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## **Exchange Arrangements Entering the 21<sup>st</sup> Century: Which Anchor Will Hold?**

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### **Abstract**

This paper provides a comprehensive history of anchor or benchmark currencies, exchange rate arrangements, and a new measure of foreign exchange restrictions for 194 countries and territories over 1946-2016. We find that the often-cited post-Bretton Woods transition from fixed to flexible arrangements is overstated; regimes with limited flexibility remain in the majority. Our central finding is that the US dollar scores as the world's dominant anchor currency (by a large margin) and, by some metrics, its use is far wider today than 70 years ago. In contrast, the global role of the euro appears to have stalled. While the incidence of capital account restrictions has been trending lower for decades, an important wave toward capital market integration dates as recently as the mid-1990s. We suggest that record accumulation of reserves post 2002 has much to do with many countries' desire to stabilize exchange rates in an environment of markedly greater capital mobility, an important amendment to the conventional portrayal of the macroeconomic trilemma. Indeed, the continuing desire to manage exchange rates despite increased capital mobility post-2003 may be a key factor underpinning the modern-day Triffin dilemma. Although the existing literature emphasizes the accumulation of "safe" advanced-economy assets, our results suggest that exchange rate regimes may also play an important role, as in the original Triffin analysis.

*JEL: E5, F3, F4, N2*

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## I. Introduction and Overview

As documented in what follows, the desire of many countries to stabilize exchange rates in an environment of markedly greater capital mobility is an important driver of the record accumulation of reserves post 2002. We connect to the new strand in the literature emphasizing that the accumulation of “safe” advanced-economy assets is a key element of the modern-day Triffin dilemma.<sup>1</sup> Our results, however, suggest that exchange rate arrangements also play an important role, as in the original Triffin analysis.

We base our analysis on a comprehensive history of anchor or “benchmark” currencies and exchange rate arrangements for 194 countries and territories over 1946-2016. In contrast to other recent classification efforts (including Reinhart and Rogoff, 2004, Shambaugh, 2004, Levy-Yeyati and Sturzenegger, 2005, 2016, and Klein and Shambaugh, 2010), our main focus here is on the choice of anchor currency. This issue that has recently been analysed theoretically by Hassan et al (2016) and He et al (2016), but the issue has not been addressed comprehensively in an empirical study of exchange arrangements.<sup>2</sup> We find a stunning rise in the dominance of the dollar. By some measures, the dollar plays a more central role in the international monetary system today than it did during the Bretton Woods period. Also, to take account of the critical impact of capital controls on the performance of exchange rate regimes as emphasized by Rey (2013), we develop a new measure of foreign exchange restrictions that captures a central element of any highly restrictive capital control regime. This allows us to view our classification in the modern context of the so-called impossible trinity, sometimes referred to as the macroeconomic trilemma, that a country cannot simultaneously have a fixed exchange rate, capital mobility, and independent monetary policy.<sup>3</sup>

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<sup>1</sup> See Farhi, Gourinchas and Rey (2011), Obstfeld (2013) and Farhi and Maggiori (2016).

<sup>2</sup> Frankel and Wei (1994) made an early contribution in narrowing in on the anchor currency question, but their analysis is restricted to East Asia and uses a different methodology based on attempts to estimate weights in currency baskets. In contrast, we provide a “holistic” approach that treats anchor currency as part of a broader exchange arrangement strategy.

<sup>3</sup> Obstfeld and Taylor (2003).

Under the conventional macroeconomic trilemma, a country with an open capital account that opts to fix its exchange rate must subjugate its monetary policy to that of the anchor currency country. If it wishes to maintain capital mobility and an independent monetary policy, then the country must give up on the idea of stabilizing its exchange rate. If intent on achieving both independent monetary policy and stabilizing its exchange rate, then it must resort to foreign exchange controls. The standard view is that only two of the three options are possible at any point in time, though more recently Korinek (2013) has argued that reserves may substitute for capital controls to some extent.<sup>4</sup>

The third side of the trinity (monetary independence) plays a smaller role in our analysis, but we nevertheless devote considerable attention to the comparatively novel phenomenon of inflation-targeting frameworks. The range of interpretations of inflation targeting encompasses highly inflexible to highly flexible exchange rate regimes, and by no means eliminates the significance of exchange arrangements. This is in some ways parallel to the Calvo and Reinhart (2001) observation that the behavior of the exchange rate and foreign exchange reserves for many countries that were self-declared floaters was virtually indistinguishable from that of countries with limited flexibility arrangements, as well as Reinhart and Rogoff's (2004) finding that gauging the true extent of exchange rate flexibility requires incorporating the parallel market exchange rate in the analysis, especially for developing countries but also for advanced economies during the Bretton Woods era.<sup>5</sup> As Levy Yeyati and Sturzenegger (2005) put it, the objective should be to quantify "deeds not words".

As noted above, there has been a proliferation of de facto exchange arrangement classifications in recent years. Reinhart and Rogoff (2004) categorize countries based on the degree of exchange rate

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<sup>4</sup> Focusing primarily on interest rates, Obstfeld, Shambaugh, and Taylor (2005) conclude that the evidence supports the implications of the Trilemma for more than a century. For instance, during the gold standard era (fixed exchange rates), which Eichengreen (1996) and others have characterized as a period of high capital mobility, the three authors suggest that monetary policy independence appears to have been quite limited. Frankel (2008), however, emphatically argues that the pairings (whether by design or circumstance) among the components of the trinity are time-varying within country as well as across countries. In principle, the optimal or desired combination is not etched in stone. Indeed, Frankel's observation about time and cross-country variation is soundly supported by the country chronologies that are a companion to this paper.

<sup>5</sup> Indeed, in periods where parallel premiums are high, the parallel market exchange rate is often a better gauge of the underlying monetary policy stance than the official (usually pegged) rate. Venezuela's ongoing hyperinflation is a recent illustration of that point. The Reinhart and Rogoff (2004) study spanned 1946-2001 and covered 153 countries.

variability, while taking into account parallel markets.<sup>6 7</sup> Levy Yeyati and Sturzenegger (2005) incorporate the behavior of reserves. Shambaugh (2004) also studies exchange rate variability, but allows for regime changes in higher frequency. The IMF's annual report on exchange arrangements and exchange restrictions has moved from a de-jure classification of exchange arrangements to a de facto one as well. As Klein and Shambaugh (2010) emphasize, these various classification schemes may be viewed as complementary, with each tailored to focus on somewhat different aspects of currency regime choice. Although our analysis here is based on a new updated version of the classification scheme advanced by Reinhart and Rogoff, we argue that our anchor currency classification should extend to the other approaches. For example, regardless of how one categorizes regimes with occasional one-time devaluations or revaluations, the choice of anchor or benchmark currency tends to be very sticky and slow to change over time due to a wide variety of institutional factors.

Compared to earlier studies, the algorithm we propose here allows much more fully for the possibility of multiple currency poles. In the process of classifying anchor currencies, we also update and refine the classification of Reinhart and Rogoff (2004): The new classification series runs through 2015, whereas the widely-used existing series ends in 2001.

There have been a number of studies that attempt to calibrate the degree of capital controls, though these are mainly based on de jure measures, whereas our regime classification methodology emphasizes de facto controls. For example, the work of Chinn and Ito (2006 and updates) covering 1970-2014 and Fernandez et. al. (2015) covering 1995-2013 have exploited a broad range of the information provided by IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AEAER) to construct a variety of measures of capital mobility. But the policies described in the AEAER are strictly de jure (what kinds of legal and regulatory restrictions do countries employ), which do not necessarily capture de facto

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<sup>6</sup> Klein and Shambaugh (2010) contains an excellent overview.

<sup>7</sup> The Reinhart and Rogoff (2004) classification has been extremely widely used in empirical macroeconomics across a wide variety of topics, for example Aghion et al (2009) and Rajan and Subramanian (2005) on growth, Aizenman and Lee (2007) and Jeanne and Ranciere (2006) on reserve accumulation, Chinn and Wei (2013) and Ghosh et al (2013) on current account adjustment, Hau and Rey (2006) on capital flows and equity prices, Mendoza and Terrones (2008) and Jorda, Schulariak and Taylor (2015), Ball et al (2013) on the effect of remittances on the macroeconomy; Habib et al (2016) on the effect of oil shocks.

capital mobility.<sup>8</sup> Indeed, in a broad array of countries, tax and capital control evasion appears almost at the level of a national sport. Our exercise is a contribution to these efforts in a narrow but important dimension. We focus on unitary/dual/multiple exchange rate practices that the AEAER compiles; regular publications by Franz Pick (various issues and Pick and Sedillot, 1971) also contribute importantly to the chronology on dual markets. This record is supplemented by information on parallel market exchange rates. Thus, apart from de jure chronologies, there is a de facto component to the index. Employing a capital controls index that closely integrates with our measures of de facto exchange rate flexibility gives an important perspective on the modern evolution of exchange rate regimes. Again, however, we believe that employing other capital controls measures would not affect the broad brush picture of how the global exchange rate regime has evolved.

Some of our main findings can be summarized as follows:

Based on our new classification of anchor currencies, the dollar is as dominant today as the world's reserve currency as it was at the time of the early Bretton Woods era. Indeed, by other metrics, its global role has expanded even further following the collapse of the ruble zone. The euro is a distant second. From the early 1980s until the introduction of the euro, the German Deutschemark's (DM) sphere expanded, first in Western Europe and later in the East. The euro consolidated the French franc and German DM zones but appears to have stalled in the 21<sup>st</sup> century. By some metrics (given the shrinking share of Europe in world output), its global importance has declined. No other major established international currencies compete at present with the dollar and the euro. The much-debated international role of the renminbi is a live possibility but, at this stage, it is difficult to quantitatively separate its role given its history of strong linkage to the US dollar.

There are, of course, many corroborating pieces of evidence on dollar dominance besides the de facto exchange rate regime, including the importance of dollar funding for global banks and non-financial firms (e.g. Bruno and Shin, 2015), the outsize influence of US Federal Reserve policy in global capital markets

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<sup>8</sup> Kose Prasad, Wei and Rogoff (2003) emphasize the important distinction between de facto and de jure classifications in their analysis of the effects of financial globalization on developing economies. Mathieson and Rojas-Suarez (1992), among others, emphasize the erosion of the effectiveness of capital controls over the course of the developing country debt crisis of the 1980s.

(e.g., Rey, 2013), and the widespread prevalence of dollar pricing in trade in global markets (e.g., Gopinath, 2015). But these corroborating pieces of evidence are all partial. The revealed preference of monetary authorities' choice of anchor currency provides an important summary statistic of the overall degree of dollar dominance. That so much of the world chooses the dollar as its anchor/benchmark currency underscores the broad importance of the dollar across global markets.<sup>9</sup>

To some, the dominance of the dollar may seem natural and obvious, but in fact this is hardly the central view in the literature. Indeed, many researchers continue to argue that since the share of the United States in the global economy is declining, the US dollar's role as the de facto world currency is likely declining as well. Eichengreen (2011), for example, argues that the world is headed towards a multi-polar system where the euro dominates in Europe, the US dollar is the anchor in the Americas while Chinese Renminbi becomes the main currency in Asia.

In fact, to the extent there has been debate, it has been more about whether fading dollar dominance can be considered a good thing. Frankel (2008) argues that it is ultimately inefficient to have multiple world currencies, for much the same reason that barter is inefficient; see also Mundell (1969) and McKinnon and Schnabl (2004). Rogoff (2001), however, argues that despite the transactions benefits of having a single world anchor currency, an equilibrium with two or three major currencies might still be preferable because it provides a critical check on the center country's incentives to misbehave, for example to inflate away debt. (This theme is echoed in Farhi and Maggiori, 2016.)

On the basis of classifying exchange rate arrangements for 194 countries over 1946-2016, we also conclude that the frequently cited global transition from fixed to floating exchange rates considerably overstates the reality. The fact that since 2007 the IMF has classified all Eurozone member countries as having independently floating exchange rates contributes to this misperception. As we revisit the classification criteria, we conclude that an approach that places Malta's exchange rate arrangements in the same bucket as Australia's is questionable on many grounds. By our metric, less flexible exchange rate

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<sup>9</sup> We use the term "benchmark" to more precisely incorporate the cases where a country has a relatively flexible exchange rate arrangement but nevertheless is less flexible against the anchor currency than others.

arrangements currently account for about 80 percent of all countries or about one-half of world GDP, the latter being lower because some of the wealthiest economies float freely and some of the largest emerging markets have recently adopted managed floating regimes.

An increasing number of countries have adopted (de jure) inflation targeting regimes and the question arises as to whether this classification makes a country's exchange rate classification irrelevant. We argue that this not the case after examining the monetary policy and exchange rate practices of countries that have adopted de jure an inflation targeting framework. Closer inspection reveals that the inflation targeting banner encompasses a very broad spectrum of exchange rate arrangements. Almost 40 percent of these regimes involve limited flexibility arrangements, such as crawling pegs (Guatemala and Serbia, for example). The majority of the regimes are managed or freely floating exchange rates. While we duly indicate in the individual country chronologies whether inflation targets are a part of the monetary framework, we do not treat these cases as a separate category.

What emerges clearly from our analysis is the markedly lower incidence of bi-polar or corner solutions, in the words of Stanley Fischer (2001). Instead, we find a pronounced increase in the adoption of intermediate regimes. De jure pegs and pre-announced narrow bands are less common today.<sup>10</sup> While the managed floating category has expanded somewhat, the same cannot be said of freely floating, which has remained confined to a few countries.

As to our index of exchange restrictions, which also spans seven decades, we find that the global march to higher capital mobility has a well-defined long-run trend. In 1946 about 70 percent of independent countries had either a dual exchange rate, multiple exchange rate practices, or active parallel markets with substantial premiums. By 2016, the share was hovering around 20 percent, despite a noticeable pick-up since 2014. The path to greater capital market integration has evolved in steps after stalling from the late 1960s to the mid-1990 (at around 50 percent). The lower incidence of controls

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<sup>10</sup> Also less common in the 21<sup>st</sup> century are the chronically collapsing currencies that accompany very high inflation. We classify these cases as freely falling, but in other classifications these "anchorless" currencies were usually included in the floating category.

globally and higher degree of capital mobility is of a fairly modern vintage for emerging and developing countries.

The mercantilist and self-insurance motive explanations of the unprecedented surge in official reserve holdings during 2003-2013 (often referred to as the demand for safe assets) are well known. We suggest here that the combination of arrangements with limited exchange rate flexibility and markedly greater (and increasing) capital market integration (as documented here) also helped to fuel the demand for reserves. To some extent, reserves have replaced capital controls.

Finally, we integrate our data and findings to the discussion of a modern-day Triffin dilemma in Farhi, Gourinchas and Rey (2011), Obstfeld (2013) and Farhi and Maggiori (2016). We document that the advanced economies that are supplying the reserve assets are comparatively shrinking. But our primary contribution comes from connecting the demand for reserves by expanding emerging markets to their exchange rate arrangements and choice of anchor or reserve currency, a relationship that played a central role in the original Triffin analysis. As already noted, reserve assets are provided primarily by the United States (by a wide margin). We conclude and concur with the aforementioned studies that the stage is set for a Triffin-type dilemma. This time it is not driven by the demand for reserves by other advanced economies, as was the case in the 1970s, but by the demand from emerging markets. Although the literature has extensively discussed global demand for safe advanced-country assets, we argue that countries' desire to stabilize exchange rates (for example because of financial dollarization) also plays a key role in this phenomenon. Unlike the 1970s, the numeraire for reserves is not connected to a sluggishly expanding supply of gold; in the modern context, the numeraire is connected to the sluggishly expanding supply of US goods and services.

Section II and the accompanying appendices describe the essential details of our exchange rate classification approach and anchor currency selection algorithms, as well as our approach to measuring capital account restrictions. Although in many ways section II is the meat of the paper, readers interested in the motivation and applications may wish to go directly to section III on a first reading.

## II. Anchor Currencies and Exchange Rate Regimes: Methodology

This section describes the classification framework that we apply to each of the 194 countries (or territories) that comprise our sample in 2016. The raw exchange rate and inflation data are monthly and span January 1946 through October 2016, approximately seven decades. The classification algorithms perform two intertwined tasks. First, they identify the relevant anchor currency for each country over the course of the sample and second, they define the exchange rate arrangement by metrics that primarily (but not exclusively) measure the degree of flexibility. Important extensions to the Reinhart-Rogoff (2004) framework address: (i) explicit classification of anchor or benchmark currency (ii) the classification of de jure inflation targeting cases; (iii) the treatment of Eurozone countries. The exercise yields a monthly classification. The criteria for evaluating the regime, however, almost always involve a multi-year window.

### 1. *Measuring Exchange Rate Flexibility*

Choosing the anchor currency and determining the exchange rate classification is an interactive simultaneous process. For expositional purposes, we begin by describing our methodology to classify exchange rate flexibility and then describe the anchor classification. We note that the full classification includes a coarse classification, including 6 categories of exchange rate flexibility, and a fine classification, that includes 15 categories. The categories are listed in Table A.1 in the appendix. A full description of the algorithm is found in Appendix 1, but its main features are outlined here, with a focus on the coarse classification.

For each of the 194 countries and territories studied, the raw data include the month-on-month rate of inflation and the absolute value of the monthly change in the spot exchange rate. We denote the latter as  $\varepsilon_{n,t}$  for country  $n$  in month  $t$ . The exchange rate is evaluated against ten candidate benchmark currencies.<sup>11</sup> We describe how the benchmark currency is determined from among these candidates in our discussion

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<sup>11</sup> Following ISO country codes, the candidate benchmarks are USD, DEM and FFR (replaced by EUR following 1999), JPY, GBP, RUB, RMB, CHF, AUD and ZAR.

of anchor classification below. We begin by separating currencies with parallel markets. Where data on the parallel exchange rate are available, we use these data alongside the official data to classify the exchange rate arrangement.<sup>12</sup> We first separate freely falling currencies (category 5) as those whose year-on-year inflation exceeded 40% for 12 consecutive months. This is important so as to distinguish exchange rates with large fluctuations due to a lack of monetary control among currencies that fluctuate freely. Next, when a country had a pre-announced exchange rate arrangement, we verify whether the exchange rate followed the announced rule. Otherwise, we use our algorithm to classify the exchange rates into four remaining categories that can be roughly categorized as pegs (category 1), narrow bands (category 2), broad bands / managed floats (category 3), and freely floating (category 4). These are classified as follows. Currencies that had zero variation ( $P(\varepsilon_{n,t} = 0) = 1$ ) for four consecutive months are classified as pegs. Narrow bands are defined as currencies with less than 2% variation in at least 80% of monthly observations in a 2 year rolling window ( $P(\varepsilon_{n,t} < 2\%) > 80\%$ ). A similar methodology classifies broad bands (category 3) as currencies with less than 5% variation in a similar window.

The remaining observations are classified as floats, with an additional algorithm to separate freely floating currencies from managed floats. To do so, we create an index of exchange rate variability  $\omega_{n,t}$  defined as follows:

$$\omega_{n,t} \equiv \frac{\sum_{s=-29}^{30} \varepsilon_{n,t+s} / 60}{\sum_{s=-29}^{30} I(\varepsilon_{n,t+s} < 0.01) / 60},$$

where  $I(\cdot)$  is the indicator function. The numerator of the measure gives the average absolute value of exchange rate change within a five year moving window. This average is a direct measure of exchange rate volatility and is naturally high for countries with freely floating rates. The denominator gives the probability that the exchange rate moved by less than 1% in a given month within a five year moving window. This probability is higher for countries with less flexible exchange arrangements.

To assess whether a country is freely floating, we compare its index  $\omega_{n,t}$  with that of the bilateral exchange rates among main anchor currencies (USD, EUR and JPY, in recent years). Namely, we

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<sup>12</sup> Where data on the dual exchange rate is unavailable, we classify the country as having a parallel market with unavailable exchange rate data (category 6).

estimate the one-sided 99% confidence interval of  $\omega_{n,t}$  for the main anchor currencies. Any floating currency whose index falls within this confidence interval (i.e. we are unable to reject with 99% confidence the hypothesis that it is freely floating) is classified as freely floating.

## ***2. Anchor or Benchmark Currency***

Having classified the degree of exchange rate flexibility for each currency against all potential anchors, we now turn to anchor classification. Since world trade and finance are dominated by a handful of currencies, the process of elimination to select the anchor for each country and period is tedious but not intractable. It also helps that there is considerable inertia and path dependence in the choice of anchor currency. Switches of anchor currencies are far more infrequent than changes and revisions to the degree of exchange rate flexibility. Intuitively, in most cases the anchor currency will display a much tighter link and less variation to the country under scrutiny than the other potential anchors.

Figure A.2 in the appendix sketches the process of anchor currency selection. If a currency is identified as “freely floating” it is classified as having no anchor or benchmark currency. At the other end of the spectrum, countries with arrangements that are less flexible than managed floating have a low degree of exchange rate variability viz a specific anchor. Given that the candidate anchors themselves showed significant variability, this allows an unambiguous anchor classification. Concretely, there is no five year window where a currency could be within a 2% band of both the Euro and the Dollar simultaneously. Two important exceptions stand out to this regularity. First, the Deutschmark was pegged to the dollar under the Bretton Woods system of fixed exchange rates. It is therefore possible that some countries classified as having a dollar benchmark were in fact latently shadowing the Deutschmark. Second, the renminbi (RMB) has had a narrow band with respect to the US dollar in recent years. It is therefore difficult to ascertain whether certain currencies (e.g. in East Asia) are anchored to the dollar or to the RMB. Given that the RMB itself has been anchored to the dollar, we classify these cases as having a dollar anchor.

More recently, managed floating has emerged as a regime of choice among the larger emerging markets. Managed floating is a relatively more flexible exchange arrangement and the classification of a currency as managed floating doesn't assign a clear anchor currency. Therefore, for these exchange rates, we calculate the one-year moving average of  $\varepsilon_{n,t}$ , the absolute value of the change in its bilateral exchange rate, relative to all candidate anchor currencies. If the currency shows smaller movements relative to any single anchor in more than 50 percent of the observations, we link the currency to this anchor.<sup>13</sup>

Even with this refinement, there remain 11 episodes whose anchor remains unclassified based on exchange rate behavior alone. Table 1 lists these cases and how, using supplementary information we were able to allocate these to a currency bloc. We use four separate criteria to assign a benchmark currency to these countries. First, in which currency is the majority of foreign trade invoiced? Second, in which currency is the largest share of external (public and publically guaranteed) debt denominated? Third, which currency comprises the largest share of central bank foreign reserves? And finally, which was the most recent anchor currency? Conveniently, all four indicators point to the same benchmark currency in all countries in the table. In Appendix 1, we propose an indicator for benchmark classification that aggregates these four measures, for future reference. However, the four measures are strategic complements and we think it is no coincidence that they give consistent predictions. As Table 1 highlights, nearly all these cases are a recent phenomenon, beginning in the early 2000s and accelerating during the global financial crisis. These are admittedly cases where the notion of an anchor currency is less relevant and we therefore refer to "benchmark currency" in these cases. (Throwing out these cases entirely would not fundamentally change our overall conclusion on the overwhelming pre-dominance of the dollar.)

For completeness, we assess the robustness of our anchor choice by studying two recent natural experiments. There have been two large recent swings in the bilateral USD-EUR exchange rate (see

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<sup>13</sup> Moving more closely against a single currency 50% of the time is a relatively high bar. Classifications are not sensitive to altering this to 40% or 60%.

Appendix 2). Both movements can be traced back to monetary policy shocks in Europe and the US. First, on July 22, 2012, ECB President Mario Draghi made his now famous speech, in which he stated that the ECB stood ready to do “whatever it takes” to preserve the euro. Following his pronouncements, spreads on sovereign bonds of peripheral EZ governments declined and the euro appreciated by about 10 percent relative to the dollar through the end of the year. Second, the minutes of FOMC meeting of June 17-18, 2014 increased market perceptions that the Federal Reserve would initiate its tightening cycle, a perception that gathered momentum throughout the rest of the year. As a result, the dollar appreciated by a cumulative 30 percent relative to the Euro through March of 2015.<sup>14</sup> While Appendix 2 provides the details for the full exercise, we highlight here that all in all, these two event studies strongly corroborate our anchor classification for the borderline cases.

Unlike other prominent exchange rate classification strategies (for example, Levi-Yeyati and Sturzenegger (2005), and Shambaugh (2004), which focus almost exclusively on the degree of exchange rate stability, our approach places considerable emphasis on getting the currency anchor right. Despite differences in approaches to classifying exchange rate arrangements, we conjecture that our anchor classification would largely carry over to other approaches. Countries change anchors infrequently and central banks’ reserve portfolio are typically overweight in the currency they are anchored to. Our aim is closer in spirit to Frankel and Wei (1994), Frankel (2008), and Frankel and Xie (2010), who attempt to estimate the weights in currency baskets.

### ***3. Classifying Eurozone and Other Currency Unions***

A major development in exchange rate practices in the past two decades has been the introduction of the Euro. Since the Eurozone (EZ) comprises more than 15 percent of world GDP, any conclusion about the evolution of global exchange rate arrangements and their degree of flexibility in recent decades depends importantly on how the exchange rate practices of EZ members are treated.

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<sup>14</sup> This differs from the proverbial “taper tantrum” of the previous year, when the Federal Reserve indicated plans to slow down and eventually reverse asset purchases as part of its quantitative easing policies. While this announcement did create some volatility in emerging market currencies, it had a relatively muted effect on the bilateral Euro-Dollar exchange rate.

As we have noted, the IMF, in its *Annual Report on Exchange Arrangements and Exchange Restrictions* (AEAER), currently treats the EZ as a single sovereign nation with a freely floating exchange rate. As a consequence, every member country of the Euro area from Malta to Italy and Germany is accordingly placed in the independently floating exchange rate category. An approach that places Malta's and Italy's exchange rate arrangements in the same bucket as Australia's and the United States is questionable on many grounds.

To be sure, according to our classification algorithm, the euro floats freely against other major currencies. But, to state the obvious, the EZ is far from a cohesive sovereign entity. Individual EZ members do not have their own currency. Faced with a country-specific shock to inflation, output or unemployment, there is no exchange rate that can immediately adjust in response.<sup>15</sup> Thus, in our classification, individual member countries of EZ are placed at the bottom end of the flexibility spectrum. The currency union label is tantamount, in the flexibility scale, to an exchange rate arrangement with no separate legal tender or a de jure peg (Coarse-grid 1). To reflect (for information purposes only) that the currency floats freely for the union as a whole, the label attached to each member of the EZ is currency union/freely floating.<sup>16</sup>

The main considerations behind our classification of the EZ countries are as follows:

First, our approach consistently defines exchange rate arrangements at the country level and not at the currency level. Under its current approach the IMF lists Portugal as having a floating exchange rate (like all EZ members) but Panama (which adopted the US dollar as its sole legal tender in the early 20<sup>th</sup> century) is placed in the category of an arrangement with no separate legal tender. If the currency criterion was applied to Panama, it should be considered a floater, since the US dollar floats. In our classification both are in the same bucket of exchange rate flexibility, because neither Portugal nor Panama has its own currency. Empirical studies that use our or other de facto exchange rate classifications often ask questions about the relative economic performance of countries under different

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<sup>15</sup> Of course, as prices adjust over time, real exchange rates will also change in response to country-specific (idiosyncratic) shocks, much the same way as these would for other "hard pegs."

<sup>16</sup> See the companion chronologies in Ilzetzki et al (2016) for individual countries over 1946-2016.

exchange rate regimes. There too, the unit of observation tends to be sovereign countries, rather than currencies.<sup>17</sup>

Second, even the largest Eurozone members (Germany, France, Italy, Spain, and the Netherlands) have the equivalent of less than a 4 percent share of voting rights each on the board of the ECB. These countries rotate such that four of the five is represented in each ECB board meeting. In meetings when they are represented, they have one of 21 votes. Other countries are represented less frequently—in only 11 out of every 19 board meetings. Hence even the largest members have only a small de-jure influence on the conduct of ECB monetary policy. This arrangement tends to limit the likelihood that ECB policy is set in response to a particular country-specific shock at any given meeting. By contrast, the monetary policies of the central banks of Australia and the United Kingdom (among other floaters) are routinely and substantially determined by the nature of their country-specific idiosyncratic shocks.

Third, our classification is continuous in the time series sense—the IMF's is not (for the EZ group at least). As we have noted, in the *Annual Report on Exchange Arrangements and Exchange Restrictions*, the IMF described the exchange rate policy of future EZ members in the latter part of the 1990s exclusively by their de jure arrangement, which involved at that time +/- 15 percent floatation bands. From 1999 until 2006, EZ countries were listed in the IMF's AEAER under the category of exchange rate arrangement with no separate legal tender. In the 2007 AEAER, EZ members had been transferred from the most rigid exchange rate regime category to the most flexible (independently floating). The AEAER classification therefore implies that the introduction of euro brought a marked *increase* in exchange rate flexibility in Europe over the past decade. By contrast, we characterize most members of the European Exchange Rate Mechanism (ERM) as having a de facto peg to the Deutschmark well prior to the introduction of the Euro.<sup>18</sup> Germany, in the freely floating category, was the exception. It follows from these observations that in our classification the adoption of the euro didn't represent a drastic change for

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<sup>17</sup> See Levi Yeyati and Sturzenegger (2005), for example.

<sup>18</sup> Some future EZ members had narrow +/-2 percent bands.

most EZ members, with a slight (yet important) reduction in the exchange rate exchange rate flexibility of its members.<sup>19 20</sup>

Finally, the de facto interest rate policy of the ECB appears to support classifying individual members of the EZ as an exchange rate arrangement with no separate legal tender. In Appendix 3 we show that the ECB policy rate hasn't responded to inflation or unemployment in any EZ country, with the possible exception of Germany. This suggests a lack of monetary autonomy consistent with a peg for most EZ members. At a very basic level, theory suggests that a country with a pegged exchange rate and an open capital account has little or no scope to adjust the policy interest rate in response to changes in domestic inflation or fluctuations in the output gap. By contrast, a country with a floating exchange rate can respond to inflationary pressures and an overheated economy by raising interest rates. This type of policy response is at the core of a Taylor rule, among the other policy prescriptions.<sup>21</sup> Simply put, evidence in favor of a Taylor rule is consistent with a flexible exchange rate regime and at odds with a peg.<sup>22</sup>

To be clear, the ECB has not considered itself to be guided by a Taylor rule when setting the course of its policies (at least in the public domain). In that context, the estimation of the Taylor rule for an individual member of the Eurozone should be interpreted primarily as a check to confirm that, indeed, the ECB's de facto monetary policy is *not* set on the basis of the idiosyncratic economic conditions of any of its members (consistent with a peg ).

Classifying other currency unions (specifically, the East Caribbean Dollar bloc and the Central African Franc (CFA) zone, which is itself comprised of Communauté Économique et Monétaire de l'Afrique Centrale (CEMAC) and West African Monetary Union (WAEMU)) is comparatively straightforward. These are pegged or rigid arrangements whether the focus is on the currency unit or the country unit. Member countries do not have their own currency, like the EZ. But in contrast to the EZ, the CFA or the

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<sup>19</sup> As shown in Table A.1 in the appendix, a de facto peg is a 4 and no separate legal tender or currency union is a 1 in the fine grid, so the introduction of the euro reduces flexibility. In the coarse grid classification, categories 1 through 4 of the fine grid are subsumed in category 1, the least flexible category.

<sup>20</sup> To reiterate, the observation on limited change refers narrowly to exchange rate flexibility. In countless other dimensions the introduction of the euro represented major changes for EZ countries, not the least of these was the creation of Target2.

<sup>21</sup> See Taylor (1993).

<sup>22</sup> Unless, of course, the country doing the pegging has virtually no idiosyncratic shocks of its own and its cycle is perfectly correlated with the anchor country's cycle. This match made in heaven scenario rarely accords with reality.

East Caribbean Dollar are pegged to the euro and US dollar, respectively. The classification outcome is then narrowly circumscribed.

#### ***4. Inflation Targeting and the Exchange Rate Regime***

A major development in monetary management over the past several decades has been the proliferation of inflation targeting (IT) regimes, which is not explicitly incorporated in earlier exchange rate regime classification exercises, so we explore the idea here. To integrate IT frameworks into our classification scheme, we begin by taking stock of the global emergence of IT and the countries that adopted these policies. IT regimes are far from homogenous, spanning across regions, income levels, and exchange rate policies. Table A.3 in the appendix lists the countries that have adopted this policy framework, the dates of its inception, and the de facto exchange rate regime classification on the basis of exchange rate behavior. The proliferation of IT as a de-jure monetary regime has been a development of the past two-three decades, with a more recent history in emerging markets. Since New Zealand adopted an inflation target in 1989, close to 30 countries have followed suit.

As the table highlights, there is considerable variation in de facto exchange rate practices with a de jure IT policy framework. Among this group (as with non-IT cases), exchange rate practices range from the freely floating currencies of Australia and the UK to Romania's de facto peg to the euro since 2012. The more flexible arrangements (categories 3 and 4 in the coarse-grid classification) include: the freely floating case, managed floating, and *moving* bands that are narrower than or equal to +/-2 percent.<sup>23</sup> Slightly less than 2/3rds of the IT group (17 of 27) falls into this basket. De facto pegs, crawling pegs and narrow crawling bands (categories 1 and 2 in the coarse-grid classification) make up the remaining ten IT countries. More than half of the Fix-IT group is from of Emerging Europe.

These insights suggest that IT is too vague and encompassing to constitute a separate category of exchange rate arrangement. The de facto exchange rate classification appears to do a far better job in predicting exchange rate variability in IT countries than the de jure classification of inflation targeting.

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<sup>23</sup> A moving band refers to the cases where periods of sustained appreciations are also evident; with crawling bands, changes are always in the direction of depreciation.

Appendix 4 studies inflation targeting and exchange rate classifications in more detail, with further evidence that the inflation targeting label is not a sufficient statistic for exchange rate classification.

### **III: The “Big Picture”**

This section quantifies to what extent a handful of major currencies serve as anchors or benchmarks for the rest of the world. Apart from documenting the exit of old anchors, the emergence of new ones, and the resilience of some, our study attempts to shed light on the factors that determine which currencies prevail or fail as anchors. We then shift emphasis from the anchor currency question to focus on the evolution of exchange rate arrangements in the seven decades since World War II. Of particular interest is the emergence of new types of de jure monetary and exchange rate arrangements and their degree of exchange rate flexibility. We ask whether these arrangements are characterized by trends toward greater exchange rate flexibility or by long cycles with no clear-cut tendency. A new measure of capital or foreign exchange restrictions is introduced.

#### ***1. Anchor Currency***

Figure 1 presents two snapshots of the world with the information on anchor currencies displayed in maps. This spatial view is shown for the years 1950 and 2015. Of course, comparable figures are possible for all the intervening years, as all the information about currency anchors on a continuous basis is contained in our chronologies in Ilzetzki, Reinhart and Rogoff (2016). The maps show that the dollar zone has expanded considerably since 1950.

This growth has been due to two world developments. Chronologically, the first spurt to the dollar zone in the years since 1950 comes from the dismantling of the sterling zone, as former British colonies switched from British pounds to US dollars in the decades following the war. This process was already underway by 1950, but gathered momentum with the UK’s sterling crisis of 1967 and the country’s

mounting economic difficulties. By the 1970s, the transition out of pound sterling was essentially complete.

Second, the collapse of the former Soviet Union in the 1990s dismantled the sizable ruble block. Russia and most of the former Soviet republics have since anchored to the dollar. Most Eastern European nations that were either a part of the USSR (the Baltics) or satellites in the Soviet sphere left the ruble to embrace first the German DM and later the euro. Estonia, Latvia, Lithuania, the Slovak Republic and Slovenia are now a part of the 19-country EZ. As the chronologies document, a number of the others in the region have fairly tight links to the euro via de facto pegs or crawling pegs or narrow corridors.

Shifting from a spatial view to the time-series dimension, Figure 2 presents the evolution of four major anchor currencies from 1946 through 2015. The top panel shows the (unweighted) share of countries anchored to each anchor currency. A similar picture with countries weighted by their share of world GDP is shown in Figure A.10 in the appendix. The bottom panel presents the same information but weighs the observations by each country's share in world GDP. Two old anchor currencies disappeared (the British pound and the French franc); one emerged in the 1970s only to disappear (the German DM); a new currency emerges (the euro); and one prevails throughout (the US dollar). In Figure 2, the French franc and German DM, which both transitioned to the euro in January 1999, are combined into a single zone for the 1946-1998 period.

The Bretton Woods system institutionalized the role of the US dollar as the main benchmark currency, and until the 1970s, about 70 percent of global GDP was anchored to the dollar. The remainder was split roughly evenly between the UK pound and the Soviet ruble. At the end of the Bretton Woods era in the 1970s, the Deutschmark emerged as the dominant European currency, as many European countries began to shadow the actions of the Bundesbank, explicitly or otherwise.

While the US dollar was the currency of choice among the former British colonies exiting the Sterling zone, the loss of comparatively high-income Europe to the DM led to a shrinking of the dollar zone by 1980. This dent to the US dollar zone is apparent in Figure 2. At this time, another rising trend was the falling share of countries with a tight exchange rate link to the US dollar.

By the late 1970s and into the 1990s, a significant proportion of countries in Latin America and Africa (and some, like Vietnam, in Asia or Turkey in Europe) had freely falling currencies.<sup>24</sup> Chronic and high inflation, and in numerous cases hyperinflation, meant that these countries were “anchorless” with regards to their exchange rate, which steadily plummeted in value versus nearly all other currencies. As inflationary crises became much less common in the 21<sup>st</sup> century (to date), nearly all the countries with freely falling currencies in the late 1970s-1990s have re-anchored to the dollar. Arguably, one can plausibly reinterpret the history of the freely falling cases and conclude that these countries maintained a US dollar anchor even during the years of very high inflation, as their trade, debts, and hard-currency reserves continued to be dominated in the US currency. In addition, during these long and chronic high inflation bouts many of these countries became significantly dollarized domestically.<sup>25</sup> The one place that the dollar link was not apparent was in the sinking value of their currencies (which had decoupled from the US dollar or any other currency).

The dollar dip was eventually largely reversed by the collapse of the Soviet Union and the global disinflation trend from the mid-1990s. The latter translated to a sharp reduction in the share freely falling currencies, which are recorded in our methodology as having no benchmark currency. The French franc zone, which had its largest roots in French Africa and most explicit connection to the CFA currency arrangement, held a steady share throughout this period until it was replaced by the euro in early 1999.

The DM zone, which in 1999 was consolidated with the French franc area under the aegis of the euro, expanded to encompass approximately 20 percent of global GDP by the start of the 21<sup>st</sup> century. Since then, the proportion of world GDP that is anchored to the euro has declined. The UK pound has delinked from its former euro anchor and EZ’s share of global GDP has declined. The shrinking euro area (as a share of world GDP) has both external causes, the growth of China and other emerging market economies

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<sup>24</sup> As noted in Figure 2 and Table 2, freely falling captures all the cases where the 12-month inflation rate exceeds 40 percent. The incidence of freely falling over 1946-2016 will be discussed later in this section.

<sup>25</sup> On de facto dollarization see, for instance, Calvo and Vegh (1999); Reinhart, Rogoff, and Savastano (2014) and Ize and Levy Yeyati (2003)

(an issue we take up in the next section) and the severe nature of the crisis of 2008-2009, which affected EZ members especially severely.<sup>26</sup>

## ***2. Drivers of Anchor Currencies***

Although Japan eventually emerged from the devastation of World War II as one of the world's most dynamic economies, with a share of world GDP that peaks close to 10 percent in the early 1990s, the Japanese yen has not figured in our discussion of post-war benchmark or reserve currencies. Indeed, given Japan's wide global trade network, it is somewhat of a puzzle that the yen never takes its place among the world's major benchmark currencies. In this section, we discuss some of the factors that help determine whether a particular currency gains ground in the global theater or not.

Each of these factors we consider has been used elsewhere as an indicator of the dollar's global reach. So, this exercise can also be seen as a cross-check that our anchor classifications are a useful summary measure of these factors. Table 3 studies four reserve currencies (dollar, euro, pound, and yen) and reports the share of countries that are anchored to each as well as a number of factors that may explain their roles as global currencies. These factors include the share of world reserves held in this currency, the share of developing country debt that is denominated in the anchor currency, and an index that summarizes the extent to which world trade is denominated in the anchor currency. The trade invoicing index is based on trade invoicing data from Gopinath (2015) and is detailed in Appendix 5. It averages the percent of countries with *any* trade invoiced in a given anchor currency with the *share* of all trade invoiced in that currency.

The picture emerging from Table 3 is fairly consistent across indicators and confirms our assessment that the US dollar stands out as the dominant anchor. Based on the classification approach outlined in Section II, the dollar serves as the anchor or benchmark currency for 62 percent of the countries in our study in 2015. About two-thirds of the world's foreign exchange reserves are held in US dollars and a comparable share of developing and emerging market economies' external debt is denominated in

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<sup>26</sup> See Reinhart and Rogoff (2014).

greenbacks.<sup>27</sup> Both in magnitude and relative importance, these numbers align with our own estimates on exchange rate arrangements. Finally, the US scores 69 percent on the trade invoicing index, a score that exceeds that of any other anchor currency.

The only other major anchor currency, by our classification, is the euro, to which 28% of countries are anchored. This number somewhat overstates the euro's global reach as the euro's sphere of influence appears to be confined to Europe (including emerging Europe). The factors show a similarly consistent picture on the role of the euro as a distant second. While the trade invoicing indicator has a fairly high reading (intra-Europe trade is significant), the other indicators on reserves and external debt are considerably lower than their readings for the US dollar. In Asia, Latin America, the Middle East and much of Africa (CFA Zone notwithstanding) dollar reserves dominate.

We are not aware of any country that pegs to or shadows the yen or UK pound at present. Indeed, apart from its colonies prior to World War II or its occupied territories during that war, Japan's currency served as an anchor only for the domestic economy. Even domestically it competed with the dollar. The trade invoicing indicator gives some insight why the UK pound and Japanese yen have very limited status as world anchor currencies during this period. For each of the factors, the score is less than 1/7<sup>th</sup> of the dollar's combined score. The late Ronald McKinnon, in several of his papers on what he called East Asia's dollar standard, emphasized this point.<sup>28</sup> As Gopinath's (2015) data highlights, about 50 percent of Japan's exports and over 70 percent of its imports are denominated in US dollars. Furthermore, Japan's link to the US dollar lasted longer than Europe's and well past the breakdown of the Bretton Woods arrangements, as Japan maintained a narrow de facto band until 1977 (see the companion chronologies to this paper.)

### ***3. Exchange Rate Arrangements***

Having described the trends in anchor currencies, we now turn to the global evolution of exchange arrangements. Figure 3 provides a spatial view of exchange rate arrangements in 1950, the early Bretton

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<sup>27</sup> See also Faudot and Ponsot (2016).

<sup>28</sup> See, for example, McKinnon and Schnabl (2004).

Woods era and recent experience (2015), comparable to what Figure 1 showed for anchor currencies. In each map, countries are shaded based on their coarse exchange rate classification, with lighter shades indicating greater exchange rate flexibility.

In the early years, the majority of countries participated in the Bretton Woods system, pegging their currencies to the US dollar, which itself was convertible to gold at a fixed rate. Why then do large tracts of Europe show up as more flexible managed arrangements in Figure 3? The answer lies directly with the first question we pose in our classification algorithm, discussed in Section II: Is the exchange rate unitary? In nearly all of post-war Europe through the mid-1950s, the answer to that question was a resounding no. While there was an official parity registered with the IMF and its gold equivalent, in practice this was an era of comprehensive and widespread foreign exchange and capital account restrictions of multiple exchange rate practices, as discussed at length in DeVries (1969, 1987). A widespread dollar shortage at the time (see Reinhart, 2016) drove parallel market premia sky high (often into triple digits). The gyration in the parallel market created what Reinhart and Rogoff (2004) called back-door floating.

On the other side of the iron curtain, many of the remaining countries were in the Soviet block and had pegs to the ruble. If Western Europe's exchange arrangements at that time were decidedly opaque, the arrangements of the Eastern bloc were outright inscrutable. Multiple exchange rate practices were the norm, and the Soviet Union and Yugoslavia could, at any point in time, list a dozen of administered exchange rates. Continued scarcity meant that black currency markets were active despite repression. Unlike the Western European countries, for which we have the parallel market exchange rate data, we do not have their counterpart in the Soviet Bloc. Hence, we leave these cases under the label Parallel markets-no data.

The geographical snapshot of Bretton Woods in 1950 and 2015 is supplemented by the time series profile over 1946-2016 shown in Figure 4 in three panels. The first traces the evolution of the least flexible arrangements (Coarse classifications 1 and 2, as defined in Table 2); the second presents the more flexible arrangements (Coarse classifications 3 and 4); the third traces out the incidence of the

dysfunctional freely falling category as well as those cases where there are dual or multiple exchange rate practices or an active parallel market and we do not have time series data on the parallel market exchange rate. Figure 4 includes only independent (sovereign) states, which means that the total number of entities more than doubles over the course of the sample, from 79 in 1946 to 188 in 2016.<sup>29</sup> To offer a clearer picture of the incidence of regimes across countries and avoid presenting a picture dominated by a handful of large economies, we first report the unweighted tally for each regime.

The most striking feature of Figure 4 (top panel) is that combining the two least flexible arrangements (Coarse 1 and 2), the share of countries living with limited exchange rate flexibility is about the same today as at the outset of the sample under Bretton Woods.<sup>30</sup> This aggregate masks a significant migration from the explicit de jure pegs of the Bretton Woods era to the still limited flexibility arrangements (Coarse Grid 2) that have more “escape valves” either because they allow for a drift in the exchange rate over time (crawling pegs), because they are de facto and not de jure arrangements—so there is no explicit commitment to “maintain the peg” and therefore adjustments to the pegs are often discretionary. It is evident in Figure 4 that coarse grid 2 arrangements were virtually nonexistent until well into the 1950s, only to gain in popularity post-1980s.

The incidence of managed and free floats (second panel) re-enforces the finding that flexible arrangements are not as commonplace since the breakdown of Bretton Woods as one might have thought or as the IMF’s classifications suggest. Freely floating exchange rates are still largely confined to a few wealthy economies. If instead of focusing on the share of countries in each category, we were to weigh the aggregation by the country shares in world GDP, then the share of floaters nearly doubles to somewhere between 30 and 40 percent. Since the United States and Japan float freely, this already

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<sup>29</sup> There are six territories for which we have a full classification, bringing the total to 194. As we also have the pre-independence de facto exchange rate arrangements, Figure 6 can be also reproduced for all countries and territories, which would mean 194 entries for each year.

<sup>30</sup> The classification regime studied by Klein and Shambaugh (2010) is broadly similar in spirit to ours and (we believe) would also show that the rise in reserves coincided with a rise in the weight of less flexible exchange rate regimes. Another widely used system, Levy-Yeyati and Sturzegger (2005) gives this result to some extent by construction, since it includes reserve accumulation (where available) in its algorithm for detecting exchange rate inflexibility.

accounts for 23 percent of world GDP. Thus, to develop a sense of country practices around the world, the unweighted share of countries of Figure 4 is more suited to the task.

The third panel of Figures 4 highlights that freely falling went into a hiatus early in the 21<sup>st</sup> century. The wave of hyperinflations that spread across former Soviet Republics came to an end. The resolution of the debt crisis of the 1980s in the mid-1990s re-opened international capital markets for many large emerging markets (Brazil, Mexico, Poland, among others), which meant that these countries that had relied heavily on inflationary finance had other options. The spread of inflation targeting to emerging markets that began in the late 1990s (Table 2) has also contributed to the lower global incidence of inflationary crises. Some resurgence of high inflation should not be ruled out; now in the third year of a sharp decline in oil and commodity prices, losses in revenues, depleted foreign exchange reserves, and markedly slowing economic activity may drive some countries back to inflationary finance. The most extreme case is Venezuela (estimated inflation was nearly 800 percent in 2016) but other some African countries have reported inflation rates climbing back into double digits.

These figures also include the share of cases where we can document that there were de jure parallel markets or multiple exchange rates, but we simply do not have the parallel market data to classify these cases according to their flexibility, as noted earlier. Our documentation of the post-2014 re appearance of parallel markets (more of this to follow) relies heavily on the financial press and web-based sources rather than on a single publication or official sources.

#### ***4. Capital Mobility, Multiple Exchange Rates, and Parallel Markets***

In much of the literature on classifying exchange rate arrangements, the closely related issue of capital mobility has often been ignored altogether. This omission is at odds with the discussions in the literature on the impossible trinity (Frankel 1999) and the macroeconomic policy trilemma or dilemma (Obstfeld and Taylor 2003, Obstfeld et al 2005, Gourinchas and Obstfeld 2012, Rey 2013). These papers pointedly connect the choice of exchange rate regime not only to the ability to conduct independent monetary policy (an issue we have discussed in the previous section in connection with the classification of EZ and IT

countries) but also to the prevalence of capital mobility. We concur that a profile of the global financial system that includes a discussion of reserve currencies, exchange rate arrangements, and monetary policy would be incomplete without an assessment of developments in capital market integration.

To this end, we compile here a (0,1) index of capital mobility that offers insights into the big question of the extent of integration of capital markets over the course of 1946-2016. The index we choose is a narrow measure of capital restrictions and we discuss the limitations of our chosen index in detail below. As described in Section II, the first step of our exchange rate arrangement classification is to determine whether the exchange rate is unitary or not. The IMF's AEAER provides an annual update on whether a country has an official dual market or multiple exchange rate practices. Indeed, this report offers detailed information on the extent of many other capital account restrictions.

The work of Chinn and Ito (2006 and updates) covering 1970-2014 and Fernandez et. al. (2015) covering 1995-2013 exploited a broad range of the information provided by AEAER to construct a variety of measures of capital mobility.<sup>31</sup> Our exercise contributes to these efforts in a narrow but important dimension. To reiterate the discussion from the introduction and overview, our interest is confined to the record on unitary/dual/multiple exchange rate practices that the AEAER compiles; regular publications by Franz Pick (various issues and Pick and Sedillot, 1971) contribute importantly to the chronology on dual markets; this record is supplemented by information on parallel market exchange rates. Depending on the era and the region, parallel markets have accounted for a significant share of the activity in foreign exchange markets. Tighter capital account restrictions are often accompanied by higher parallel market premia.<sup>32</sup> The monthly index we provide for 194 countries or territories from 1946 through 2016 is based on the answers to three questions: (i) is there a de jure dual market?; (ii) is there a de jure system of multiple exchange rates?; (iii) is there a parallel market (official, tolerated or outright illegal), and, if there is, is the parallel market premium above 10 percent over the majority of a moving

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<sup>31</sup> See Quinn, Schindler and Toyoda (2011) for an assessment of this literature and Quinn (2003) for an insightful long view spanning 1890-1999.

<sup>32</sup> The premium is defined as  $(s_t^p - s_t)/s_t$ , the percentage difference between the parallel market and the official exchange rate.

12-month period? If the answer is yes to any of the three questions above, the index takes on the value of one. It is zero otherwise.

As we have noted, this measure of capital mobility is not as comprehensive as others which incorporate specific measures that are designed to limit or ban capital outflows or inflows, regulate the repatriation of profits abroad, cap foreign ownership, require the surrender of foreign exchange receipts, etc. We suggest, however, that this index is informative nonetheless as a “minimum measure” of restrictions. While a country can have many of the capital account restrictions listed above (or others) and still have a de facto as well as a de jure unified exchange rate, the converse is not true. If the answer to questions (i) and (ii) is yes, these are de jure controls. If the answer to question (iii) is yes, it is difficult to see how a significant and sustained gap between the official exchange rate and the parallel market exchange rate can persist in a country where there is a high degree of capital mobility. De facto (if not de jure) capital mobility would tend to equalize those rates.<sup>33</sup> Therefore there must be other restrictions or market imperfections that prevent this from happening.

With these caveats in mind and noting that in reality capital controls are not binary, the top panel of Figure 5 plots the index (as a share of all independent countries) with and without weights that reflect country shares in world GDP. While the index is available since 1946, GDP weights are only available for these many countries since 1950. About 70 percent of all countries did not meet the criteria of a unified exchange market in 1950. In the 1960s, that share drops to around 50 percent, as many advanced economies move to eliminate multiple exchange rate practices (an important goal of the IMF at the time, as discussed by De Vries (1969) and shown in the bottom panel of Figure 9). The post-war dollar shortage is less acute. The next round of capital market integration occurs in the 1990s, as the former Soviet bloc joins global capital markets alongside the emerging markets that regain capital market access after a long debt crisis.

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<sup>33</sup> De facto capital mobility refers here to cases where the existing de jure controls are not binding, either because these are being circumvented or because they have become outmoded or obsolete.

Since mid-2014, many developing and emerging markets, particularly (but not exclusively) those that rely on primary commodity exports, have seen foreign exchange reserves dry up and governments have turned once again to capital controls. Under these conditions, parallel markets have re-emerged, particularly in Africa, the Middle East and Central Asia. Parallel market premia have risen, in several cases into the three and four digit range. Despite this recent revival of foreign exchange controls, which has been mostly confined to lower income countries, global capital mobility (by this measure) is higher since the mid-1990s. Perhaps the combination of increasingly mobile capital across borders and the stubbornly high share of countries that continue with exchange rate arrangements that have limited flexibility (Figure 4) can help explain the sustained and unprecedented rise in the emerging world's demand for reserves. The next section takes up this and related issues.

#### **IV. Trilemmas and Dilemmas: Triffin and the Impossible Trinity**

Having developed a quantitative assessment of the global evolution of the world's reserve currencies, exchange rate arrangements, and international capital mobility over seven decades, we turn our attention to the implications of these trends and some potential risks in the current global financial system. We begin by revisiting a topic that has attracted the attention of academics and policy makers alike for more than a decade now: the surge in reserve accumulation since the early 2000s by emerging markets in general and China in particular. We argue that the persistence of less flexible exchange arrangements combined with increased capital mobility—both documented in Part II—confronts these economies with the impossible trinity. We argue that countries with less flexible exchange arrangements may have substituted reserve accumulation for capital controls,

We then turn to the possibility of a modern version of the Triffin dilemma. This has been recently addressed in Farhi, Gourinchas and Rey (2011), Obstfeld (2013), and Farhi and Maggiori (2016)—we connect that discussion to our data. Specifically, we relate the centrality of the US dollar as a benchmark currency to demand for dollar reserves.

### ***1. The Impossible Trinity and the 2003-2013 Reserve Surge***

Since the International Monetary Fund was established at the end of World War II, no period has witnessed a comparable surge in the stock of reserves held by central banks across the world. As is well known, this war chest of reserves was built primarily by emerging markets, notably Asia, and most famously China. A fast-growing literature has examined the causes of that growth. Some papers have stressed the precautionary, self-insurance motive (see, Gourinchas and Obstfeld, 2012, for instance) while others have highlighted the mercantilist motive and the desire to avoid or limit exchange rate appreciation (Aizenman and Lee, 2007, Dooley et al, 2003). Figure 6 plots world reserves—and their emerging market and developing country component—scaled by US GDP. US GDP was the scale variable of choice, as the US dollar remains the dominant reserve currency by what appears to be a widening margin.<sup>34</sup>

Apart from the aforementioned self-insurance or mercantilist motivation, we would add that the impossible trinity offers insights why reserve accumulation accelerated so markedly in the past decade. This motivation for reserve accumulation has been suggested by Korinek (2013), Bussiere et al (2015), and Heathcoate and Perri (2016) among others. Countries that want to simultaneously limit exchange rate fluctuations and reduce their reliance on capital controls or other administrative measures will rely more heavily on the use of foreign exchange reserves and interest rate policy to achieve their goals. Other things equal, a country that is fully committed to a floating exchange rate will require lower levels of reserves, even with a fully open capital account.

In connecting this discussion to the data, we recall that in the previous section it was shown (Figure 4, top panel) that limited flexibility arrangements still dominate the landscape. At the same time, we estimated that about 80 percent of all countries had abandoned the kinds of exchange controls that led to a fragmented foreign exchange market (Figure 5 top panel). Combining information from figures 4 and 5, these two trends in exchange rate arrangements and capital market integration are connected in Figure 7.

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<sup>34</sup> A variant of this Figure could pair reserves held in US dollars to US GDP and another variant could pair world reserves to world GDP. This latter version would be far less informative since what we want to ultimately focus on are the North-South trends (more of this to follow).

Because we are focusing on the unweighted measures, the series start in 1946. Figure 8, top and bottom panels, connect reserve accumulation to the rising share of countries with limited exchange rate flexibility (top panel) and the decline in exchange controls, or rising capital mobility (bottom panel).

As documented by Reinhart, Reinhart and Trebesch (2016), since the early 2000s, emerging markets faced a “double bonanza” of booming commodity prices and surging capital inflows. Apart from an acute but brief interruption during the Global Financial Crisis of 2008-2009, this process resumed in full force in May 2013, following the Federal Reserve’s announcement to scale back from their accommodative policy stance, known as the “Taper Tantrum”. Also at this time, China began to slow and commodity prices started to slide. As Figure 6 highlights, this also marks the peak in reserves for both the world and the emerging markets. Leaning against the wind of an appreciation and a “double bonanza” with mobile capital may have required the buildup of significant reserves. The arguments advanced in Levy Yeyati, Sturzenegger and Guzmán’s (2013) “Fear of Appreciation” may also help motivate the reserve accumulation in some countries during the double bonanza decade.

The trends in reserves, exchange rate flexibility, and capital mobility shown here are not a substitute for popular explanations that stress self-insurance and mercantilist motives behind the 2003-2013 historic episode of reserve accumulation. Yet these components of the impossible trinity perhaps merit a larger role than they were assigned in the large pool of studies on the topic. The role of growth differentials in the advanced and emerging economies, which we turn to next, is another trend influencing the demand and supply of international reserves.

## ***2. The Triffin Dilemma***

With recovery from the war underway in Europe and a sustained expansion in global trade, the global demand for reserves grew rapidly in the 1950s and 1960s. Reserves, at that time, usually took two forms: gold and dollar assets (US government debt or greenbacks), which were also linked to gold. Given that the world’s gold supplies were not increasing as fast as the demand for reserves, an expanding share of the world’s reserve assets came to be paper denominated in US dollars. The rest of the world’s appetite

for dollars could be met by the US issuing more dollar debt and selling it to the rest of the world. In the balance of payments, this would require the US to run not only sustained current account deficits, but importantly, also a fiscal deficit, as Obstfeld (2013) observes. However, fulfilling the demand for reserves also meant that over time the ratio of “paper dollar” reserves to gold reserves was steadily rising (as shown in Figure 9). Until 1969, the “paper-to-gold” ratio had been hovering around 0.5, but in a couple of years in the very early 1970s it quadrupled to almost two.

To maintain the official dollar/gold parity, the US would have had to restrict its supply of dollars and cease to borrow from the rest of the world, that is run a current account surplus, which in the context of the time meant running a fiscal surplus. The incompatibility of the national goals to maintain the parity and the international role to serve as sole provider of the reserve currency is the essence of the dilemma that Robert Triffin (1960) foresaw as a risk to the Bretton Woods system.

As the supply of dollars rose (relative to gold reserves) the gap between the parallel market price of gold and the official US price of gold (then set at \$35 per ounce) widened (Figure 10). Two increases in the official price of gold (tantamount to a devaluation of the dollar) in December 1971 and February 1973 were not sufficient to correct the “overvaluation” of the dollar. The Bretton Woods system came to an end in March 1973, when the dollar and other major currencies were allowed to float.

### **3. *Triffin II?***

The underpinnings of a modern version of the Triffin dilemma has been recently addressed in Farhi, Gourinchas and Rey (2011) and Obstfeld (2013), who also revisits the 1970s episode. Farhi and Maggiori (2016) add to the discussion, by primarily focusing on the *supply* of the reserve asset, which includes the possibility of a small group of suppliers, as well as the hegemon case. They note that fiscal capacity, reputation, and pricing currency in the goods market are the key factors that importantly determine the emergence of a hegemon. The demand for reserves is not their focal point. We connect some of the issues raised in these studies to our data. In particular, the data on exchange rate arrangements, currency preferences, and capital mobility help to shape and quantify the potential *demand* for reserves. Of

particular interest is the connection between exchange rate arrangements and the demand for reserves, as the surge in reserves during 2003-2013 came from the official sector (the central banks) in emerging markets (see, for instance, Alfaro, Kalemli-Ozcan, Volosovych, 2014).<sup>35</sup>

Our point of departure is in line with Obstfeld (2013), who observes that the asymmetry driving the modern-day Triffin dilemma is that “the emerging and developing world is growing more quickly than the more creditworthy industrial world.” Our focus here is less on the creditworthiness of advanced economies and more on the centrality of the US dollar as the main benchmark currency. This distinction has important implications for the modern Triffin Dilemma: there are alternatives to US dollar assets in terms of safety, but no alternative if the objective is exchange rate stabilization viz the dollar.

Figure 11 shows the shrinking share of advanced economies in world GDP and the accompanied increased share of emerging markets. The figure shows the shares of world GDP for advanced and emerging economies from 1950 through 2015. On a PPP-weighted basis, emerging and developing countries now account for about 60 percent of world GDP, far higher than at any time in the past. Given that advanced economy growth prospects remain subdued, these trends are likely to continue (even with the evident slowing in China and other emerging markets.) The imbalance inherent in the modern Triffin Dilemma is the relative decline of advanced economies supplying the reserve assets and the relative expansion of emerging markets demanding reserves. Complicating matters is the fact that it is primarily (by a large margin) the United States, among the advanced economies, that is providing the reserve assets.

Exchange rate arrangements usually play a key role in driving the demand for international reserves. Figure 12 juxtaposes our measures of potential sources of “world demand” for assets denominated in US dollars and the US’s share of world GDP. The top panel plots the share of countries where the US dollar is the main anchor currency in the context of their prevailing exchange rate arrangements. The dashed line represents the US share in world GDP. The bottom panel only differs in that the share of countries anchored to the benchmark currency is weighted by their share in world income. The US dollar retains its

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<sup>35</sup> For instance, it would be quite interesting to consider in a Farhi and Maggiori (2016) setting the demand implications of a hegemon (People’s Bank) or small but influential group (ASEAN).

dominant position as the world's benchmark currency: 60 to 70 percent of all countries have the dollar as the anchor or benchmark currency (top panel). By some metrics it is as dominant now as it was at the time of the early Bretton Woods era. By other metrics, its global role has expanded even beyond that following the collapse of the ruble zone. In Section III, we already discussed the main factors behind the "dip" of the late 1970s and 1980s. What is most suggestive of Figure 12 is the trends since the start of the 21<sup>st</sup> century, which show a more rapidly shrinking US share of that world economy coupled with a rise in the share of the world anchored to the dollar. Presumably, the latter translates into demand for US dollar assets (reserves). These widening and divergent trends are the essence of the modern-day Triffin dilemma for the United States, particularly because there is little competition from other potential anchor currencies.

Figures A.11 to A.13 in the appendix repeat this same exercise for the euro, the UK Pound, and the Japanese yen. The euro (Figure A.11 in the appendix) is a distant second to the US dollar as a benchmark currency. From the early 1980s until the introduction of the euro, the German Deutschemark's (DM) sphere expanded first in Western Europe and later in the East. The euro consolidated the French franc and German DM zones but appears to have stalled in the 21<sup>st</sup> century. By some metrics (given the shrinking share of Europe in world output) its global importance has declined. No other major established international currencies compete at present with the dollar and the euro.

For the United Kingdom (Figure A.12 in the appendix), the loss of its colonies following World War II eventually translated to a shift away from the pound into the US dollar. The sterling crisis of 1967 was followed by a lingering economic crisis. In June 1972 the UK introduced a series of capital control measures that effectively put an end to the sterling area, although the official dismantling of the Sterling Area was in 1979. The Farhi and Maggiori (2016) criteria all seem to apply to the demise of sterling, as the UK had 11 IMF programs during the 1950s-1970s (with significant consequences to its global image), a precarious fiscal situation, and a shrinking piece of the trade and invoicing pie. To interpret the bottom panel, we note that since the Global Financial Crisis, the pound has gone its own way. While the UK has a history back to the early 1970s (see chronology) of managed floating, during the late 1970s until 2008,

it was included (on the basis of the exchange rate behavior) in the DM/euro group, with practically all the rest of Europe.

In the case of Japan (Figure A.13 in the appendix), which has a freely floating exchange rate since the late 1970s, the two series overlap in the bottom panel because Japan is the only country that has a yen anchor. Between 1950 and 1978, Japan's anchor currency had been the US dollar. Farhi and Maggiori (2016) highlight that fiscal capacity, reputation, and pricing currency in the goods market are the key factors that importantly determine the emergence of a hegemon. Applying their criteria to Japan, it is very clear that the world does not invoice in yen. As Table 3 highlights, the yen isn't a major invoicing currency. As Gopinath (2015), highlights, only 18 percent of the countries in her sample have any trade invoiced in yen, and the shares invoiced in yen are a trivial share of the total. Furthermore, not even Japan invoices the majority of own trade in yen. But invoicing notwithstanding, its lack of international resonance remains puzzling. In its heyday, prior to the banking crisis of the early 1990s, Japan accounted for nearly 10 percent of world GDP; it had low levels of public debt; it had higher ratings than the United States according to Institutional Investors, and, in the 1980s, it was the *it* country to emulate. Perhaps regulatory measures or the structure of domestic banking, postal saving, and pension funds never gave the rest of the world an opportunity to hold yen assets (specifically yen government bonds). It remains a case for further study.

## **V. Concluding remarks: Which anchor will hold?**

By placing the issue of anchor currencies in a comprehensive quantitative historical perspective, this paper offers new insights into contemporary issues ranging from the impossible trinity to the modern-day Tiffin dilemma to the implications of individual country inflation-targeting for the overall global exchange rate system.

What topics and areas would enhance our understanding of the international financial system in general and the anchor currency question in particular? While that list is long, perhaps an obvious key

starting point involves China and its rapidly expanding global role. While a great deal has been written on the subject, it is a much smaller literature that quantifies that role. More is known about China's connections through trade of goods and services with the rest of the world than its growing financial linkages. Chinese lending to a broad range of emerging and developing countries is not captured in the extensive databases of the World Bank, International Monetary Fund, or Bank of International Settlements. Much of this lending is done through its development banks, but credit lines and swap arrangements between the People's Bank of China and other central banks are also rapidly expanding. Given the opaqueness of these cross-border financial transactions, it is not clear whether the US dollar or the renminbi is the dominant currency in this new source of lending. As the Gopinath (2015) study reflects, information on China's trade invoicing by currency is also scant.

It should be noted that our categorization of anchor/benchmark currencies is fundamentally retrospective. Over time, one might expect the Chinese yuan, with its far reaching trade and finance network, to serve as an anchor for some countries. Indeed, it is possible that the Chinese yuan has already become (or made significant inroads as) an anchor currency. In the summer of 2015, the modest devaluation of the renminbi triggered marked depreciations of several Asian currencies (as well as others outside Asia). By our exchange rate metric, however, China remains part of the dollar bloc, and it is unclear how many countries might move along with the yuan if it were ever to separate from the US dollar. This will certainly be a significant development when it happens. During the latter stage of Bretton Woods, a cursory inspection of exchange rate practices in Europe would have led one to conclude that the US dollar was the across-the-board anchor. It was only when Germany's DM separated from the dollar that it became evident that the European economies had already transitioned from a dollar to a DM anchor.

The role of China also figures prominently in questions we raise about the global demand for reserves and the implications of the modern-day Triffin dilemma. These implications include: the possibility of sustained dollar depreciation (as in the 1970s), imparting a capital loss on China and other major holders of US Treasuries; some significant reduction in the global demand for reserves (China floating); and a

new supplier of reserve assets that is re-oriented and connected to some degree to the fast-growth regions of the world. This connection could be more direct (renminbi acquires reserve currency status) or less direct, as in an expanded role for the SDR (renminbi is now a part of the SDR). The common thread in this discussion is the pressing need to better quantify the finance networks of the world's second largest economy.

Lastly, we reiterate our main conclusions. Our new algorithm for jointly determining a country's anchor currency and its degree of exchange rate flexibility shows a world where relatively inflexible exchange rate regimes remain extremely important, and where the dollar's dominance as an anchor/benchmark currency appears to be at least as great as it was under Bretton Woods. Moreover, many countries' continuing desire to stabilize exchange rates despite generally increasing capital mobility (as our new measure of capital ability based on exchange rate restrictions underscores) is potentially a key element of the modern-day Triffin dilemma that needs to be added to the widely-discussed scarcity of safe advanced-country assets.

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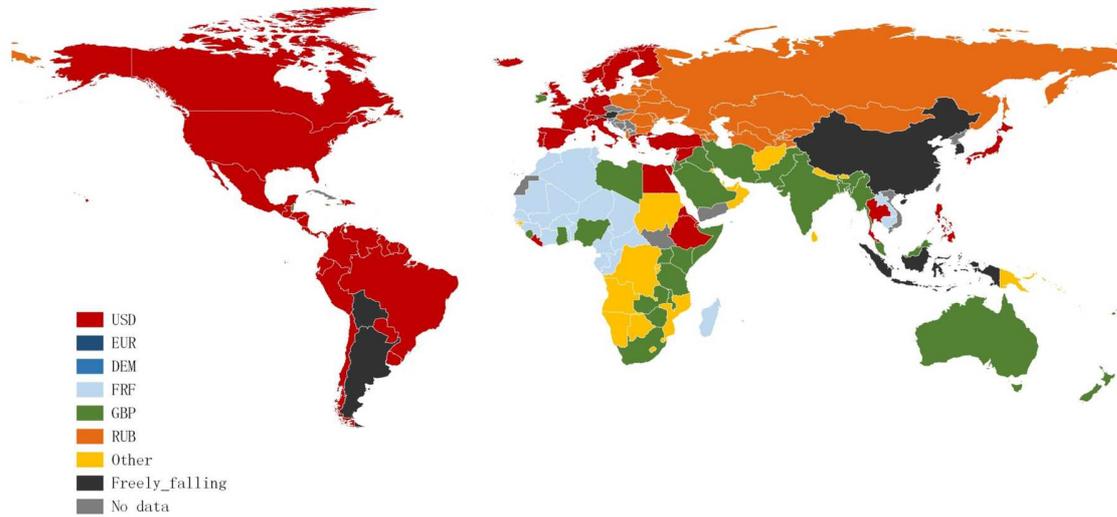
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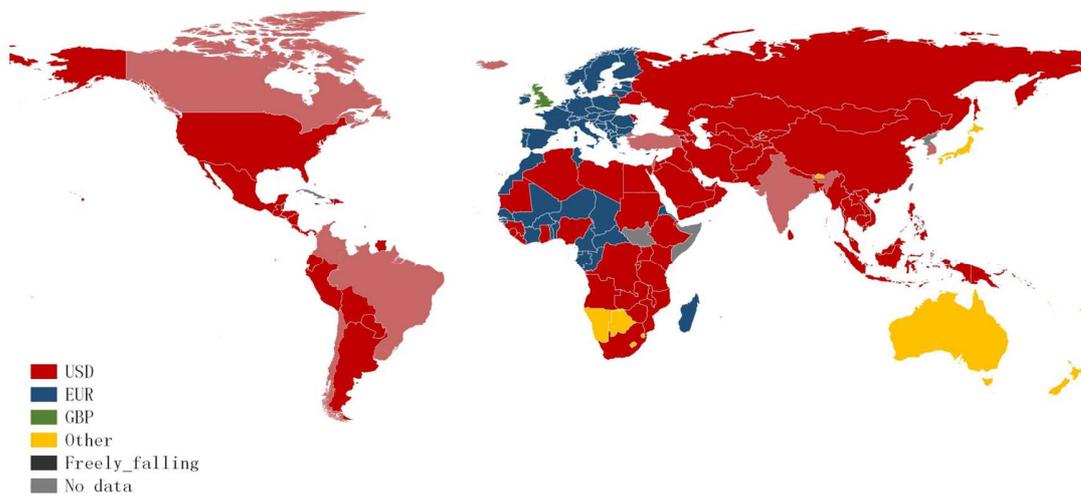
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Figure 1. The Geography of Anchor Currencies, 1950 and 2015

1950



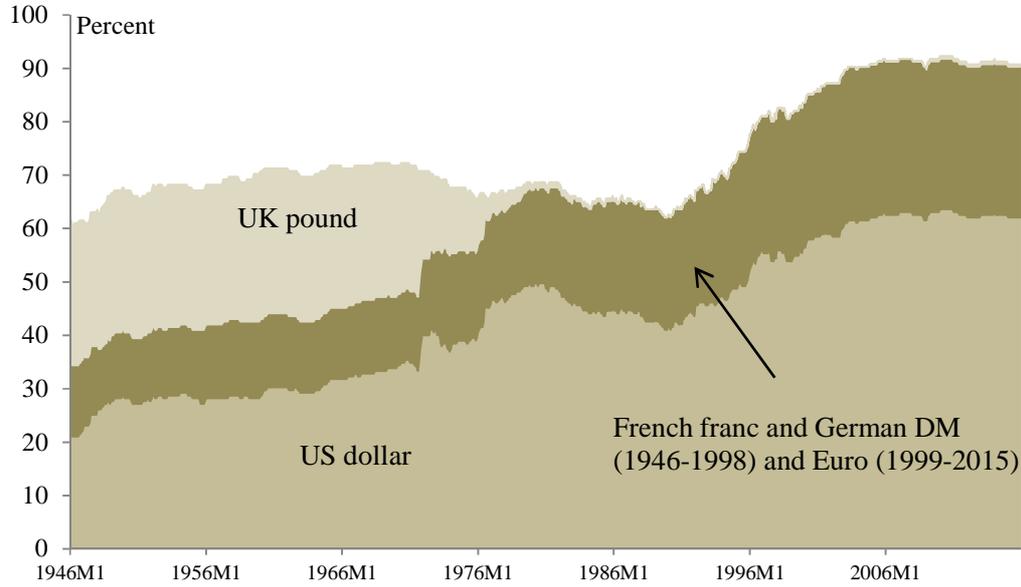
2015



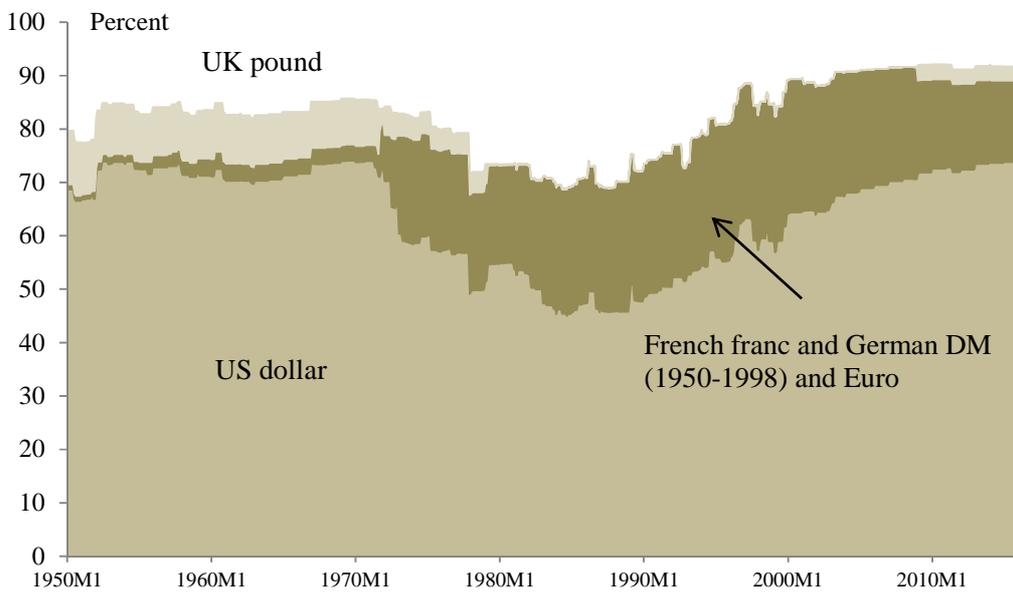
Sources: *Currency Yearbook*, various issues, International Monetary Fund, *International Financial Statistics*, Pick and Sedillot (1971), Reinhart and Rogoff (2004) and sources cited therein.

Figure 2. Post-World War II Major Anchor Currencies

*Share of countries, 1946-2015, excludes freely falling cases*



*Number of countries weighted by their share in world GDP, 1950-2015, excludes freely falling cases*

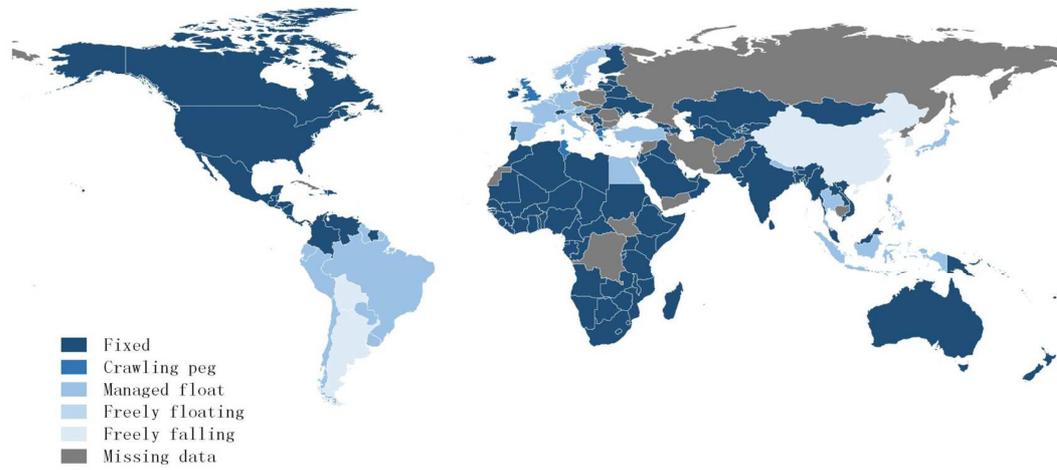


Sources: The Conference Board *Total Economy Database*, International Monetary Fund *International Financial Statistics*, Reinhart and Rogoff (2004) sources cited therein, and authors' calculations

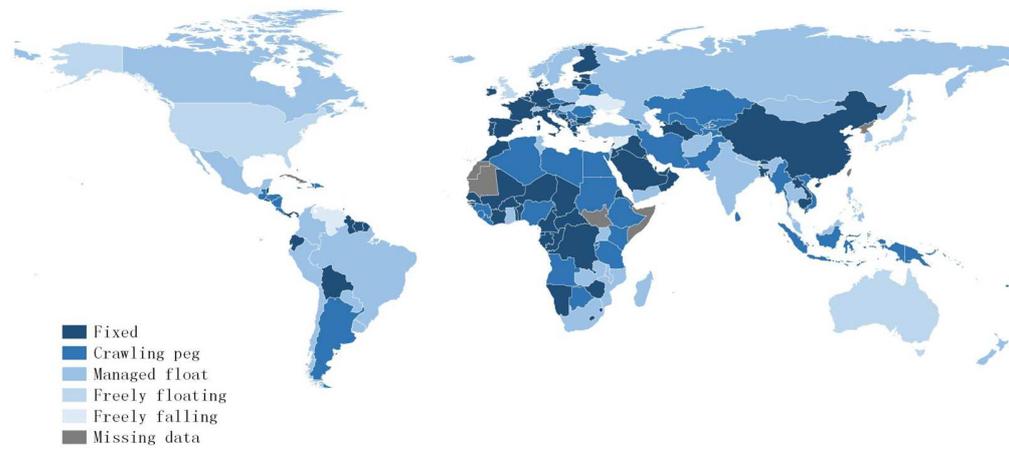
Note: The Country Chronologies that supplement this paper show the evolution of the anchor currency on a country-by-country basis.

Figure 3. The Geography of Exchange Rate Arrangements, 1950 and 2015

1950



2015

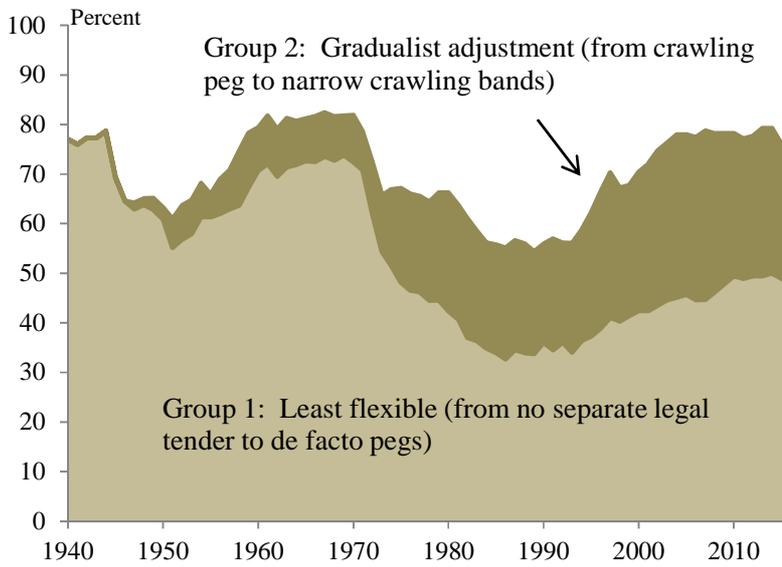


Sources: *Currency Yearbook*, various issues, International Monetary Fund, *International Financial Statistics*, Pick and Sedillot (1971), Reinhart and Rogoff (2004) and sources cited therein.

Figure 4. De Facto Exchange Rate Arrangements, Coarse Classification, 1946-2016:

Share of (independent) countries in each group

*Groups 1 and 2: Less flexibility, primarily nominal exchange rate anchors*



*Groups 3 and 4: Flexibility, primarily interest rate, money and most inflation target arrangements*

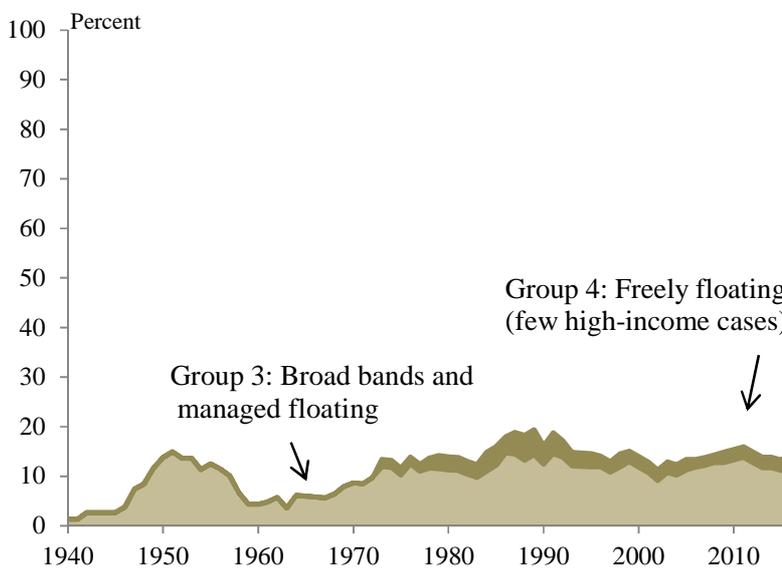
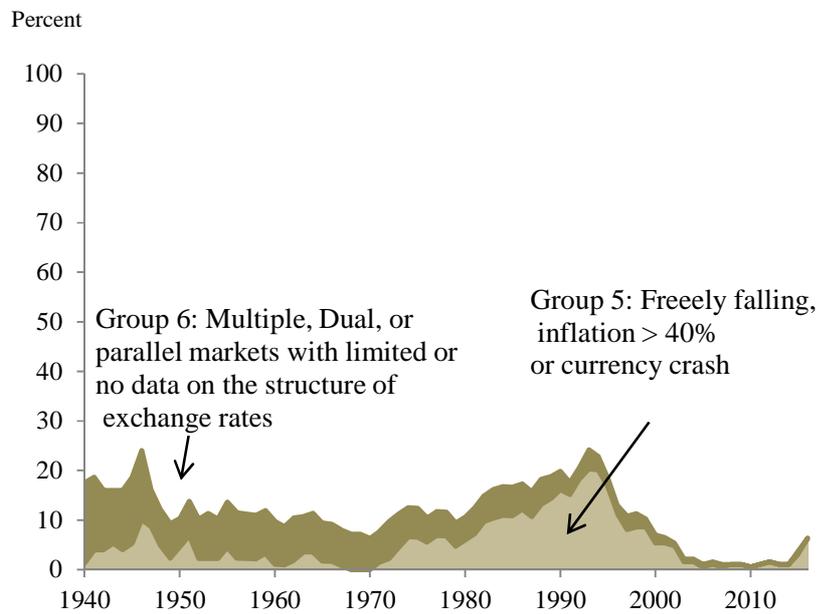


Figure 4 (concluded) De Facto Exchange Rate Arrangements, Coarse Classification, 1946-2016:

Share of (independent) countries in each group

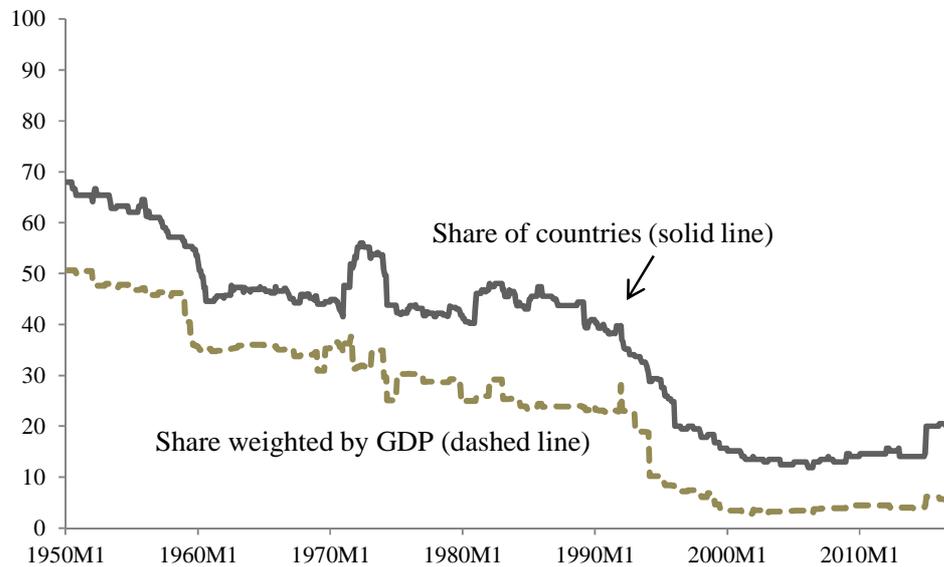
*Groups 5 and 6: Flexibly unstable: Anchorless*



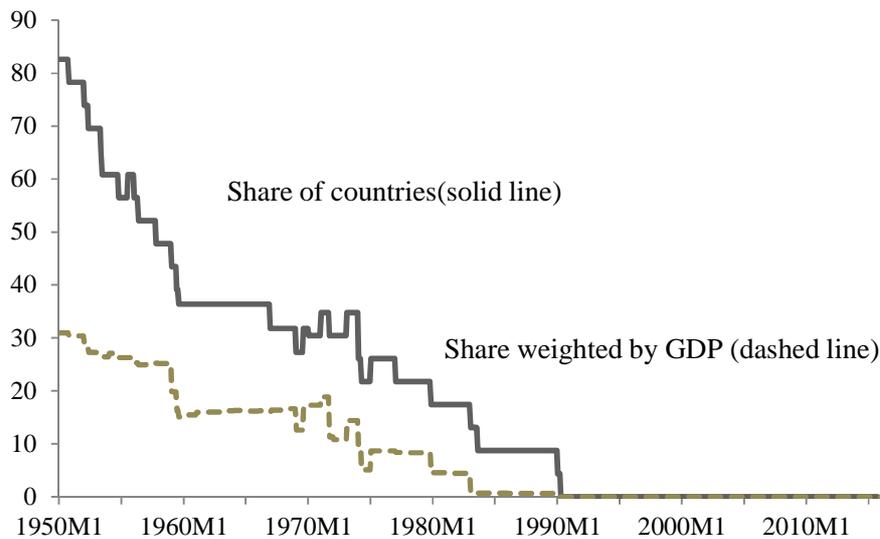
Sources: International Monetary Fund *International Financial Statistics* and *Exchange Arrangements and Exchange Restrictions*, Reinhart and Rogoff (2004) sources cited therein, numerous detailed country sources listed in the Data Appendix, and authors' calculations.

Figure 5. Share of Independent Countries with Dual, Multiple, or Parallel Exchange Rates, January 1950-September 2016

*All independent countries*



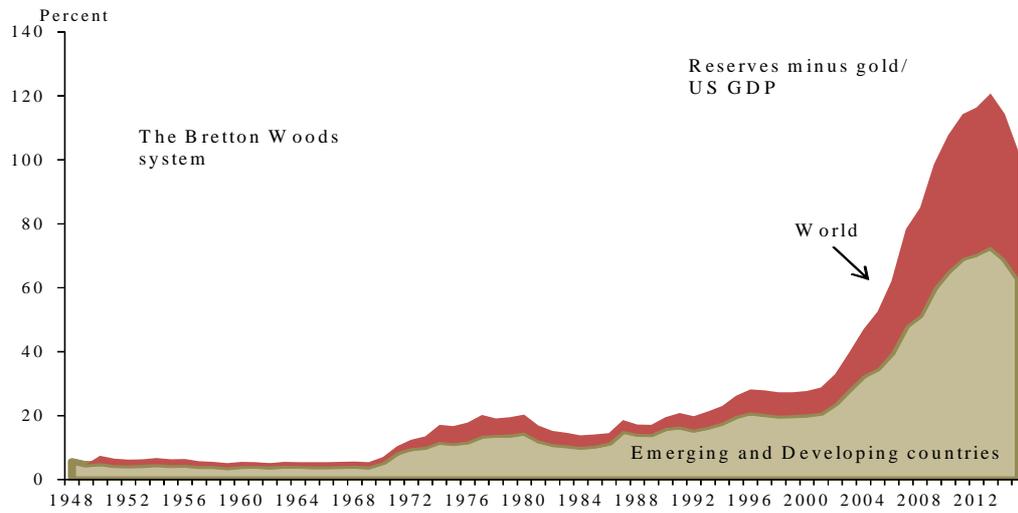
*Advanced economies*



Sources: International Monetary Fund *International Financial Statistics* and *Exchange Arrangements and Exchange Restrictions*, Reinhart and Rogoff (2004) sources cited therein, and authors' calculations.

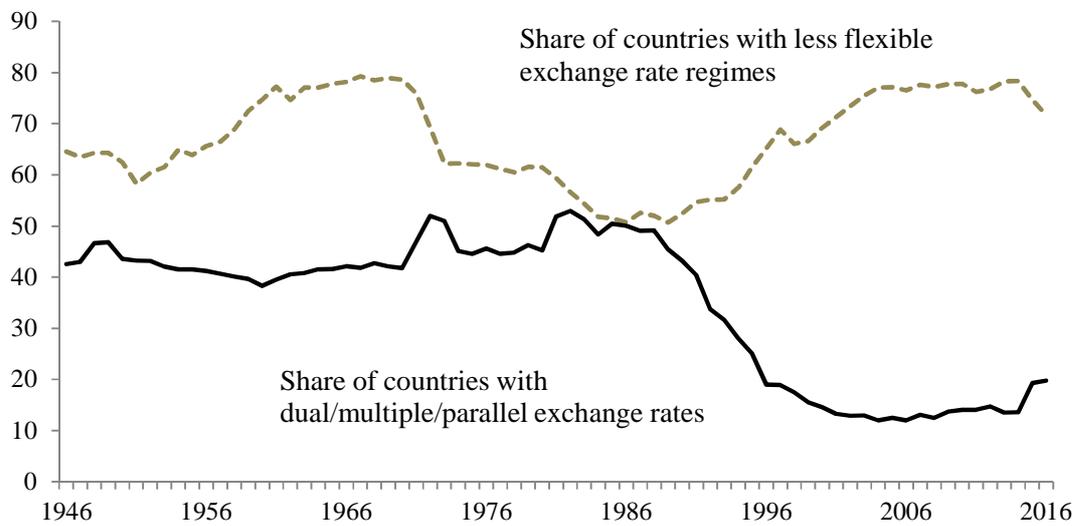
Note: The Country Chronologies that supplement this paper show the evolution of the anchor currency on a country-by-country basis and whether a system of dual, multiple, or parallel exchange rates was in place. The number of countries increases from 72 in 1946 to 184 in 2016.

Figure 6. World Reserves minus Gold (US dollars) as a percent of US GDP (Principal anchor currency country), 1948-2015



Sources: International Monetary Fund *International Financial Statistics*, Bureau of Economic Analysis, and authors' calculations.

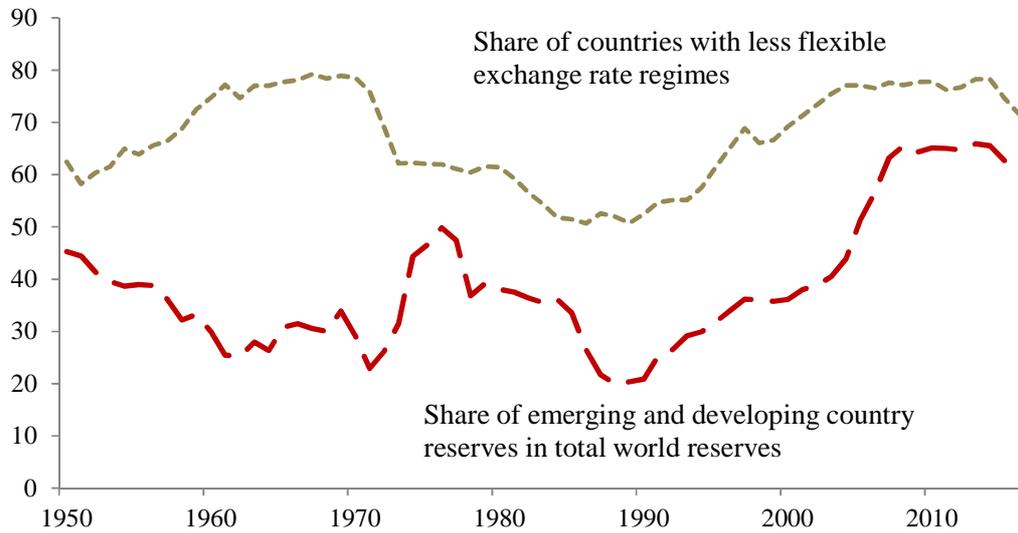
Figure 7. Exchange Rate Arrangements and Capital Mobility, 1946-2016



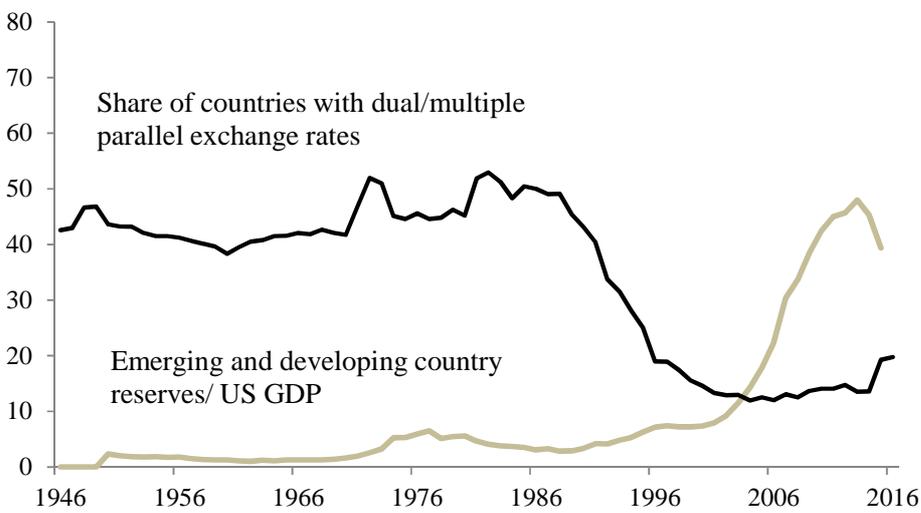
Source: The authors, based on Figures 4 and 5.

Figure 8. Reserves and Two Sides of the Impossible Trinity, 1950-2015

*The incidence of limited exchange rate flexibility*

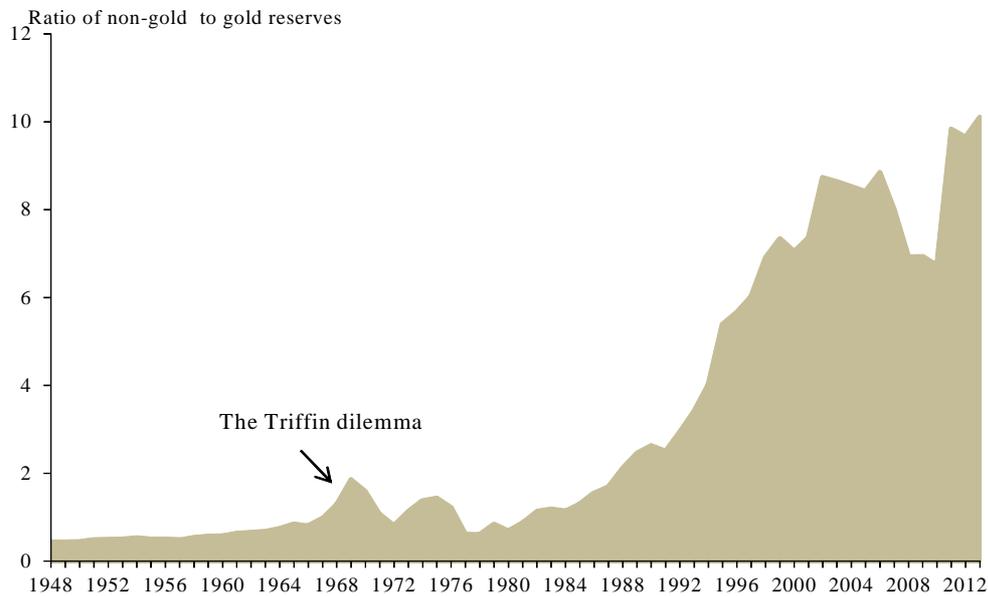


*Are reserves a substitute for capital controls?*



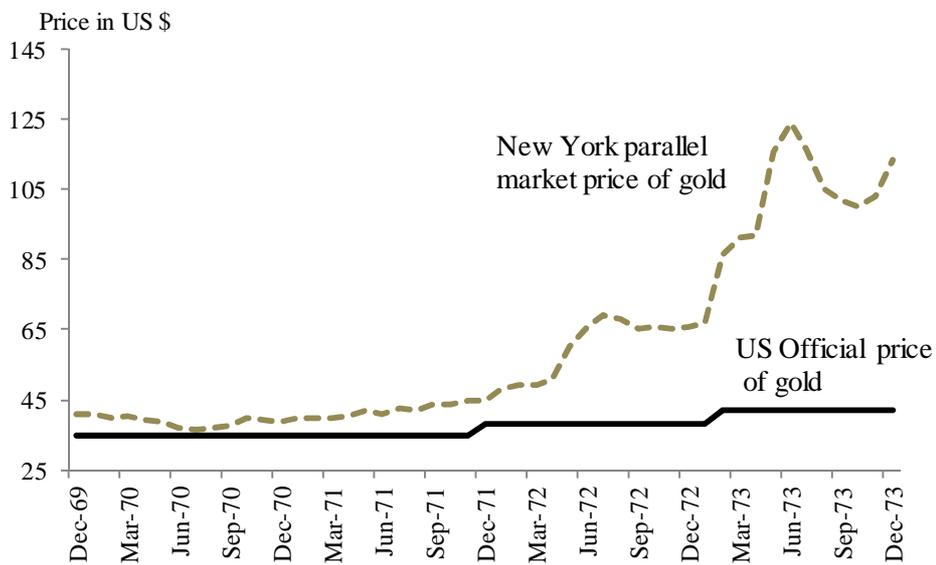
Sources: International Monetary Fund *International Financial Statistics*, Bureau of Economic Analysis, and authors' calculations.

Figure 9. Ratio of Total Reserves minus Gold (US dollars) to Gold Reserves (US dollars): World, 1948-2015



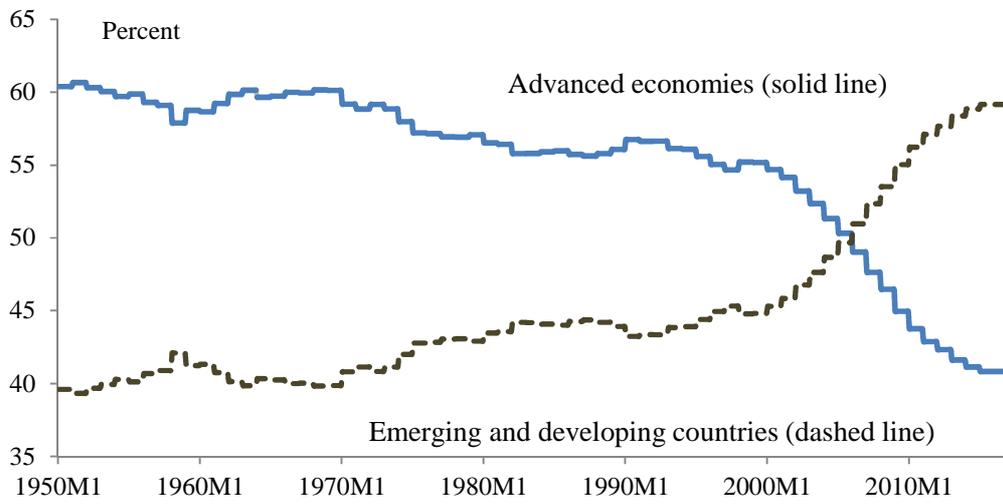
Sources: International Monetary Fund *International Financial Statistics* and authors' calculations.

Figure 10. Official and Parallel Market Price of Gold, United States December 1969-December 1973



Sources: *World Currency Reports* (various issues) and *World Currency Yearbooks* (various issues).

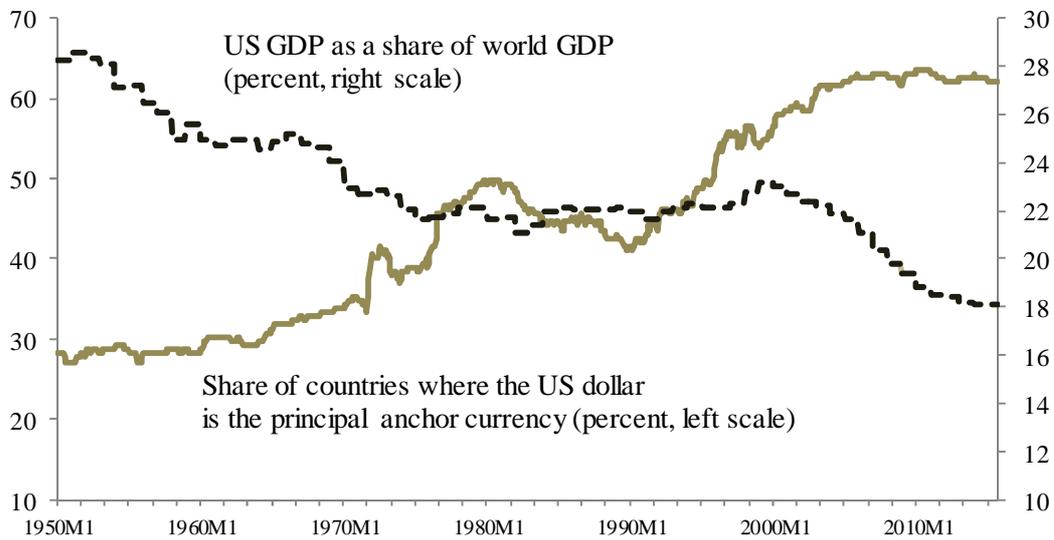
Figure 11. The Shifting Distribution of World GDP, 1950-2015



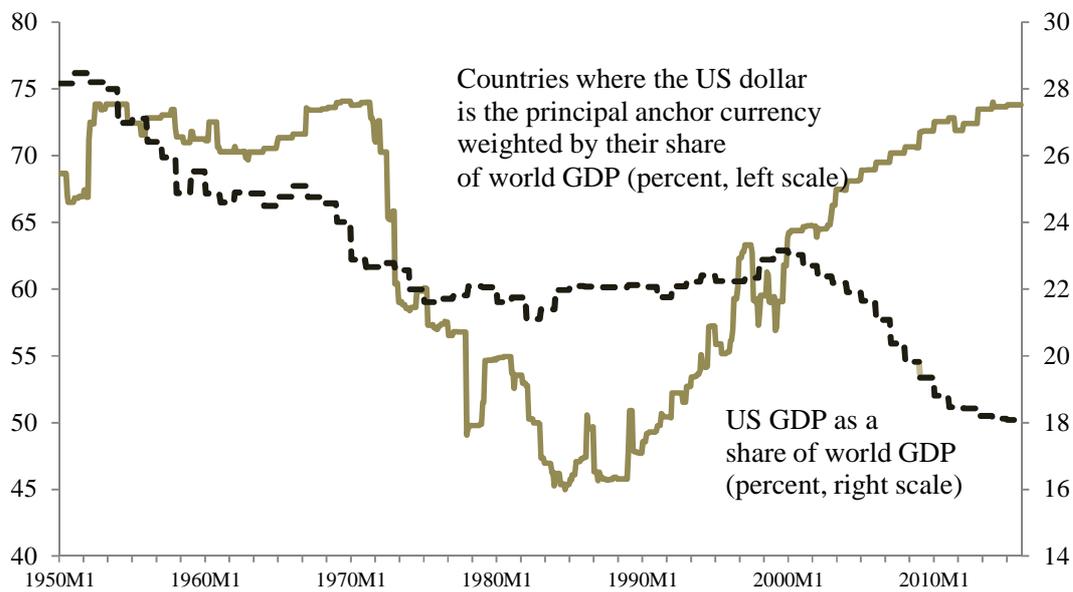
Source: The Conference Board, *Total Economy Database*.

Figure 12. Measures of the Role of the Dollar and US Economy in a Global Context, 1950-2015

*Share of countries measure*



*Share of countries measure weighted by share of world income*



Sources: The Conference Board *Total Economy Database*, International Monetary Fund *International Financial Statistics*, Reinhart and Rogoff (2004) sources cited therein, and authors' calculations.

Note: The Country Chronologies that supplement this paper show the evolution of the anchor currency on a country-by-country basis.

Table 1: Classifying Benchmark Currencies with Supplementary Information

Country (anchor)	Years	Fine ERA Classification	Indicators
Brazil (USD)	2001-	12	94% of exports and 84% of imports in USD. 90% of PPG debt in USD. Anchored to USD before the 2000s.
Canada (USD)	2001-	12	70% of exports and 75% of imports in USD. Debt in domestic currency. Most recently anchored to USD.
Chile (USD)	2008-	12	No data available on invoicing, but given the large share of copper in exports and the denomination of international copper prices in USD, the lion share of exports are likely denominated in USD. Algorithm anchors the CLP to the USD as recently as 2008.
Colombia (USD)	2008-	12	Close to 100% of invoicing in USD and close to 100% of public debt in USD. Algorithm classifies a dollar anchor as recently as 2008.
Iceland (USD)	2001-	10	Very diversified invoicing between USD, GBP and EUR, but with USD the largest share. Central bank FX reserves diversified with USD the largest close to 50%.
India (USD)	2012-	10	86% of exports and 80% of imports in USD. 80% PPG debt in USD.
Israel (USD)	2005-	10	Approximately 70% of exports and imports denominated in USD. Over 60% of Bank of Israel reserves in USD. Most recently anchored to the USD.
Korea (USD)	1999-	12	Anchored to the USD in the 1990s. Other data unavailable.
Latvia (EUR)	1998- 2001	10	Diversified invoicing, with EUR the majority at approximately 50% of imports and exports. The country was in transition to joining the Eurozone.
Turkey (USD)	1998-	10 (until 2000)  and 12 (from 2003)	Diversified invoicing with the majority in USD. Foreign currency public debt is 60% in USD and 40% in EUR.
Uruguay (USD)	2009-	10	Anchored to the USD until the late 2000s. Other data unavailable.

Table 3. Markers of an Anchor Currency

(figures for 2015, unless otherwise noted)

Anchor measure or criteria: US dollar	Percent
Share of countries with a US dollar anchor in their exchange rate arrangements	62
Share of world's reserves (excluding gold) in US dollars	65
Share of developing country external debt denominated in US dollars. (This does not include debt owed to China that are denominated in US dollars)	64
Trade invoicing "index"	69
Memorandum item:	
Share of the US in world GDP	18
Anchor measure or criteria: Euro	Percent
Share of countries with a euro anchor in their exchange rate arrangements	28
Share of world's reserves (excluding gold) in euro	20
Share of developing country external debt denominated in euro	13
Trade invoicing "index"	55.5
Memorandum item:	
Share of the Eurozone in world GDP	11.8
Share of France and Germany in World GDP	5.6
Anchor measure or criteria: UK pound	Percent
Share of countries with a pound anchor in their exchange rate arrangements	Nil
Share of world's reserves (excluding gold) in pounds	4
Share of developing country external debt is denominated in pounds	Less than 1
Trade invoicing "index"	8.5
Memorandum item:	
Share of UK in World GDP	2.7
Anchor measure or criteria: Japanese yen	Percent
Share of countries with a yen anchor in their exchange rate arrangements	nil
Share of world's reserves (excluding gold) in euro	4
Share of developing country external debt is denominated in euro	6
Trade invoicing "index"	9.6
Memorandum item:	
Share of Japan in World GDP	5

Sources: The Conference Board *Total Economy Database*, Gopinath (2015), International Monetary Fund *International Financial Statistics*, Reinhart and Rogoff (2004) sources cited therein, World Bank, and authors' calculations.

Note: The Country Chronologies that supplement this paper show the evolution of the anchor currency on a country-by-country basis. GDP in millions of 1990 US\$ (converted at Geary Khamis PPPs)