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Appendix (Not for Publication) For
Exchange Arrangements Entering the 21ˢᵗ Century: Which Anchor Will Hold?

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1. Classifying Floating Currencies (Freely vs. Managed)

This appendix provides a narrative classification that separates freely floating currencies from managed floats. The classification is only conducted for country-years where a currency fluctuated outside a 5% band. The narrative account is based on a variety of sources including central bank minutes, reports, and statements; the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER); OECD reports (for OECD countries); BIS reports; the US Treasury's biannual Report to Congress on International Economic Exchange Rate Policies (for Brazil, Mexico, and Korea); central bank data on reserve holdings and net FX purchases; press reports; Ghosh et al (2018); and country-specific research.

Our classification procedure posits that central bank reserve operations or restrictions on capital mobility that have the clear intent to affect exchange rate's level, path, or volatility are inconsistent with a freely floating currency. We classify country-years where we have found evidence of such interventions as "managed float" and the remainder as "freely floating".

Our classification is conservative (potentially biased towards classifying countries as "freely floating") for two reasons. First, central banks may manage the exchange rate using other instruments than the two aforementioned. Most notably, central banks may use interest rate policy to target the exchange rate. In addition, there more subtle ways to affect exchange rate volatility. Several of the countries classified as freely floating (e.g. Australia, South Africa) have a de-jure managed floating policy, where the central bank reserves the right to intervene in FX markets to limit "extreme" volatility, as part of its official mandate. Such announcements may affect exchange rates through market expectations, even if the central bank never intervenes in practice. Second, there may be some cases where we are unable to detect intervention due to data limitations. For example, we have limited information about Brazil's FX interventions in the early 2000s and have therefore classified this episode as freely floating.

Australia

2000-2016: Freely floating

The Reserve Bank of Australia (RBA) has a de jure managed floating exchange rate regime, as it reserves the right to intervene in FX if the exchange rate deviates extremely from fundamentals.[1] However, in the period in question, the RBA has only intervened twice, both interventions were brief and under extreme circumstances where global financial markets faced severe liquidity shortages. These cases were (i) the days following 9/11, and (ii) late 2008, following the collapse of Lehman Brothers. In both cases, the RBA had no exchange rate objectives. We note that dollar shortages were a global phenomenon in late 2008, leading even the ECB to request swap lines with the Federal Reserve to ease FX market access to European firms.

Given that the RBA didn't exercise its de jure mandate to limit exchange rate volatility and intervened only in extreme cases with no exchange rate target, we classify Australia as freely floating.

Brazil

2000-2002: Managed Floating, Reference Currency: Dollar

2003-2007: Freely Floating

Throughout this period, Brazil had a de jure freely floating regime. It is difficult to assess whether central bank reserve operations were intended to affect the level or volatility of the BRL from 2000 to 2007, although the central bank (BCB) was very active in FX markets throughout the period. This is case is borderline, as interest rate policy and some central bank FX transactions may have been intended to limit exchange rate volatility, particularly during the 2002 market scare. Both the US Treasury Report to

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[1] "Australia has a flexible exchange rate regime, and the RBA is prepared to accept substantial fluctuations in the exchange rate, both day-to-day and over the course of the economic cycle. RBA intervention in the market is infrequent, and is undertaken during periods in which the exchange rate appears to be overshooting (either up or down) and is intended to signal to market participants that the RBA believes that the exchange rate is behaving in a way that does not seem warranted by the underlying economic factors in the market. Any potential impact of intervention on the domestic money market is sterilised." Source: https://www.rba.gov.au/publications/annual-reports/rba/2002/oper-fin-mkts.html.

Congress[2] and the BIS[3] suggest that FX operations of the central bank were intended to "lean against the wind" of strong exchange rate depreciation (against the dollar) in 2002. Given the strong countercyclical sale of international reserves in 2002, we classify the regime as managed floating.

In contrast, in the period 2003-2007 there is less evidence that reserve accumulation was intended at limiting exchange rate volatility and the BCB seems to have accepted that a (de jure) freely floating regime entails large exchange rate fluctuations.[4]

Analyzing the period 2000-2007 is complicated by the fact that this is a brief period of relative market tranquility sandwiched between the *plan real* in the late 1990s and the 2002 market panic (following Lula's election) on one hand and the 2007-2009 global financial crisis on the other.

2008-2016: Managed Floating. Reference Currency: Dollar

There is ample evidence that the BCB intervened heavily to lean against the wind during and following the global financial crisis, with some suggestions that this began as early as 2006. These interventions were established in official rues from 2008 to 2014 (Adler et al 2015). Ghosh et al (2018) note that Brazil was (alongside Peru) the most active among Latin American countries in undertaking sterilized reserve accumulation in response to capital inflows. They assess that Brazil absorbed 90% of the capital inflows since 2008 through reserve accumulation. This is the highest among the emerging markets that they study.

By 2010, Finance Minister Mantega acknowledged that Brazil was in the "midst of an international currency war"[5] and by 2013 the BCB acknowledged official intervention.[6] Chamon et al (2016) use a

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[2] [Between June and December 2002] "The central bank intervened in the foreign exchange market in support of the real, with a resulting fall in net international reserves from $26.5 billion at end-June to $14.2 billion by end-December." Source: US Treasury Report to Congress on International Economic and Exchange Rate Policies (2002) https://www.treasury.gov/resource-center/international/exchange-rate-policies/Documents/Treasury_ReportToCongressOnInternationalEconomicAndExchangeRatePolicies-2002H1_2002Nov12.pdf.

[3] "During the market turbulence in 2001-02, the Central Bank of Brazil intervened in the foreign exchange market by both directly selling foreign currency in the spot market, and providing foreign currency indexed instruments in the futures markets. Such interventions proved effective. However, they were temporary and were part of a broader strategy that involved other policies, whose objective was not to target the exchange rate level but to provide liquidity to the economy." Source: https://www.bis.org/publ/bppdf/bispap24f.pdf.

[4] The US Treasury Report to Congress on International Economic and Exchange Rate Policies of 2006 noted that "The central bank increased net international reserves to $62.7 billion by June 2006 compared to $53.8 billion in December 2005. The central bank has a broad objective of increasing reserves in the medium run to make the economy less vulnerable to shocks, but it does not commit to a specific numerical target." This illustrates the ambiguity of the "freely floating" classification during this period. The reserve accumulation in face of an appreciated real may have been interventions to limit this appreciation or a replenishment of reserves lost during the interventions of 2001-2. In 2007, reserve accumulation accelerated with reserves more than doubling from $81 billion to $171 billion, with the backdrop of strong capital inflows and an appreciating real.

synthetic controls approach and estimate that BCB interventions lead to a 10 percent appreciation of the BRL during this period. Intervention policy began unofficially earlier than it was officially acknowledged, with reserves increasing by one-third (nearly $100 billion) in 2009-2010[7] and a tightening cycle of capital controls beginning in October 2009. While the BCB frequently denied that exchange rate objectives were the purpose of FX intervention,[8] the Bank's official policy guidelines note that limiting (extreme) exchange rate volatility is one of the purposes of its reserve policies.[9] Moreover, the predominant view among market observers and participants was that these policies were aimed at limiting exchange rate volatility.[10]

Canada

2000-2002: De facto moving band that is narrower than or equal to +/-2%

Classified algorithmically.

2003-2002: Freely Floating

The Bank of Canada has had a de jure freely floating currency since 1998 and there is no indication that it has intervened to affect the exchange rate.[11] At 3% of GDP, the BoC's FX reserves are an order of magnitude smaller than the typical managed-floating central bank.

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[5] https://www.ft.com/content/33ff9624-ca48-11df-a860-00144feab49a

[6] "An increasing number of countries are using derivatives as an alternative instrument to intervene in the foreign exchange market. Brazil has reported the use of foreign exchange swaps as an indirect intervention channel." Source: IMF AREAER (2017). See also US Treasury Report to Congress on International Economic and Exchange Rate Policies (2015).

[7] US Treasury Report to Congress on International Economic and Exchange Rate Policies (2011).

[8] "Letting the market set the exchange rate does not mean remaining inactive when markets become dysfunctional. Thus, the Central Bank has used its reserves, during the current period of global financial turmoil, to ensure that Brazilian exporters and importers retain access to trade finance, to help Brazilian corporates rollover their debts and to provide liquidity to the spot market." Source: http://www.bcb.gov.br/Pec/ApPron/Apres/10%20years%20of%20floating%20vf.pdf.

[9] "The BCB maintains… reserves, in order to contribute to the sustainability of the country's external accounts and to avoid excessive volatility of the currency, as defined by the economic policy guidelines." Source: http://www.bcb.gov.br/conteudo/home-en/FAQs/FAQ%2011-Central%20Bank%20of%20Brazil%20Functions.pdf.

[10] "Brazil has tried a number of measures to stabilize its volatile exchange rate, which strengthened in 2011 to levels that threatened local industry but then weakened too fast in 2012-13, fueling inflation… In one of its most successful initiatives, the central bank… [in] August started daily auctions of currency swaps. The derivatives allow the bank to support the real without selling a single dollar from its $380 billion in foreign reserves." https://www.reuters.com/article/brazil-cenbank-swaps/brazil-likely-to-wind-down-fx-program-as-real-steadies-idUSL1N0OK2AP20140616. "The BCB intervenes to smooth out excessive volatility." Source: IMF AREAER (2017). "The central bank's fight against the real's gain includes the implementation of a reserve requirement for local banks. The real rose about 30% against the greenback in 2010." Source: https://www.marketwatch.com/story/brazil-currency-up-on-rate-hike-possibility-2011-01-26.

[11] It's official policy states: "Although there is no target for the Canadian dollar and the Bank no longer

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Chile

2000-2007: De facto moving band that is narrower than or equal to +/-5%

Classified algorithmically.

2008-2016: Managed Floating: Reference Currency: Dollar

The Chilean Central Bank (BCC) has a de jure managed floating exchange rate regime and intervenes sporadically to limit exchange rate volatility. Limiting exchange rate volatility is a stated objective of its reserve policies.[12] This is a marginal case, however, as intervention was sporadic and the BCC intervened during only four main episodes since 2000.[13]

Colombia

Managed Floating. Reference Currency: Dollar

The Colombian Central Bank (BRC) has a de jure managed floating exchange rate regime and limiting exchange rate volatility is a stated objective of its reserve policies.[14] The central bank was highly active in

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intervenes in foreign exchange markets except in very exceptional circumstances, the Bank is not indifferent to persistent currency movements, up or down, and takes into account their effect, together with that of other domestic and external factors, on total demand and inflation in Canada. Source: https://www.bankofcanada.ca/wp-content/uploads/2010/11/exchange_rate.pdf.

[12] "Under the floating regime, the Central Bank of Chile reserves the right to intervene in the foreign exchange market -through exchange operations and/or supplying instruments for exchange hedging- in exceptional circumstances of excessive appreciation or depreciation of the exchange rate, that may have negative effects on the economy." Source: Banco Central de Chile (2007), *La Politica Monetaria del Banco Central de Chile en el Marco de Metas de Inflacion.* "Under the current floating exchange rate regime, the primary purpose [of international reserves] is to ensure access to liquidity in foreign exchange, to intervene in the FX market in exceptional and qualified circumstances… A situation of illiquidity in international financial markets that are relevant for Chile, for example, could lead to a depreciation of the peso that does not follow from fundamentals and that would imply real and important costs to our economy. Source: http://www.bcentral.cl/documents/20133/0/BCCH_ARCHIVO_104637_ES.pdf/91d144fa-154e-bcfe-0d95-99be671964d1

[13] "There have been four episodes of [FX] intervention in Chile since the flexible exchange rate regime was implemented. In 2001 and 2002, the Central Bank intervened providing liquidity in foreign currency due to upward pressures in the exchange rate generated by the crises of some neighbouring countries… During the beginning of 2008, and the beginning of 2011, the Central Bank announced currency purchases to increase its availability of international liquidity." http://www.bcentral.cl/flexibilidad-cambiaria. In 2001: "Given the notion that we could be facing turbulences with a high possibility of a transitory overreaction [in the exchange rate], and with the conviction that instead of trying to find a price [for the peso] it is necessary to provide liquidity, the Central Bank announced on August 16th that it would intervene in the FX market, given the exceptional circumstances that our economy experienced. The intervention would be for a limited amount... and also limited in time, given a maximum limit until the end of December." http://www.bcentral.cl/documents/20143/32019/bcch_archivo_096530_es.pdf/7583aa74-142d-d817-3dee-e96811640c49. See also the discussion of the exchange rate objectives of these interventions in Claro and Sotto (2013): the first author was a member of the BCC board at the time of writing. For press reporting see https://www.ft.com/content/3d546e18-182a-11e0-88c9-00144feab49a.

[14] "The Bank of the Republic intervenes in the FX market, as a complementary mechanism, to avoid volatility in economic growth and in the real exchange rate. Said intervention is conducted in a discretionary manner, through currency purchase and/or sell auctions whose rules of operation are of public knowledge. The great challenge of exchange rate policy in the present time is to conserve an adequate level of foreign reserves and a currency management that is compatible with the inflation targeting scheme". Source: BRC (2006) http://www.banrep.gov.co/docum/ftp/borra429.pdf. "Intervention in the foreign-exchange market

FX markets throughout the period. Before 2004 these were largely rule-based interventions (Vargas, 2005), but there is some suggestion of official rules for intervention later (Adler, 2015) and discretionary reserve operations were used with increased frequency in the following decade.

Iceland

2000-2005: De facto moving band that is narrower than or equal to +/-5%

Classified algorithmically.

2006-2009: Managed Float. Reference Currency: Dollar-Euro Basket.

During its financial crisis, the Central Bank of Iceland abandoned its de facto band around the euro. FX intervention was a regular occurrence during this period (in fact more aggressive than in the period when we are able to classify the exchange rate arrangement algorithmically) and part of official monetary policy.[15] Assessing Iceland's reference currency during this period is complicated by the fact that Iceland is roughly balanced between the euro and the dollar on the indicators we use to classify reference currency. For example, the CBI held slightly more dollar than euro reserves during this period and its trade is invoiced in dollars and euros in roughly equal measure. Given this relative balance between the euro and the dollar and that this period is a transition from a euro anchor to a euro-dollar basket we classify this period as being a euro-dollar anchor.

2010-2016: De facto crawling band that is narrower than or equal to +/-2%

Classified algorithmically.

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is one of the instruments available to the Bank for meeting the basic objective of keeping inflation stable within a long-term target range (2% to 4%) and fostering output growth at around its long-term trend. For example, when a rapid depreciation of the peso poses a threat to meeting inflation targets, the Bank may mitigate exchange-rate pressures by selling foreign currency in the market, while avoiding that the burden of the adjustment should fall exclusively on the interest rate." Source: BRC (2009, 2011) www.banrep.gov.co/es/intervencion-banco-republica and http://www.banrep.gov.co/sites/default/files/publicaciones/archivos/frmr_2011.pdf. "The Bank of the Republic, as the currency authority, has the authority to intervene in the FX market. Said intervention does not limit exchange rate flexibility, does not attempt to fix or reach a certain level of the exchange rate, and follows goals that are compatible with the inflation targeting strategy. Specifically, intervention seeks to: i) increase the level of reserves… ii) mitigate movements in the exchange rate that do not clearly reflect the behavior of fundamentals… and iii) moderate rapid and sustained deviations in the level of the exchange rate with respect to trend. Source: BCC (2016) http://www.banrep.gov.co/sites/default/files/paginas/anexo_re_transparencia.pdf.
[15] See https://www.cb.is/publications/news/news/2017/05/18/Central-Bank-suspends-regular-foreign-currency-purchases

Japan

2000-2016: Freely Floating

The Bank of Japan (BoJ) has an official policy of reserve accumulation for exchange rate stabilization.[16] On rare occasions, the BoJ has intervened to limit yen appreciation, particularly against the dollar. In 2011, this followed the earthquake and Tsunami that hit Japan that year and was coordinated with other major central banks. But in 2012, the BoJ conducted a series of unannounced reserve purchases (primarily dollar), increasing reserves by 10 percent, just as the yen was peaking to historical highs.[17] This is entirely consistent with a managed floating regime, with the BoJ leaning against the wind. However, this was also a period of intensifying quantitative easing policies and the BoJ described its reserve accumulation as being part of this broader strategy. With this ambiguity in mind, we classify Japan as freely floating throughout this period.

Interestingly, the yen was weakening relative to the Euro, so that insofar as the Yen is managed floating, its reference currency is likely the dollar. This is reinforced by the fact that virtually all of Japan's trade is denominated in dollars.

Korea

2000-2003: De facto moving band that is narrower than or equal to +/-5%

2004-2009 Managed Floating. Reference Currency: Dollar.

The Won had a brief period of floating outside a 5% moving band in the years prior to the global financial crisis. Throughout this period, the central bank used official instruments whose explicit purpose was to sterilize FX market interventions (Foreign Exchange Stabilization Fund Bonds, FESFBs). During the global financial crisis, Ghosh et al (2018) find that Korea was among the most active emerging markets in both FX intervention and countercyclical capital controls. They estimate that the central bank purchased

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[16] "[T]he Bank acts on the government's behalf in international financial business. The Bank buys and sells yen for foreign currencies (foreign exchange intervention) to stabilize the exchange rate of Japan's national currency, the yen." Source: Bank of Japan https://www.boj.or.jp/en/about/outline/data/foboj10.pdf.
[17] Source: Bank of Japan reserves data. See also https://www.ft.com/content/b91061ce-5168-11e1-a99d-00144feabdc0 and https://www.reuters.com/article/global-forex-boj/chronology-history-of-japanese-fx-intervention-idUSL8N15Q4BY.

up to 70% of the capital inflow in reserves.[18] But Bank of Korea (BoK) interventions were frequent in the period prior to the crisis as well, with the direction and timing of interventions consistent with exchange rate stabilization.[19]

2010-2016: De facto moving band that is narrower than or equal to +/-5%

Classified algorithmically.

Mexico

2000-2008: De facto moving band that is narrower than or equal to +/-5%

Classified algorithmically.

2009-2016 Managed Floating. Reference Currency: Dollar.

The Central Bank of Mexico (BdM) has a de jure managed floating policy with an Exchange Commission that may instruct the BdM to conduct operations in the foreign exchange market if considered necessary. The BdM has been very active in foreign exchange markets, intervening frequently, often on a one sided basis. For example, prior to the crisis, FX was typically auctioned at the previous day's closing rate, reflecting the BdM's intent to be a price taker in these markets.[20] In contrast, from 2011 to 2013 the BdM began auctioning at prices 2% above the previous day's close and from 2014 to 2016 the BdM auctioned at prices 1.5% above the previous day's *only if* the currency depreciated more than 1.5%. These appear to be attempts to limit excessive exchange rate volatility, sometimes on a one-sided basis.[21]

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[18] See also https://www.cfr.org/blog/i-gave-korea-too-much-credit-letting-won-appreciate-december.
[19] "The won appreciated by 14.5% relative to the dollar between the first quarter of 2004 and the first quarter of 2005 (Figure 2.5), the largest rise of any Asian currency. In effective terms (relative to Korea's 41 major trading partners), the won increased 12% over the same period. The appreciation occurred despite large-scale intervention in the foreign exchange market aimed at smoothing the currency's upward trend." Source: OECD Economic Surveys, Korea, 2005. "Exchange rate appreciation was accompanied by foreign exchange market intervention intended to smooth the upward trend in the won, while accepting its trend increase. Korea should maintain a flexible exchange rate policy, given the costs and risks of intervention. With foreign reserves of $247 billion or 27% of GDP, more than double Korea's short-term foreign debt, there is no need for continued reserve accumulation." Source: OECD Economic Surveys, Korea, 2007.
[20] US Treasury Report to Congress on International Economic and Exchange Rate Policies (2011).
[21] IMF AREAER (2017).

Paraguay

2000-2002: Crawling band that is narrower than or equal to +/-5%

Classified algorithmically.

2002-2008: Moving band that is narrower than or equal to +/-5%

Classified algorithmically.

2011-2013: Managed Floating. Reference Currency: Dollar

The Paraguayan Peso had intermittent periods of floating, while typically within a moving band around the dollar. During the brief floating episodes, the Central Bank of Paraguay intervened regularly in FX markets.[22]

2014-2016: Crawling band that is narrower than or equal to +/-5%

Classified algorithmically.

Russia

2000-2008: Crawling peg.

Classified algorithmically. Transitions from dollar to dollar-euro basket peg in 2003.

2009-2012: Managed Floating. Reference Currency: Dollar-Euro Basket.

During this period the Bank of Russia (BoR) had a de jure managed floating regime, with an official policy of FX intervention if the rubble exchange rate against a dollar-euro basket (with weights 55% and 45%, respectively) moved outside of a roughly 20 percent (6, later 7, rubbles) moving band.[23]

2012-2014: Crawling band that is narrower than or equal to +/-2%

2015-2016: Currency Crash.

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[22] IMF AREAER (2016).
[23] Source: https://www.cbr.ru/eng/DKP/exchange_rate/fx_policy_hist/. See also IMF AEREAER (2016).

South Africa

2000-2016 Freely floating

The central bank has a de jure managed floating policy, which allows the South African Reserve Bank (SARB) to look at the exchange rate for signs of pass-through, but with no specific target for the exchange rate.[24] The SARB has also accumulated reserves throughout this period going from nearly zero to $60 billion. South African foreign exchange reserves are now 20% of GDP, similar to Brazil's. However, there is no evidence that the central bank used reserve policy with an exchange rate objective and has accumulated reserves steadily and in a largely a-cyclical way.[25] Ghosh et al (2018) estimate no correlation between the policy rate and capital inflows during the crisis and limited correlation of reserve accumulation with capital inflows. Public and unofficial pronouncements by the SARB have reinforced the view that the Bank has no intention to limit exchange rate volatility.[26] Market participants and Bank staff appear to hold the view that the SARB does not, and is likely unable to, limit exchange rate volatility.[27]

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[24] "The South African Reserve Bank may, in line with prevailing monetary and exchange rate policy, intervene in the market from time to time by purchasing or selling dollars. When intervening in the market, the Bank does not attempt to bring about any structural change in the economy or to affect longer-term movements in balance-of-payments transactions; it merely intervenes to smooth out unduly large short-term fluctuations in money-market liquidity or the exchange rate." https://www.resbank.co.za/AboutUs/Documents/Exchange%20Rates%20and%20Exchange%20Control.pdf.

[25] Late 2008 was an exception to this regularity.

[26] As early as 2001, Governor T.T. Mboweni stated: "The Reserve Bank does not have a target value for the exchange rate of the rand in mind. (....) We are only interested in the exchange rate in so far as its movements may ignite (or counter) a domestic inflation spiral. If strong exchange rate depreciation, for example, leads to higher 'imported' inflation, the second-round effect, which would push CPIX inflation above the 6 per cent threshold, the Reserve Bank would have to raise short-term interest rates in order to brake the inflation spiral. Exchange rate targeting and intervention in the foreign exchange market do not feature in the Reserve Bank's way of conducting monetary policy." Source: https://www.resbank.co.za/Publications/Speeches/Detail-Item-View/Pages/default.aspx?sarbweb=3b6aa07d-92ab-441f-b7bf-bb7dfb1bedb4&sarblist=a01d874c-c3f6-4b93-a9dc-c984cf8652cf&sarbitem=200. In 2006, an unofficial report by Reserve Bank staff notes that ""This [macroeconomic balance approach] raises the question whether the authorities (i.e. Reserve Bank) should intervene to make adjustments smoother and quicker (or allow the process to adjust on its own). If the marginal cost of intervening in the foreign-exchange market is smaller than the marginal benefit that would be gained from quicker adjustment, then intervention is encouraged. However, it is highly unlikely that the marginal cost to the country will be less than the benefit gained. Successful foreign-exchange intervention requires large amounts of foreign reserves – much more than South Africa currently has." Source: https://www.resbank.co.za/AnalyticsReports/Abedian.pdf. In 2011, "Finance Minister Pravin Gordhan said today South Africa can't counter currency appreciation on its own, though it would continue to accumulate reserves 'to the extent that affordability allows.' He was responding to comments yesterday by Trade and Industry Minister Rob Davies, who said the rand is overvalued and the government is considering ways of limiting currency strength." Source: https://www.fin24.com/Markets/Currencies/Rand-overvalued-says-minister-20110606.

[27] "Successful foreign-exchange intervention requires large amounts of foreign reserves – much more than South Africa currently has." Source: https://www.resbank.co.za/AnalyticsReports/Abedian.pdf. "John Cairns and Nema Ramkhelawan, currency strategists at Rand Merchant Bank in Johannesburg, said in a research note: 'The bottom line is that the authorities can't do much about the currency even if they wanted to.'" Source: https://www.bloomberg.com/news/articles/2011-06-07/rand-weakens-against-dollar-after-bank-s-forex-gold-reserves-fell-in-may. "While India, Brazil and Indonesia commit billions of

Turkey

2000-2002 Currency crash.

2003-2010 Freely floating

The Lira was officially allowed to float starting February 2001. The Central Bank of Turkey (CBRT) has a de jure managed floating regime as it reserve the right to intervene to limit exchange rate volatility.[28] While the central bank was accumulating reserves during this period, there is no evidence that the pace of reserve accumulation was affected by the level or volatility of the exchange rate and by 2007 the CBRT was inactive in currency markets.

2011-2016 Crawling band that is narrower than or equal to +/-5%. Anchor Currency: US dollar

Classified algorithmically. In addition, the central bank resumed FX operations in 2011 and was leaning against the wind of TRL depreciation. The CBRT changed the rules governing FX auctions almost weekly and was intervening heavily to limit exchange rate volatility in 2012, 2013 (in response to the "taper tantrum"), and 2014 (in face of market turbulence following political protests in the country).[29] In this period (2013-2015) the Lira was briefly within a 2% moving band of the dollar. The CBRT didn't intervene in FX markets in 2015 and 2016.

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dollars to attempts to prop up their fast depreciating currencies, South Africa has no set plans to intervene to support its weak rand." Source: https://www.ft.com/content/105ddf90-0d85-11e3-9fbb-00144feabdc0.

[28] "The CBRT takes measures against excessive appreciation or depreciation of the Turkish lira to reduce financial stability risks." Source: http://www.tcmb.gov.tr/wps/wcm/connect/c2396a1b-1896-4220-9400-f838dd183e42/INTERVENTION.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-c2396a1b-1896-4220-9400-f838dd183e42-m3fxy0B

[29] "Turkey held foreign exchange selling auctions to support short-term additional monetary tightening. These auctions were used to slow the depreciation of the lira after Turkey's heavy reliance on short-term capital inflows became apparent when global demand for emerging market assets fell markedly when the Federal Reserve signaled it would take steps to normalize monetary policy." Source: IMF AREAER (2016). "Faced with significant volatility against the backdrop of political protests and unwarranted changes in the lira exchange rate, Turkey initiated unsterilized foreign exchange interventions early in 2014, which resulted in a rapid loss of international reserves. In April 2014, the daily foreign exchange selling auction amount decreased from a minimum of US$50 million to US$40 million as a result of improvement in the current account deficit." Source IMF AREAER (2017).

UK

2000-2007 De facto moving band that is narrower than or equal to +/-2%. Anchor currency: euro

Classified algorithmically.

2008-2016 Freely floating.

The Bank of England has a de jure freely floating policy and doesn't have an official exchange rate policy. It buys reserves on a pre-announced schedule. The vast majority (90%) of FX reserves are held by the UK government, not the BoE. The BoE's reserves are around 1% of GDP—an order of magnitude smaller than typical managed floating central banks. Despite massive quantitative easing policies beginning in 2009, FX intervention was not part of the strategy. Bank of England reserves barely changed during the sharp drops in the value of the pound in 2008 and following the Brexit referendum in 2016.

Uruguay

2000-2007 De facto crawling band that is narrower than or equal to +/-5%

Classified algorithmically. (Currency crash in 2002.)

2009-2012 Managed floating. Reference Currency: dollar

Uruguay adopted an inflation target range in 2004 and gradually allowed the peso to fluctuate more freely against the dollar. During the floating period, the Central Bank of Uruguay (BCU) intervened periodically to smooth excess exchange rate volatility. Interventions intensified in 2012-2015.[30] The objective of limiting exchange rate volatility is official and public.[31] During this period of interventions, the inflation target range was increased, allowing the BCU more freedom to meet multiple policy objectives.

20013-2016 De facto crawling band that is narrower than or equal to +/-5%

Classified algorithmically.

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[30] IMF AREAER (2017)

[31] "Regarding interventions in the FX market in July to contain the price of the dollar, Central Bank governor Mario Bergara said: "The intervention tries to reduce volatility, assist in graduality, and avoid [exchange rate] jumps that don't have a justification in fundamentals. We cannot put a horizon on that process." Source: https://www.elobservador.com.uy/no-tiene-sentido-seguir-brasil-su-depreciacion-dijo-bergara-n670223.

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2. Classifying Reference Currencies

We use four separate criteria to assign a reference currency for countries with a managed float. First, in which currency is the majority of foreign trade is 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? In the current sample, all four indicators conveniently point to the same reference currency in all countries in the table. The exception is Iceland, which is evenly balanced in all indicators, but was most recently anchored to the euro and the dollar dominates in all other measures. Given that the Icelandic krona subsequently anchored to a dollar-euro basket (classified algorithmically), we classify the krona as having a dollar-euro basket as its reference currency while under a managed float as well.

For completeness and future reference we outline here an index that would allow us to classify the reference currency if these four indicators disagree. The reference currency index is calculated for each currency-anchor pair an arithmetic sum of the following four variables:

1) Percent of trade (with equal weights on imports and exports) invoiced in the anchor currency.

2) Percent of central bank reserves denominated in the anchor currency.

3) Percent of foreign debt denominated in the anchor currency.

4) The reciprocal of the number of years since the currency was anchored to the anchor currency based on exchange rate based criteria described above.

Table A.2. shows the reference currency index against the dollar and the euro for the year 2016, for six countries requiring classification, and where sufficient data were available. The index is essentially zero for all candidate reference currencies other than the dollar and the euro. The index shows that for most of these countries, the choice of reference currency is classified as the dollar by a large margin.

To illustrate the construction of the index, consider the case of Iceland, which is the most marginal case. 38% of Iceland's trade is invoiced in dollars (32% in Euros), its debt is denominated in domestic

currency, and its central bank holds 52% of its reserves in dollar denominated assets (37% in euro assets). The Icelandic Krona hasn't been anchored to the dollar in recent history (giving a 0 score on the recent anchor category) and was anchored to the euro 15 years ago (giving a score of 7%). This gives Iceland a 23% score on the dollar anchor index and 19% score on the euro index.

3. Stress testing Anchors

We assess the robustness of our anchor choice by studying two recent natural experiments. There have been two large recent swings in the bilateral dollar-euro exchange rate. Both movements can be traced back to monetary policy shocks in Europe and the US. First, on July 22, 2012, Mario Draghi, the ECB President, made his now famous speech, in which he stated that the ECB stood ready to do "whatever it takes" to preserve the euro. 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.[32] Figure A.1 highlights these events.

The large movements of the dollar-euro bilateral exchange rate allow "stress-testing" of our anchor currency classification, at least between the critical choice of the dollar or the euro. Specifically, we would expect currencies anchored to the dollar to move more closely with the dollar during these episodes, while currencies with other anchors (most commonly the euro) might move more freely relative to the dollar. These two episodes have the advantage that they are primarily due to the monetary policies of the ECB and the Federal Reserve, not idiosyncratic shocks facing other economies. In one case the dollar depreciated while it appreciated in the other.

Figure A.2 shows the median percent depreciation of countries with either +/-5 percent exchange rate bands; the results would naturally be far sharper if we included all countries. The red (dashed) line shows

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[32] This differs from the proverbial "taper tantrum" of the preceding 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.

countries classified as anchored to the US dollar and the blue (dotted) line shows countries classified with other anchors (three countries anchored to the Euro and one to the Australian dollar). The third group includes currencies (shown in Table 1 of the main text) that have the dollar as a reference currency. Their movement against the dollar is shown in the purple (dash-dotted) line. For completeness, the black (solid) line shows the euro-dollar bilateral exchange rate.

In both episodes, currencies not anchored to the US dollar moved in tandem with the Euro. These currencies appreciated 5 percent on average relative to the dollar in 2012 and depreciated 20 percent in 2014-5. In contrast, currencies classified as having a dollar anchor moved far less relative to the dollar. Following Draghi's speech, their bilateral US dollar exchange rate appreciated by less than 2%. These currencies depreciated only 10 percent in 2014-15 as the Fed began signaling a tightening cycle. The difference in cumulative exchange rate movement relative to the US dollar between these two groups of countries is statistically significant at the 90 percent confidence level in the first episode and at the 99 percent confidence level in the second.

As might be expected from more loosely anchored cases, movements of the "reference currency" group relative to the dollar were larger than currencies more clearly anchored to the dollar, but less so than the freely-floating euro or currencies that were not anchored to the dollar. (In both episodes, we cannot reject the hypothesis that exchange rate movement relative to the dollar in these intermediate cases was the same as either of the other two groups of countries, on average.)

In summary, we looked at two "shocks" to the bilateral euro-dollar exchange rate that were prompted by ECB or Fed announcements. Even restricting attention to currencies that were loosely anchored to their reference currency, we find that those currencies classified as having a dollar reference remained relatively more anchored to the dollar than those classified as borderline or with a different reference currency. This provides a cross check for our classification algorithm.

4. Trade Invoicing Index

Using data from Gopinath (2015), who studies trade invoicing patterns and exchange rate pass-through, we create an index of trade invoicing by anchor currency. Based on her data for 49 countries over the period 1999-2014, we construct a composite measure of invoicing importance for the four major currencies: the US dollar, the euro, the UK pound, and the Japanese yen. This measure combines information on the incidence of use of the four currencies for invoicing (i.e., the share of countries who quote some of their trade in these currencies) and the quantitative importance, as measured by the share of total imports and exports in each currency. The two components are complementary since it is possible that many countries invoice some of their trade in, say, the UK pound. However, it may be the case, that the fraction of total trade that is invoiced in pounds is so small that its overall quantitative importance is quite limited. Table A.3 summarizes the components and the summary measure of the trade invoicing index for the four anchor currencies.

5. Classifying the Eurozone

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.

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.[33] 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. [34]

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 20th 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 exchange rate regimes. There too, the unit of observation tends to be sovereign countries, rather than currencies.[35]

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

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[33] 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."
[34] See the companion chronologies in Ilzetzki, Reinhart, and Rogoff (2017) for individual countries over 1946-2016.
[35] See Levi Yeyati and Sturzenneger (2005), for example.

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.[36] 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 most EZ members, with a slight (yet important) reduction in the exchange rate exchange rate flexibility of its members.[37] [38]

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

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[36] Some future EZ members had narrow +/-2 percent bands.

[37] 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.

[38] 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.

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 other policy prescriptions.[39] Simply put, evidence in favor of a Taylor rule is consistent with a flexible exchange rate regime and at odds with a peg.[40]

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

In what follows, we describe the approach adopted and results obtained from estimating an individual Taylor rule for the countries that make up the Eurozone. We regressed the ECB's policy interest rate on inflation, unemployment, and on a constant term. Specifically, we estimate (A.1) below for each country:

$$i_{t,n} = \alpha + \beta_1 \pi_{t,n} + \beta_2 y_{t,n} + \varepsilon_{t,n} \qquad\qquad A.1$$

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[39] See Taylor (1993).
[40] 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.

Where $\pi_{t,n}$ is year-on-year inflation for country n; as a proxy for the output gap $y_{t,n}$, we use the difference between average unemployment in country n over 1992-2007 and unemployment in month t. The Taylor principle is satisfied when $\beta_1 > 1$. Given the definition of the output gap, countercyclical policy implies $\beta_2 > 0$.

Figure A.6 shows the coefficients on inflation (top panel) and the output/unemployment gap (bottom panel) for all original Eurozone members, plus Greece. The whiskers depict the 95 percent confidence intervals of the estimates. The data is monthly and spans from January 1999, when the Euro was adopted, to September 2014 when the ECB set interest rates at zero and the connection to a simple Taylor rule loses meaning (variants that incorporate quantitative easing are not explored here.)

The contrast between the coefficient estimates for Germany and other Eurozone members is of note. The coefficient on the inflation rate for Germany is estimated at slightly below one, but the standard error is large enough to encompass the possibility that the coefficient is greater than one, the necessary response for monetary policy to be stabilizing. This result becomes even stronger when the post-2008 crisis years are excluded. Therefore, we cannot reject the hypothesis that the ECB follows the Taylor principle—that the real interest rate should rise in response to an increase in inflation—for Germany. This result is anticipated in Smant (2002), who concludes that, after an initial period of lower than expected interest rates, since mid-2000 the ECB has set the policy interest rate consistent with the Bundesbank's old policy rule.

In contrast, for all other Eurozone members, we can reject at the standard levels of significance that the coefficient is greater than one.[41] The Taylor principle is also violated for the Eurozone as a whole. In other words, we cannot reject the hypothesis that the ECB's practice has been to stabilize inflation in Germany, but not for the currency area as a whole. On the surface, at least, these estimates indicate that in the decade and a half of its existence, the ECB may have placed a de facto greater emphasis on stabilizing inflation in Germany than elsewhere. Beyond the Taylor rule, there is broad agreement and clear theoretical foundations for the notion that a central banks' interest rate policy ought to respond actively to

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[41] Or that it is significantly different from zero, for that matter.

inflation. Based on this notion, it is hard to argue that countries other than Germany have had the type of monetary autonomy that would justify classifying them as having a freely floating currency.

The coefficient on the output gap, shown in the bottom panel of Figure A.6, paints a somewhat different picture, as it is positive for all Eurozone members other than Finland and Germany with the interpretation that the ECB does conduct countercyclical monetary policy for most EZ members. There is less agreement as to the necessity that the central bank responds to unemployment, nor on the value that the coefficient on unemployment should take. Given that the ECB's dominant mandate is achieving and maintaining price stability, one cannot rule out that the countercyclical nature of its policy is indeed secondary.

A different way to pose the same question is to re-construct what interest rate policy would have looked like using a Taylor rule for the Eurozone and for individual Eurozone members, and ask whether actual policy followed that path. Taylor's (1993) original rule, given by:

$$i_t = \pi_t + .5y_t + .5(\pi_t - 2) + 2 \hspace{4cm} A.2$$

where i_t is the recommended policy rate, y_t is the output gap, and π_t is inflation over the 12 previous months. As in (A.1), the output gap is measured as the difference between average unemployment in the country in question and unemployment in month *t*.

Figure A.7 presents the evolution of the hypothetical policy rate associated with a Taylor rule as a dashed line first for two Eurozone countries: Portugal, and France; and then for Germany and the Eurozone as a whole.[42] Policy rates were far lower than the Taylor rule would have advocated for countries like France and Portugal and indeed for the currency union as a whole until 2008. By contrast, from 1999 to the onset of the global financial crisis, the ECB followed Germany's "Taylor rule" with a remarkable degree of precision.

As the crisis hit, the ECB became more willing to loosen policy due to conditions in the crisis countries, which in varying degrees included France, Greece, Germany, Ireland, Italy, the Netherlands,

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[42] We report the results for France and Portugal, as these are representative of the remaining Eurozone countries (with the exception of Germany, as discussed). The Taylor rule for all the remaining Eurozone countries are not reported to economize on space but are available from the authors.

Portugal, and Spain, as documented in Reinhart and Rogoff (2014). As a result, the policy rate has followed the Eurozone Taylor rule more closely (Figure A.7(b), bottom panel). In recent years it would appear that no single Eurozone member country, including Germany, has had the degree of monetary autonomy that would be implied by the independently floating label that the IMF assigns to all EZ countries.

In sum, apart from Germany's case during 1999-2007, we conclude that the de facto practice of the ECB (alongside the other criteria discussed in Section III) justifies classifying Eurozone members as tantamount to having an exchange rate arrangement with no separate legal tender.

However, for completeness, Figure A.8 repeats Figure 2 from the main text, while replacing Eurozone members with the Eurozone as a whole, classified as freely floating. The general patterns remain intact.

6. Inflation Targeting Countries: A Breed Apart?

This appendix outlines our analysis of inflation targeting (IT) countries, summarized in Section II.E of the paper. To begin, Table A.4 lists countries that have adopted a de jure inflation target, the year in which it was adopted, and the de facto exchange rate arrangement based on our classification. As Table A.4 highlights, there is considerable variation in de facto exchange rate practices among countries 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.[43] 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.

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[43] 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.

This suggests that the de-jure IT category masks significant differences in monetary practices and that our classification provides information beyond the headline IT label. In effect, there is a subset of cases where the mantra of IT has hidden a continued "fear of floating" by many central banks (Calvo and Reinhart, 2002).

Beyond the analysis of the exchange rate through our various filters, we provide two different but complementary empirical strategies to assess whether the behavior of IT countries and their non-IT counterparts are similar or distinct. The first of these focuses on a pair of event studies over 2008-2014 while the second involves estimating an augmented Taylor rule for the IT group over the period 1990-2015. The aim of these exercises is to ascertain whether IT countries behave distinctly as a single group or whether that overarching de jure label needs to be qualified with additional considerations.

Lehman, September 2008 and FOMC Minutes, June 2014

We consider two major macroeconomic shocks from recent years, one real and the other nominal. In Figure A.9 we compare the exchange rate movement of countries divided along two dimensions: first their de jure classification IT or not IT, and second their exchange rate classification in broad categories of "fixed" (coarse classification categories 1 and 2) and "flexible" (coarse classification categories 3 and 4). The average response of (nearly) all currencies during two episodes is plotted in the two panels of Figure A.9. The period surrounding the collapse of Lehman in the fall of 2008 is shown in the top panel while the bottom panel presents the comparable data around the June 2014 meeting of the Federal Open Market Committee (FOMC). The grey solid and dashed lines trace the responses of currencies within the less flexible arrangements, which include de jure and de facto pegs, crawling pegs, or narrow (less than +/-2%) bands or crawling bands (coarse-grid 1 and 2). The black solid and dashed lines chart the responses of currencies with managed or freely floating regimes (coarse-grid 3 and 4). Solid lines give the average exchange rate index of IT countries vis a vis their anchor currency and dashed lines present the comparable index for the control group of non-IT countries.

As shown in Figure A.9, the depreciation cycle around the Lehman shock in fact began in July of 2008, when commodity prices peaked and the ECB increased its policy rate. Depreciations accelerated following the collapse of Lehman Brothers. For the IT cases (solid lines), it is evident that our classification picks up large differences in exchange rate practices. Currencies that we classify as floating depreciated sharply: peaking at more than 20%. In contrast, exchange rate movements were more muted among IT countries we classify as having a variant of a peg, with a median depreciation of merely 10%. The difference between the average depreciation in these two groups of countries is statistically significant at the 95% confidence interval. The response of the IT group with a de-facto crawling peg was almost identical to their counterparts with coarse classifications 1 or 2 without an inflation target. Currencies' response to the defining shock of the 2008-9 global recession shows that our classification adds important information to the de-jure label of IT, when considering exchange rate movements.

A similar pattern is evident as the Fed tightened policy in 2014. IT countries with flexible exchange arrangements posted a depreciation of 10% from the FOMC meeting in June to the end of the year. This contrasts with a 2% cumulative depreciation among IT cases with comparatively fixed exchange arrangements. The difference between the two groups is again statistically significant at the 95% confidence interval. As before, exchange rate movements among inflation targeters that we classify as having a fixed exchange arrangement is strikingly similar to the non-IT control group. The temporary bout of exchange rate flexibility in mid-December among IT countries with fixed or semi fixed exchange arrangements reinforces rather than contradicts our argument. This spike is driven by a single currency—the Armenian dram, with a de-facto inflation target, but which we classify as having a narrow crawling band.

Following a 30% depreciation in a single week, the dram recovered by 28% in two trading days (December 17-18).[44] Tracing the dram's monthly movements over a number of years (Figure A.10) it is evident that the currency's trajectory is strikingly similar to currencies under a traditional crawling peg

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[44] The Central Bank of Armenia auctioned $4 million in reserves on the 17th, although it claimed that it attracted no purchase bids. The ruble recovered 9% on the 17th and it is impossible to reject the possibility that the dram's movements were merely a reaction to the recovering ruble.

(or crawling narrow band), and illustrates the value of lower frequency measures of exchange flexibility. The dram shows remarkable stability vis a vis the US dollar for long stretches, punctuated with the occasional devaluation.

Augmented Taylor Rule

We further demonstrate our contention that IT cases are far less distinctive as a group than advertised by estimating an augmented Taylor rule for the sample of countries with an inflation targeting framework in place. Specifically,

$$i_{t,n} = \bar{r} + \pi_{t,n} + a(\pi_{t,n} - \bar{\pi}) + by_{t,n} + cs_{t,n} \qquad\qquad A.3$$

where $\pi_{t,n}$ is year on year inflation in country n in month t, $y_{t,n}$ is the output gap, measured by the difference between a country's average unemployment rate and that in month t. The usual specification is augmented by the inclusion of the exchange rate, $s_{t,n}$ viz country n's anchor or reference currency. Of course, Taylor rules aren't the only way to characterize monetary policy, but they do contain the key variables of interest to most central banks. As we shall see, the exercise is quite revealing.

The version of equation A.3 we estimate for a panel of IT countries is given by equation A.4. The regressions include country fixed effects, so that they exploit the time variation within countries, giving the average Taylor rule coefficient for countries in the panel. We then augment our Taylor rule with a reaction to exchange rates. Formally, we estimate the following regression:

$$i_{t,n} = \beta_1 \pi_{t,n} + \beta_2 y_{t,n} + \beta_3 FIX_{t,n}\pi_{t,n} + \beta_4 FIX_{t,n}y_{t,n} + \alpha_n + \varepsilon_{t,n} \qquad\qquad A.4$$

where $FIX_{t,n}$ is a dummy variable that obtains a value of 1 if we classify country n as following a variant of a peg or crawling peg in month t, and α_n is a vector of country fixed effects.

Results are summarized in Table A.5. In the first three columns, we treat central banks as having a strict inflation target. Regressing the policy rate on inflation alone gives a coefficient of 0.68. This is consistent with a response to inflation, albeit not sufficient to increase the (ex-post) real interest rate in response to inflation. In the second column, we include the natural logarithm of the bilateral exchange rate with respect to each country's anchor currency. We find that the policy rate responds to the exchange rate, with a sign that is consistent with exchange rate stabilization. IT central banks increase the policy rate by an average of 20 basis points in response to a10 percent exchange rate depreciation.

Column 3 provides interaction terms that allow a separate Taylor rule estimates for countries with "fixed" exchange rates and those with more flexible arrangements. We classify countries with a coarse classification of 2 as "fixed" and those with coarse classifications of 3 or 4 as "flexible". We see that inflation targeting central banks with more flexible exchange arrangements stabilize inflation more aggressively, with a coefficient of 0.74 on inflation. They nevertheless do appear to respond to the exchange rate. However, countries with more rigid de-facto exchange rate arrangements target inflation less aggressively, with a coefficient of 0.55. Instead, they respond more aggressively to exchange rate movements, with a coefficient that is 17% larger than in countries with more flexible arrangements. This may in fact understate the full difference between countries with different exchange arrangements as much currency intervention is conducted with non-interest-rate tools.

Column 4 includes unemployment in the Taylor rule. The coefficient is of the "wrong" sign, with central banks increasing interest rates when unemployment is high. This is plausible if a country follows a strict inflation target.

It is possible that the exchange rate may embed information about future inflation and the central bank is responding to this information in its interest rate policy. While we cannot fully reject this possibility, we include a forward looking variable in the regression reported in column 5. Commodity prices have been suggested as an important forward looking variable, whose exclusion may bias estimates of central banks' policy rules (see Sims 1992). We use an index of the prices of global commodities (from the IMF's International Finance Statistics) to measure commodity price inflation. Central banks do respond to

commodity price inflation, with a coefficient of 1, although the coefficient is not precisely estimated. Once accounting for the response to commodity prices, the average response to the exchange rate is smaller. The difference across exchange arrangements, however, remains almost identical, with countries classified as having fixed exchange arrangement responding less aggressively to inflation and more to the exchange rate. Similar results follow when controlling for oil prices or food prices.

The event studies show that the exchange rates of inflation targetters with a de facto crawling peg react almost identically on average to shocks as do countries with a de facto peg and no inflation target. Similarly, IT countries that we classify as floating react similarly to other floaters. That is, our classification gives information about exchange rate behavior that goes beyond the de jure IT moniker.

The take-away from the Taylor rule estimates is similar. In countries we classify as having a crawling peg, the policy interest rate responds less aggressively to inflation and more aggressively to exchange rate movements than in countries with flexible exchange arrangements, supporting the conclusions of the event studies. These insights suggest that IT by itself is too vague and encompassing to constitute a separate category as its own 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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7. Capital Controls

This appendix provides additional background on indices of capital controls, discussing some of the measures in the literature and how these compare to the exchange rate controls index developed in this paper specifically to complement our exchange rate classification index. A summary of some of the

available indices and their samples and country coverage are presented in Table A.6. The general conceptual and methodological approach taken in these papers is also briefly discussed. There is a somewhat related literature providing indices of equity market liberalization (to foreign ownership), but we do not include the paper in that strand.

We focus our comparison on the Chinn and Ito (2006 and 2008) indices—CI, henceforth--primarily because, apart from its widespread usage, their index spans a longer sample (1970-2015) than other studies while their geographical coverage encompassed nearly all the countries and territories we include in this study. Therefore, CI is far more inclusive than any of the other studies summarized in Table A.6 and closer to our sample, at least for the post-Bretton Woods era. As will be clear, we view or index as a complement to CI, with one or both being very useful depending on the application.

As noted in the general discussion of methodology, the CI approach falls into the class of studies that relies on the IMF de jure narrative (as recorded in the EAAER). Specifically, the CI index consists of four key components: dummy for current account restrictions; comparable variable for capital account restrictions; a dummy (equal to one) if there is a legal requirement that export proceeds be surrendered; and de jure zero-one variable to capture whether the exchange rate is unitary or not.[45] This last variable corresponds to our de jure component. Because their exercise does not address possible discrepancies between de jure policy and de facto practices, as regards their effects on actual capital market integration, there are some cases which stand out as candidates of overstating capital controls/understating capital mobility.

Figure A.11 plots the IIR and CI indices side by side for the advanced economy group. In this category CI includes 22 of the 23 countries that make up this study (CI do not include Luxembourg). As the figure highlights the correlation over 1970-2015 for the two indices is 0.89. The CI index runs consistently higher throughout the sample. As both are {0,1} indices, discrepancies between the two measures are easy to pinpoint and interpret. The median difference, defined as CI-IIR, for the full sample is 0.181, but since 2000 it drops to 0.045 (discrepancies were even smaller, 0.027, in the pre-crisis years).

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[45] See Chinn and Ito (2008) for details.

The single largest and most persistent wedge is the readings for Greece trough 1991. Since the 1950s Greece had a unified exchange rate with no evidence of a high chronic parallel market premia—not even ahead of the numerous significant depreciation/devaluations of the drachma. The IIR index is accordingly 0 while the CI index is 0.834, consistent with high capital controls (and a low level of capital mobility, 1-0.834=0.166, which is how CI report the indices). In a CI international comparison, Greece's controls readings through 1991 are the same as those readings for Pakistan, Turkmenistan, and Nepal among others. This example highlights a recurring pattern for a subset of countries that suggests that in a few cases, the two indices bracket the upper and lower bounds for estimates of capital flow restrictions.[46]

Figure A.12 plots the comparison of the IRR and CI indices for the full sample of 179 countries common to both studies spanning all regions and levels of development. While the correlation over 1970-2015 is an impressive 0.96, indicating both indices present very similar time profiles over almost five decades. There are, however, significant discrepancies on the extent of capital controls (degree of capital mobility) along the lines already discussed. The median difference (CI-IRR) is 0.327 over the entire sample and it remains fairly constant through the recent period (notwithstanding the fact that this wedge narrowed significantly across the 20-plus advanced economies that are included in the sample). While a country-by country assessment of the discrepancies is beyond the scope of this appendix, we would like to highlight some of the sources of the gap.

As discussed, IRR will overstate the degree of capital market integration (which appears to have diminished slightly in recent years) when countries with unified exchange rates have other capital or current account restrictions. These other measures should be mostly captured in the CI index; to be sure, Fernandez et al, (2016) (covering 1995-2013) stands out as the study that has provided the most granular analysis of any measures that specifically target capital outflows or inflows. For instance, in recent years, middle-income countries, like Mexico and Malaysia, have a reading of zero in IIR but their comparable CI index is 0.30 and 0.59, respectively.

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[46] For capital mobility, the converse is true, IRR constitutes the upper bound and CI the lower estimate.

Pointing in the direction that the CI capital control index (Figure A.13) may bias upward their actual importance (for the reasons already noted—that these are based strictly on de jure histories) comes from examining more closely two groups of countries with shared characteristics. The first of these groups are small island states, many of which depend primarily on tourism as a source of income (there are around 20 such countries in the sample). Secondly, there are countries that are a part of some variant of a common currency zone (such as the CFA zone, which includes 14 Sub-Saharan African countries). Some of the small island states (the 8 that comprise the East Caribbean dollar block) for a part of both of these subgroups.

In the case of island states, Figure A.13 highlights that for most of the 46-year sample, these small islands have tighter capital controls than the all-country aggregate; the median difference is 0.15 and the average is 0.17. Barbados, Grenada, and St. Kitts have indices of 0.834. This high control/ low capital mobility readings are at odds with the fact that these islands, among others, do not have a history of active parallel markets, where the parallel rate deviates substantially form the official exchange rate. Furthermore, the US dollar circulates freely, consistent with the flow of tourism. Our interpretation is not that the CI index overstates the *de jure* measures, it is that *de facto* the legal measures are much less binding.

Similar biases in the CI index arise in the context of the CFA franc zone countries where the 2015 readings for Cameroon, Central African Republic, Chad, Republic of Congo (among other currency union members) is the same 0.834 as non-members in the region, like Mozambique, with a long history of active parallel markets (legal and otherwise) and long bouts of very high (three-digit) parallel market premia.

In general, capital controls involve an array of instruments and policies that may be implemented with varying intensity across time and place. For purposes of our exchange rate classification algorithm, which specifically incorporates the possibilty of parallel market premiums, we view the new index developed in this paper as particularly useful in the extensive literature that involves comparisons of the effects of different exchange rate regimes. In general, our index, which captures different features of

capital controls than previous indices (particularly in its emphasis on the de facto effects of exchange rate

controls), should be viewed as a complement not a substitute to others such as CI.

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Potchamanawong, Pariyate (2007). A New Measure of Capital Controls and Its Relation to Currency Crises. Ph.D. dissertation, Claremont Graduate University.

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Quinn, Dennis (2003). "Capital Account Liberalization and Financial Globalization, 1890 – 1999: A Synoptic View," International Journal of Finance and Economics, Vol. 8, No. 3, p. 189-204.
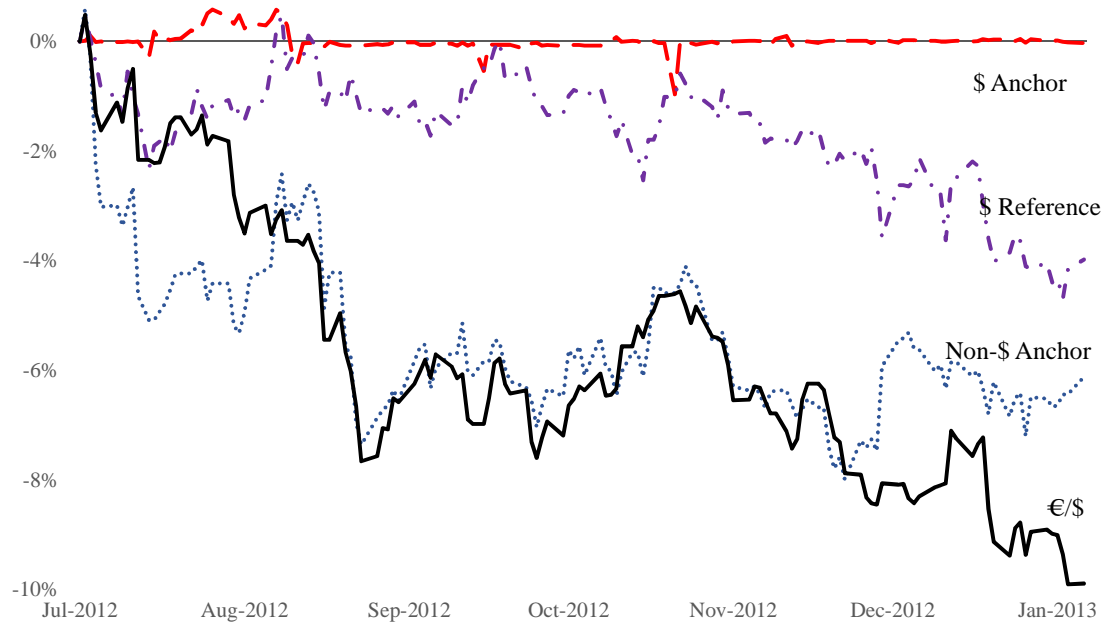
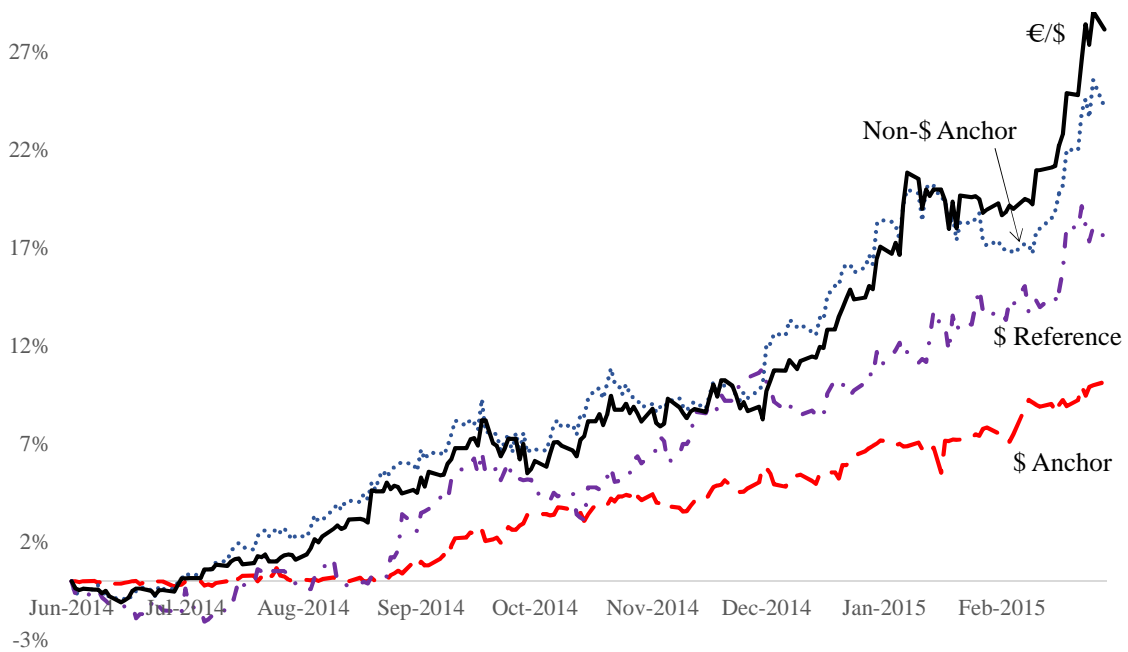Figure A.1: US dollar-Euro Exchange Rate, 2010-2016
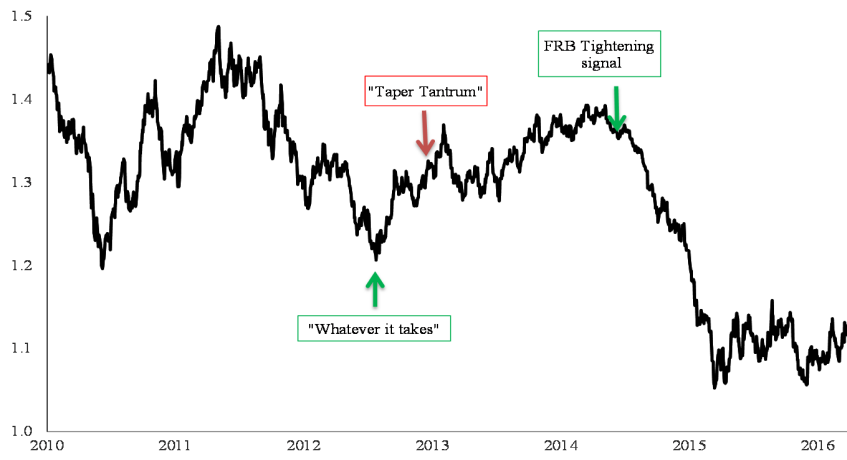
Source: Bloomberg.

Figure A.2: Stress Testing Anchor/Reference Currency Classification: Two Monetary Policy Events,
2012 and 2014
Draghi's Whatever it Takes, 2012

Fed Tightening, 2014

Source: Bloomberg and authors' calculations.

Figure A.3. Evolution of Anchor Currencies: 1950-2015. Excluding Managed Floating Currencies.

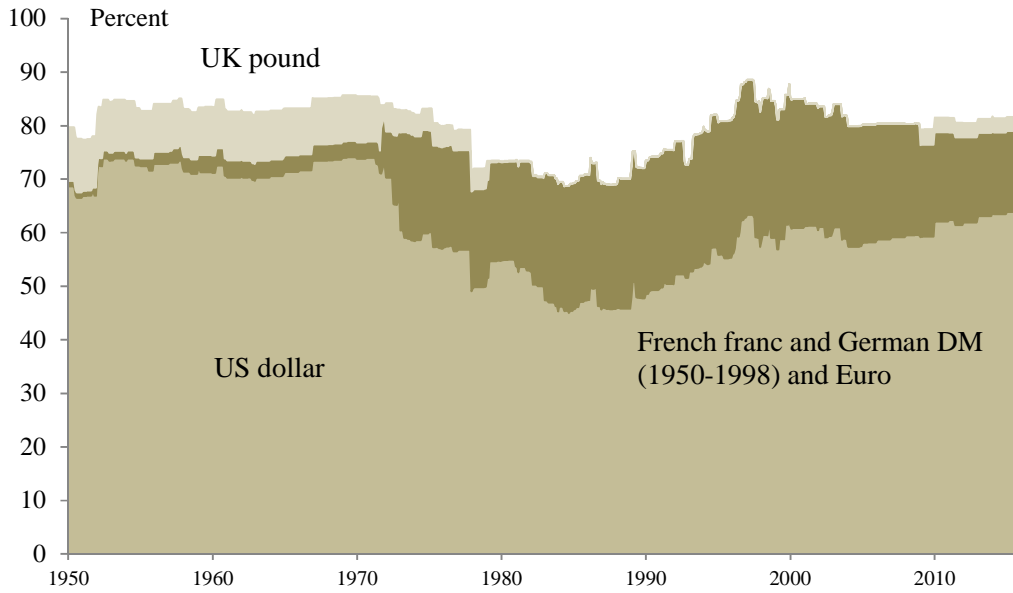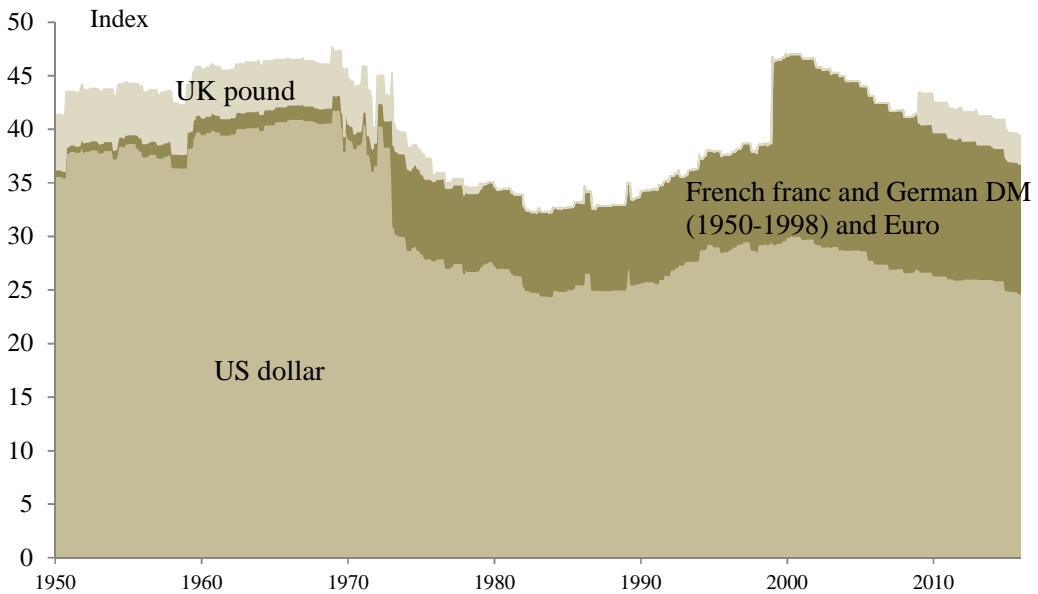*Number of countries weighted by their share in world GDP, 1950-2015*

Figure A.4. Evolution of Anchor Currencies: 1950-2015. Reweighted by Exchange Arrangement.

Number of countries weighted by their share in world GDP, 1950-2015

Note: Each currency in this figure is reweighted by the reciprocal of its fine exchange rate classification, giving an index of anchor currencies that puts a higher weight on more closely anchored currencies.

Figure A.5 (a). The German Revaluation of 1969 as a Case Study for Latent Anchoring

The French Franc (blue, right hand scale) and the Deutschmark (black, left hand scale), 1969
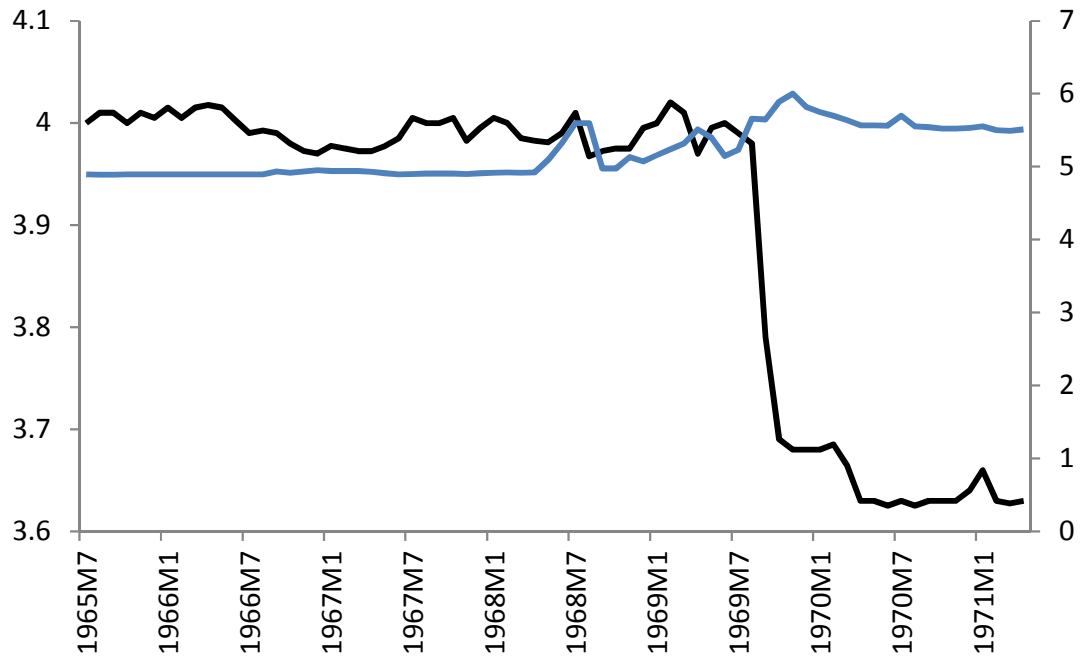
The French Franc (blue, right hand scale) and the Deutschmark (black, left hand scale), post Bretton Woods
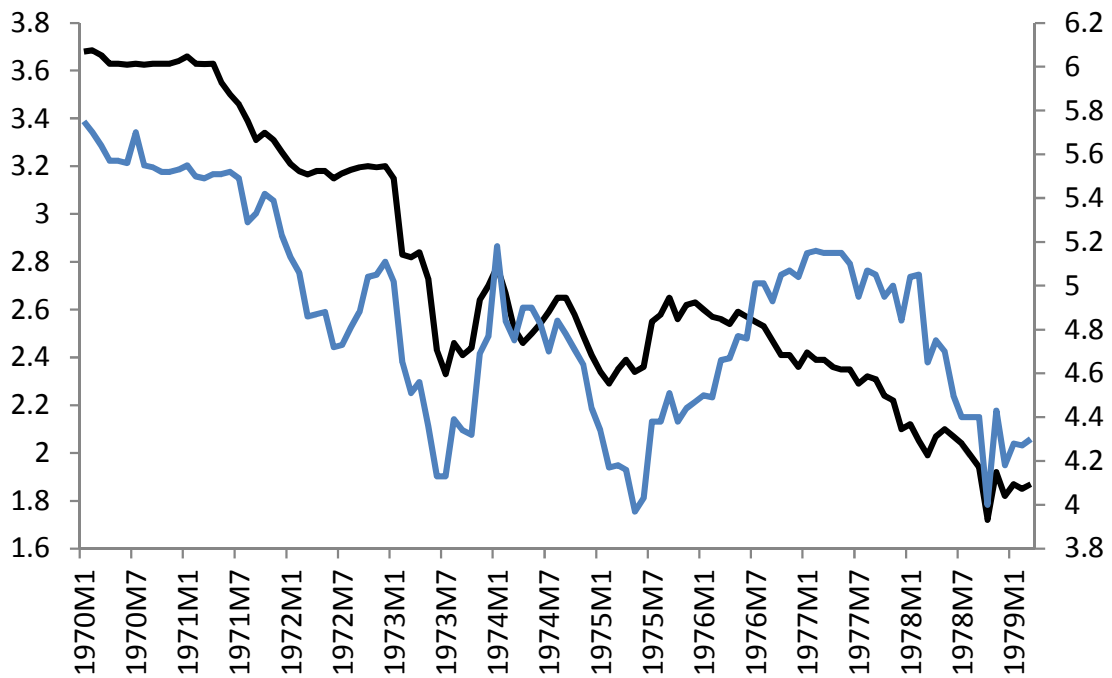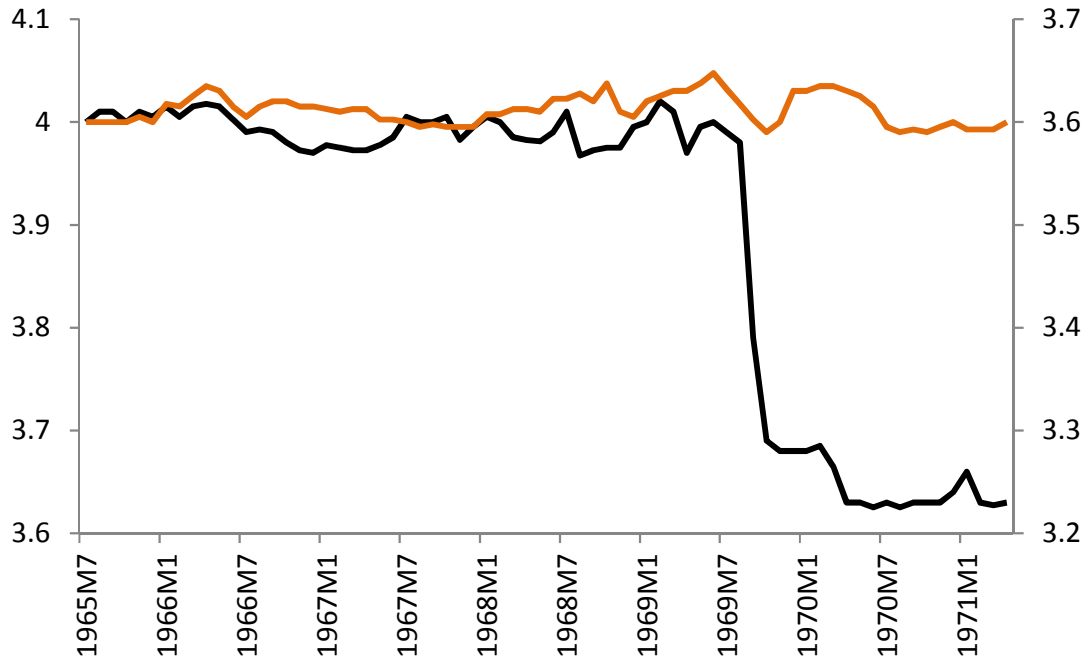
Figure A.5 (b). The German Revaluation of 1969 as a Case Study for Latent Anchoring

The Dutch Guilder (orange, right hand scale) and the Deutschmark (black, left hand scale), 1969

The Dutch Guilder (orange, right hand scale) and the Deutschmark (black, left hand scale), post Bretton Woods
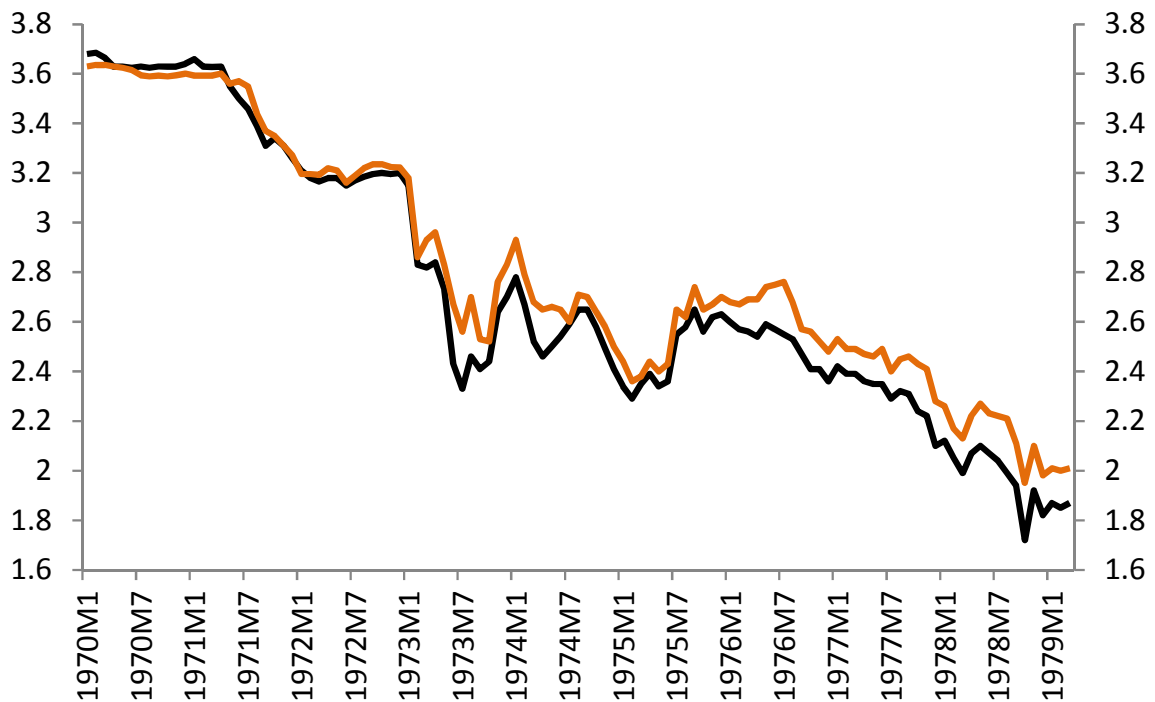
Figure A.6. Taylor Rule Coefficients and Confidence Bands: January 1999 – September 2014

Inflation

Unemployment gap
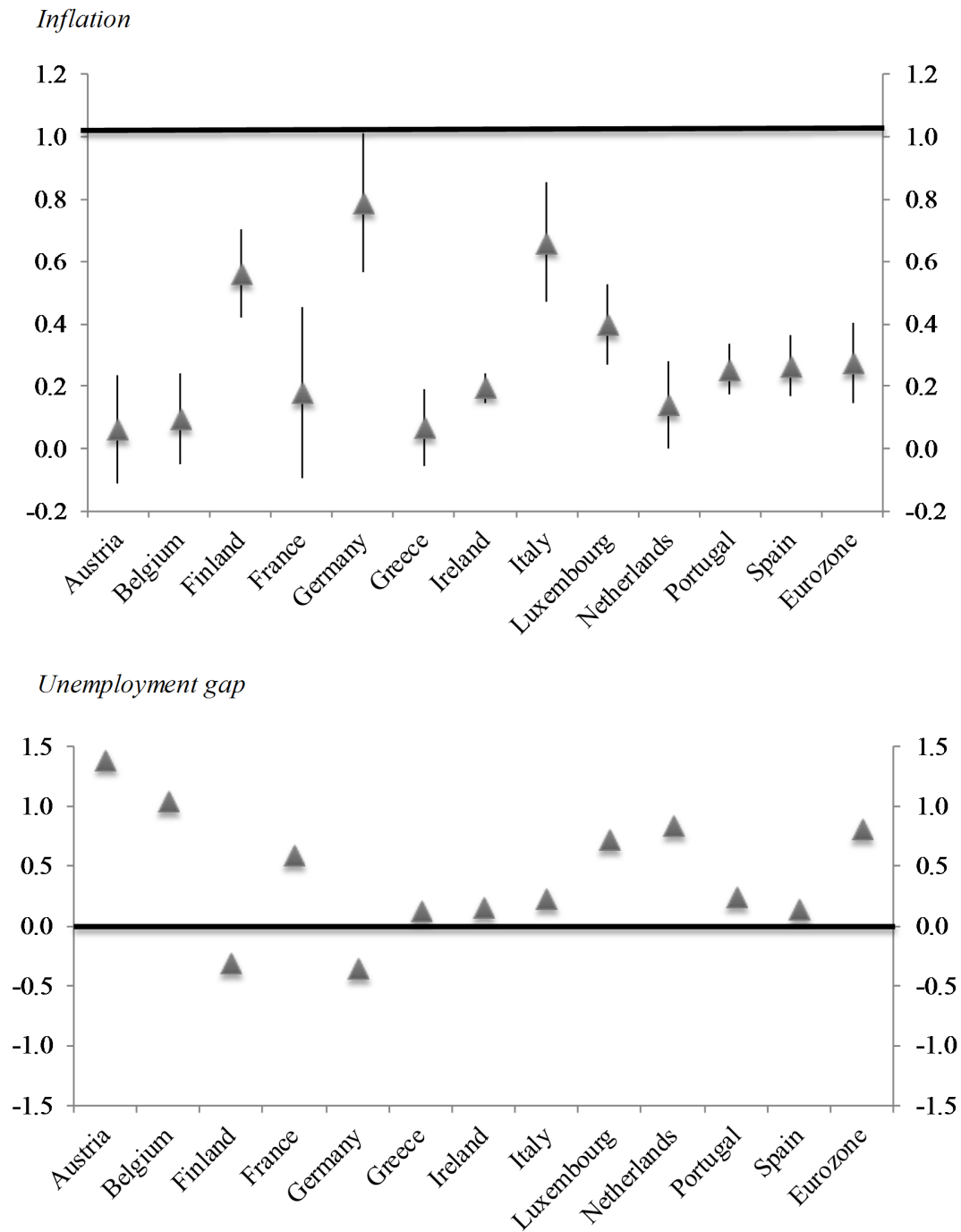
Sources: Eurostat, OECD, International Monetary Fund, and the authors.

Figure A.7(a). Taylor Rule versus Actual Policy Rate: France and Portugal, 1992 to 2015

France
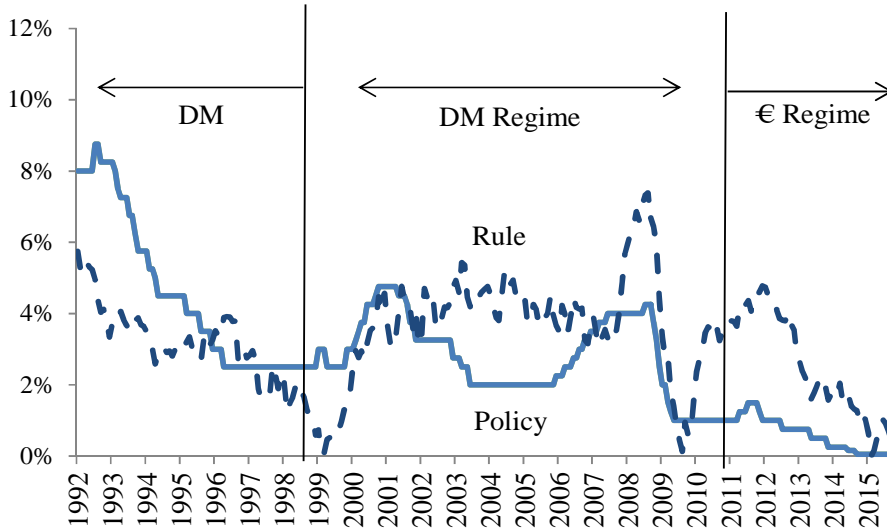
Portugal
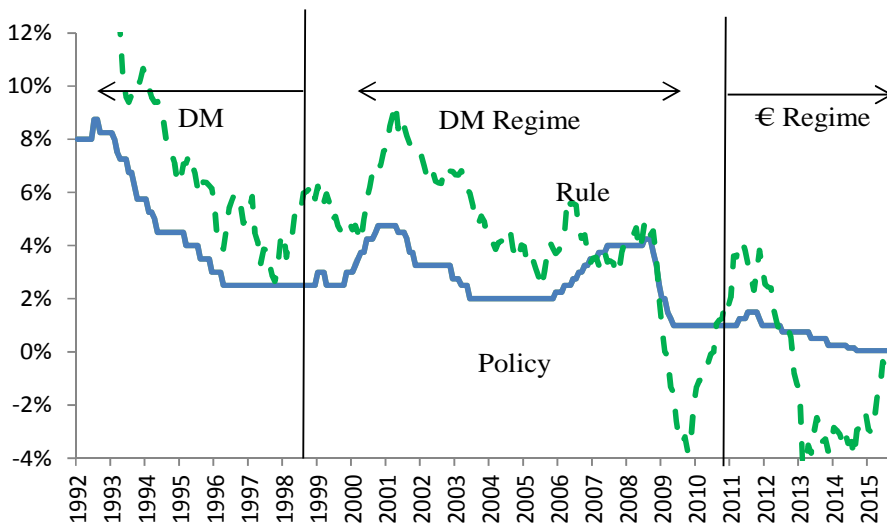
Sources: Eurostat, International Monetary Fund, OECD, and the authors.

Figure A.7(b). Taylor Rule versus Actual Policy Rate: Germany and Eurozone, 1992 to 2015

Germany
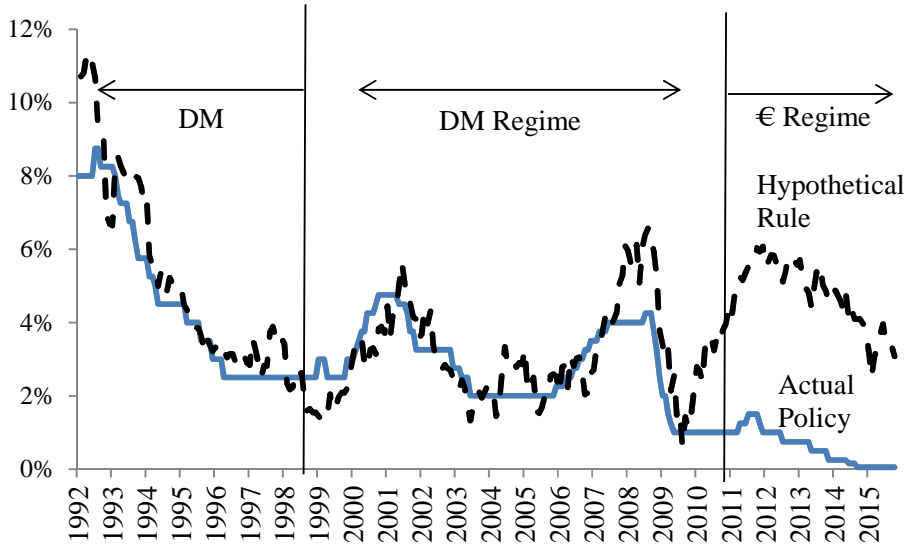
Eurozone
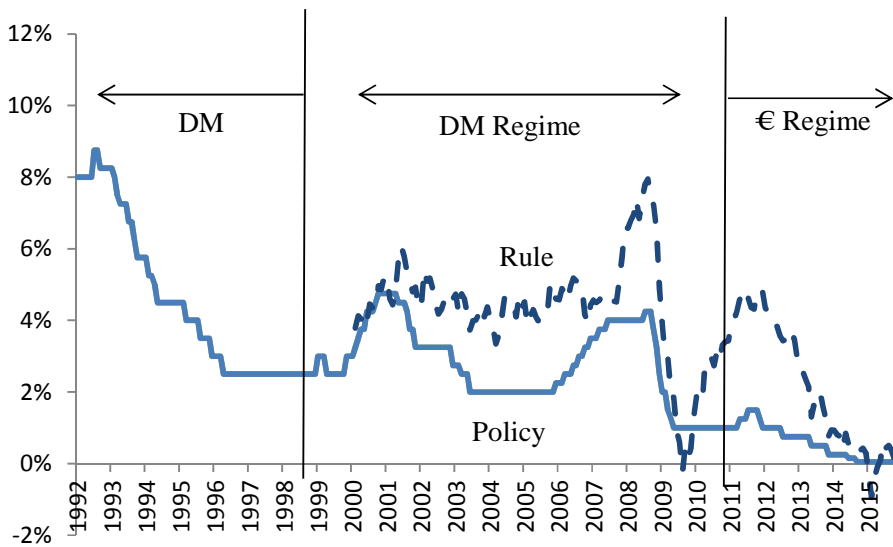
Sources: Eurostat, International Monetary Fund, OECD, and the authors.

Figure A.8. De Facto Exchange Rate Arrangements, Coarse Classification: 1950-2015, with Eurozone classified as freely floating. Share of (independent) countries in each group.

Groups 1 and 2: Less flexibility, primarily nominal exchange rate anchors
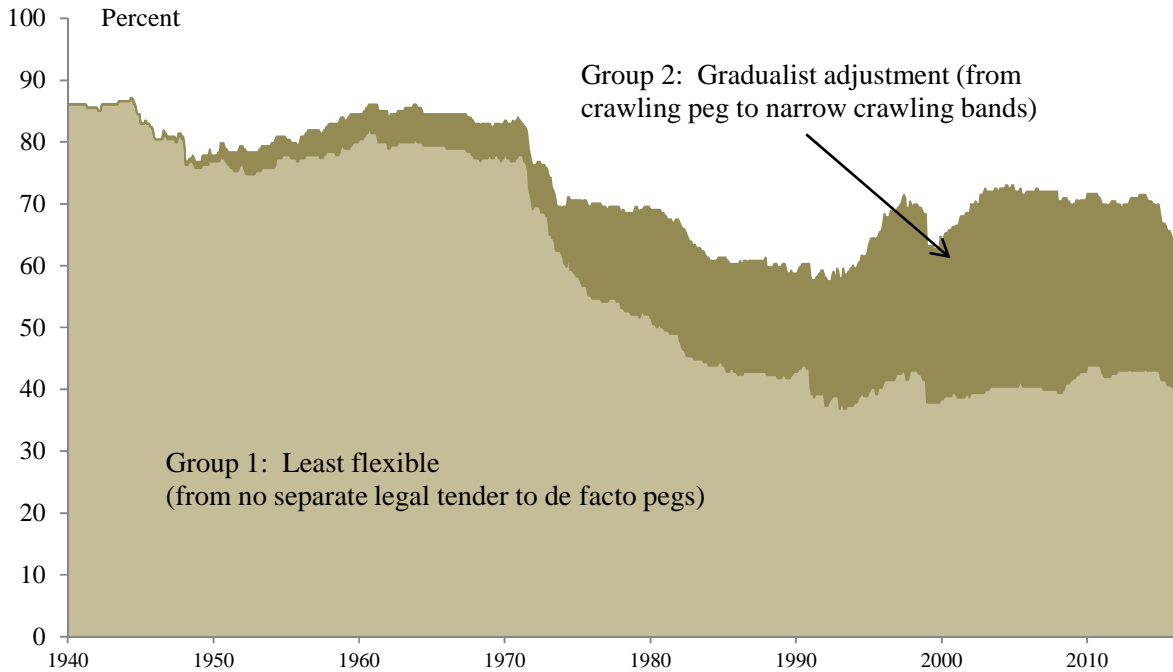
Groups 3 and 4: More flexible arrangements
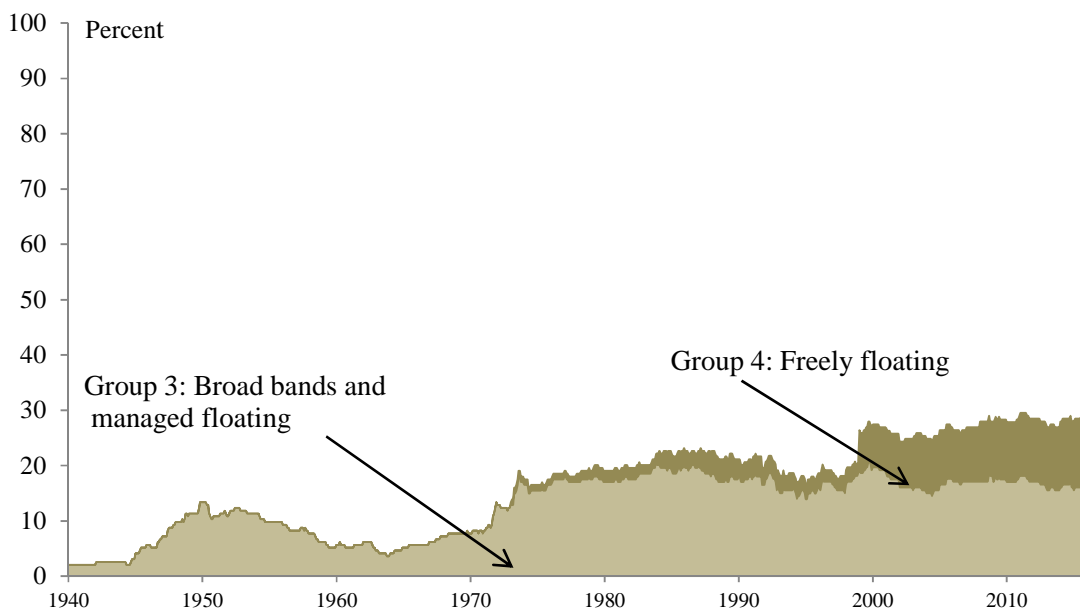
Figure A.9. Stress Testing Inflation Targeters' Anchor/Reference Currency Classification: Two Macroeconomic Events, 2008 and 2014
Lehman, September 2008
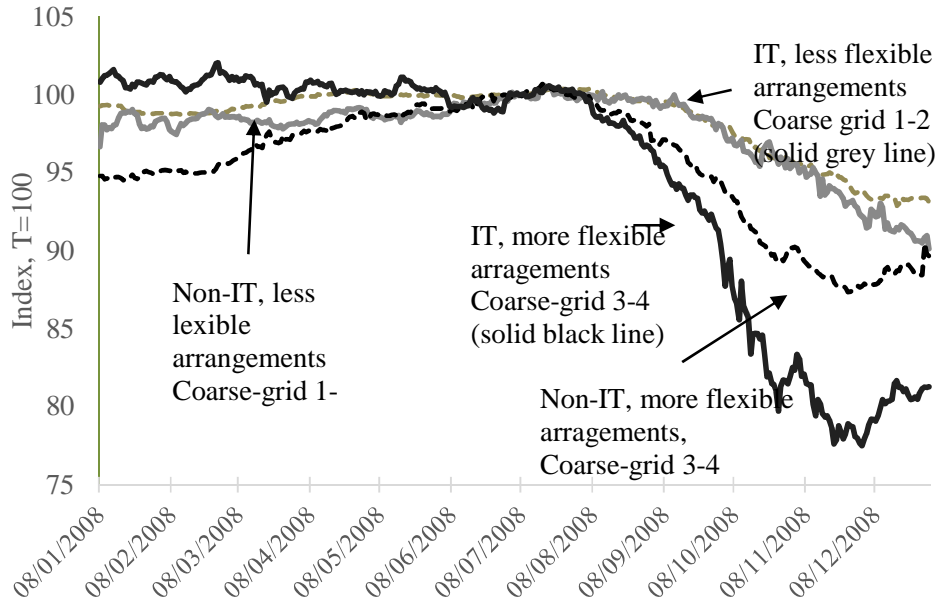
FOMC Minutes June 17-18, 2014
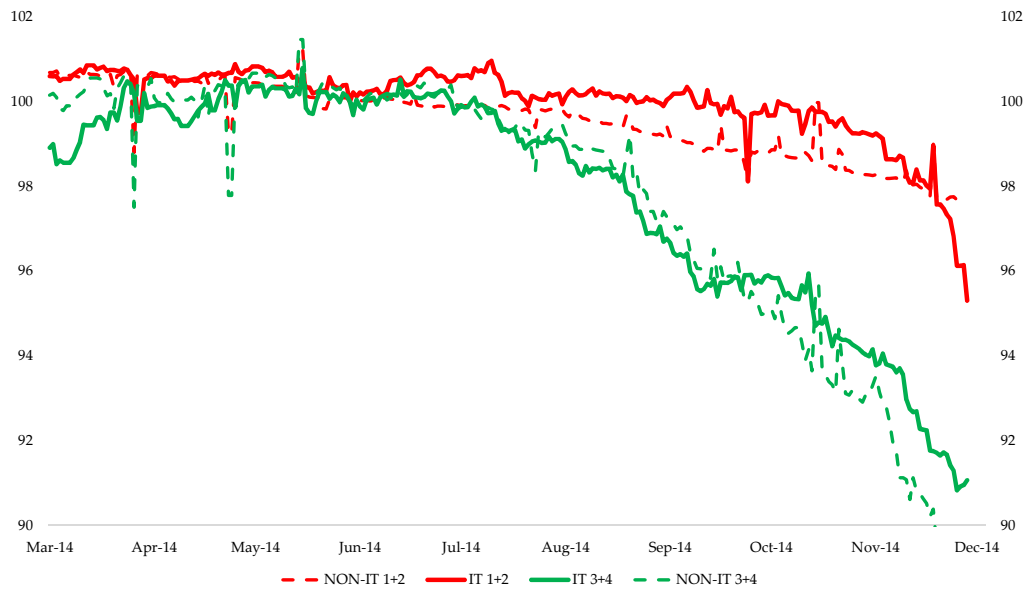
Sources: Bloomberg and the authors' calculations.

Figure A.10. The Armenian Dram-US Dollar Exchange Rate, 2007:1 to 2016:8
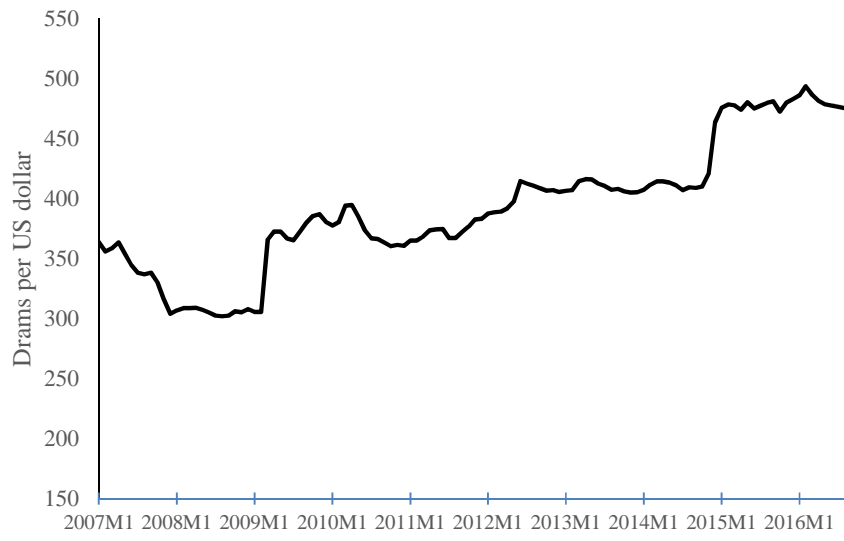
Source: International Monetary Fund, *International Financial Statistics.*

Figure A.11. Share of Countries with Dual, Multiple, of Parallel Exchange Rates (IRR, 1950-2016) and Chinn and Ito Capital Control Index (1970-2015): A comparison (unweighted)

Advanced economies
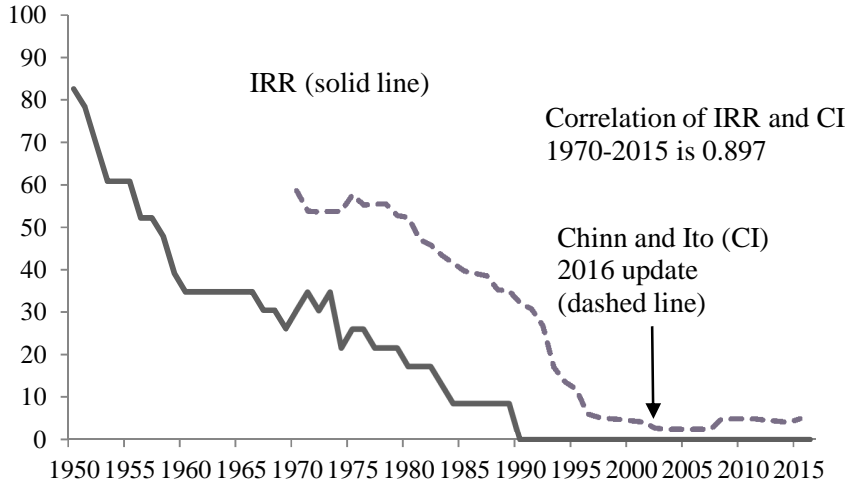
IRR (solid line)

Correlation of IRR and CI
1970-2015 is 0.897

Chinn and Ito (CI)
2016 update
(dashed line)

Sources: Chinn and Ito (2006 and 2008), and http://web.pdx.edu/~ito/Chinn-Ito_website.htm. International Monetary Fund International Financial Statistics and Exchange Arrangements and Exchange Restrictions, Reinhart and Rogoff (2004) sources cited therein, and the 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; including colonies and territories it totals 192.

Figure A.12. Share of Countries with Dual, Multiple, of Parallel Exchange Rates (IRR, 1950-2016) and Chinn and Ito Capital Control Index (1970-2015): A comparison (unweighted)

Percent

Chinn Ito (CI)
2016 update
179 countries
(dashed line)

Correlation of IRR and CI
1970-2015 is 0.96

IRR (solid line)
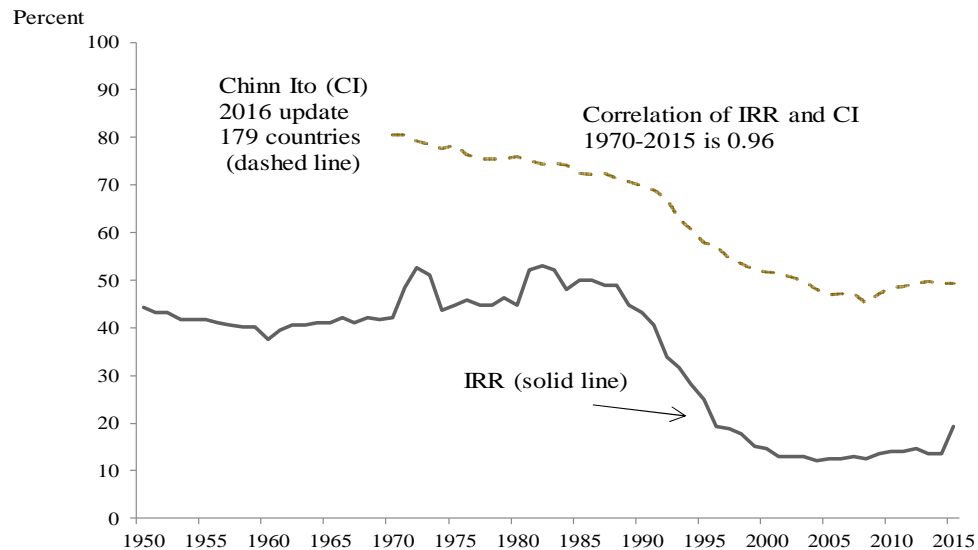
Sources: Chinn and Ito (2006 and 2008), and http://web.pdx.edu/~ito/Chinn-Ito_website.htm International Monetary Fund International Financial Statistics and Exchange Arrangements and Exchange Restrictions, Reinhart and Rogoff (2004) sources cited therein, and authors' calculations.

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; including colonies and territories it totals 192.

Figure A.13 Chinn and Ito Capital Control Index (1970-2015) All Countries and Small Island States: A comparison (unweighted)

Sources: Chinn and Ito (2006 and 2008), and http://web.pdx.edu/~ito/Chinn-Ito_website.htm, and authors' calculations.
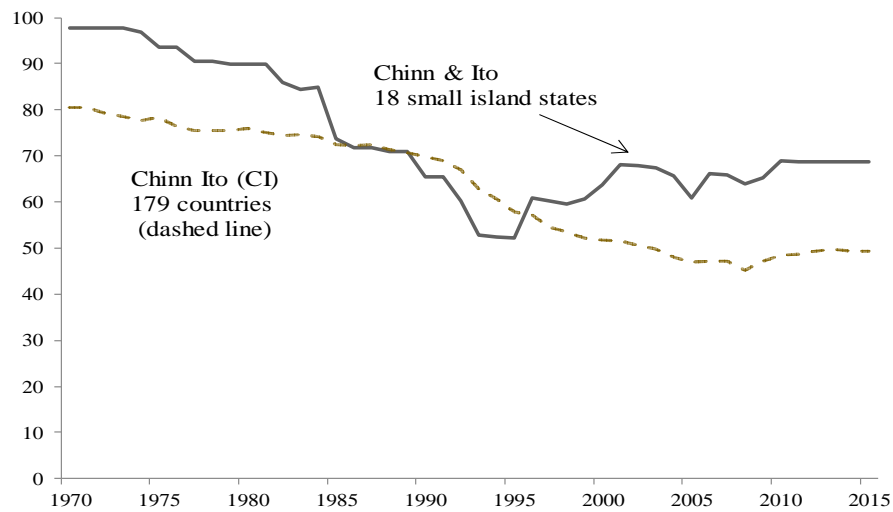
Table A.1. Fine and Coarse De Facto Exchange Rate Arrangement Classification

	The fine classification codes are:
1	• No separate legal tender or currency union
2	• Pre announced peg or currency board arrangement
3	• Pre announced horizontal band that is narrower than or equal to +/-2%
4	• De facto peg
5	• Pre announced crawling peg; de facto moving band narrower than or equal to +/-1%
6	• Pre announced crawling band that is narrower than or equal to +/-2% or de facto horizontal band that is narrower than or equal to +/-2%
7	• De facto crawling peg
8	• De facto crawling band that is narrower than or equal to +/-2%
9	• Pre announced crawling band that is wider than or equal to +/-2%
10	• De facto crawling band that is narrower than or equal to +/-5%
11	• Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)
12	• De facto moving band +/-5%/ Managed floating
13	• Freely floating
14	• Freely falling
15	• Dual market in which parallel market data is missing.

	The coarse classification codes are:
1	• No separate legal tender
1	• Pre announced peg or currency board arrangement
1	• Pre announced horizontal band that is narrower than or equal to +/-2%
1	• De facto peg
2	• Pre announced crawling peg
2	• Pre announced crawling band that is narrower than or equal to +/-2%
2	• De factor crawling peg
2	• De facto crawling band that is narrower than or equal to +/-2%
3	• Pre announced crawling band that is wider than or equal to +/-2%
3	• De facto crawling band that is narrower than or equal to +/-5%
3	• Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)
3	• Managed floating
4	• Freely floating
5	• Freely falling
6	• Dual market in which parallel market data is missing.

Table A.2. Dollar and Euro Reference Currency Indexes for Six Marginal Anchor Classifications 2016

Country	Dollar Reference Index	Euro Reference Index
Brazil	62%	4%
Chile	48%	9%
Colombia	71%	0%
Iceland	23%	19%
Mexico	48%	4%
Paraguay	70%	1%

Sources: Authors' calculations based on Gopinath (2015), World Bank intl. debt statistics and national central banks.

Table A.3. Trade Invoicing Patterns in 49 Countries, 1999:Q1-2014:Q4

	Share of countries (excluding home country) where invoicing in the anchor currency > 0			Average share (excluding home country): imports, exports, trade in the anchor currency			Summary of incidence and volume
	Imports	Exports	Trade	Imports	Exports	Trade	
US dollar	93.8	95.8	94.8	43.0	44.1	43.6	69.2
Euro	93.3	83.9	88.6	25.0	19.7	22.3	55.5
UK pound	18.8	14.6	16.7	0.3	0.4	0.4	8.5
Japanese yen	22.9	14.6	18.8	0.7	0.3	0.5	9.6

Source: Gopinath (2015) and authors' calculations.

Table A.4. Countries with Inflation Targets and Their De Facto Exchange Rate Arrangements

Country	Start date	Exchange rate arrangement
Armenia, Republic of	January 2006	+/-2% crawling band. US dollar.
Australia	June 1993	Freely floating
Brazil	June 1999	Managed floating. Freely floating 2003-2008.
Canada	February 1991	Freely floating
Chile	September 1999	Managed floating
Colombia	October 1999	Managed floating
Czech Republic	December 1997	+/-2% band. Euro
Ghana	May 2007	De facto crawling peg and later +/-2% band. Large devaluations and nearly freely falling. Managed floating since December 2010.
Guatemala	December 2005	Crawling peg
Hungary	June 2001	De facto crawling band +/- 2% since 2009. Euro. Broader band prior.
Iceland	March 2003	Managed floating. De facto band +/- 2% since 2010. Dollar-euro basket.
Indonesia	July 2005	De facto crawling band +/-2 to 5% range, depending on the sub-period considered. US dollar.
Israel	June 1997	Managed floating / Moving band +/-2%.
Korea, Republic of	April 1998	De facto moving band +/-2 to 5% range, depending on the sub-period considered.
Mexico	December 2001	Managed floating
New Zealand	December 1989	Managed floating
Norway	March 2001	De facto moving band +/-2%. Euro.
Peru	January 2002	De facto crawling band +/-2%. US dollar.
Philippines	January 2002	De facto crawling band +/-2%. US dollar.
Poland	December 1998	De facto crawling band +/-2 to 5% range, depending on the sub-period considered. Euro.
Romania	August 2005	De facto peg since 2012. Euro. De facto crawling band, 2-5%, depending on sub-period.
Serbia	January 2009	De facto crawling peg. Euro.
South Africa	February 2000	Freely floating
Sweden	December 1995	De facto moving band +/-2% since 2008. Euro.
Thailand	May 2000	De facto Moving band +/-2%. US dollar.
Turkey	January 2006	Managed floating. Freely Floating 2003-2009.
United Kingdom	October 1992	Freely floating since January 2009. Moving band, +/-2%. Euro earlier subsample.
Memorandum items:		
Number (share) of IT cases with more flexible arrangements (Coarse grid 3-4)	17 (63%)	Australia, Brazil, Canada, Chile, Colombia, Iceland, Israel, Korea, Mexico, New Zealand, Norway, South Africa, Sweden, Thailand, Turkey, United Kingdom, and Ghana more recently.
Number (share of IT cases with least flexible arrangements (Coarse grid 1-2)	10 (37%)	Armenia, Czech Republic, Guatemala, Hungary, Indonesia, Peru, Philippines, Poland, Romania, and Serbia

Table A.5. Estimated Taylor Rules for Inflation Targeting Countries
Unbalanced Panel 1990-2015

	Regression Results w. Country Fixed Effects Dependent Variable = Nominal Interest Rate				
	1	2	3	4	5
Inflation	.68***	.67***	.74***	.74***	.73***
	(.014)	(.015)	(.017)	(.017)	(.017)
Log(Exchange Rate)		2.24***	2.03***	1.99***	1.60***
		(.144)	(.147)	(.150)	(.150)
Unemployment				.10***	.07***
				(.017)	(.017)
Commodity Price Inflation					1.00
					(.628)
Inflation*"Fixed"			-.19***	-.19***	-.18***
			(.026)	(.026)	(.026)
Log(Exchange Rate)*"Fixed"			.34***	.36***	.34***
			(.053)	(.053)	(.054)
Commodity Price Inflation*"Fixed"					.22
					(.168)
R^2	0.32	0.35	0.36	0.36	0.36
N	4717	4666	4665	4574	4529

Table A.6. Survey of Capital Control Indexes

Study	Coverage	Sample	Control index basis
Grilli and Milesi Ferretti (1995)	61 countries	1966-1989	Based on AREAER, three components: current and capital account restrictions; unitary/not unitary exchange rate,
Quinn (1997)	63 countries (20 advanced and 43 developing)	1958-1997 Developing: 1958, 1973, 1982, 1988	Based on descriptions in AREAER regarding capital account restrictions. Attempts to interpret adherence/intensity of control from the summary.
Montiel and Reinhart (1999)	16 emerging markets	1990-1996	Intensity of capital account restrictions (0, 1, 2) Country chronologies and AREAER
Kaminsky and Schmukler (2003)	28 countries	1996-2005	Two capital account transactions
Minianne (2004)	34 countries	1983-2004	Post-1996 AREAER disaggregated breakdown of 13 capital account transactions, and extrapolated back to 1983
Chinn and Ito (2006 and 2008)	181 countries	Latest update: 1970-2015	Based on AREAER, four components: current and capital account restrictions; export surrender requirements; unitary/not unitary exchange rate,
Potchamanawong (2007)	26 emerging markets	1994-2004	AREAER revision on the post-1996 disaggregated categories and divided depending on whether the restrictions are place on inflows or outflows of capital
Ilzetzki, Reinhart and Rogoff (2016)	184 independent counties; 192 including colonies and territories	1946-2016, monthly and annual	De jure component: unitary/not unitary exchange rate based on AREAER 1950-2016 and chronologies for 1946-1949. De facto component: chronic (12-month) parallel market premia >10%
Fnrnandez et al (2016)	100 countries	1995-2013	Based on AREAER on the post-1996 disaggregated categories and divided depending on whether the restrictions are place on inflows or outflows of capital

Table A.7. Country Coverage

Country	Official exchange rate	Parallel market exchange rate
Albania	1954:12-2001:12	1954:12-1998:12
Algeria	1946:1-2001:12	1955:1-1998:12
Argentina	1946:1-2001:12	1946:1-1998:12
Armenia	1992:4-2001:12	n.a.
Australia	1946:1-2001:12	1946:1-1998:12
Austria	1946:1-2001:12	1946:1-1998:12
Azerbaijan	1992:12-2001:12	n.a.
Belarus	1992:1-2001:12	1991:8-1998:12
Belgium	1946:1-2001:12	1946:1-1998:12
Benin	1946:1-2001:12	1970:7-1998:12
Bolivia	1946:1-2001:12	1948:1-1998:12
Bosnia-Herzegovina	1997:1-2001:12	n.a.
Botswana	1946:1-2001:12	1989:1-1998:12
Brazil	1946:1-2001:12	1946:1-1998:12
Bulgaria	1946:7-2001:12	1946:7-1998:12
Burkina Faso	1946:1-2001:12	1970:7-1998:12
Burundi	1946:1-2001:12	1983:1-1998:12
Cameroon	1946:1-2001:12	1970:7-1998:12
Canada	1946:1-2001:12	1947:1-1998:12
Central African Republic	1946:1-2001:12	1970:7-1998:12
Chad	1946:1-2001:12	1970:7-1998:12
Chile	1946:1-2001:12	1948:1-1998:12
China	1951:1-2001:12	1949:9-1998:12
Colombia	1946:1-2001:12	1952:1-1998:12
Congo, Democratic Republic of	1946:1-2001:12	1962:1-1996:12
Congo, Republic of	1946:1-2001:12	1970:7-1998:12
Costa Rica	1946:1-2001:12	1948:1-1998:12
Cote D'Ivoire	1946:1-2001:12	1970:7-1998:12
Croatia	1992:12-2001:12	1991:12-1998:12
Cyprus	1955:1-2001:12	1970:7-1998:12
Czech Republic	1946:1-2001:12	1946:1-1998:12
Denmark	1946:1-2001:12	1946:1-1998:12
Dominican Republic	1946:1-2001:12	1960:3-1998:12
Ecuador	1946:1-2001:12	1947:1-1998:12
Egypt	1946:1-2001:12	1946:1-1998:12
El Salvador	1946:1-2001:12	1961:1-1998:12
Equatorial Guinea	1946:1-2001:12	1970:7-1998:12
Estonia	1992:62001:12	1991:8-1998:12
Finland	1946:1-2001:12	1946:1-1998:12
France	1946:1-2001:12	1946:1-1998:12
Gabon	1946:1-2001:12	1970:7-1998:12
Gambia	1946:1- 2001:12	1985:1-1998:12
Georgia	1995:10-2001:12	n.a.
Germany	1946:1-2001:12	1946:1-1998:12
Ghana	1946:1- 2001:12	1962:3-1998:12
Greece	1946:1-2001:12	1946:1-1998:12

Table A.7. Country Coverage (continued)

Country	Official exchange rate	Parallel market exchange rate
Guatemala	1946:1-2001:12	1985:1-1998:12
Guinea	1949:1-2001:12	1970:7-1998:12
Guinea-Bissau	1946:1-2001:12	1970:7-1998:12
Guyana	1946:1-2001:12	1985:1-1998:12
Haiti	1946:1-2001:12	1985:1-1998:12
Honduras	1946:1-2001:12	1985:1-1998:12
Hong Kong	1946:1-2001:12	1946:1-1998:12
Hungary	1946:8-2001:12	1946:8-1998:12
Iceland	1946:1-2001:12	1949:1-1998:12
India	1946:1-2001:12	1946:1-1998:12
Indonesia	1946:1-2001:12	1947:1-1998:12
Iran	1946:1-2001:12	1947:1-1998:12
Iraq	1946:1-2001:12	1947:2-1998:12
Ireland	1946:1-2001:12	1946:1-1998:12
Israel	1948:5-2001:12	1946:1-1998:12
Italy	1946:3-2001:12	1946:1-1998:12
Jamaica	1946:1-2001:12	1974:1-1998:12
Japan	1946:3-2001:12	1946:3-1998:12
Jordan	1950:7-2001:12	1955:1-1998:12
Kazakhstan	1993:11-2001:12	n.a.
Kenya	1946:12- 2001:12	1966:12-1998:12
Kuwait	1949:9-2001:12	1970:7-1998:12
Kyrgyz Republic	1993:5-2001:12	n.a.
Laos	1946:1-2001:12	1959:1-1998:12
Latvia	1992:2-2001:12	1991:8-1998:12
Lebanon	1946:1- 2001:12	1946:1-1998:12
Lesotho	1946:1-2001:12	1985:1-1998:12
Liberia	1946:1-2001:12	1989:1-1998:12
Libyan Arab Republic	1952:1-2001:12	1955:1-1998:12
Lithuania	1992:1-2001:12	1991:9-1998:12
Luxembourg	1946:1-2001:12	1946:1-1998:12
Macedonia	1993:12-2001:12	1997:6-1998:12
Madagascar	1946:1- 2001:12	1985:1-1998:12
Malawi	1946:1 2001:12	1970:7-1998:12
Malaysia	1946:1-2001:12	1946:1-1998:12
Mali	1946:1-2001:12	1970:7-1998:12
Malta	1946:1-2001:12	1985:1-1998:12
Mauritania	1946:1- 2001:12	1974:1-1998:12
Mauritius	1946:1-2001:12	1985:1-1998:12
Mexico	1946:1-2001:12	1947:1-1998:12
Moldova	1991:12-2001:12	n.a.
Mongolia	1970:3-2001:12	1970:3-1998:12
Morocco	1956:10-2001:12	1959:1-1998:12
Myanmar	1946:1-2001:12	1955:1-1998:12
Nepal	1955:12-2001:12	1970:7-1998:12
Netherlands	1946:1-2001:12	1946:1-1998:12
New Zealand	1946:1-2001:12	1948:1-1998:12
Nicaragua	1946:1-2001:12	1947:1-1998:12
Niger	1946:1-2001:12	1970:7-1998:12
Nigeria	1946:1-2001:12	1970:7-1998:12

Table A.7. Country Coverage (concluded)

Country	Official exchange rate	Parallel market exchange rate
Norway	1946:1-2001:12	1946:1-1998:12
Pakistan	1946:1-2001:12	1948:4-1998:12
Panama	1946:1-2001:12	n.a.
Paraguay	1946:1-2001:12	1951:3-1998:12
Peru	1946:1-2001:12	1946:1-1998:12
Philippines	1946:1-2001:12	1949:8-1998:12
Poland	1946:1-2001:12	1946:1-1998:12
Portugal	1946:1-2001:12	1946:1-1998:12
Romania	1957:1-2001:12	1946:7-1998:12
Russian Federation	1992:6-2001:12	1946:1-1998:12
Saudi Arabia	1952:10-2001:12	1959:12-1998:12
Senegal	1946:1-2001:12	1970:7-1998:12
Singapore	1946:4-2001:12	1973:5-1998:12
Slovak Republic	1993:1-2001:12	1993:1-1998:12
Slovenia	1991:12-2001:12	n.a.
South Africa	1946:1-2001:12	1946:1-1998:12
South Korea	1946:1-2001:12	1946:1-1998:12
Spain	1946:1- 2001:12	1946:1-1998:12
Sri Lanka	1946:1-2001:12	1956:1-1998:12
Suriname	1949:9-2001:12	1970:7-1998:12
Swaziland	1946:1-2001:12	1985:1-1998:12
Sweden	1946:1-2001:12	1946:6-1998:12
Switzerland	1946:1-2001:12	1946:1-1998:12
Syrian Arab Republic	1947:7-2001:12	1970:7-1998:12
Tajikistan	1992:1-2001:12	n.a.
Tanzania	1946:12- 2001:12	1970:7-1998:12
Thailand	1946:5-2001:12	1948:1-1998:12
Togo	1946:1-2001:12	1970:7-1998:12
Tunisia	1956:3-2001:12	1960:1-1998:12
Turkey	1946:1- 2001:12	1946:1-1998:12
Turkmenistan	1993:11-2001:12	n.a.
Uganda	1946:12- 2001:12	1970:7-1998:12
Ukraine	1992:12-2001:12	1991:8-1998:12
United Kingdom	1946:1-2001:12	1946:1-1998:12
United States	1946:1-2001:12	n.a.
Uruguay	1946:12-2001:12	1946:1-1998:12
Venezuela	1946:1-2001:12	1960:11-1998:12
Zambia	1946:12- 2001:12	1970:7-1998:12
Zimbabwe	1946:12- 2001:12	1970:7-1998:12

Table A.8. Data Sources

Variable	Source
Official exchange rate, 1946-1956	Pick's Currency Yearbook and Pick's World Currency Report, various issues.
Official exchange rate, 1957-2001	IMF, International Financial Statistics
Parallel Market exchange rate 1946-1980	Pick's Currency Yearbook, Pick's Black Market Yearbooks, and Pick's World Currency Report, various issues.
Parallel Market exchange rate 1980-1998	World Currency Yearbook, various issues.
Consumer price index, 1957-2001	IMF, International Financial Statistics