China's Dominance Hypothesis and the Emergence of a Tri-polar Global Currency System

Marcel Fratzscher and Arnaud Mehl *

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Abstract

This paper assesses whether the international monetary system is already tri-polar and centred around the US dollar, the euro and the Chinese renminbi (RMB). It focuses on what we call China's "dominance hypothesis", i.e. whether the renminbi is already the dominant currency in Asia, exerting a large influence on exchange rate and monetary policies in the region, a direct reference to the old "German dominance hypothesis" which ascribed to the German mark a dominant role in Europe in the 1980s-1990s. Using a global factor model of exchange rates and a complementary event study, we find solid evidence that the RMB has become a key driver of currency movements in emerging Asia since the mid-2000s, and even more so since the global financial crisis. These results are consistent with China's dominance hypothesis and with the view that the international monetary system is already tri-polar. However, we also find that China's currency movements are to some extent affected by those in the rest of Asia.

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* European Central Bank, Kaiserstrasse 29, 60311 Frankfurt am Main, Germany. Fax: +49 69 1344 7666. Email: marcel.fratzscher@ecb.int and arnaud.mehl@ecb.int. We are grateful to participants at the Tsinghua University – Columbia University conference in Beijing, 27-28 June 2011, for helpful discussions and suggestions. The views expressed in this paper are those of the authors and do not necessarily reflect those of the European Central Bank or the Eurosystem.

1. Introduction

The 2007-2010 global financial crisis has brought the reform of the international monetary system back to the forefront of the international policy debate. Some G20 Leaders, notably from emerging economies, are questioning the configuration of the current system, which is based on a single currency, the US dollar, as the global reference currency, and the euro, as a more regional currency.[1] Not only was the United States at the origin of the financial crisis, and Europe the first continent to be engulfed in subsequent sovereign debt crises, but many link the global financial crisis to the dominant role of the US dollar, the "exorbitant privilege" it gives to the United States (see e.g. Gourinchas and Rey, 2007a and 2007b; Curcuru, Dvorak and Warnock, 2008), to the lack of policy discipline it encourages, and to the negative externalities it creates for the global economy.

A move to a multi-polar international monetary system is deemed by many as a distant prospect (Dobson and Masson, 2009; Cheung, Ma and McCauley, 2010; Kenen, 2011), but others expect it to unfold over the next two decades as a natural outcome of the emergence of Asia as the world economy's powerhouse (see e.g. Eichengreen, 2009 and 2010; Angeloni et al. 2011). Over those years, as the story goes, the Chinese renminbi (RMB) may emerge as a truly global currency, along with the euro, while the US dollar may lose its dominant status. It is therefore unsurprising that the reform of the international monetary system has become one of the main priorities of the G20's policy agenda, with some its members pushing actively for the emergence of a more "diversified" international monetary system (Zhou, 2009; BRIC, 2010) that would give a greater role to the RMB or to the Special Drawing Right (SDR).

This paper assesses to what extent a tri-polar international monetary system – including the US dollar, the euro and the RMB– has *already* emerged along with the implications of this emergence for the global economy and international financial markets. In so doing, the paper focuses on what we call "China's dominance hypothesis", i.e. whether the RMB is already the dominant currency in Asia, exerting a large influence on exchange rate and monetary policies in the region, as much as China exerts a large influence on its neighbours through the well-known Asian production chain or Asian supply chain.[2]

Our focus on this hypothesis is rooted in the fact that there is, somewhat paradoxically, a strong sense of *déja vu* in today's debate on the future of the international monetary system. This debate is remarkably reminiscent of a much older one, which took place in Europe in the 1980s-90s, about the so-called "German dominance hypothesis". The parallels that can be drawn between discussions at that time and current ones are indeed striking.

[1] The euro's international role, notably as a reserve or anchoring currency, is indeed most evident in the euro area's neighbouring regions; yet the euro has also global outreach in some respects, in bonds and FX markets, for instance (see ECB, 2011).

[2] See e.g. Feenstra and Wei (2009), Koopman, Wang and Wei (2008) or Hummels, Ishii and Yi (2001).

The international monetary system was back then already dominated by the US dollar. *De jure*, the European currencies were all linked to each other under the European Monetary System (EMS), through a network of bilateral pegs vis-à-vis the ECU (a weighted average of the participating currencies) at fixed, but adjustable, exchange rates agreed jointly. *De facto*, the system was markedly asymmetric (Giavazzi et al. 1986), with Germany's Deutsche Mark playing a dominant role, and other European currencies shadowing the German currency.[3] The proponents of the "German dominance hypothesis" (e.g. Giavazzi and Giovannini, 1987; Giavazzi and Pagano, 1988; Gros and Thygesen, 1988; Russo and Tullio, 1988; von Hagen and Frattianni, 1990) saw this as a rather coercive arrangement, which forced the other members to follow the disciplinary, low-inflation monetary policy of the Bundesbank. Allegedly, reducing Germany's dominance through a sharing of its monetary supremacy was, in the view of several European countries, a prime motivation to create the euro (Marsh, 2009).[4]

Empirical tests of this hypothesis produced somewhat more nuanced results, however (e.g. de Grauwe, 1989; Cohen and Wyplosz, 1989; von Hagen and Frattianni, 1990; Frattianni and von Hagen, 1990). A result of many studies was that Germany's effect on other EMS countries was stronger, rather than the reverse effects on Germany. These countries' monetary and exchange rate policies were therefore affected *both* by Germany and some of the EMS countries themselves, while Germany's monetary and exchange rate policy remained independent. Strictly speaking, this rather points to a special role of Germany within the EMS than to its dominance per se. Typically, these studies used money market interest rates or money growth data as well as parameter restriction tests implied by the German dominance hypothesis and/or Granger causality tests to assess whether German interest rates or money growth led interest rates and money growth elsewhere in Europe (see e.g. von Hagen and Frattianni, 1990).[5]

There are important similarities with Asia's situation today. *De jure*, emerging Asian economies peg their currencies to the US dollar, like Europeans did to the ECU, in what has been coined a "Revived Bretton Woods system" (Dooley, Folkerts-Landau and Garber, 2004) or an "East Asian dollar standard" (McKinnon and Schnabl, 2004). *De facto*, Asian economies are tightly dependant on China, by far the region's largest economy, as European economies were on Germany. There are

[3] The 1992-93 EMS crises, which forced Italy, Portugal, Spain, Sweden and the UK out of the system, made these asymmetries particularly apparent when Germany –hit by the unification shock– tightened monetary policy while the rest of Europe was still in recession. This episode paved the way for the creation of the euro by the end of the decade.

[4] For instance, Marsh (2009, p.113) notes that "in the second half of the 1980s France realised it needed political as well as technical measures to restrain Germany's monetary predominance", which led to early thinking about creating a single currency. He further quotes (p. 115) the late President Mitterrand as saying in 1988 that "Germany has recovered its economic power but refuses to share it".

[5] Some of the subsequent literature used more sophisticated techniques to gauge asymmetries in the ERM, such as non-linear forecasts when performing causality tests, with broadly similar results (e.g. Bajo-Rubio et al. 2001).

ongoing plans to strengthen monetary and financial cooperation within Asia, such as through the Chiang Mai Initiative, a regional network of currency swaps to be activated in times of crisis. The mesh of real and financial linkages woven under the Asian production chain encourages Asian economies to maintain their external competitiveness relative to China and currency stability relative to the RMB. In turn, this suggests that China's exchange rate and monetary policy, together with the reform measures taken since mid-2005 to increase exchange rate flexibility and the international role of the RMB, is likely to exert a significant –if not dominant– influence on exchange rate and monetary policies elsewhere in emerging Asia.

By no means does this necessarily imply that the RMB's influence in the region is or will be stronger than that of the US dollar. For instance, for Europe in the 1980s, it was found that while German interest rate movements had the strongest effect on interest rates of all countries in the continent, US interest rates had also retained a significant effect. The concept of a country's dominance is a relative one, and it can still exist alongside that of another country that also exerts strong influence. This may be the case of the RMB indeed. While it may not dominate the US dollar's impact on Asian economies, it may nevertheless exert a large and rapidly growing impact on the region.

As noticeable as the parallels between Europe yesterday and Asia today may be, the China dominance hypothesis cannot be tested in a similar fashion as the German dominance hypothesis. One needs first to take into account an identification challenge that arises from the RMB's *de facto* peg to the US dollar (or, to be more precise, snail-paced crawling peg between mid-2005 and mid-2008, as well as since mid-2010). Moreover, short-term interest rate or money aggregate co-movements, which were used in the German dominance hypothesis literature, are unlikely to be very informative about China's influence on the rest of Asia. China's money, credit and other financial markets remain heavily regulated, segmented or repressed. The People's Bank of China relies still largely on administrative measures and reserve requirements, aside from price-based measures. China's capital account remains largely closed, suggesting that domestic monetary and financial conditions do not cross borders easily. Lastly, and perhaps most importantly, as for most emerging markets which exhibit a fear of floating, China's main monetary policy tool is the anchoring of its currency: monetary policy is the exchange rate policy (Calvo and Reinhart, 2002).

To overcome these challenges, we test China's dominance hypothesis by following two complementary empirical approaches. In a first step, we carry out an unconditional analysis based on a three-factor model of exchange rates, comprising a US dollar factor, a euro factor and a regional currency factor for a set of 48 currencies of advanced and emerging economies. Through the evolution of the regional FX factor, we test whether other regional currencies have grown in importance in driving domestic exchange rate changes over time, and whether the regional factor has become particularly important in emerging Asia. We then link the regional factor in Asia to movements in the renminbi by means of Granger causality tests. In a second

step, we conduct a conditional analysis based on shock-augmented factor model. In this analysis, we investigate the FX market reaction to official statements by Chinese authorities on exchange rate and reserve policy to identify the impact of these statements on global exchange rate constellations, while still controlling for the three FX factors of the first approach. The key strength of this complementary approach is that it allows for a clean identification of specific and exogenous RMB shocks and to measure how they affect exchange rates in the rest of Asia and beyond.

Overall, we find evidence in line with China's dominance hypothesis, albeit with some qualifications, which suggests that the international monetary system is *already* on the verge of being tri-polar. We identify a statistically significant regional FX factor in emerging Asia's exchange rate dynamics, stronger than in any other regions of the world, a factor that has risen markedly in magnitude since China started its exchange rate reforms in 2005. Moreover, this Asian regional FX factor is found to be mainly driven by the RMB. There is, however, also significant evidence that causality is bi-directional and that the movements in Asia's regional factor also steer those of the renminbi to some extent. China's impact on other emerging Asian countries' exchange rate policy is therefore increasingly strong and significant, but the region, taken together, still has an impact on China's exchange rate policy. Strictly speaking, this points to an important role of China in the region, but not to exclusive dominance per se.

The results of the complementary event-study consistently point to a much greater impact of Chinese officials' statements on FX configurations both globally and in Asia since 2005, and even more so since the global financial crisis of 2007-08. We estimate that such RMB shocks lead to an appreciation of emerging Asian currencies of 0.2% on average vis-à-vis the US dollar, suggesting that Asian policy-makers may have been paying much greater attention to developments in the renminbi.[6] The largest effect of those statements, however, is on currencies that rely on the euro as an anchor, possibly due to market expectations of diversification of China's reserves out of the US dollar into the euro, along with that of a possibly declining dominance of the US currency in the international monetary system.

Alongside the literature on the future of the international monetary system and on the "German dominance hypothesis", our paper is also linked to a nascent literature on the role of the renminbi as an anchor currency in Asia. Chen et al. (2009) and Ito (2010) apply the standard Frankel-Wei methodology (Frankel and Wei, 1994 and 2008) to find evidence that the renminbi plays a role in other East Asian currencies' *de facto* baskets since 2005, although the weight of the US dollar in this basket remains by far the largest. Chow (2011), by contrast, finds no evidence for such an RMB role.

[6] As a point of clarification, there is a fine but important distinction between whether policy-makers with managed exchange rate regimes allow markets to move their currencies in response to RMB policy announcements, or whether they actively pursue such movements. A case in point for the latter is the announcement by Malaysian authorities within days of China's RMB policy change in 2005 to appreciate the ringgit, explaining this decision by China's FX move.

The rest of the paper is structured as follows. Section 2 presents our estimation methodology and hypotheses. Section 3 reviews the empirical results. Section 4 concludes and draws policy implications.

2. Estimation and hypotheses

This section describes the empirical methodology underlying the two complementary approaches, as well as outlines the data sources and construction.

2.1 Unconditional analysis

The starting point of our analysis is a three-factor global model of foreign exchange returns, in the spirit of the methodology proposed by Frankel and Wei (1994 and 2008). The three factors include a US dollar factor, a euro factor (i.e. the two main currencies of the international monetary system) as well as a regional currency factor. In its most general specification, the model is written as

$$\Delta s_{i,t} = \alpha_i + \beta_{i,t}^{USD} \Delta s_t^{USD} + \beta_{i,t}^{EUR} \Delta s_t^{EUR} + \beta_{i,t}^{REG} \Delta s_{i,t}^{REG} + \boldsymbol{\delta}_{i,t} \mathbf{X}_{\mathbf{i,t}} + \varepsilon_{i,t} \qquad (1)$$

where $s_{i,t}$ is the log of the exchange rate of country i vis-à-vis the SDR at time t; $\mathbf{X}$ a vector of control variables; the α_i country fixed effects; the various βs and δs (country- and time-varying) parameters; ε the n.i.d. residuals; and where the superscripts USD, EUR and REG denote the US dollar, euro and regional FX factors, respectively. As is common in the literature using the Frankel-Wei methodology, we use exchange rates vis-à-vis the SDR in order to be able to estimate the importance of the US dollar for local currencies i. In extensions to this benchmark specification, we will also use bilateral US dollar exchange rates, which allows gauging the economic magnitude of the effects of movements in the regional FX factor.

Our dataset includes daily exchange rate data for 48 advanced and emerging economies over the period 1 January 1997 (i.e. just before the Asian crisis) to 28 January 2011 (see the full list of countries in Table 1). We source the data from Bloomberg and use exchange rate quotes as available at 16:00 p.m. GMT (i.e. the London fixing time, a standard industry benchmark; see Melvin and Prins, 2010). We use 2-day non-overlapping exchange rate returns to account for the fact that trading zones in Asia and the Pacific, Europe and the Western Hemisphere do not overlap (see e.g. Ehrmann, Fratzscher and Rigobon, forthcoming) and to avoid creating spurious MA(1) residual correlation if 2-day returns were overlapping.[7]

[7] Using 2-day returns makes no meaningful difference for the estimation of the factor model for exchange rates, as all currency values are taking at the same time, i.e. 16:00 p.m. GMT, i.e. London fixing time. However, in the robustness checks for other asset markets, such as short-term interest rates,

Tables 1-2

The regional factor is constructed as a GDP-weighted average of the currencies of a particular region, excluding country *i* itself to ensure that it is not on both sides of Eq. (1).[8] We group countries in six regions: advanced economies (the G10 floating and most liquid currencies, as well as Denmark and Iceland), emerging Asia, Latin America, the Gulf Cooperation Council (GCC), emerging Europe, and Middle-East and Northern Africa (MENA, see Table 1 for more details).

To ensure that the factors are exogenous and to allow for their interpretability, we apply the following three identification conditions: we consider the US factor as exogenous, reflecting the US dollar's dominant role in the international monetary system; we orthogonalize the euro factor with respect to the US dollar factor by regressing the former on the latter and taking the residuals as the euro factor; and we orthogonalize the regional factor with respect to both the US and euro factors. This latter condition is especially important when considering emerging Asia, where most countries manage their currencies vis-à-vis the US dollar, as we want to make sure to identify movements in the region's currencies that are not solely due to US dollar movements. In sum, we have $s_t^{EUR} \perp s_t^{USD}$ and $s_t^{REG} \perp s_t^{USD}, s_t^{EUR}$. Figure 1 and Figure 2 show the US factor, the euro factor as well as the regional factor (for each of our six regions) in levels (i.e. not in returns as used in the model estimations) to facilitate visual interpretation.

Figures 1-2

Table 2 reports pair-wise correlations between the three factors *prior* to orthogonalization, when pooling all the data for the regional factor as well as broken down by region. The rather low correlations (below 0.2 in absolute terms), and even negative one between the US and euro factors suggest that, even after orthogonalization, a significant share of euro factor-related and regional factor-related information remains to explain global FX configuration dynamics. There is some heterogeneity across regions, however. For instance, the US dollar factor is much more correlated with Asia and the GCC's regional factors (in the order of 0.5-0.7), in line with the US dollar pegs prevalent in many countries of these regions. The euro factor is strongly correlated with the advanced economies' regional factor (which likely reflects the inclusion of Iceland, Sweden and Denmark in the region, which all manage their currency heavily relative to the euro).

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which are available only at local closing times, the issue of non-overlapping trading times becomes relevant.

[8] Strictly speaking, we would therefore need to denote the regional return $s_{i,t}^{REG\backslash i}$ but we use the shortcut for notational ease. We prefer to use fixed weights (calculated as full sample period averages) rather than time-varying ones to ensure that the factor loading estimates reflect only currency movements and not changes in weights.

Our test of China's dominance hypothesis relies on two nested hypotheses. We first test for the existence of a regional FX factor in emerging Asia and whether it has grown in economic importance after the onset of China's exchange rate reforms in 2005, i.e. our null hypotheses are

$$H_0 : \hat{\beta}_i^{REG} = 0 \text{ and } H_0' : \hat{\beta}_{i|t>2005}^{REG} \leq \hat{\beta}_{i|t\leq 2005}^{REG} \tag{1bis}$$

for $i \in$ emerging Asia. Second, and conditional on this, we test whether Asia's regional factor (excluding the renminbi) is driven by movements in the renminbi and not vice-versa, by means of Granger causality tests, i.e. in the VAR model

$$\begin{cases} \Delta s_t^{REG\setminus RMB} = \sum_{k=1}^{n} \beta_k^1 \Delta s_{t-k}^{REG\setminus RMB} + \sum_{k=1}^{n} \rho_k^1 \Delta s_{t-k}^{RMB} + \nu_t^1 \\ \Delta s_t^{RMB} = \sum_{k=1}^{n} \beta_k^2 \Delta s_{t-k}^{REG\setminus RMB} + \sum_{k=1}^{n} \rho_k^2 \Delta s_{t-k}^{RMB} + \nu_t^2 \end{cases}$$

for $REG \in$ emerging Asia and lag order n, we use a standard F-test to test the two following null hypotheses

$$H_0'' : \hat{\rho}_1^1 = ... = \hat{\rho}_n^1 = 0 \quad \text{and} \quad H_0''' : \hat{\beta}_1^2 = ... = \hat{\beta}_n^2 = 0 \tag{1ter}$$

2.2 Conditional analysis

The three-factor model of equation (1), on which the tests of China's dominance hypothesis presented so far are based, is informative about co-movements and correlations across global foreign exchange returns. However, such a model is mute about the ultimate source of these co-movements, which can be identified only indirectly. A more direct way to test for China's dominance hypothesis is therefore to analyze the transmission of specific shocks, of which the true origin and nature can be clearly identified. This allows identifying the direction of causality and the origin of co-movements with the added advantage to more cleanly trace the effect of a particular shock through global foreign exchange markets.

We therefore conduct a complementary analysis based on a shock-augmented factor model. The aim is to carry out an event-study to exploit the global FX market reaction to official statements made by Chinese authorities on exchange rate and reserve policy so as to identify their exchange rate impact, in particular for emerging Asian currencies. The key strength of this approach (see also Fratzscher, 2008a, 2008b, 2009; Fratzscher and Mehl, 2009) is that it allows for a clean identification of specific and exogenous RMB shocks and to measure how they affect the rest of Asia. Our hypothesis is that if market participants consider such statements as credible, they

can be expected to have a depreciating effect on the US dollar against the euro and against currencies that use the US dollar as an anchor, like those of emerging Asia.

This prior is based on the following motivation. Chinese official statements pointing to a diversification of reserves out of US dollars or to the desirability of an appreciation of the RMB against the US dollar should weaken the US dollar against other major currencies primarily through a portfolio balance channel. This would imply indeed that China reduces its purchases of US dollar-denominated securities and, in turn, its demand for US dollars. This channel has been shown to have played some role in the past for foreign exchange market intervention by central banks (see e.g. Branson, 1977; Dominguez and Frankel, 1993). The effect of official statements may also occur through a coordination channel (Sarno and Taylor, 2001) as they may trigger and help coordinate expectations among market participants. In particular, statements interpreted by markets as suggesting a weakening of the strong US dollar focus of China's exchange rate policy might be interpreted as a signal that relative demand for global currencies could fundamentally change and, in particular, that the role of the US dollar in the international monetary system could decline.

Dollar-pegged currencies in emerging Asia should also appreciate relative to the US dollar for two related reasons. First, market participants might interpret official statements as a signal that, should China decouple from the US dollar, the rest of Asia could well de-couple too. Second, official statements that point to an appreciation of the RMB against the US dollar encourage other emerging Asia economies to let their currencies appreciate in turn, to stabilise their relative competitiveness within the Asian production chain.

Our conditional model is an extended version of the model we use for the unconditional analysis, i.e.

$$\Delta s_{i,t} = \alpha_i + \beta_{i,t}^{IO} IO_t + \beta_{i,t}^{USD} \Delta s_t^{USD} + \beta_{i,t}^{EUR} \Delta s_t^{EUR} + \beta_{i,t}^{REG} \Delta s_{i,t}^{REG} + \boldsymbol{\delta}_{i,t} \mathbf{X_{i,t}} + \varepsilon_{i,t} \qquad (2)$$

where we have added *IO*, a [-1; 0; +1] indicator variable for Chinese statements on the exchange rate regime or reserves. Appendix B provides a theoretical basis for such a model, based on the microstructure literature of FX markets, and more specifically the literature on announcement effects and asset prices (e.g. Andersen et al. 2003, Blinder et al. 2008).

In order to take the model to the data, we compile a novel database of statements of official statements by Chinese authorities on exchange rate and reserve policy, which builds partly on the database used in Fratzscher and Mehl (2009). We collect statements by the People's Bank of China (PBC) Governor, People's Republic President and Premier as well as by other PBC officials, including the Head of the State Administration of Foreign Exchange (SAFE) and other Chinese officials who have occasionally –albeit more rarely– expressed public views on the renminbi and/or

on the composition of China's reserves.[9] A list of those policy-makers is provided in Table I in Appendix A.

Public statements generally stem from three sources: speeches, interviews and public testimonies. In order to ensure that these statements were also available to market participants in financial markets, one of the most commonly used wire services, *Reuters News*, was chosen to extract relevant news releases for the period 1 January 1997 to 28 January 2011. These releases were obtained through Factiva. *Reuters News* has the advantage of being one of the most comprehensive wire services, reporting on and disseminating all major news in a timely and truly global fashion, usually within a short timeframe after a public announcement. It is also among those providers which receive greatest attention among traders and investors globally. This allows using daily data to analyse the impact of statements on FX markets.[10]

In selecting the statements, the search criteria for those relating to China's exchange rate policy were:

(a) the name or the title of the policy-maker,

(b) the word "exchange rate" or "renminbi" or "RMB" or "yuan" and

(c) the words "stable" or "stability" or "flexible" or "flexibility" or "dollar" or "peg".

Likewise, the search criteria for statements on China's reserve policy were:

(i) the name or the title of the policy-maker,

(ii) the word "reserves" and

(iii) the words "composition" or "diversification" or "portfolio" or "rebalancing" or "dollar".

Clearly, a crucial issue is how to classify the statements in terms of both content and meaning. Statements *IO* are categorised as advocating that the US dollar peg will be relaxed either to let the RMB appreciate or depreciate or that the peg will be maintained. Moreover, statements referring to reserve allocation are classified as

[9] For instance, these include officials from Chinese Investment Corporation, the institution which – along with SAFE– is in charge of managing China's reserve assets.

[10] Arguably an alternative might be to use intraday data together with the time stamps corresponding to the statements of our database. However, using intraday data is not a feasible option for improving our identification scheme because the reports of Reuters News are the articles summarising a particular statement by a policy-maker. These articles may come as soon as 20 minutes after a particular statement, or they become available several hours later in the day. Hence we cannot measure the high-frequency market response of a statement because no data is available for the initial "snaps" (i.e. real-time reporting of headlines containing at most a few words), which may occur within seconds after a statement.

either suggesting diversification away from the US dollar, diversification into the US dollar or that the composition of reserves remains unchanged:

$$IO_t = \begin{cases} +1 & \text{US dollar peg relaxed to appreciate} \\ & \text{Diversification out of the US dollar} \\ 0 & \text{US dollar peg maintained} \\ & \text{Reserve composition unchanged} \\ -1 & \text{US dollar peg relaxed to depreciate} \\ & \text{Diversification into the US dollar} \end{cases}$$

Table II in Appendix A contains examples of statements for each of those categories. The classification is a judgmental one and clearly in some cases difficult to make. Three points should be noted. First, the classification is done in a mechanical way, i.e. all statements are classified based on their language content, and by at least two persons. Second, the only statements that are not classified and left out are those that occurred on release days of relevant macroeconomic data or monetary policy meeting days, which could have a dominant effect on those days. Third, the advantage of using newswire services is that an interpretation of the statements is very often provided by professionals who are aware of nuances and experienced in interpreting them.

Two additional caveats should yet be borne in mind. A first caveat is that newswire reports may not reflect the true intention of policy-makers. Moreover, some public statements may not be covered hence the list of statements is only a list of statements as reported by Reuters, and not necessarily a complete one. This is a relatively minor drawback, however. As the objective of our conditional analysis is to analyse the reaction of market participants to policy-makers' communication, it seems sensible indeed to focus only on those statement that actually become available to market participants and, again, *Reuters News* is among those providers that receive greatest attention among traders and investors.

Table III in Appendix A provides a summary of the around 320 statements we collected for the period 1 January 1997 to 28 January 2011. The bulk of these statements (269, or about 80%) are on the exchange rate regime. In terms of meaning and content, about 60% of the statements repeat a mantra that the exchange rate regime will remain unchanged and are classified as neutral; about 30% are classified as signalling that the reference to the US dollar will be relaxed to let the RMB appreciate; about 10% are classified as signalling that the reference might be relaxed to let the RMB depreciate (e.g. when uncertainties mounted in the wake of the Asian crisis as to whether the Chinese renminbi might be devalued). Statements on reserve policy reserve are fewer (about 50) than those on exchange rate flexibility. More than half thereof signal diversification away from the US dollar. In terms of authorship, about 40% of the statements were made by the Governor of the People's Bank of China and 20% by the Chinese Premier, while the President of the People's Republic

and the Head of SAFE speak much less frequently (each account for less than 10% of the statements).

Figure 3

To further give an intuition of the data, Figure 3 plots the statements by Chinese officials together with the RMB/USD over time. Statements by Chinese authorities were markedly more frequent in the aftermath of the Asian crisis, in 1997-2000, when the debate about a possible devaluation of the renminbi mounted, between 2004/5 (start of the exchange rate reform) and mid-2008 (start of the global financial crisis and *de facto* re-pegging of the renminbi to the US dollar), as well as since late 2009 (eruption of sovereign debt crises).

Our test of China's dominance hypothesis consists in testing whether the official statements lead to an appreciation of emerging Asian currencies (relative to the SDR in the baseline specification, and relative to the US dollar in the robustness checks), and appreciation which has become stronger since the start of China's exchange rate reform in 2005, i.e. our null hypotheses are:

$$H^*_0 : \hat{\beta}_i^{IO} \geq 0 \quad \text{and} \quad H^{**}_0 : \hat{\beta}_{i|t>2005}^{IO} \leq \hat{\beta}_{i|t\leq 2005}^{IO} \tag{2bis}$$

for $i \in$ emerging Asia.

3. Results

This section presents the empirical results, starting with those for the unconditional analysis, then proceeding with the conditional analysis, and concluding with various extensions and robustness checks.

3.1 Unconditional analysis

Table 3 reports baseline estimates for the three-factor exchange rate model of equation (1), using a pooled OLS estimator (columns (1) to (3)) and a fixed effect estimator (columns (4) to (6)). We consider model specifications including only the factors and also including controls, namely the change in oil prices, global liquidity conditions (as proxied by the TED spread, i.e. the difference between short-term US interbank and T-bill rates) and risk (as proxied by the VIX index, a measure of implied volatility of S&P 500 index options).[11] We correct standard errors for heteroscedasticity and clustered heterogeneity.

Tables 3 – 4

[11] Data for the control variables are taken from Bloomberg.

A first key insight from Table 3 is that the US factor explains the bulk of global FX dynamics. The US factor loading is the largest of the three factors, at around 0.4 (i.e. a 1% depreciation of the US dollar vis-à-vis the SDR is associated with an average 0.4% depreciation of the sample's currencies vis-à-vis the SDR). This reflects the US dollar's dominant role in the international monetary system. Both the euro and regional factors are of a smaller magnitude, with a loading estimate of about 0.14-0.17 (i.e. less than half that of the US factor), pointing to a more modest importance for exchange rate dynamics globally. Depending on the specification, adjusted-R^2s are in the order of 7%-11%, which is fairly satisfactory when considering the high data frequency. The results are also very robust across specifications and they are not altered when adding controls or country effects. The latter, in particular, are insignificant and only explain a very small share of the data's variance (as indicated by the ρ-statistics reported in the bottom row of Table 3).

Another important aspect is the marked increase of the regional factor's importance over time. Table 4 presents estimation results for two sub-periods: (i) before the start of China's exchange rate reform in 2005 and (ii) after the start of the reform. Strikingly, the estimated regional factor loading more than quadruples between these two periods, from about 0.07 before 2005 to over 0.30 afterwards. This underscores the growing importance of the regional dimension in global exchange rate dynamics, an aspect of key importance for Asia.

Table 5, Figure 4

Do the factor model estimates vary between advanced and emerging economies and, within emerging economies, across regions? Table 5 presents estimates broken down by country groups and regions. When restricting the estimation to advanced economies, the factors are found to be mostly insignificant (or barely significant in the case of the euro factor), in line with the fact that most of these currencies are floating.[12] Within the emerging economies, the US factor is found to be most important for emerging Asia, Latin America and the GCC, with loadings of about 0.6, 0.8 and 1, respectively, which mirrors the strong orientation of these regions' currencies to the US dollar. In turn, the importance of the euro factor is strongest for emerging Europe, with a loading estimate of 0.3, in line with the euro's important role in the region, which itself rests on strong institutional, trade and financial linkages between the euro area and its Central and Eastern European neighbours.

Importantly, the regional factor is statistically significant for emerging Asia, a piece of evidence in line with China's dominance hypothesis, which also implies that the null hypothesis H_0 of Eq. (1bis) can be rejected. Emerging Asia's regional factor is also by far the largest in magnitude across all regions, with an estimated loading of over 0.2, underscoring the strong regional orientation of exchange rate policy in the

[12] The statistical significance of the euro factor might be due to the fact that our group of advanced economies also includes Sweden, Denmark and Iceland, which all manage (more or less heavily) their currencies vis-à-vis the euro.

area, under the "East Asian dollar standard" and the "Asian production chain". Moreover, the model for emerging Asia has a remarkably good fit, with an adjusted R^2 of over 20%, which is better only for the GCC economies (for which the model has perfect fit, which is due to these countries' stringent US dollar pegs).

In line with this evidence, Figure 4 shows that there is a significant degree of heterogeneity in regional exposures across our sample's 48 currencies, but that the regional factor is especially important for emerging Asian currencies. The figure, which plots the distribution of the regional factor loadings estimated for all of the currencies, suggests that this distribution is very heterogeneous. Some currencies react almost one-to-one with the regional factor; others are unaffected by regional currency dynamics, with loadings close to zero; and a few others move in a direction systematically opposite to that of the currencies of their region, with a negative loading estimate. The estimates for the emerging Asian currencies, which are indicated by the red lines in the figure, confirm that the regional dimension is of key importance for these currencies. Arguably, China and Hong Kong have regional factor loadings that are virtually close to zero (due to their hard pegs to the US dollar). But India has a loading of about 0.1 (close to the pooled sample estimate), while that of Indonesia, Singapore and Taiwan are much higher (at about 0.3, i.e. over twice the pooled sample estimate) and that of Taiwan, Thailand; Philippines; Malaysia and Korea are among the highest in the sample (at about 0.5).

Tables 6 – 7

Considering now emerging Asia more specifically, Table 6 presents evidence that the regional factor has grown in economic importance over time, another piece of evidence consistent with China's dominance hypothesis, which also implies that the null hypothesis H_0' of Eq.(1bis) can be rejected. The table reports regression results when restricting the sample to emerging Asia and for two sub-periods (before and after 2005). Strikingly, the regional factor loading estimate after the start of China's exchange rate reform in 2005, at 0.25, is about one-third higher than that before 2005. This is supportive of the view that emerging Asia's policy-makers pay more attention to regional currency developments as China gradually strengthens the flexibility of its exchange rate regime.

Table 7 presents even more direct evidence of the growing role played by the renminbi in the region. It reports estimates based on a slightly modified version of the factor model where the regional factor is replaced with a "China factor", i.e. the RMB/SDR exchange rate, which we orthogonalize with respect to the US factor (and the euro factor) to identify renminbi movements that are not purely driven by the US dollar. The estimates are reported for various sub-periods: before and after 2005; prior to the outbreak of the global financial crisis (2005 to 2007); during the global financial crisis (2007 to 2008); and since the onset of the recovery in emerging Asia (since 2009). China is excluded from the estimations so as not to have it on both sides of the regression. What is conspicuous about the results is that the China factor is neither statistically significant over the full estimation period nor over all sub-periods

up to the global financial crisis. But since emerging Asia started to recover in 2009, the China factor is both statistically significant and very important in terms of economic magnitude, with a loading of about 0.15, i.e. several times larger than the pre-crisis estimate. Again, this is supportive of the view that policy-makers and/or markets in emerging Asia are paying much greater attention to developments in the renminbi for the valuation of other regional currencies since the crisis.

Table 8

Having established that a regional factor explains currency movements significantly in emerging Asia and increasingly so since China started to reform its exchange rate regime in 2005, we now test whether this regional factor is driven by the renminbi and not vice-versa. This is taken up in Table 8, which reports Granger causality test results based on a bi-variate VAR for emerging Asia. The VAR includes 2-day (non-overlapping) returns for the RMB/SDR and the regional factor (excluding China) and up to 3 lags. The table shows the *p*-value of the corresponding *F*-tests for various sub-periods.

Overall, there is significant evidence that the RMB causes movements in Asia's regional factor, in line with China's dominance hypothesis since the start of China's exchange rate reform in 2005. The null that it does not (i.e. H_0'' in Eq. (1ter)) is rejected for the period after 2005, but not before (see upper quadrant of Table 8). This again suggests that it is only after China embarked on reforms that the renminbi gained influence on the rest of emerging Asia's currencies. Noticeably, the null is most strongly rejected in post-crisis data, i.e. after the onset of the recovery in emerging Asia in 2009. This further confirms that the global financial crisis was a major turning point in strengthening the RMB's role in the region.

A further interesting finding is that the renminbi is not immune from influences stemming from the rest of Asia. There is evidence that causality is bi-directional. In other words, movements in Asia's regional factor also cause those of the renminbi to some extent. We cannot reject the null that they do not indeed (i.e. H_0''' in Eq. (1ter)) either before 2005 nor after (see the lower quadrant of Table 8). We can only do so during the acute phase of the crisis (2007-2008), perhaps because of China's *de facto* re-pegging to the US dollar in the middle of 2008. All in all, these results suggest that China's dominance in emerging Asia remains weaker so far than that of Germany on Europe two or three decades ago. China's impact on other emerging Asian countries' exchange rate policy is strong and significant, but the region, taken together, also has an impact on China's exchange rate policy. Strictly speaking, this points to an important role of China in the region, but not to dominance per se.

3.2 Conditional analysis

The evidence on the RMB's role in emerging Asia we have presented thus far is only indirect, however. To gauge more directly the impact of China's currency in the region, we conduct a complementary analysis based on an event-study that exploits the FX market reaction to official statements on exchange rate and reserve policy made by Chinese authorities. As discussed above, this allows for a clean identification of exogenous RMB-specific shocks and to trace their effect through global foreign exchange markets, notably in Asia. Our hypothesis remains that if market participants consider such statements as credible, they can be expected to have a depreciating impact on the US dollar against the euro and the other currencies that use the dollar as an anchor, like those of emerging Asia.

Tables 9 – 11

Table 9 reports estimates for the full sample of the conditional model of equation (2), using a pooled OLS estimator (columns (1) to (3)) and a fixed effect estimator (columns (4) to (6)). There is strong evidence that RMB shocks impact global exchange rate configurations in line with our theoretical prior. A statement pointing to a relaxation of China's peg to the US dollar or to a diversification of China's reserves away from the US dollar leads to a statistically significant appreciation of the currencies in our sample relative to the SDR basket, i.e. including the US dollar, of 0.1% on average, on the day the statement occurs. This result is very robust across specifications and is not altered when adding controls or country effects. Country effects, in particular, are again insignificant, and explain an infinitesimally small share of the data's variance (as indicated by the ρ-statistics). Moreover, the factor loadings of the three FX factors remain quasi identical to those estimated under the unconditional model.

The economic importance of RMB shocks for overall FX markets has increased somewhat over time, as shown by Table 10, which reports that the estimated impact of Chinese statements rises from -0.08 before 2005 to -0.11 afterwards. The impact of the RMB shocks yet varies appreciably in magnitude across country groups and regions (see Table 11). It tends to be stronger for advanced economies (with an estimate of about -0.14) than for EMEs (with an estimate of about -0.09), perhaps because of the latter's more rigid exchange rate regimes. Within EMEs, the estimated impact is also stronger for emerging Europe (at about -0.15) than for Latin America or Asia (at about -0.11 and -0.08, respectively), while GCC and MENA countries' currencies are found to remain unresponsive to RMB shocks. The strong effect found for emerging European currencies might reflect the fact that they are often managed vis-à-vis the euro which, in line with portfolio balance models predictions, could be markedly impacted if market participants would expect China to de-couple from the US dollar.

Table 12

Focusing now on emerging Asia, Table 12 shows that the effect of RMB shocks on the region's currencies has grown markedly in economic importance since China embarked on exchange rate reforms in 2005. This is a further piece of evidence consistent with China's dominance hypothesis, which implies that the two null hypotheses H_0^* and H_0^{**} of Eq. (2bis) can be rejected. The estimated shock impact after 2005, at -0.09, is roughly three times larger than before 2005 (see Table 12).

Robustness and extensions to the conditional analysis

We extend the conditional analysis in various directions in order to gauge the robustness of the findings and also to draw out more about the economic relevance of the effects of the RMB. We first use the US dollar rather than the SDR basket as numéraire, in order to make the parameter estimates readily interpretable. Table 13 reveals that the parameter estimates double from -0.10 before 2005 to almost -0.20 after 2005. In other words, a statement pointing to a relaxation of China's peg to the US dollar or to a diversification of China's reserves away from the US dollar leads to an appreciation of emerging Asian currencies of 0.2% on average vis-à-vis the US dollar, on the day the statement occurs.

We find a similarly strong post-2005 increase in economic magnitude when using forward exchange rates (non-deliverable forward contracts, NDFs), which can be taken as a proxy of market expectations regarding future exchange rates (see Table 14). Considering also the evidence after 2005 in more detail, it is striking that the impact of RMB shocks is strongest after the start of emerging Asia's recovery in 2009, with an order of magnitude that is almost four times larger than before 2005 (Table 15).

Tables 13 – 15

These findings give further support to the view that policy-makers in emerging Asia have been paying much greater attention to developments in the renminbi since the crisis. They are in line with the existence of both a portfolio balance channel and a signalling channel, in which market participants regard Chinese official statements as a signal that, should China decouple from the US dollar, the rest of Asia could may decouple too. Moreover, the results are supportive of the view that official statements pointing to an appreciation of the RMB against the US dollar encourage other emerging Asian economies to let their currencies appreciate in turn, so as to stabilise their relative competitiveness within the "Asian production chain".

Figures 5 – 6

Moreover, there is significant heterogeneity in the impact of RMB shocks across currencies, however. Figure 5 shows the estimated impact for each of our 48 currencies over the full sample period, using the SDR basket as numéraire, while Figure 6 provides the corresponding estimates when using the US dollar as numéraire. Both charts suggest that the dispersion in the estimated impact is rather wide. The

Swedish crown and the Korean won are the currencies that are most affected by Chinese statements (appreciating by an estimated 0.5%-0.6% against the US dollar on average on the day a statement occurs). By contrast, the currencies of Hong Kong, Lebanon, the UAE, the Ukraine, etc. are hardly, if at all, impacted by such statements.

It is the currencies that rely on the euro as an anchor that seem to be impacted most such as, alongside Sweden's currency, those of the Czech Republic, Poland, Iceland, Denmark, Estonia or Latvia and the euro itself. All are found to gain between 0.2% and over 0.4% on average against the US dollar on the day a statement occurs.

Table 16

Further evidence to this point is provided in Table 16, which reports pooled OLS estimates of potential determinants of the heterogeneity in the country-specific elasticities with respect to RMB shocks shown in Figure 5. We consider four particular aspects: trade integration with China (i.e. both the share of exports to China in total exports and that of imports from China in total imports); financial integration with China (i.e. the share of portfolio investments in China in total portfolio investments); the flexibility of the exchange rate regime; as well as dummies for countries belonging to what we consider as the "dollar bloc" (emerging Asia and the GCC) and those belonging to what we call the "euro bloc" (emerging Europe).[13]

Three results are worth stressing. First, stronger trade and financial integration with China increases $\hat{\beta}_i^{IO}$, implying a weaker appreciation of the exchange rate in response to an RMB shock. By contrast, higher exchange rate flexibility tends to increase $\hat{\beta}_i^{IO}$ and is associated with a stronger appreciation of the exchange rate as a result of an RMB shock. This may apply in particular to currencies such as the euro and other European currencies, which have been shown above to respond strongly to Chinese statements on the RMB. Lastly, the anchor currency matters. The currencies of the countries belonging to the US dollar bloc tend to appreciate less to an RMB shock, while those belonging to the euro bloc tend to appreciate more, a result that is fairly robust across specifications. This further underscores the possible existence of a portfolio balance channel and a signalling channel, as well as the role played by market expectations of diversification of China's reserves out of the US dollar into the euro, along with that of a possibly declining dominance of the US currency in the international monetary system.

We stress that this final part of the analysis on the determinants is merely suggestive, as other channels and mechanisms may be at work as well. The point is rather to show that the cross-sectional heterogeneity in the responses to Chinese FX statements has an underlying economic rationale that is indeed related to the choice of

[13] Data for trade and financial integration are taken from the IMF's WEO and CPIS databases. Exchange rate regimes are classified according to Reinhart and Rogoff (2004) in line with the 2008 updates of Ilzetzki, Reinhart and Rogoff, and with following coding: 1 = dollarisation/euroisation or hard peg; 2-3 = managed float; 4 = free float. The estimates of Table 16 are obtained using the SDR as numéraire. Quasi similar results are obtained when using the US dollar as numéraire.

exchange rate regimes and economic fundamentals of countries. Overall, the findings point not only to a rising role of the RMB in determining exchange rates of other Asian countries, but also to a global influence of the RMB in affecting global FX configurations.

4. Conclusions

This paper has presented empirical evidence consistent with China's dominance hypothesis, suggesting that the international monetary system is already on the verge of being tri-polar, with the US dollar as global currency, and both the euro and the Chinese renminbi playing an important role for regional currencies. China's exchange rate policy is found to already exert a strong and growing influence on other emerging Asian economies' exchange rate policies since 2005, and even more so since the global financial crisis.

However, exchange rate developments in China do not seem entirely immune from influences from the rest of Asia: we have also uncovered evidence of bi-directional causality and that Asian currency movements also drive those of the renminbi, albeit to a lesser extent. All in all, these results suggest that China's dominance in emerging Asia remains weaker so far than that of Germany on Europe two or three decades ago since Germany's monetary and exchange rate policy was found never to be influenced by that of other European countries at that time.

Looking ahead, many open questions remain. One of them concerns the optimality of FX configurations and whether countries should focus their FX management vis-à-vis a currency from outside the region, such as the US dollar, is optimal or whether stronger explicit exchange rate coordination at the regional level might be beneficial. This is indeed what Europe's experience is the 1980s and 1990s would suggest. As China continues to reform its exchange rate regime in the years ahead, it is well possible to that such a question could be of increasingly pressing policy interest, both for Asia and globally.

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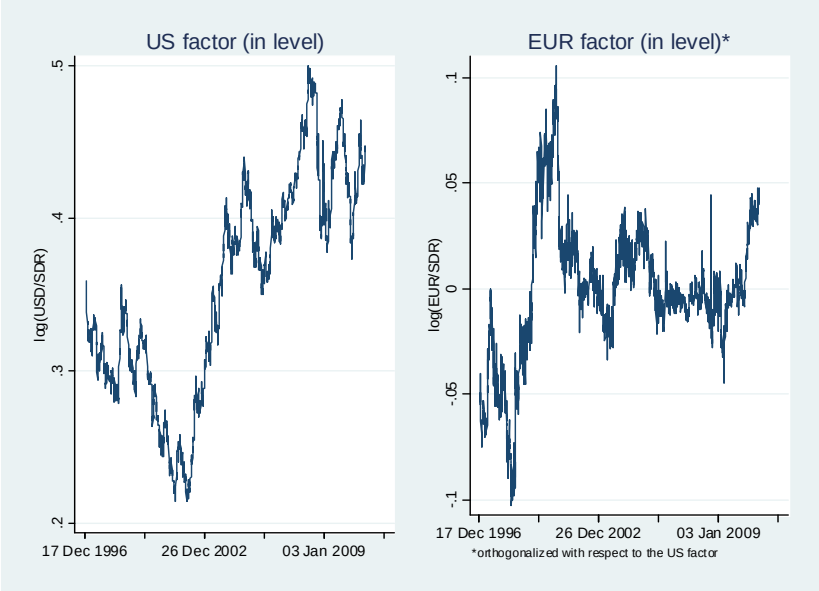
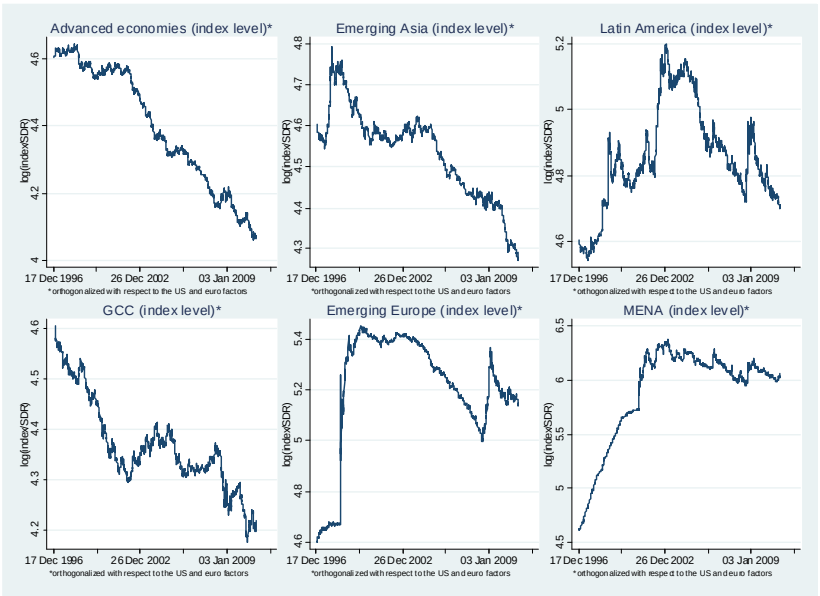
Figure 1: US and euro factors



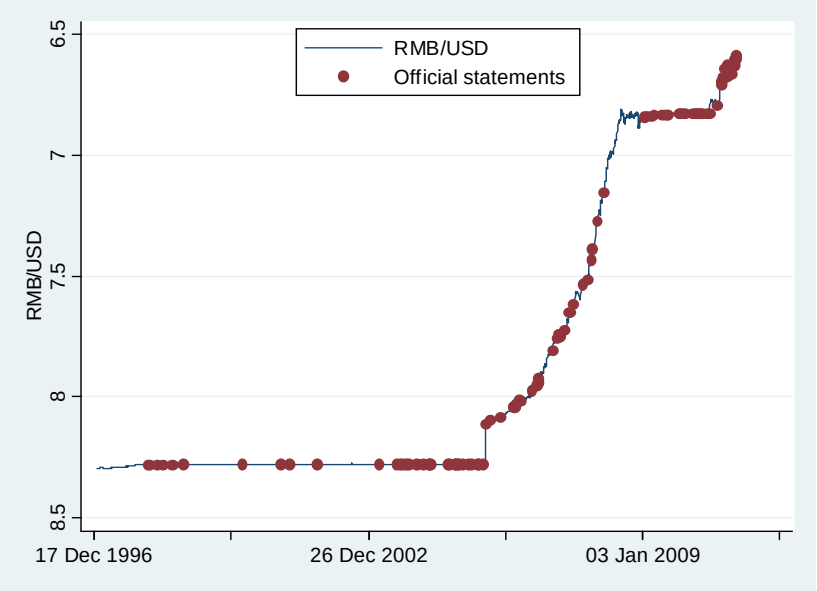
Note: The figures show the US factor (USD/SDR) along with the euro factor (EUR/SDR) used in the unconditional model described in Eq. (1). An upward movement indicates depreciation relative to the SDR basket (euro, US dollar, pound sterling and yen). Our identification condition is that the US factor is considered exogenous, reflecting the US dollar's dominant role in the international monetary system, while the euro factor is orthogonalized with respect to the US dollar factor. Factor levels are shown to facilitate visual interpretation, although we use in the empirical estimation 2-day (non-overlapping) returns to ensure that the variables are stationary.

Figure 2: Regional factors



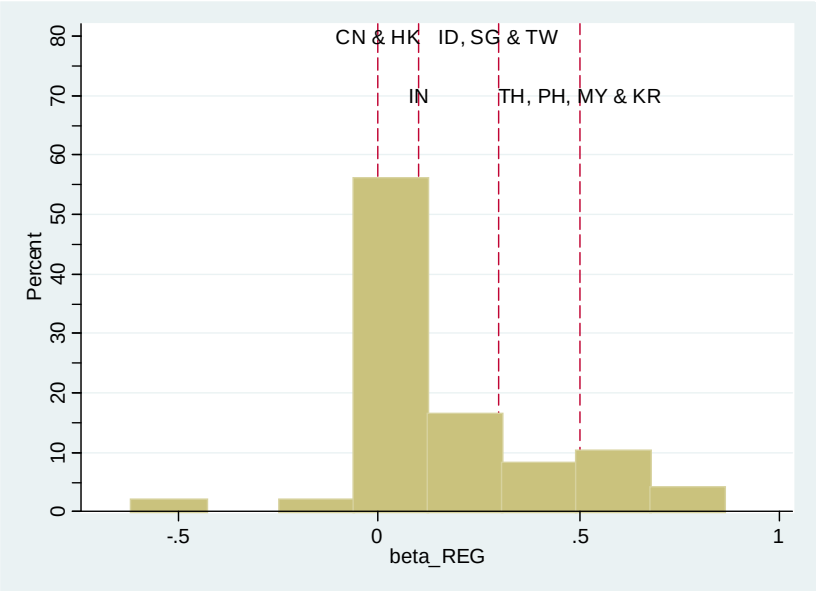
Note: The figures show the regional factor (regional currency index/SDR) corresponding to each of our six regions. An upward movement indicates depreciation relative to the SDR basket. Our identification conditions are that the US factor and the euro factor are considered as exogenous, while the regional factor is orthogonalized with respect to these two factors. Factor levels are shown to facilitate visual interpretation, although we use in the empirical estimation 2-day (non-overlapping) returns to ensure that the variables are stationary. As the regional factor for country *i* is calculated by excluding country *i* itself, to make sure that it is not on both sides of Eq. (1), regional factors are country specific (but very highly correlated within regions). The factors shown here are those for Switzerland, Hong Kong, Argentina, Bahrain, Hungary and South Africa.

Figure 3: RMB/USD exchange rate and official statements by Chinese policy-makers on exchange rate and reserve policy



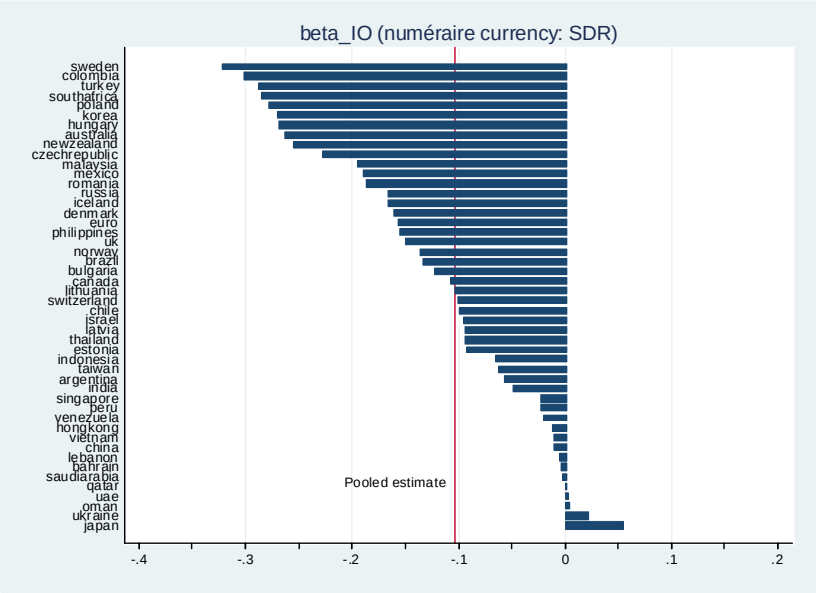
Note: reversed scale for the *y*-axis. *Source*: authors' own compilation from Reuters News and Factiva; Bloomberg.

Figure 4: Distribution of regional factor loadings



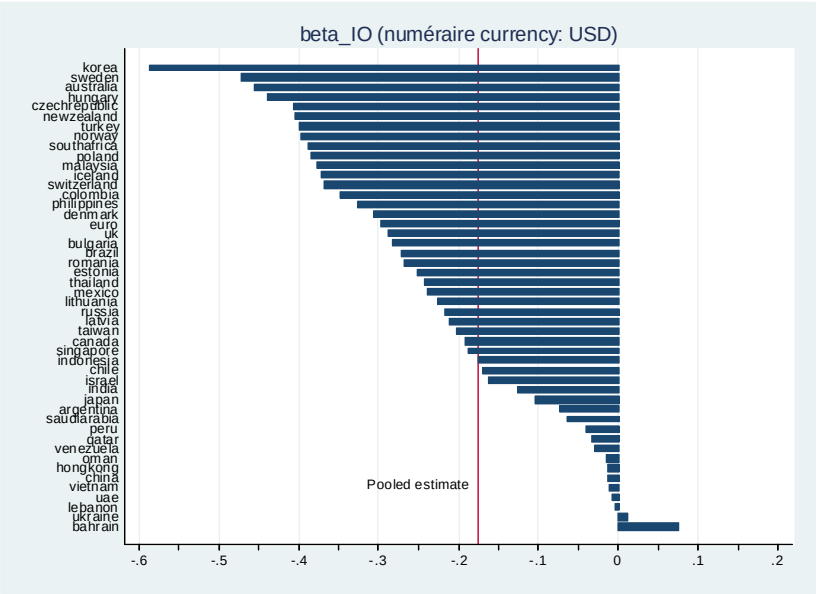
Note: The figure shows the distribution of the regional factor loadings β_i^{REG} when estimating Eq. (1) for each of the 48 countries of our sample. The estimates specific to emerging Asian countries are indicated by the red lines (CN: China; HK: Hong Kong; IN: India; ID: Indonesia; SG: Singapore; TW: Taiwan; TH: Thailand; PH: Philippines; MY: Malaysia; KR: Korea).

Figure 5: Impact of a Chinese official statement on global FX markets (*breakdown by currency; SDR as numéraire currency; in %*)



Note: The figure shows the average impact (in %) as estimated from Eq. (2) of an official statement by Chinese policy-makers on exchange rate/reserve allocation policy on each of our sample's 48 currencies on the day the statement occurs. The SDR basket is used as numéraire. A negative entry indicates an appreciation of the respective currency vis-à-vis the SDR.

Figure 6: Impact of a Chinese official statement on global FX markets (*breakdown by currency; US dollar as numéraire currency; in %*)



Note: The figure shows the average impact (in %) as estimated from Eq. (2) of an official statement by Chinese policy-makers on exchange rate/reserve allocation policy on each of our sample's 48 currencies on the day the statement occurs. The US dollar is used as numéraire to facilitate the interpretation of the results. A negative entry indicates an appreciation of the respective currency vis-à-vis the US dollar.

Table 1: List of the countries included in the sample

Advanced economies	**Emerging Asia**	**Latin America**	**Gulf Co-operation Council**	**Emerging Europe**	**Middle-East and Northern Africa**
Australia	China	Argentina	Bahrain	Bulgaria	Israel
Canada	Hong Kong	Brazil	Oman	Czech Republic	Lebanon
Euro*	India	Chile	Qatar	Estonia	Southafrica
Japan	Indonesia	Colombia	Saudi Arabia	Hungary	Turkey
New Zealand	Korea	Mexico	United Arab Emirates	Latvia	
Norway	Malaysia	Peru		Lithuania	
Sweden	Philippines	Venezuela		Poland	
Switzerland	Singapore			Romania	
United Kingdom	Taiwan			Russia	
United States*	Thailand			Ukraine	
	Vetnam				
Denmark					
Iceland					

Note: The table reports the 48 countries included in our sample broken down by country group/region. The euro and the US dollar are reported *pro memoria* since they enter as explanatory variables in the models of Eq. (1) and (2).

Table 2: Pair-wise correlations across the three factors (*prior to orthogonalization*)

	US factor	Euro factor	Regional factor
US factor	1		
Euro factor	-0.1416*	1	
Regional factor (all countries)	0.1380*	0.1543*	1
Regional factor (by region)			
- only advanced economies	-0.1385*	0.7685*	1
- only emerging Asia	0.5186*	-0.0239*	1
- only Latin America	0.2517*	0.0367*	1
- only GCC	0.7357*	-0.0703*	1
- only emerging Europe	0.0174*	0.1254*	1
- only MENA	0.0462*	0.1472*	1

Note: (*) indicates that the correlation coefficient is significant at the 5% level of confidence. The correlations are calculated using 2-day (non-overlapping) exchange rate returns.

Table 3: Global exchange rate factor model – Full sample estimates

	Pooled OLS			*Fixed effects*		
	(1)	(2)	(3)	(4)	(5)	(6)
US factor	0.391***	0.389***	0.399***	0.391***	0.389***	0.399***
	(0.077)	(0.072)	(0.072)	(0.077)	(0.072)	(0.072)
Euro factor	0.171***	0.170***	0.161***	0.171***	0.170***	0.161***
	(0.037)	(0.036)	(0.035)	(0.037)	(0.036)	(0.035)
Regional factor		0.153***	0.139***		0.153***	0.139***
		(0.023)	(0.023)		(0.023)	(0.023)
Oil prices			-0.014***			-0.014***
			(0.002)			(0.002)
Liquidity risk			0.110**			0.111**
			(0.044)			(0.044)
Risk aversion			0.037***			0.037***
			(0.007)			(0.007)
Constant	0.009**	0.009**	0.010**	0.009**	0.009**	0.010***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	85,823	85,819	85,819	85,823	85,819	85,819
Adjusted R^2	0.0679	0.0915	0.108	0.0679	0.0916	0.108
ρ				0.000519	0.000567	0.000582

Note: Pooled OLS and fixed effect estimates of Eq. (1) for the full sample. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 4: Global exchange rate factor model – Full sample estimates *(by time period)*

	Before 2005	*After 2005*
	(1)	(2)
US factor	0.537***	0.301***
	(0.068)	(0.073)
Euro factor	0.111***	0.194***
	(0.034)	(0.040)
Regional factor	0.074***	0.322***
	(0.019)	(0.055)
Oil prices	-0.005***	-0.018***
	(0.001)	(0.004)
Liquidity risk	0.077	0.081*
	(0.054)	(0.048)
Risk aversion	0.017***	0.037***
	(0.005)	(0.008)
Constant	0.018***	0.004
	(0.006)	(0.004)
Observations	48,644	37,175
Adjusted R^2	0.118	0.139

Note: Pooled OLS estimates of Eq. (1) for the full sample and for two sub-periods: (i) before the start of China's exchange rate reform in 2005 and (ii) after the start of the reform. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 5: Global exchange rate factor model – Full sample estimates *(by country group/region)*

	Advanced economies	*Emerging economies*	*Emerging Asia*	*Latin America*	*GCC*	*Emerging Europe*	*MENA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
US factor	-0.018	0.523***	0.656***	0.779***	0.999***	-0.070	0.493*
	(0.137)	(0.077)	(0.078)	(0.076)	(0.001)	(0.142)	(0.203)
Euro factor	0.244*	0.122***	0.085***	0.087**	-0.000	0.284***	0.145
	(0.114)	(0.030)	(0.020)	(0.028)	(0.001)	(0.081)	(0.092)
Regional factor	0.135	0.113***	0.216**	0.165**	-0.000	0.045***	0.073*
	(0.228)	(0.016)	(0.077)	(0.053)	(0.002)	(0.008)	(0.029)
Oil prices	-0.029**	-0.011***	-0.005***	-0.011*	0.000	-0.021***	-0.011
	(0.009)	(0.002)	(0.001)	(0.005)	(0.000)	(0.004)	(0.007)
Liquidity risk	0.103	0.102**	0.147**	0.210*	-0.003*	-0.035	0.093
	(0.182)	(0.043)	(0.060)	(0.106)	(0.001)	(0.074)	(0.267)
Risk aversion	0.037	0.039***	0.029***	0.054**	-0.000	0.050***	0.068
	(0.023)	(0.007)	(0.009)	(0.018)	(0.000)	(0.011)	(0.034)
Constant	-0.000	0.011**	0.013**	0.014*	0.000	0.011	0.027
	(0.006)	(0.004)	(0.005)	(0.006)	(0.000)	(0.010)	(0.029)
Observations	14,655	67,510	20,022	12,760	9,164	18,258	7,306
Adjusted R^2	0.0802	0.141	0.238	0.235	0.994	0.0976	0.0960

Note: Pooled OLS estimates of Eq. (1) for each of the sample's country groups or regions. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively. GCC = Gulf Co-operation Council; MENA = Middle-East and Northern Africa.

Table 6: Global exchange rate factor model – Estimates for emerging Asia *(by time period)*

	Before 2005	***After 2005***
	(1)	(2)
US factor	0.736***	0.598***
	(0.072)	(0.087)
Euro factor	0.042*	0.146***
	(0.019)	(0.036)
Regional factor	0.186**	0.251***
	(0.077)	(0.077)
Oil prices	-0.003	-0.003*
	(0.002)	(0.002)
Liquidity risk	0.263*	0.065
	(0.138)	(0.045)
Risk aversion	0.014**	0.034**
	(0.005)	(0.011)
Constant	0.024**	-0.002
	(0.008)	(0.007)
Observations	11,308	8,714
Adjusted R^2	0.219	0.284

Note: Pooled OLS estimates of Eq. (1) restricted to emerging Asia and for two sub-periods: (i) before the start of China's exchange rate reform in 2005 and (ii) after the start of the reform. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 7: Global exchange rate factor model – Estimates for emerging Asia
(RMB used as regional factor)

	Full sample	*Before 2005*	*After 2005*	*Pre-crisis (2005/7)*	*Financial turmoil (2007/8)*	*Post-crisis (since 2009)*
	(1)	(2)	(3)	(4)	(5)	(6)
US factor	0.695***	0.771***	0.645***	0.632***	0.640***	0.687***
	(0.059)	(0.051)	(0.069)	(0.086)	(0.062)	(0.063)
Euro factor	0.047**	0.001	0.120***	0.053	0.172***	0.150**
	(0.016)	(0.011)	(0.034)	(0.029)	(0.053)	(0.052)
RMB factor	0.031	0.002	0.063	0.017	0.029	0.147**
	(0.036)	(0.028)	(0.052)	(0.042)	(0.089)	(0.053)
Oil prices	-0.006***	-0.004*	-0.003*	0.001	0.003	-0.010**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Liquidity risk	0.154**	0.300*	0.039	0.303	0.037	1.282*
	(0.060)	(0.140)	(0.047)	(0.184)	(0.050)	(0.597)
Risk aversion	0.039***	0.020***	0.047***	0.019**	0.042***	0.058***
	(0.009)	(0.005)	(0.012)	(0.007)	(0.012)	(0.016)
Constant	0.011**	0.026***	-0.008	-0.021**	0.026	-0.022*
	(0.004)	(0.008)	(0.007)	(0.008)	(0.019)	(0.010)
Observations	18,188	10,267	7,921	2,600	2,606	2,715
Adjusted R^2	0.200	0.186	0.244	0.279	0.229	0.257

Note: Pooled OLS estimates of Eq. (1) restricted to emerging Asia and for various sub-periods: (i) before the start of China's exchange rate reform in 2005; (ii) after the start of the reform; (iii) before the eruption of the global financial crisis (2005/7); (iv) during the intensification of the global financial turmoil (2007/08); (v) since the onset of the recovery in emerging Asia (post-2009). The RMB/SDR (orthogonal with respect to both the US and euro factors) is taken here as regional factor. China is excluded from the estimation so as not to have it on both sides of the regression. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 8: Granger causality test results

	Lag order of the VAR model		
	1	2	3
***H*'''$_0$: RMB does not cause Asia's regional factor**			
All sample	0.001	0.026	0.058
Pre-2005	0.014	0.205	0.301
Post-2005	0.004	0.000	0.000
Pre-crisis (2005/06)	*0.188*	*0.067*	*0.095*
Crisis (2007/08)	*0.315*	*0.042*	*0.103*
Post-crisis (post-2009)	*0.008*	*0.001*	*0.004*
***H*'''$_0$: Asia's regional factor does not cause RMB**			
All sample	0.000	0.000	0.000
Pre-2005	0.000	0.000	0.000
Post-2005	0.015	0.026	0.058
Pre-crisis (2005/06)	*0.000*	*0.000*	*0.000*
Crisis (2007/08)	*0.457*	*0.397*	*0.538*
Post-crisis (post-2009)	*0.000*	*0.001*	*0.001*

Note: Granger causality test results based on a bi-variate VAR estimated for emerging Asia and including the RMB/SDR and the regional factor (excluding China), with up to 3 lags. The table shows the *p*-value of the corresponding *F*-tests for various sub-periods.

Table 9: Conditional analysis – Full sample estimates

	Pooled OLS			*Fixed effects*		
	(1)	(2)	(3)	(4)	(5)	(6)
Chinese statements	-0.105***	-0.105***	-0.104***	-0.105***	-0.105***	-0.104***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
US factor	0.395***	0.393***	0.403***	0.395***	0.393***	0.403***
	(0.077)	(0.072)	(0.071)	(0.077)	(0.072)	(0.071)
Euro factor	0.169***	0.169***	0.159***	0.169***	0.169***	0.159***
	(0.037)	(0.035)	(0.035)	(0.037)	(0.035)	(0.035)
Regional factor		0.152***	0.139***		0.152***	0.139***
		(0.023)	(0.023)		(0.023)	(0.023)
Oil prices			-0.014***			-0.014***
			(0.002)			(0.002)
Liquidity risk			0.114**			0.114**
			(0.044)			(0.044)
Risk aversion			0.037***			0.037***
			(0.007)			(0.007)
Constant	0.012***	0.012***	0.013***	0.012***	0.012***	0.013***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Observations	85,823	85,819	85,819	85,823	85,819	85,819
Adjusted R^2	0.0684	0.0918	0.109	0.0685	0.0919	0.109
ρ				0.000517	0.000567	0.000609

Note: Pooled OLS and fixed effect estimates of Eq. (2) for the full sample. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 10: Conditional analysis – Full sample estimates *(by time period)*

	Before 2005	*After 2005*
	(1)	(2)
Chinese statements	-0.082***	-0.106***
	(0.018)	(0.018)
US factor	0.539***	0.305***
	(0.068)	(0.073)
Euro factor	0.110***	0.192***
	(0.034)	(0.040)
Regional factor	0.073***	0.321***
	(0.019)	(0.055)
Oil prices	-0.005***	-0.018***
	(0.001)	(0.004)
Liquidity risk	0.076	0.084*
	(0.054)	(0.048)
Risk aversion	0.017***	0.037***
	(0.005)	(0.008)
Constant	0.019***	0.008**
	(0.006)	(0.004)
Observations	48,644	37,175
Adjusted R^2	0.119	0.139

Note: Pooled OLS estimates of Eq. (2) for the full sample and for two sub-periods: (i) before the start of China's exchange rate reform in 2005 and (ii) after the start of the reform. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 11: Conditional analysis – Full sample estimates *(by country group/region)*

	Advanced economies	*Emerging economies*	*Emerging Asia*	*Latin America*	*GCC*	*Emerging Europe*	*MENA*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Chinese statements	-0.144**	-0.094***	-0.084***	-0.111**	0.000	-0.151***	-0.163
	(0.048)	(0.016)	(0.025)	(0.038)	(0.001)	(0.028)	(0.071)
US factor	-0.013	0.526***	0.660***	0.784***	0.999***	-0.066	0.499*
	(0.138)	(0.077)	(0.077)	(0.076)	(0.001)	(0.141)	(0.201)
Euro factor	0.242*	0.121***	0.083***	0.085**	-0.000	0.282***	0.142
	(0.114)	(0.030)	(0.020)	(0.028)	(0.001)	(0.081)	(0.091)
Regional factor	0.135	0.113***	0.215**	0.164**	-0.000	0.043***	0.072*
	(0.228)	(0.016)	(0.077)	(0.053)	(0.002)	(0.008)	(0.028)
Oil prices	-0.029**	-0.011***	-0.005***	-0.011*	0.000	-0.021***	-0.011
	(0.009)	(0.002)	(0.001)	(0.005)	(0.000)	(0.004)	(0.007)
Liquidity risk	0.107	0.105**	0.149**	0.214*	-0.003*	-0.031	0.100
	(0.183)	(0.043)	(0.061)	(0.108)	(0.002)	(0.074)	(0.268)
Risk aversion	0.037	0.039***	0.029***	0.054**	-0.000	0.050***	0.069
	(0.023)	(0.007)	(0.009)	(0.018)	(0.000)	(0.011)	(0.034)
Constant	0.004	0.014***	0.015**	0.017**	-0.000	0.015	0.031
	(0.008)	(0.005)	(0.005)	(0.006)	(0.000)	(0.010)	(0.030)
Observations	14,655	67,510	20,022	12,760	9,164	18,258	7,306
Adjusted R^2	0.0807	0.142	0.238	0.235	0.994	0.0984	0.0969

Note: Pooled OLS estimates of Eq. (2) for each of the sample's country groups or regions. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively. GCC = Gulf Co-operation Council; MENA = Middle-East and Northern Africa.

Table 12: Conditional analysis – Estimates for emerging Asia *(by time period)*

	Before 2005	***After 2005***
	(1)	(2)
Chinese statements	-0.039*	-0.092**
	(0.019)	(0.032)
US factor	0.738***	0.602***
	(0.072)	(0.086)
Euro factor	0.041*	0.144***
	(0.019)	(0.035)
Regional factor	0.185**	0.249***
	(0.078)	(0.076)
Oil prices	-0.003	-0.003*
	(0.002)	(0.002)
Liquidity risk	0.263*	0.068
	(0.138)	(0.045)
Risk aversion	0.014**	0.034**
	(0.005)	(0.011)
Constant	0.025**	0.002
	(0.008)	(0.008)
Observations	11,308	8,714
Adjusted R^2	0.219	0.284

Note: Pooled OLS estimates of Eq. (2) restricted to emerging Asia and for two sub-periods: (i) before the start of China's exchange rate reform in 2005 and (ii) after the start of the reform. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 13: Conditional analysis – Estimates for emerging Asia
(US dollar as numéraire currency)

	Before 2005	***After 2005***
	(1)	(2)
Chinese statements	-0.101**	-0.189**
	(0.042)	(0.060)
Euro factor	0.124**	0.215***
	(0.044)	(0.063)
Regional factor	0.277**	0.348**
	(0.115)	(0.148)
Oil prices	-0.002	-0.003
	(0.002)	(0.002)
Liquidity risk	0.205*	0.106*
	(0.107)	(0.057)
Risk aversion	0.010*	0.032**
	(0.004)	(0.011)
Constant	0.086**	0.086*
	(0.031)	(0.041)
Observations	11,301	8,710
Adjusted R^2	0.0311	0.158

Note: Pooled OLS estimates of Eq. (2) restricted to emerging Asia prior to and post-2005 and using the US dollar as numéraire currency (rather than the SDR basket). Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 14: Conditional analysis – Estimates for emerging Asia
(using forward exchange rates)

	Before 2005	***After 2005***
	(1)	(2)
Chinese statements	-0.038	-0.092**
	(0.028)	(0.030)
Euro factor	0.093**	0.126**
	(0.037)	(0.046)
Regional factor	0.214*	0.197**
	(0.097)	(0.082)
Oil prices	-0.002	-0.002
	(0.002)	(0.002)
Liquidity risk	0.097	0.025
	(0.117)	(0.050)
Risk aversion	0.005*	0.034**
	(0.002)	(0.015)
Constant	0.011	-0.002
	(0.007)	(0.005)
Observations	11,352	8,687
Adjusted R^2	0.0158	0.0932

Note: Pooled OLS estimates of Eq. (2) restricted to emerging Asia prior to and post-2005 and using bilateral forward exchange rates (vs. the US dollar) rather than spot exchange rates. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 15: Global exchange rate factor model – Estimates for emerging Asia *(RMB used as regional factor)*

	Full sample	*Before 2005*	*After 2005*	*Pre-crisis (2005/7)*	*Financial turmoil (2007/8)*	*Post-crisis (since 2009)*
	(1)	(2)	(3)	(4)	(5)	(6)
Chinese statements	-0.071**	-0.038*	-0.070**	0.074*	-0.046*	-0.149***
	(0.023)	(0.020)	(0.028)	(0.040)	(0.024)	(0.041)
US factor	0.697***	0.772***	0.648***	0.629***	0.641***	0.698***
	(0.059)	(0.051)	(0.068)	(0.087)	(0.061)	(0.061)
Euro factor	0.046**	0.000	0.119***	0.054*	0.172***	0.145**
	(0.016)	(0.011)	(0.033)	(0.029)	(0.053)	(0.051)
RMB factor	0.030	0.001	0.063	0.020	0.030	0.148**
	(0.036)	(0.028)	(0.052)	(0.042)	(0.089)	(0.053)
Oil prices	-0.006***	-0.004*	-0.003	0.001	0.003	-0.009**
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Liquidity risk	0.158**	0.299*	0.043	0.273	0.038	1.353*
	(0.061)	(0.140)	(0.047)	(0.190)	(0.050)	(0.605)
Risk aversion	0.039***	0.020***	0.047***	0.020**	0.042***	0.057***
	(0.009)	(0.005)	(0.012)	(0.007)	(0.012)	(0.016)
Constant	0.013**	0.026***	-0.005	-0.027**	0.028	-0.015
	(0.004)	(0.008)	(0.007)	(0.008)	(0.019)	(0.010)
Observations	18,188	10,267	7,921	2,600	2,606	2,715
Adjusted R^2	0.200	0.186	0.245	0.281	0.229	0.262

Note: Pooled OLS estimates of Eq. (2) restricted to emerging Asia and for various sub-periods: (i) before the start of China's exchange rate reform in 2005; (ii) after the start of the reform; (iii) before the eruption of the global financial crisis (2005/7); (iv) during the intensification of the global financial turmoil (2007/08); (v) since the onset of the recovery in emerging Asia (post-2009). The RMB/SDR (orthogonal with respect to both the US and euro factors) is taken here as regional factor. China is excluded from the estimation so as not to have it on both sides of the regression. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Table 16: Determinants of the heterogeneity in the elasticity to RMB shocks across countries

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Exports to China	0.250***						0.099		
	(0.073)						(0.067)		
Imports from China		0.204***						0.076	
		(0.048)						(0.053)	
Financial integration with China			0.384***						0.252**
			(0.066)						(0.111)
Exchange rate flexibility				-0.034**			-0.038**	-0.039**	-0.020
				(0.016)			(0.018)	(0.018)	(0.021)
Dollar bloc dummy					0.090***				
					(0.027)				
Euro bloc dummy						-0.041	-0.063**	-0.065**	-0.078**
						(0.033)	(0.029)	(0.028)	(0.036)
Constant	-0.130***	-0.130***	-0.148***	-0.034	-0.149***	-0.111***	-0.017	-0.015	-0.078
	(0.016)	(0.016)	(0.017)	(0.037)	(0.018)	(0.017)	(0.045)	(0.045)	(0.060)
Observations	46	46	35	48	48	48	46	46	35
Adjusted R^2	0.0258	0.0142	0.0356	0.130	0.158	0.00604	0.160	0.158	0.0662
log likelihood	40.95	40.68	32.84	45.66	46.46	42.47	45.44	45.38	34.50

Note: The table reports pooled OLS estimates of the determinants of the heterogeneity in the country-specific elasticities with respect to RMB shocks (Chinese statements on exchange rate and reserve policy) shown in Figure 5. Robust standard errors are reported in parentheses. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% level of confidence, respectively.

Appendix A: Additional tables

Table I: List of the main authors of official statements

Presidents of the People's Republic of China

- Jiang Zemin: 27 March 1993 – 15 March 2003
- Hu Jintao: since 15 March 2003 – present

List of Premiers of the People's Republic of China

- Li Peng: 1987 – 17 March 1998
- Zhu Rongji: 17 March 1998 – 16 March 2003
- Wen Jiabao: since 16 March 2003

Governor of the People's Bank of China (PBC)

- Dai Xianglong: June 1995 – December 2002
- Zhou Xiaochuan: December 2002 – present

Other PBC officials, Head of State Administration of Foreign Exchange (SAFE) and other Chinese officials (including from China Investment Corporation)

- Various relevant officials

Table II: Selected examples of official statements

A. Examples of statements on the exchange rate regime

Market impact	Dummy value	Date	Time	Policy-maker	Statement
US dollar reference is relaxed to appreciate	1	28/08/2005	23:48 GMT	Governor Zhou (People's Bank of China)	"I think it is very clear that China is introducing a new exchange rate mechanism. It is not a one-time adjustment."
US dollar reference is maintained	0	09/10/2004	03:32 GMT	Prime Minister Wen Jiabao (China)	"We will take gradual steps towards building a flexible and resilient exchange system."
US dollar reference is relaxed to depreciate	-1	08/05/1998	02:10 GMT	Governor Dai (People's Bank of China)	"We still have enough confidence to say we will be able to maintain a stable currency… It goes without saying that China has to pay a certain price to maintain a stable renminbi."

B. Examples of statements on reserve composition

Market impact	Dummy value	Date	Time	Policy-maker	Statement
Diversification out of the US dollar	1	08/01/2002	13:32 GMT	Finance Minister Xiang Huaicheng (China)	"China has always thought the euro important and thinks that it will some day be on an equal footing with the U.S. dollar. It is inevitable that the euro will become some countries' reserve currency."
Reserve composition is maintained	0	24/03/2005	11:52 GMT	Deputy chief of SAFE Wei Benhua (China)	"When managing our foreign exchange reserves, we insist on the principle of safety, liquidity and profitability."
Diversification into the US dollar	-1	05/03/2006	01:25 GMT	Governor Zhou (People's Bank of China)	"The forex reserves are still growing. Some people are concerned that the amount of dollar assets in the reserves will fall. But that is not the case."

Source: authors' own compilation from Reuters News and Factiva.

Table III: Selected statistics on the data on official statements

	# by type:	
	Exchange rate regime	FX reserve composition
-1	26	9
0	167	14
1	76	29
Total:	**269**	**52**

	# by author:					
	People's Bank of China (Governor)	People's Bank of China (other official)	President	Premier	Head of SAFE	Other Chinese official
-1	8	3	6	5	1	3
0	96	11	11	42	18	10
1	36	8	7	19	5	8
Total:	**140**	**22**	**24**	**66**	**24**	**21**

Source: authors' own compilation from Reuters News and Factiva.

Appendix B: Theoretical basis underlying the conditional model

The theoretical basis for such a model can be found in the microstructure literature of FX markets, and more specifically the literature on announcement effects and asset prices (e.g. Andersen et al. 2003, Blinder et al. 2008). This literature commonly models the exchange rate in a standard asset-pricing framework, where the log exchange rate s_t is a function of the discounted value of private sector expectations about future fundamentals f_{t+i}:

$$s_t = (1-\theta)\sum_{i=0}^{\infty}\theta^i \; E_t(f_{t+i}|\,\Omega_t)$$

with Ω_t as the public information available at time t, and θ as the discount factor. Since the objective is to understand the effect of public statements by policy-makers on exchange rates, it is useful to formulate a dynamic specification of this model, which yields

$$\Delta s_t = (1-\theta)\sum_{i=0}^{\infty}\theta^i \left[E_t(f_{t+i}|\Omega_t) - E_{t-1}(f_{t+i}|\Omega_{t-1})\right]$$

The implication is that what drives exchange rates are changes to expectations by market participants about relevant future fundamentals. As China's reserve diversification plans and changes in its exchange rate regime may precisely be such fundamentals, along with our three-factor pricing model, our conditional empirical model can be rationalized from this simple, stylized conceptual framework as Eq. (2).