 displays the percentile ranks of the default and AE-specific thresholds among EMs and AEs, respectively. As expected, the thresholds for the quarterly growth ($\bar{e}_q$), quarter-on-quarter acceleration ($\bar{e}_{qq}$), and quarter-on-year acceleration ($\bar{e}_{qy}$) have percentile ranks around 90, and the threshold for the year-on-year growth ($\bar{e}_{yy}$) have percentile ranks near 75.

Annex Table 2. Percentiles of Series

(Percent)	All	AE	EM	DM
e_q^{90th}	11.9	9.1	13.9	12.2
e_{qq}^{90th}	12.3	11.5	12.1	12.8
e_{qy}^{90th}	10.5	9.3	10.5	11.4
e_{yy}^{75th}	17	13.8	18.8	17.3

Note: Based on ENDE series in 1970M1-2024M12. Percentiles are calculated conditional on having a positive value of the series.

Annex Table 3. Percentile Ranks of Thresholds

(Percent)	Default		AE-Specific	
	Threshold	Rank	Threshold	Rank
$\bar{e}_q$	15	90.8	10	92.3
$\bar{e}_{qq}$	10	86.1	10	85.5
$\bar{e}_{qy}$	10	89.4	9	89.1
$\bar{e}_{yy}$	20	76.6	15	79.6

Note: Based on ENDE series in 1970M1-2024M12. The percentile ranks of the default thresholds are calculated among EMs. The percentile ranks of the AE-specific thresholds are calculated among AEs. Percentile ranks are calculated among observations that have a positive value of the series.

Annex III. Algorithms

Pinpointing the Month of the Event

The four criteria in section “Constructing Large Depreciation Episodes” identifies the window $(t - 3, t]$ in which there was a large depreciation event. We use the following algorithm to determine the exact month of the event.

Let $\alpha_s = (e_s - e_{s-1}) / (e_t - e_{t-3})$ where $s \in \{t - 2, t - 1, t\}$

1. The month of the event is $t - 2$ if any of the following conditions are met.
 - a. $\alpha_{t-2} > 0.5$
 - b. $\alpha_{t-2} > \max\{\alpha_{t-1}, \alpha_t\}$
 - c. $\alpha_{t-2} > 0.3$ and $(e_{t-2} - e_{t-3}) > \max\{e_{t-3} - e_{t-6}, \bar{e}_q/3\}$
 - d. $\alpha_{t-2} > 0.1$ and a peg was detected until month $t - 3$.
2. Else, the month of the event is $t - 1$ if any of the following conditions are met.
 - a. $\alpha_{t-1} > 0.5$
 - b. $\alpha_{t-1} > \max\{\alpha_{t-2}, \alpha_t\}$
 - c. $\alpha_{t-1} > 0.3$ and $(e_{t-1} - e_{t-2}) > \max\{e_{t-2} - e_{t-5}, \bar{e}_q/3\}$
 - d. $\alpha_{t-1} > 0.1$ and a peg was detected until month $t - 2$.
3. Otherwise, the month of the event is t .

Detecting Pegs and Crawls

We classify the months $t, t - 1, t - 2$ as under a peg when the change in the ENDE in t relative to $t - 1, t - 2$ and $t - 3$ are less than a threshold $\bar{e}_p$, i.e.,

$$|e_t - e_{t-s}| < \bar{e}_p, \quad \forall s = 1, 2, 3.$$

We classify the months $t, t - 1, t - 2$ as under a crawl when the change in the slope of ENDE in t relative to $t - 1$ and to $t - 2$ are less than a threshold $\bar{e}_c$ and the slopes are greater than or equal the threshold, i.e.,

$$\max\{|(e_t - e_{t-1}) - (e_{t-1} - e_{t-2})|, |(e_t - e_{t-1}) - (e_{t-2} - e_{t-3})|\} < \bar{e}_c,$$

$$|e_s - e_{s-1}| \geq \bar{e}_c, \quad \forall s = t, t - 1, t - 2.$$

We set the thresholds $\bar{e}_p$ and $\bar{e}_c$ equal to 0.25 percent.

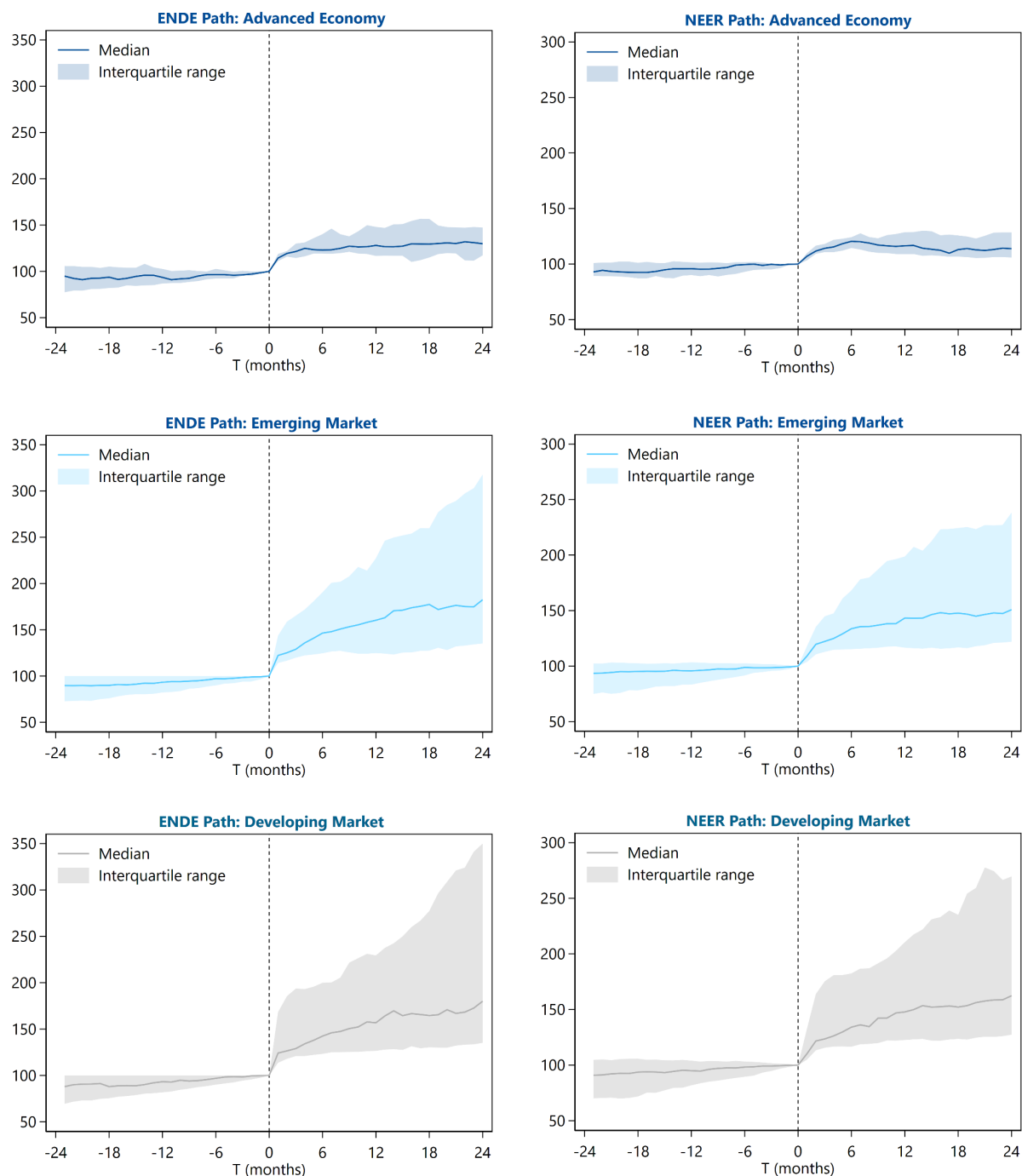
Annex IV. Cross-Tabulation of Episode Groups

Cross-Tabulation of Groups (percent of group in row, unless noted otherwise)		TOTALS		Income group		REER Trajectory			Exchange Rate Flexibility				Aftershock		IMF Program Status						
		Number of episodes	Share, percent of all episodes	Advanced Economy Emerging Market Developing Market			Stable Depreciation	Unstable Depreciation	Depreciation Not Sustained	Fixed → Fixed Fixed → Flexible Flexible → Fixed Flexible → Flexible				No Aftershock	Has Aftershock	On Track at T=1	Off Track at T=1	Before & After	Only Before	Only After	No Program
Income group	Advanced Economy	29	6				55	10	35	21	24	7	48	86	14	0	0	0	0	13	88
	Emerging Market	243	46				48	21	32	42	16	10	31	65	35	13	5	9	6	11	55
	Developing Market	254	48				44	26	30	47	16	11	26	61	39	24	5	16	6	16	33
REER Trajectory	Stable Depreciation	169	46	7	49	44				40	19	7	34	68	32	23	7	12	6	17	35
	Unstable Depreciation	82	23	2	44	54				51	17	9	23	50	50	13	6	17	7	6	51
	Depreciation Not Sustained	113	31	6	49	45				35	11	19	36	73	27	16	6	15	6	9	49
Exchange Rate Flexibility	Fixed → Fixed	228	43	3	45	52	45	28	26					65	35	20	3	14	4	9	50
	Fixed → Flexible	88	17	8	45	47	55	24	21					65	35	22	10	7	7	15	38
	Flexible → Fixed	54	10	4	46	50	30	18	53					50	50	14	5	20	11	25	25
	Flexible → Flexible	156	30	9	48	43	49	16	35					67	33	15	5	9	5	14	51
Aftershock	No Aftershock	338	64	7	47	46	48	17	34	44	17	8	31			18	5	12	5	11	48
	Has Aftershock	188	36	2	45	53	43	33	25	42	16	14	27			18	5	13	7	17	41
IMF Program Status	On Track at T=1	74	18	0	35	65	58	15	27	43	20	8	28	64	36						
	Off Track at T=1	21	5	0	48	52	50	20	30	24	33	10	33	67	33						
	Before & After	50	12	0	36	64	40	27	33	46	10	18	26	62	38						
	Only Before	24	6	0	46	54	45	25	30	29	21	21	29	54	46						
	Only After	55	13	4	38	58	66	11	24	25	18	20	36	55	45						
	No Program	189	46	7	57	36	38	25	36	43	14	6	38	67	33						

Annex V. Interquartile Ranges by Group

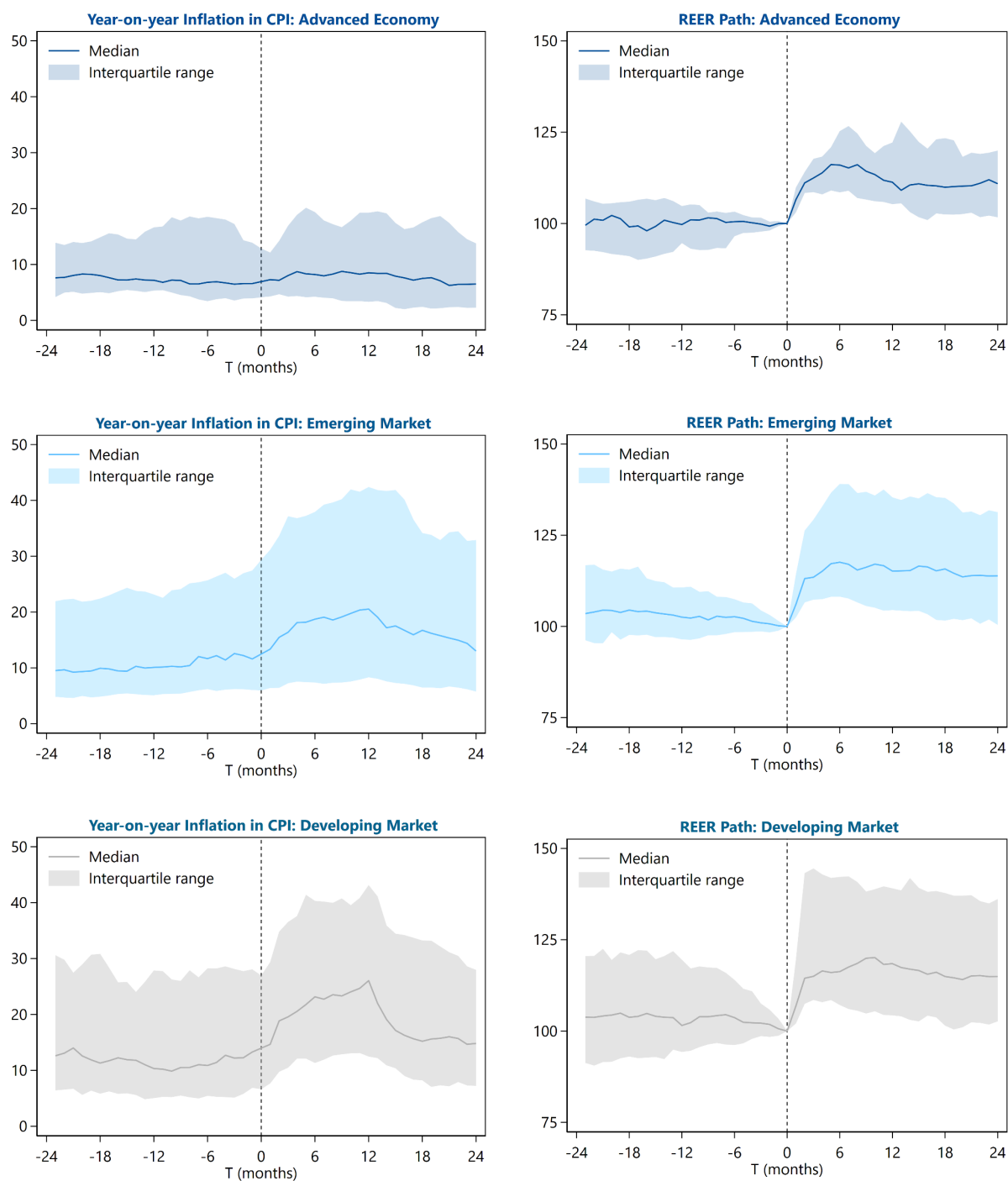
Income Groups

Annex Figure 2. Interquartile Ranges of ENDE (left) and NEER (right) by Income Group



Note: All series are normalized to 100 at T=0.

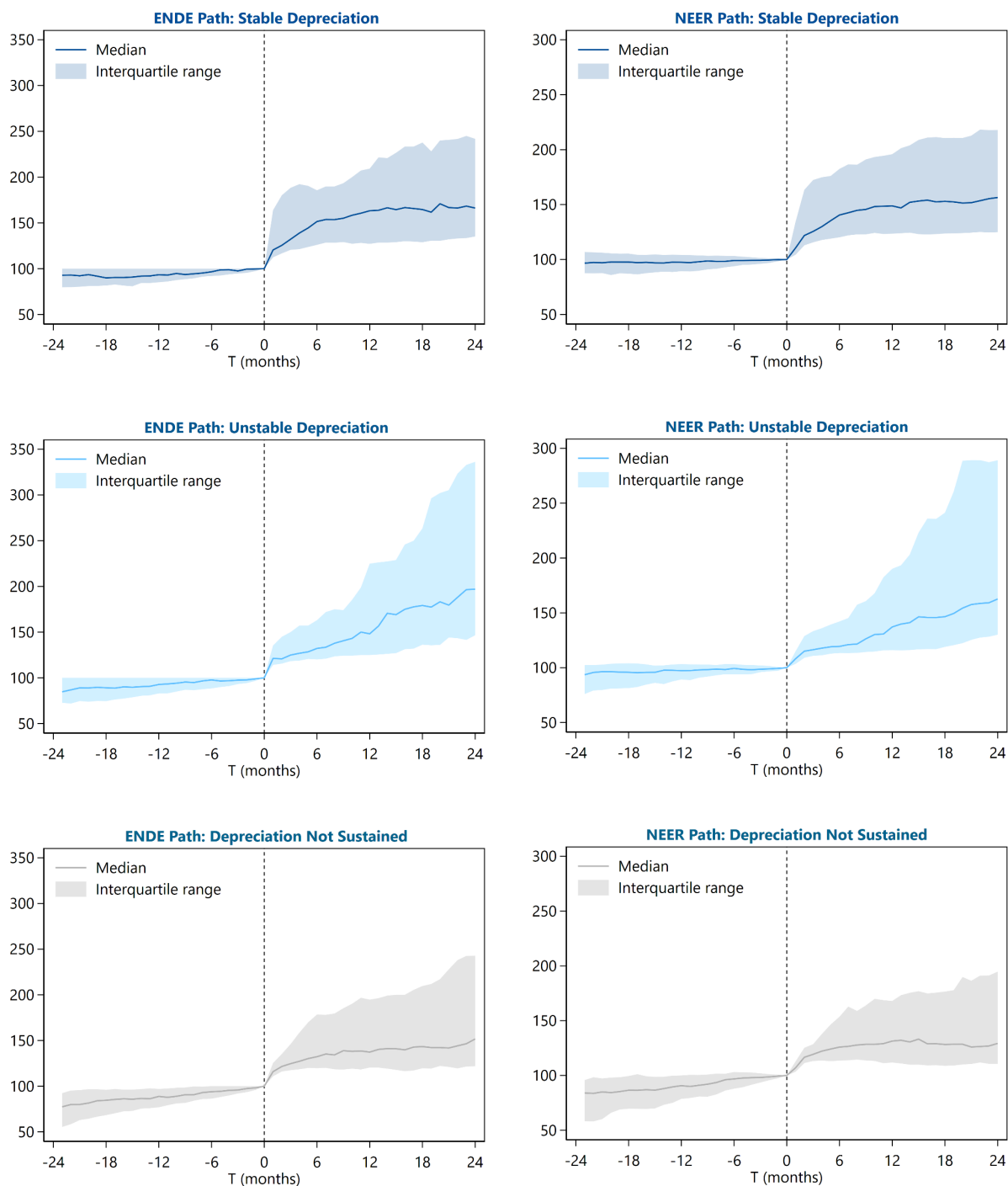
Annex Figure 3. Interquartile Ranges of Inflation (left) and REER (right) by Income Group



Note: All series are normalized to 100 at T=0.

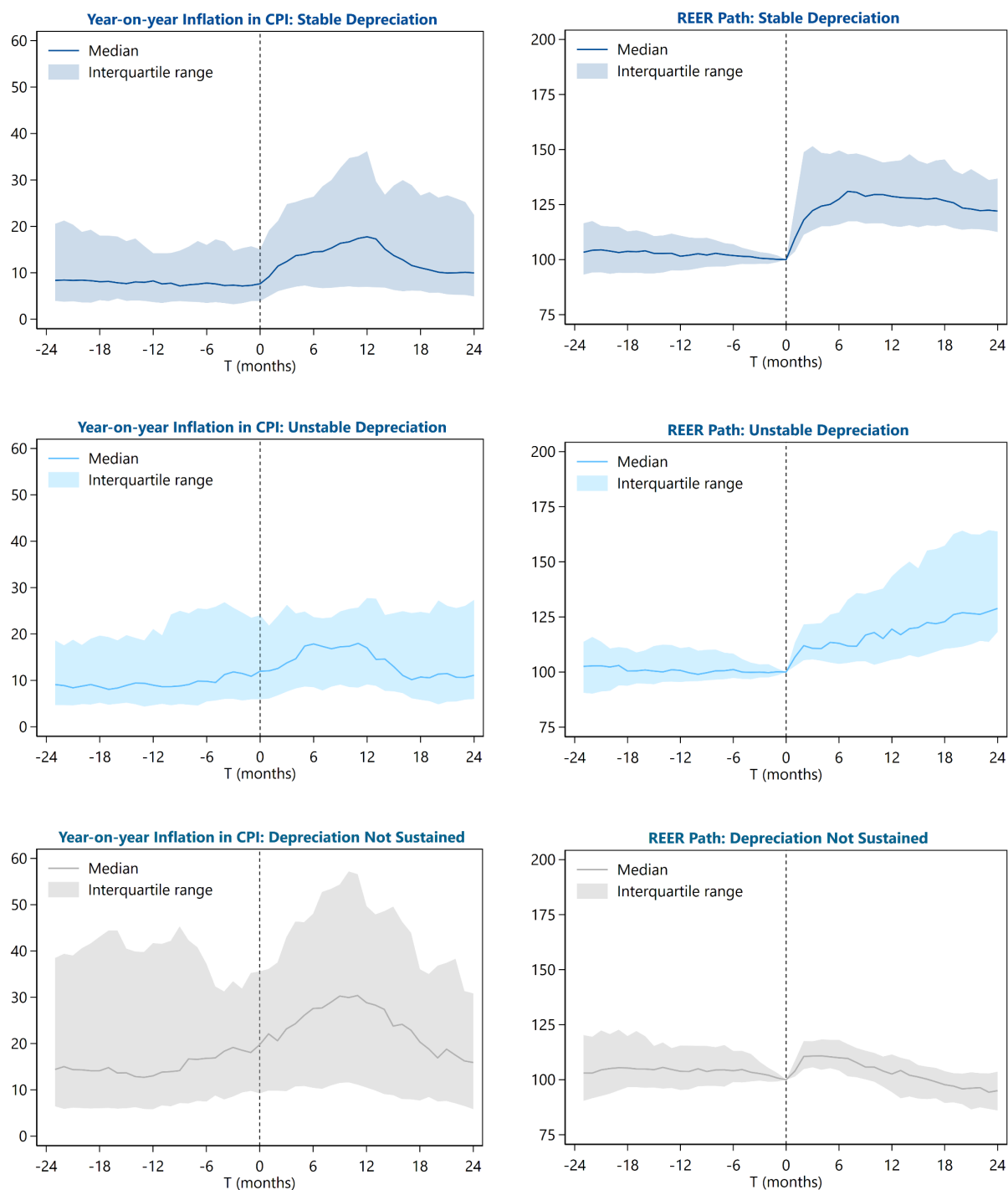
REER Trajectory Groups

Annex Figure 4. Interquartile Ranges of ENDE (left) and NEER (right) by REER Trajectory Group



Note: All series are normalized to 100 at T=0.

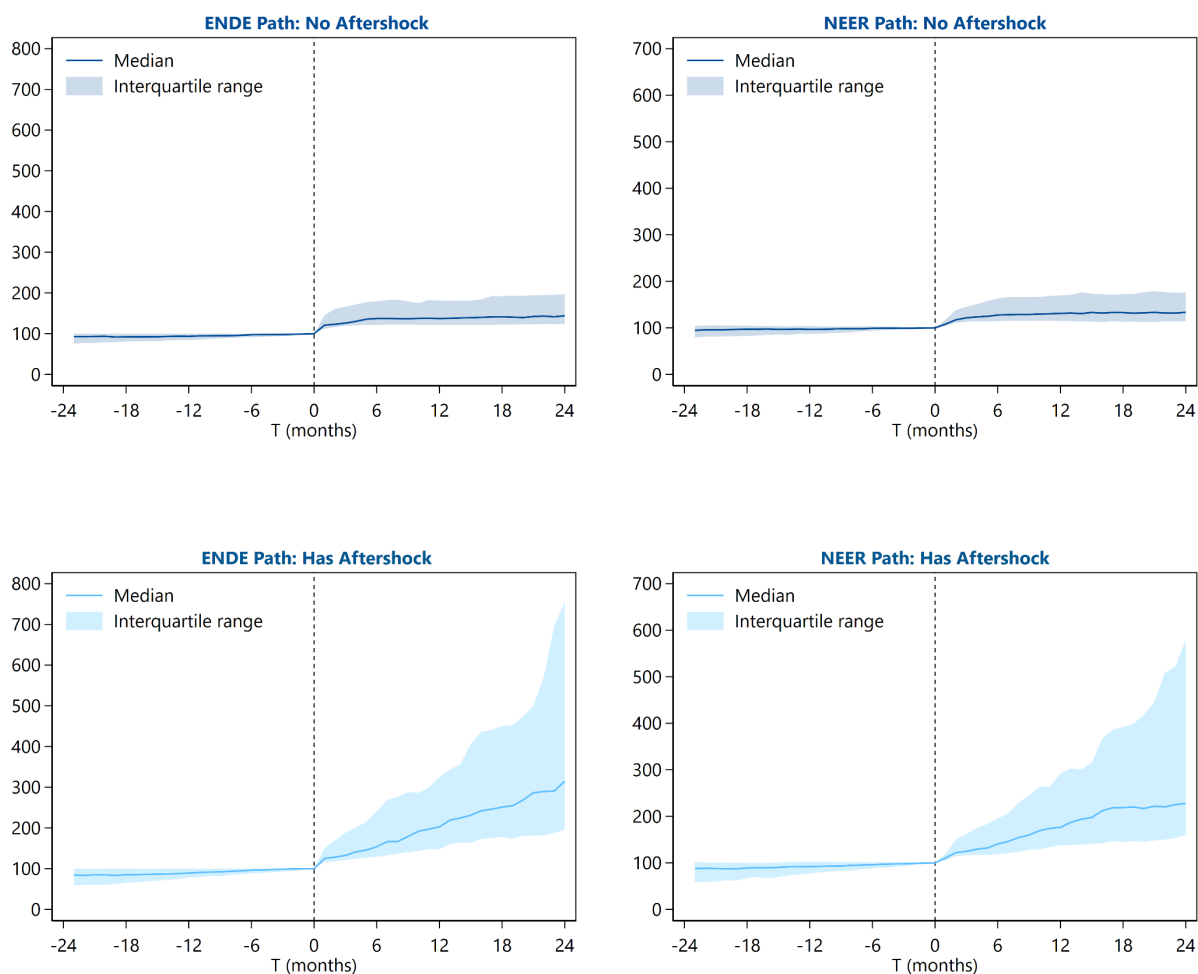
Annex Figure 5. Interquartile Ranges of Inflation (left) and REER (right) by REER Trajectory Group



Note: All series are normalized to 100 at T=0.

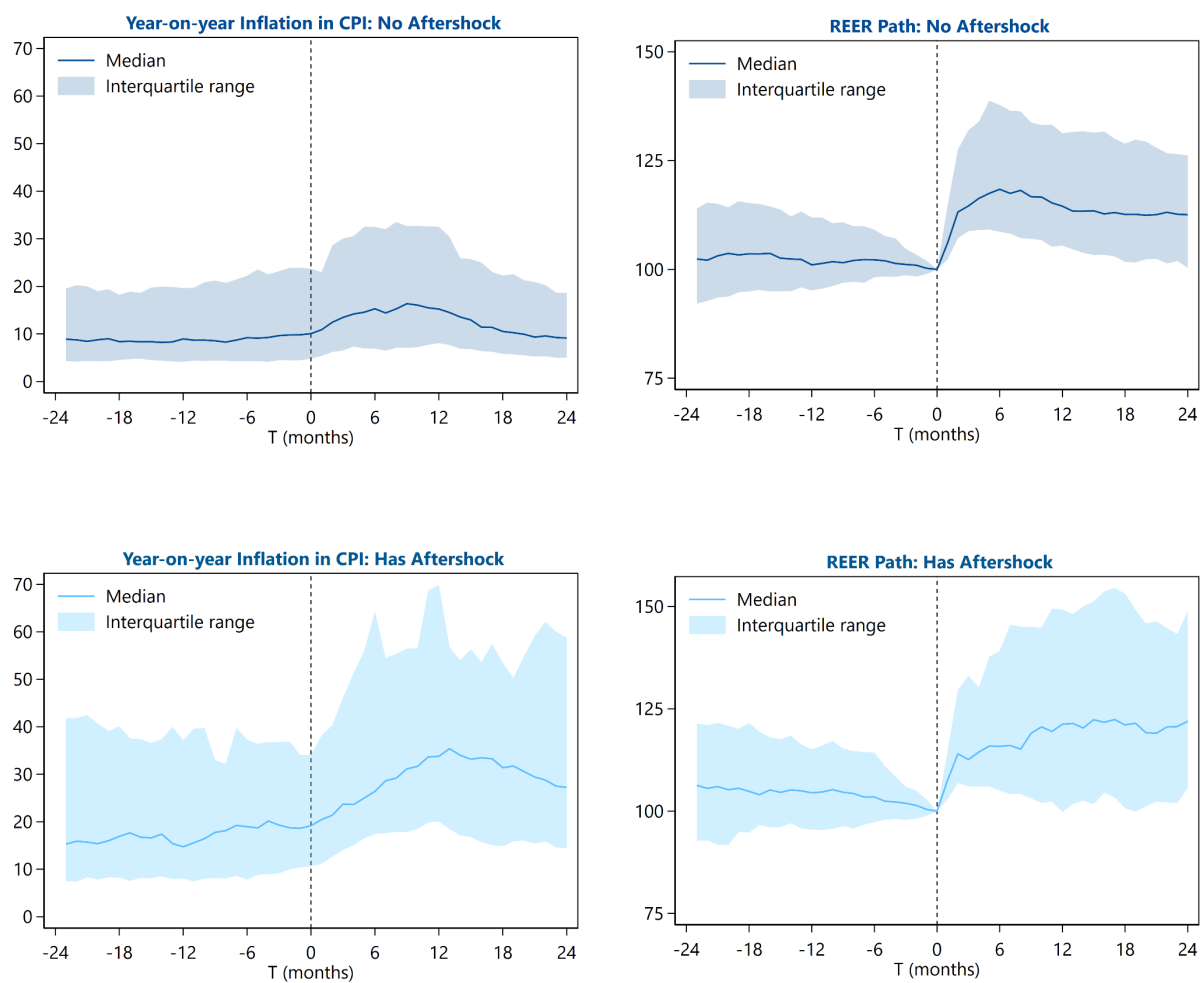
Aftershock Groups

Annex Figure 6. Interquartile Ranges of ENDE (left) and NEER (right) by Aftershock Group



Note: All series are normalized to 100 at T=0.

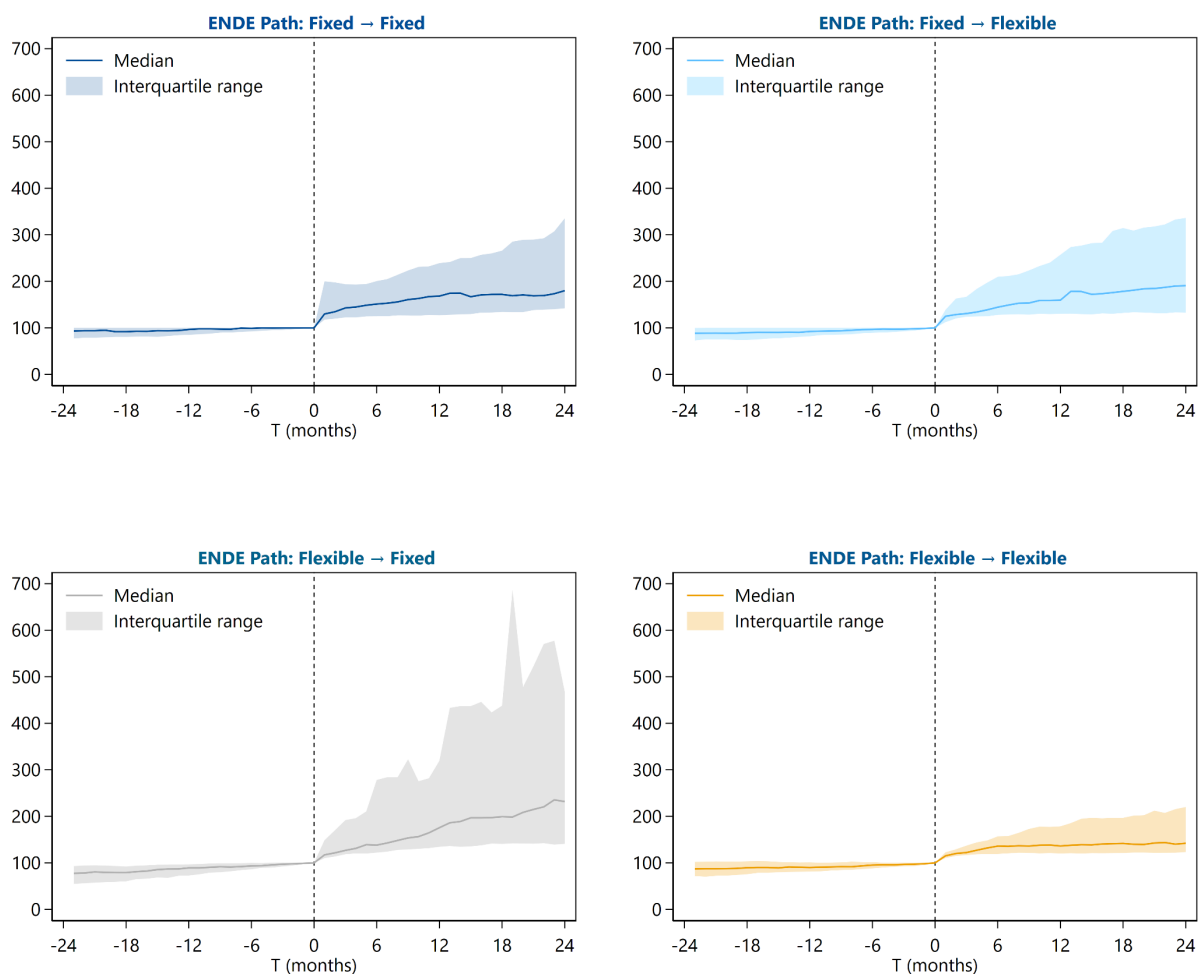
Annex Figure 7. Interquartile Ranges of Inflation (left) and REER (right) by Aftershock Group



Note: All series are normalized to 100 at T=0.

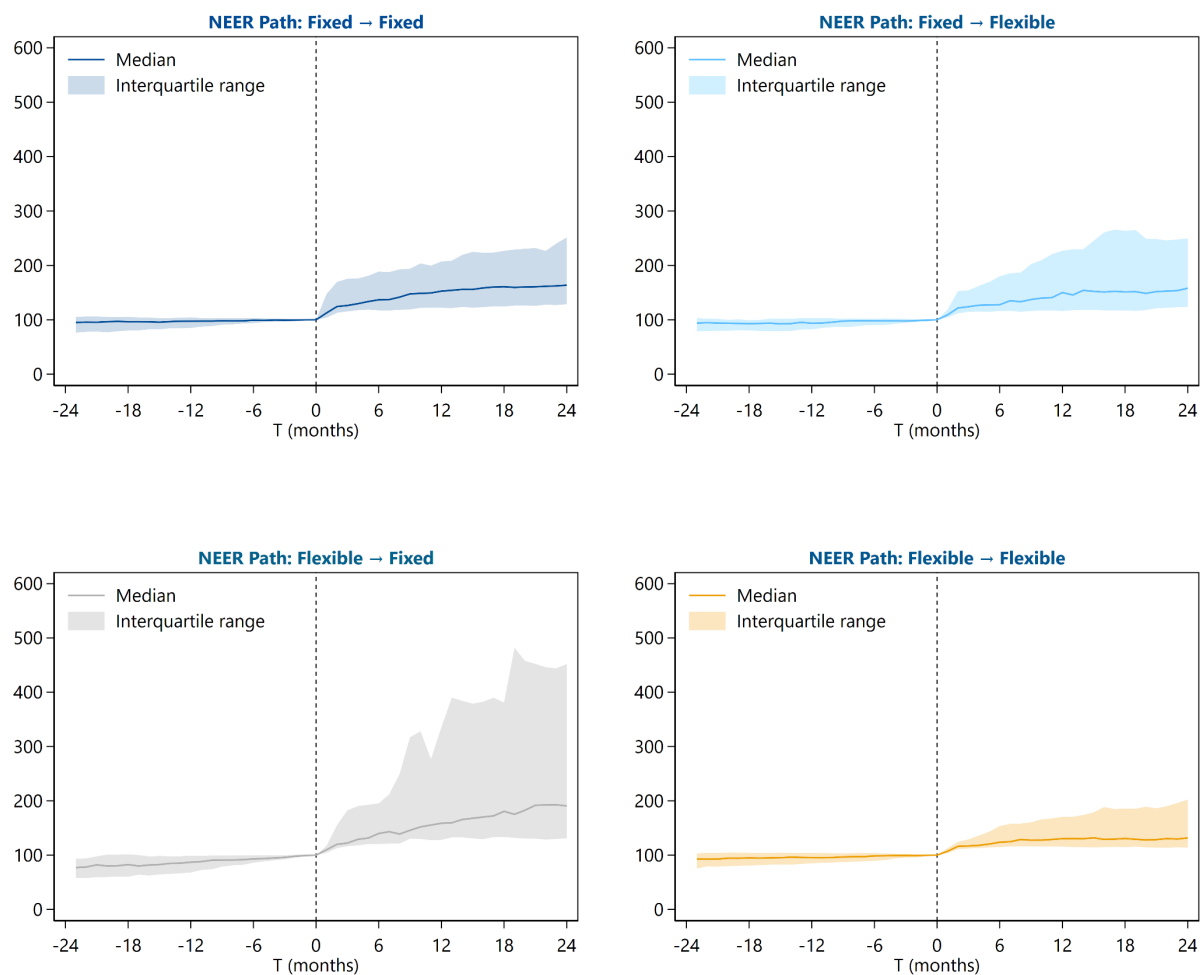
Exchange Rate Flexibility Groups

Annex Figure 8. Interquartile Range of ENDE by Exchange Rate Flexibility Group



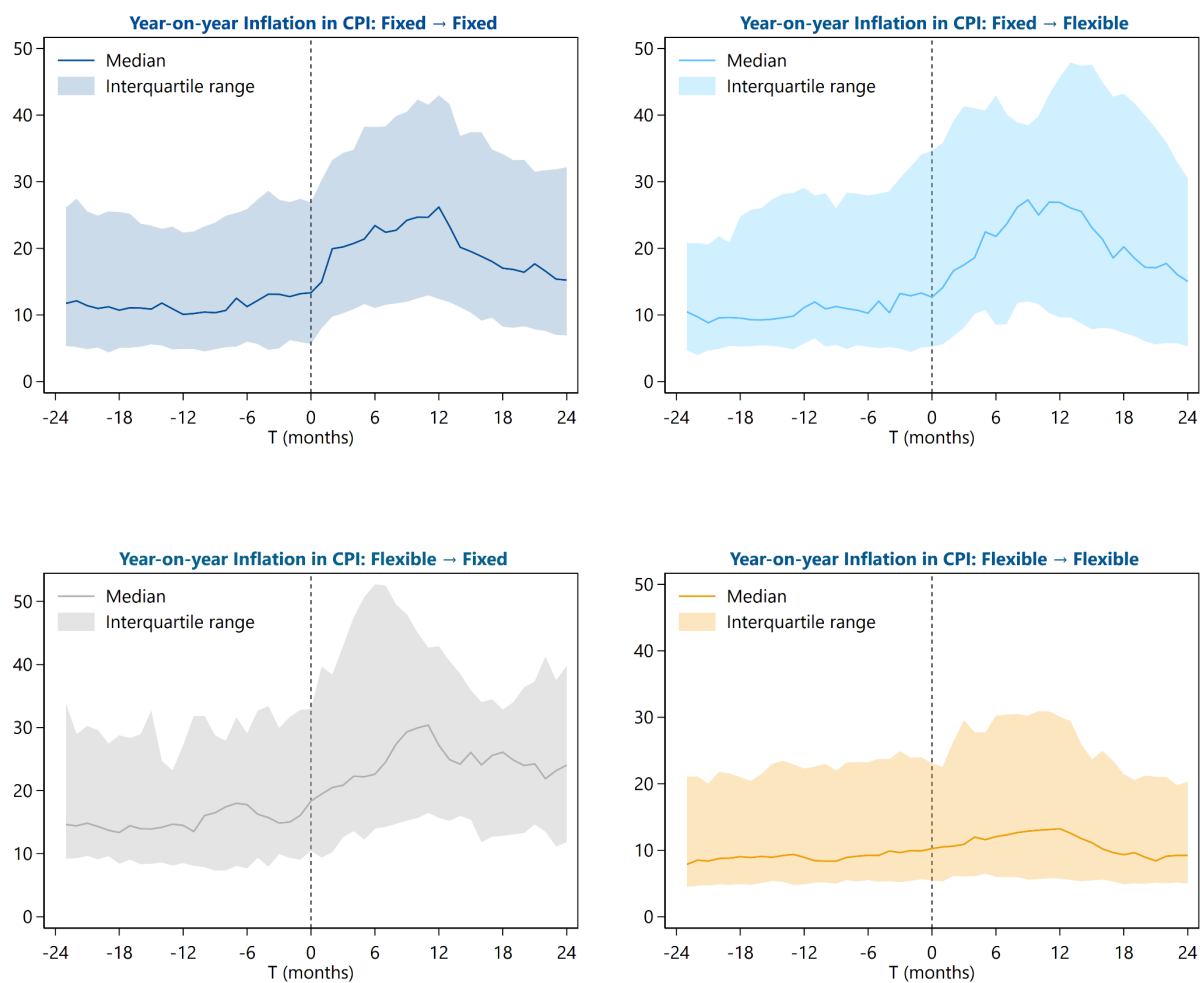
Note: All series are normalized to 100 at T=0.

Annex Figure 9. Interquartile Range of NEER by Exchange Rate Flexibility Group



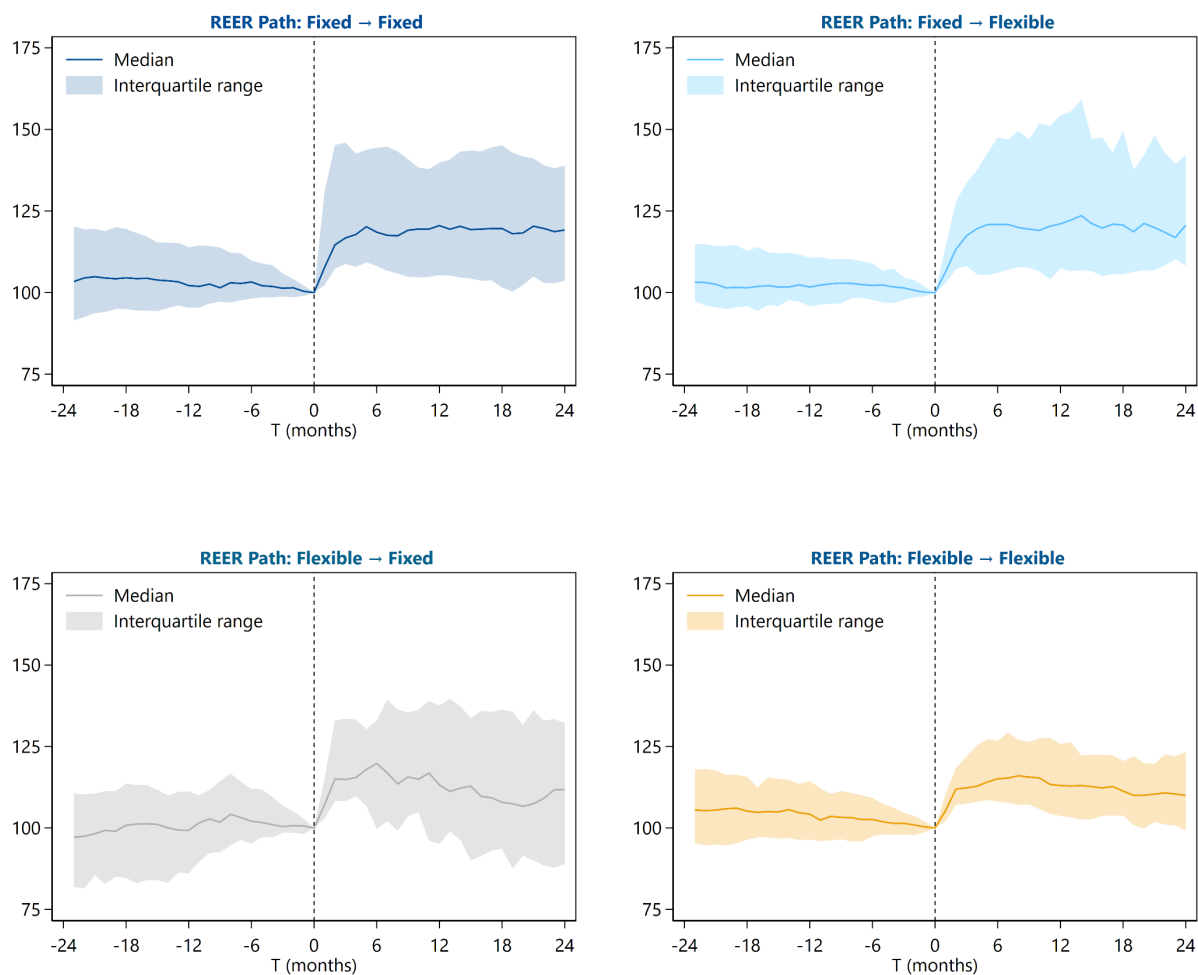
Note: All series are normalized to 100 at T=0.

Annex Figure 10. Interquartile Range of Inflation by Exchange Rate Flexibility Group



Note: All series are normalized to 100 at T=0.

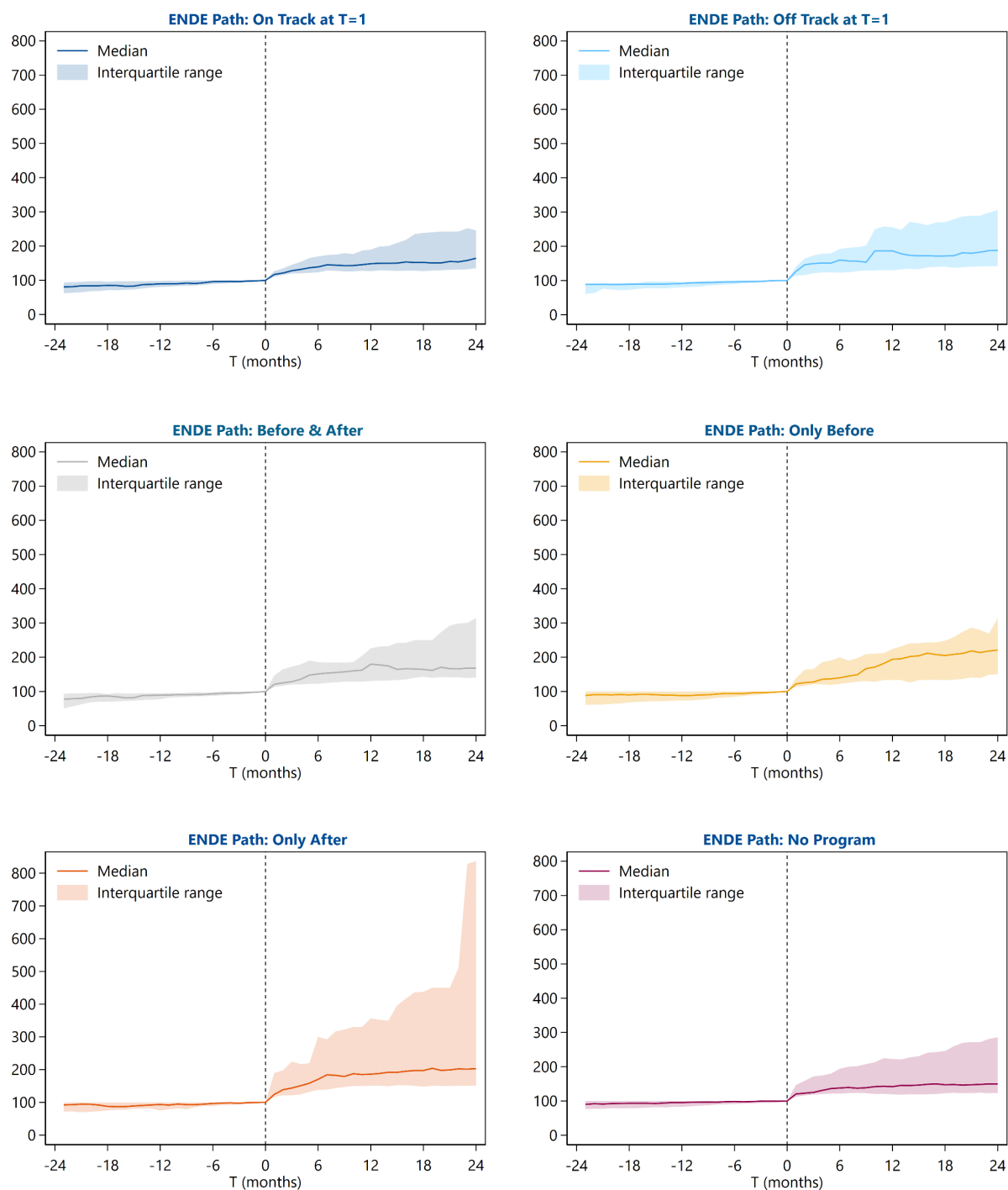
Annex Figure 11. Interquartile Range of REER by Exchange Rate Flexibility Group



Note: All series are normalized to 100 at T=0.

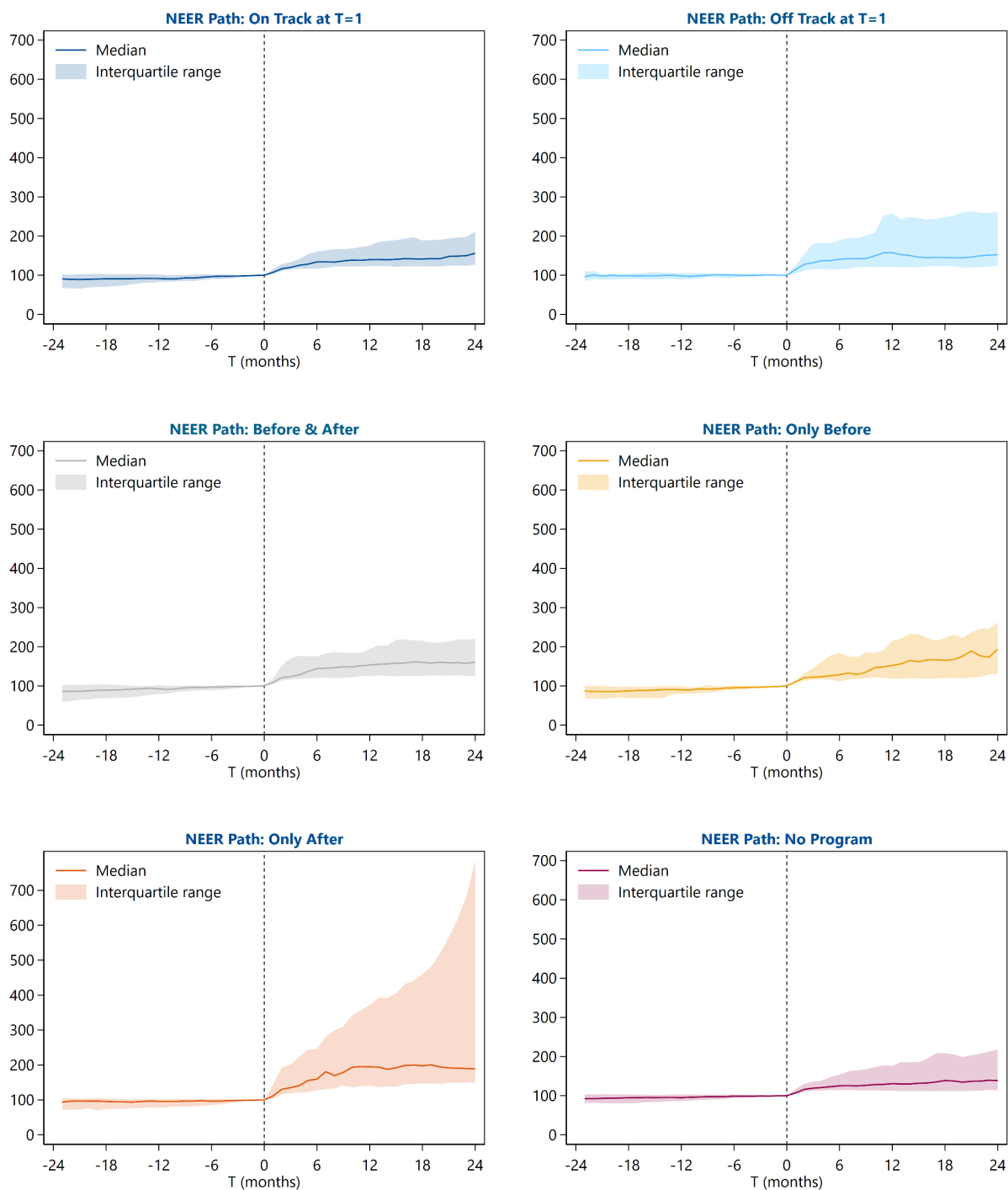
IMF-supported Program Status Group

Annex Figure 12. Interquartile Range of ENDE by IMF-supported Program Status Group



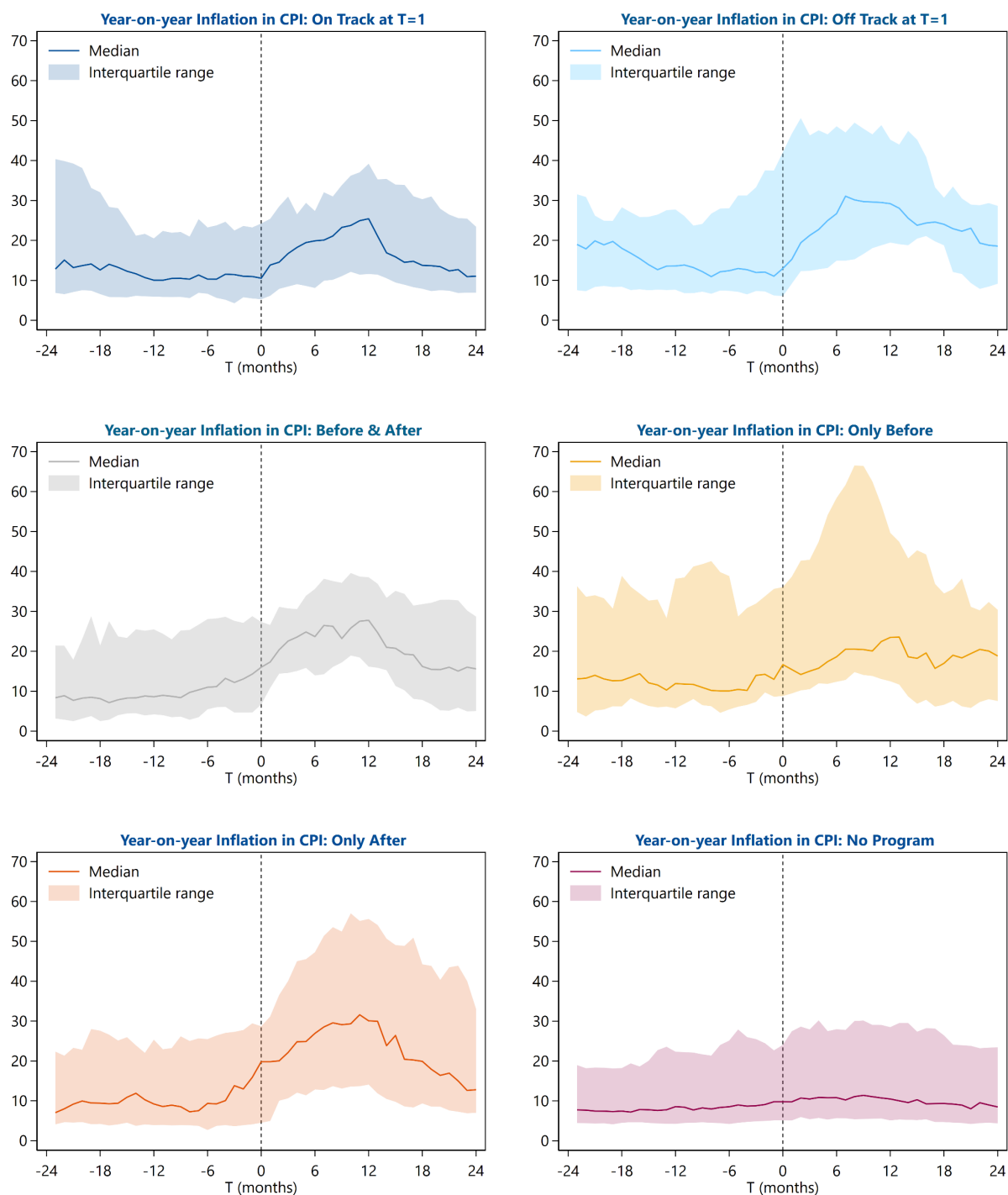
Note: All series are normalized to 100 at T=0.

Annex Figure 13. Interquartile Range of NEER by IMF-supported Program Status Group



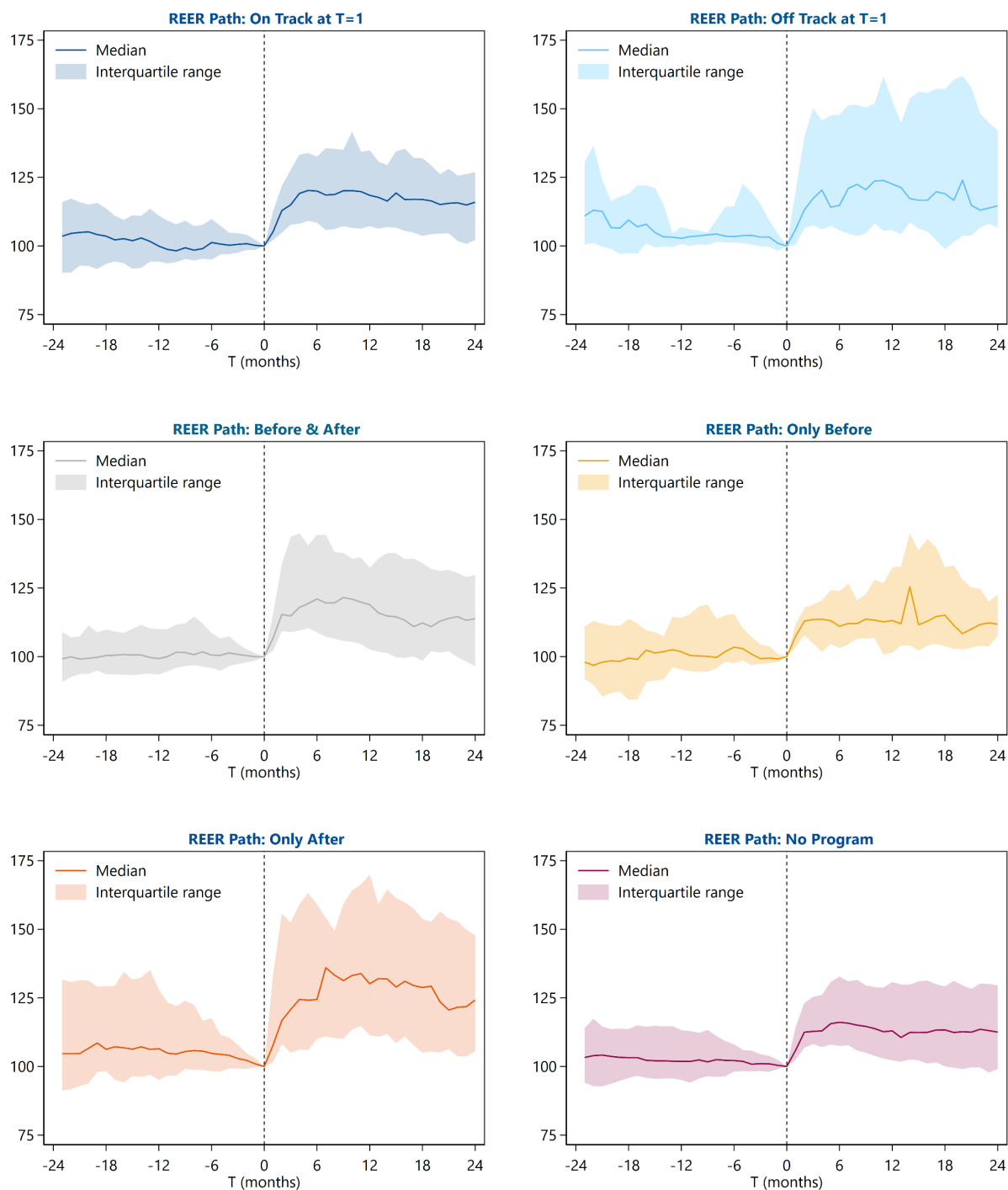
Note: All series are normalized to 100 at T=0.

Annex Figure 14. Interquartile Range of Inflation by IMF-supported Program Status Group



Note: All series are normalized to 100 at T=0.

Annex Figure 15. Interquartile Range of REER by IMF-supported Program Status Group

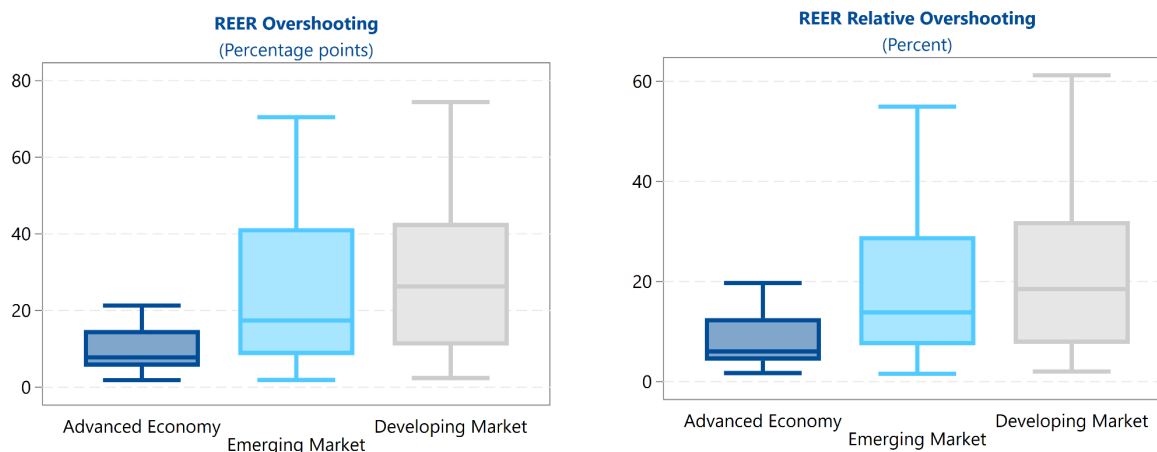


Note: All series are normalized to 100 at T=0.

Annex VI. Robustness Checks

Overshooting by Income Group for Stable Episodes Only

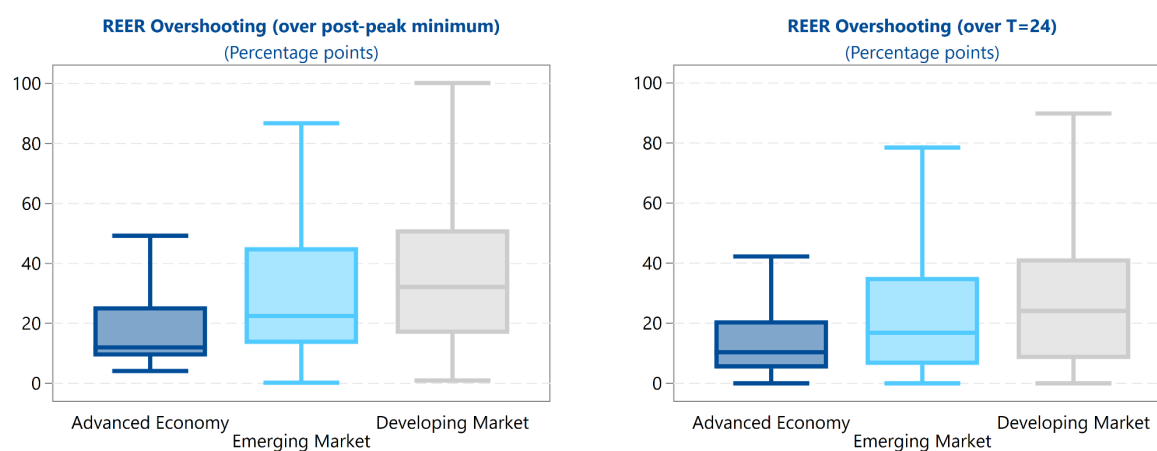
Annex Figure 16. REER Absolute and Relative Overshooting by Income Group (Stable Only)

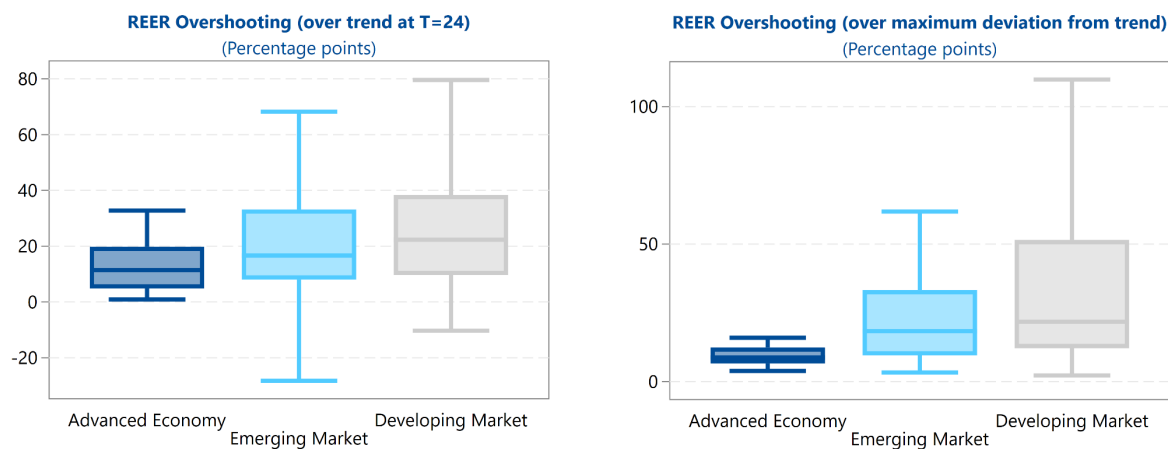


Note: The charts do not plot outside values that lie beyond the whiskers. The upper (lower) whisker is extended to the 25th percentile plus (minus) 1.5 times the interquartile range.

Overshooting by Income Group using Alternative Measurement Approaches

Annex Figure 17. REER Absolute Overshooting by Income Group (continued on next page)

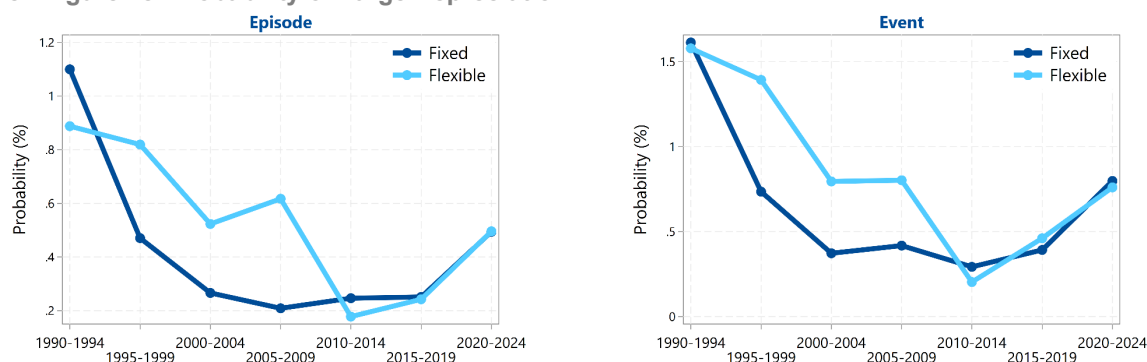




Note: Computing REER overshooting as deviation from trend at T=24 can produce negative numbers, as the trend is computed before the episodes are truncated to 48 months. This is particularly likely for episodes characterized by unstable REER depreciations (see also Annex I discussion). For cases characterized by unstable REER depreciation, The charts do not plot outside values that lie beyond the whiskers. The upper (lower) whisker is extended to the 25th percentile plus (minus) 1.5 times the interquartile range.

Probability of Large Depreciation Using AREAER Classification

Annex Figure 18. Probability of Large Depreciation



Note: The left chart shows the probability that a large depreciation episode will begin each month by whether the exchange rate was flexible the year before. Flexible exchange rates are defined as having the AREAER classification of “free floating” or “floating”. Fixed exchange rates are all other exchange rate arrangements. The right chart shows similar probabilities for events. The probabilities are averaged over 5-month intervals.

Annex VIII. List of Variables in the Dataset

Episodes.dta

Each observation in this dataset is a large depreciation episode (episodeld).

Variable Name	Description
episodeld	Episode ID
ifscode	Country IFS code
country	Country name
wbcode	World Bank ISO3 country code
t	Year Month
episodeYr	Episode year
episodeMo	Episode month
eventsNum	Depreciation events within an episode
territory	Territories that use the sovereign country's currency as legal tender
episodeAeOnly	Initial event satisfies AE thresholds but not default thresholds (0/1)
episodeEnded	Episode has ended (contains full 48 month history)
endeMax	ENDE (LCU/USD EOP) max level
endeMaxDep	ENDE (LCU/USD EOP) max depreciation
endeMaxT	ENDE (LCU/USD EOP) T of max level
endeEqEnd	ENDE (LCU/USD EOP) Equilibrium level (using T=24)
endeEqDepEnd	ENDE (LCU/USD EOP) Equilibrium depreciation (using T=24)
endeOsEnd	ENDE (LCU/USD EOP) Overshooting (over T=24)
endeOsRelEnd	ENDE (LCU/USD EOP) Relative overshooting (over T=24)
endeEqMin	ENDE (LCU/USD EOP) Equilibrium level (using post-peak minimum)
endeEqDepMin	ENDE (LCU/USD EOP) Equilibrium depreciation (using post-peak minimum)
endeOsMin	ENDE (LCU/USD EOP) Overshooting (over post-peak minimum)
endeOsRelMin	ENDE (LCU/USD EOP) Relative overshooting (over post-peak minimum)
endeEq6mo	ENDE (LCU/USD EOP) Equilibrium level (using last 6mo average)
endeEqDep6mo	ENDE (LCU/USD EOP) Equilibrium depreciation (using last 6mo average)
endeOvrDep	ENDE (LCU/USD EOP) Overall depreciation (% change from [-5,0] to [19,24])
endeOs6mo	ENDE (LCU/USD EOP) Overshooting (over last 6mo average)
endeOsRel6mo	ENDE (LCU/USD EOP) Relative overshooting (over last 6mo average)
endeOsCyc	ENDE (LCU/USD EOP) Overshooting (over max dev from HP400 trend)
endeOsCycT	ENDE (LCU/USD EOP) T of max OS (over max dev from HP400 trend)
endeMaxCyc	ENDE (LCU/USD EOP) Level at max overshooting (over max dev from HP400 trend)
endeMaxDepCyc	ENDE (LCU/USD EOP) Depreciation at max overshooting (over max dev from HP400 trend)
endeEqCyc	ENDE (LCU/USD EOP) Equilibrium level at max overshooting (over max dev from HP400 trend)
endeOsRelCyc	ENDE (LCU/USD EOP) Relative overshooting (over max dev from HP400 trend)
endeEqEndTrend	ENDE (LCU/USD EOP) Equilibrium level (using HP400 trend at T=24)

endeEqDepEndTrend	ENDE (LCU/USD EOP) Equilibrium depreciation (using HP400 trend at T=24)
endeOsEndTrend	ENDE (LCU/USD EOP) Overshooting (over HP400 trend at T=24)
endeOsRelEndTrend	ENDE (LCU/USD EOP) Relative overshooting (over HP400 trend at T=24)
neerMax	NEER (Inverse) max level
neerMaxDep	NEER (Inverse) max depreciation
neerMaxT	NEER (Inverse) T of max level
neerEqEnd	NEER (Inverse) Equilibrium level (using T=24)
neerEqDepEnd	NEER (Inverse) Equilibrium depreciation (using T=24)
neerOsEnd	NEER (Inverse) Overshooting (over T=24)
neerOsRelEnd	NEER (Inverse) Relative overshooting (over T=24)
neerEqMin	NEER (Inverse) Equilibrium level (using post-peak minimum)
neerEqDepMin	NEER (Inverse) Equilibrium depreciation (using post-peak minimum)
neerOsMin	NEER (Inverse) Overshooting (over post-peak minimum)
neerOsRelMin	NEER (Inverse) Relative overshooting (over post-peak minimum)
neerEq6mo	NEER (Inverse) Equilibrium level (using last 6mo average)
neerEqDep6mo	NEER (Inverse) Equilibrium depreciation (using last 6mo average)
neerOvrDep	NEER (Inverse) Overall depreciation (% change from [-5,0] to [19,24])
neerOs6mo	NEER (Inverse) Overshooting (over last 6mo average)
neerOsRel6mo	NEER (Inverse) Relative overshooting (over last 6mo average)
neerOsCyc	NEER (Inverse) Overshooting (over max dev from HP400 trend)
neerOsCycT	NEER (Inverse) T of max OS (over max dev from HP400 trend)
neerMaxCyc	NEER (Inverse) Level at max overshooting (over max dev from HP400 trend)
neerMaxDepCyc	NEER (Inverse) Depreciation at max overshooting (over max dev from HP400 trend)
neerEqCyc	NEER (Inverse) Equilibrium level at max overshooting (over max dev from HP400 trend)
neerOsRelCyc	NEER (Inverse) Relative overshooting (over max dev from HP400 trend)
neerEqEndTrend	NEER (Inverse) Equilibrium level (using HP400 trend at T=24)
neerEqDepEndTrend	NEER (Inverse) Equilibrium depreciation (using HP400 trend at T=24)
neerOsEndTrend	NEER (Inverse) Overshooting (over HP400 trend at T=24)
neerOsRelEndTrend	NEER (Inverse) Relative overshooting (over HP400 trend at T=24)
reerMax	REER (Inverse) max level
reerMaxDep	REER (Inverse) max depreciation
reerMaxT	REER (Inverse) T of max level
reerEqEnd	REER (Inverse) Equilibrium level (using T=24)
reerEqDepEnd	REER (Inverse) Equilibrium depreciation (using T=24)
reerOsEnd	REER (Inverse) Overshooting (over T=24)
reerOsRelEnd	REER (Inverse) Relative overshooting (over T=24)
reerEqMin	REER (Inverse) Equilibrium level (using post-peak minimum)
reerEqDepMin	REER (Inverse) Equilibrium depreciation (using post-peak minimum)
reerOsMin	REER (Inverse) Overshooting (over post-peak minimum)
reerOsRelMin	REER (Inverse) Relative overshooting (over post-peak minimum)
reerEq6mo	REER (Inverse) Equilibrium level (using last 6mo average)
reerEqDep6mo	REER (Inverse) Equilibrium depreciation (using last 6mo average)

reerOvrDep	REER (Inverse) Overall depreciation (% change from [-5,0] to [19,24])
reerOs6mo	REER (Inverse) Overshooting (over last 6mo average)
reerOsRel6mo	REER (Inverse) Relative overshooting (over last 6mo average)
reerOsCyc	REER (Inverse) Overshooting (over max dev from HP400 trend)
reerOsCycT	REER (Inverse) T of max OS (over max dev from HP400 trend)
reerMaxCyc	REER (Inverse) Level at max overshooting (over max dev from HP400 trend)
reerMaxDepCyc	REER (Inverse) Depreciation at max overshooting (over max dev from HP400 trend)
reerEqCyc	REER (Inverse) Equilibrium level at max overshooting (over max dev from HP400 trend)
reerOsRelCyc	REER (Inverse) Relative overshooting (over max dev from HP400 trend)
reerEqEndTrend	REER (Inverse) Equilibrium level (using HP400 trend at T=24)
reerEqDepEndTrend	REER (Inverse) Equilibrium depreciation (using HP400 trend at T=24)
reerOsEndTrend	REER (Inverse) Overshooting (over HP400 trend at T=24)
reerOsRelEndTrend	REER (Inverse) Relative overshooting (over HP400 trend at T=24)
incGroup	Income Group
reerGroup	REER Trajectory Group
pegCrawlGroup	Exchange Rate Flexibility Group
aftershockGroup	Aftershock Group
progGroup	IMF-supported program Group

Panel.dta

This is a panel dataset where each panel member (episodeId) is observed for 48 months (from episodeT=-23 to episodeT=24). The dataset is balanced except for episodes starting from February 2023 onward that end after December 2024.

Variable Name	Description
episodeId	Episode ID
episodeT	Episode month count
country	Country name
ifscode	IFS country code
wbcode	World Bank ISO3 country code
group	Income group (AE/EM/DM)
t	Year Month
episode	Depreciation episode
event	Depreciation event
eventsNum	Depreciation events within an episode
eventAeOnly	Event satisfies AE thresholds but not default thresholds (0/1)
episodeAeOnly	Initial event in episode satisfies AE thresholds but not default thresholds (0/1)
episodeEnded	Episode has ended (contains full 48 month history)
territory	Territories that use the sovereign country's currency as legal tender
ende	ENDE (LCU/USD EOP)
endeNorm	ENDE (LCU/USD EOP) Normalized (100 at T=0)
endeTrend	ENDE trend component
endeCyc	ENDE cyclical component
neerNorm	NEER (Inverse) Normalized (100 at T=0)
neerTrend	NEER trend component
neerCyc	NEER cyclical component
reerNorm	REER (Inverse) Normalized (100 at T=0)
reerTrend	REER trend component
reerCyc	REER cyclical component
cpiNorm	CPI normalized (100 at T=0)
cpiInflation	CPI inflation (year-on-year)
peg	Peg detected
crawl	Crawl detected
ifscodeBase	IFS code of the base country
progActive	IMF-supported program is active
progOffTrack	IMF-supported program is off track



PUBLICATIONS

Currency Crises in the Post-Bretton Woods Era: A New Dataset of Large Depreciations
Working Paper No. WP/25/221