

# RMB Internationalisation: Where to Next?

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Photo: Thomas Ruecker

## Abstract

China's push to make its own currency – the renminbi (RMB) – available for use by non-residents was a catalyst for important reforms. Since the RMB internationalisation policy began in 2009, not only is the RMB now in greater use internationally, capital flows more freely across China's borders, the exchange rate is more flexible and domestic interest rates are more market determined. In time, the RMB could emerge as a widely used regional currency in Asia.

## Introduction

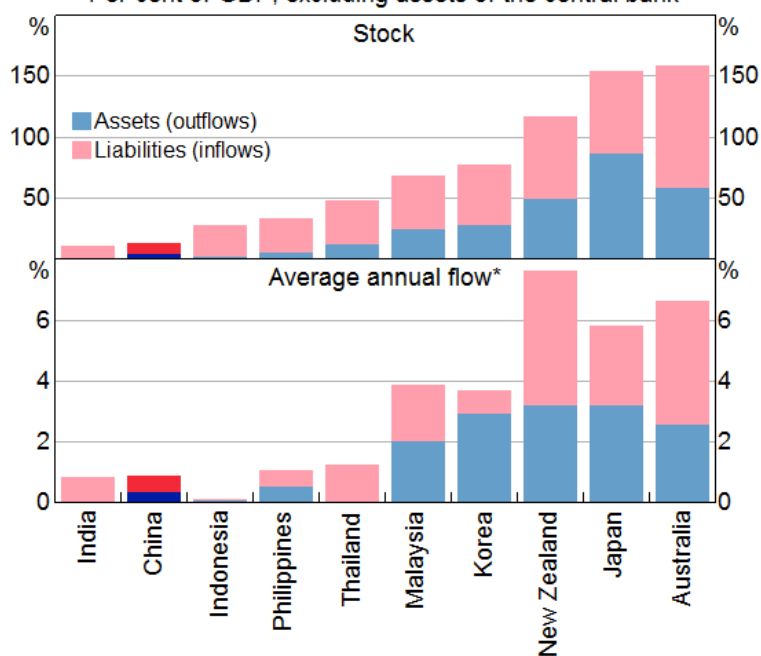
A currency can be considered to be 'international' if it is used offshore for trade and investment. There are strong natural drivers behind the international use of the RMB. China is the world's largest trader, it is the second biggest economy and its securities markets are among the largest in the world. Hence, as businesses become more comfortable using the RMB, the currency is likely to become increasingly internationalised. Unlike other cases of currency internationalisation in the 20th century, Chinese authorities began promoting the use of the RMB outside its borders in 2009 while still maintaining extensive controls on capital flows and a tightly regulated financial market (McCauley 2011a). The goal of RMB internationalisation has been an important motivator for opening the capital account and advancing financial market reforms. Indeed, greater use of the RMB internationally is likely to accompany capital account opening and financial market reform in China.

A more open capital account in China could be transformative for financial flows globally, including for Australia. Among other things, it will have an impact on the type of offshore financial assets Chinese residents purchase. Most of China's offshore financial assets are still held by the central bank, which invests in safe and liquid assets, such as government bonds, in a range of advanced economies. However, as the capital account opens, private sector entities in China will hold more foreign assets, and will probably hold different and more diversified assets than the central bank does. Currently, China's holdings of offshore portfolio assets (excluding the People's Bank of China (PBC)'s official reserve assets) and associated outflows are much smaller than its Asian neighbours (Graph 1).<sup>[1]</sup>

Graph 1

## Asia – Offshore Portfolio Holdings

Per cent of GDP; excluding assets of the central bank

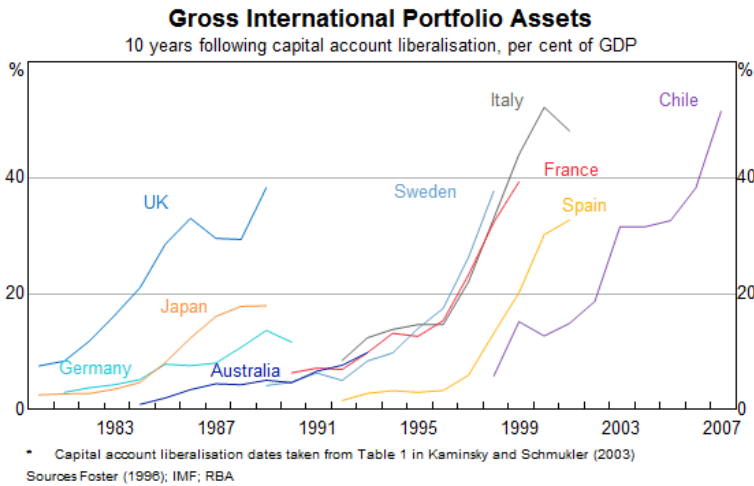


\* Over past five years

Sources: IMF; RBA

But, if Chinese outflows as a share of its economy were equal to the average of its developed Asian peers – around 3 per cent of GDP – they would have amounted to US\$360 billion last year. This is equivalent in value to the combined portfolio outflows of Germany, Japan, the United Kingdom and France.<sup>[2]</sup> However, the experience of other economies following capital account liberalisation suggests that the process of greater integration is drawn out and, as a result, Chinese residents are likely to increase their exposure to international portfolio assets gradually over a long period of time (Graph 2).

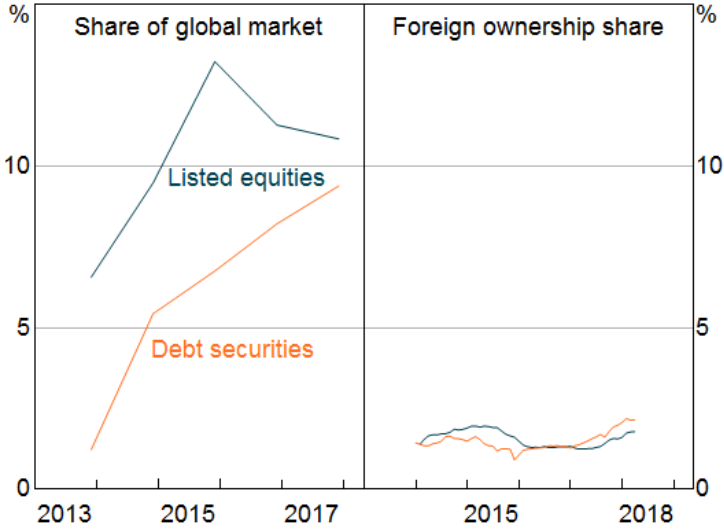
Graph 2



A more open capital account may also be transformative for China's own financial markets. Foreigners currently own about 2 per cent of the total amount outstanding in Chinese securities markets, despite mainland Chinese securities accounting for around 10 per cent of the global amount outstanding – making them the third largest capital market in the world (Graph 3). This illustrates how under-represented Chinese securities are in global investors' portfolios. Even for Chinese Government debt – which in the past has been more open to foreign investment than corporate debt – the foreign ownership share is the lowest in the Asian region (Graph 4). Increased foreign participation would create a more diverse investor base in Chinese securities markets, which would potentially allow different types of credit risk to be priced more accurately. It would also provide a catalyst for market development – for example, in China's budding bond futures market. This would encourage yet more foreign investment, resulting in a self-reinforcing feedback loop. However, a more open capital account also has risks, such as more volatile funding flows.

Graph 3

### The Weight of China

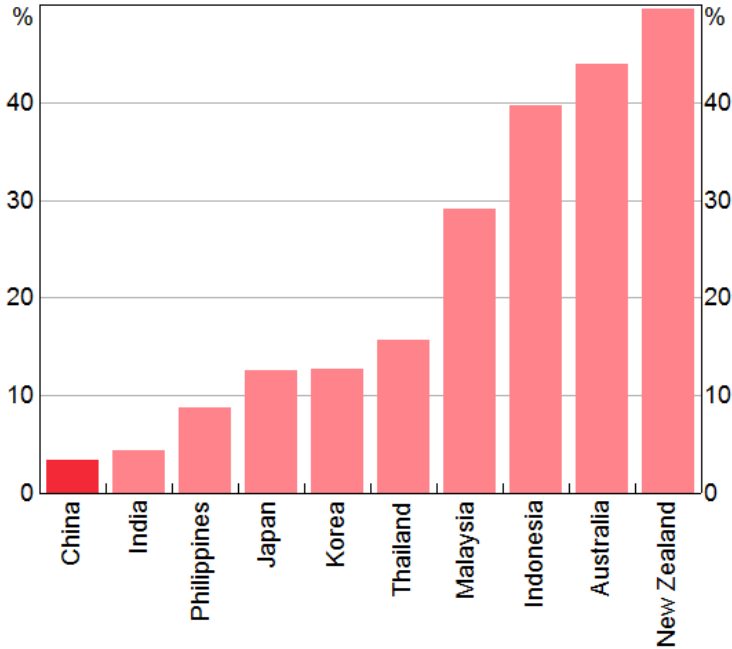


Sources: BIS; CEIC Data; PBC; RBA; WIND; World Bank

Graph 4

### Asian Sovereign Debt – Foreign Ownership

Local currency debt; per cent of outstanding



Sources: IMF; RBA

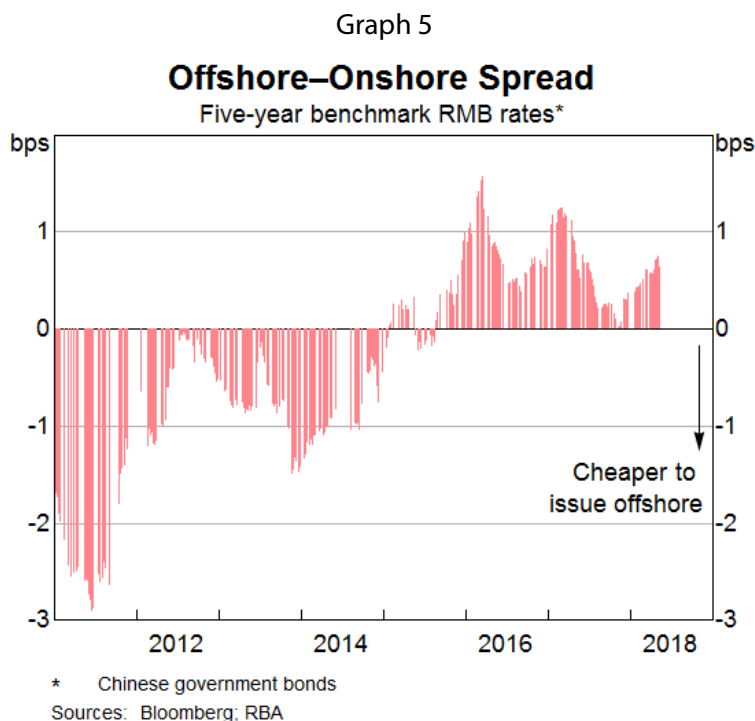
Against this background, it is important to reflect on the developments to date in the internationalisation of the RMB and consider the opportunities for the future. In doing so, this article is organised into two parts. The first examines why the Chinese authorities sought to have an internationalised currency while also maintaining extensive controls on capital flows and a tightly regulated financial market. It also discusses the development of a pool of offshore RMB as a tool to internationalise the RMB. It then examines trends in the international use of the RMB, including in the Australian market. The second part is forward looking, highlighting the RMB's natural fit as a regional currency in Asia. Some empirical evidence is presented showing the emergence of an embryonic RMB currency bloc in the region, although the evidence is far from definitive.

## Why Internationalise the RMB?

In some ways, it is easy to appreciate why the authorities have sought an internationalised currency – a policy push that began meaningfully in 2009.

- Important symbolic benefits come from issuing a currency that is recognised internationally. Such recognition provides an implicit 'seal of approval' for China's markets, institutions and policies (Bernanke 2015).
- Tangible benefits can also follow from issuing an international currency. It is often argued that the US dollar's international role confers a so-called 'exorbitant privilege', which is reflected in a lower-than-otherwise interest rate on US dollar financial assets. This allows the United States to hold a net foreign liability position (with US residents holding fewer offshore assets than foreign holdings of US assets), but have a net income surplus (with US residents earning more on their total holdings of offshore assets than foreigners earn on their holdings of US assets).<sup>[3]</sup>
- Greater use of the RMB in trade reduces exchange rate risks and provides greater convenience for Chinese exporters and importers whose other costs and revenues are mostly in local currency terms.
- Greater use of the RMB reduces the exposure of China's tradeable sector to sudden falls in the global supply of US dollars. A reduction in US dollar liquidity during the global financial crisis has been cited as a contributor to the substantial fall in Chinese exports during that time (IMF 2009).
- RMB internationalisation reduces borrowing costs for Chinese firms by increasing access to offshore RMB funding markets. An offshore pool of RMB and the development of an offshore RMB bond market – the so-called 'dim sum' market – have allowed mainland

Chinese firms to borrow offshore at rates that have often been lower than those available in the onshore market (Graph 5). Borrowing offshore in local currency also reduces the exposure of Chinese firms to exchange rate risks.



But, in other ways, the push to internationalise the RMB is unusual. Historically, the widespread adoption of a currency for use by non-residents has depended more on fundamental factors than policy initiatives. The historical record suggests three fundamentals in particular seem to matter (Frankel 2012): economic size; confidence in the currency; and open and dependable financial markets. In 2009, the Chinese authorities stepped up their efforts to develop an offshore market for the local currency while still maintaining extensive controls on capital flows and a tightly regulated financial market.

For this reason, some observers have also speculated that the push to internationalise the RMB was tied to domestic development goals – namely, further opening of the capital account and the liberalisation of the domestic financial system (Prasad (2017a, 2017b); Yu (2015); Kroeber (2013) and Thornton (2012)). Indeed, some authors suggest that RMB internationalisation has had parallels with the way the Chinese authorities were able to take advantage of China's entry into the World Trade Organisation in 2001 as a vehicle for some domestic market reforms, which otherwise could have been politically difficult to achieve (Gao 2016). The core of this argument is that RMB

internationalisation was used to accelerate China's capital account opening, which would in turn build pressure to introduce further financial reforms.<sup>[4]</sup> According to this view, a vehicle was needed for pushing ahead with further liberalisation of the financial system because, by 2009, reform momentum in China had slowed. The liberalisation of the capital account, domestic interest rates and the exchange rate were seen as essential for producing a better allocation of capital and more sustainable growth in China.<sup>[5]</sup> But, despite being on the formal policy agenda, these reforms had become politically difficult to progress in the aftermath of the global financial crisis.

Once the capital account became more open, arbitrage required more flexibility in setting deposit interest rates, as well as increasing the benefits of exchange rate flexibility. These reforms did not necessarily have to be carefully sequenced – prioritising interest rate reform over capital account convertibility and currency flexibility. Instead, the PBC had argued that they could occur at the same time 'in a coordinated way,' consistent with the historical experiences of other economies (PBC 2012).

The global prestige accorded by the RMB's possible inclusion in the International Monetary Fund's (IMF) Special Drawing Right (SDR) basket – which is reviewed only every five years – also created a timeline for reforms. This is because the IMF viewed certain reforms as necessary before the RMB's inclusion in its currency basket. This important symbolic recognition came in late 2015, with the decision becoming effective in 2016.

## The Reform Journey

The key component of China's initial efforts to internationalise the RMB was the establishment of a pool of offshore RMB in Hong Kong. Not only was this important for the role of the RMB, it was perhaps important as a catalyst for broader market reform.

### The offshore pool of RMB

To establish the initial pool of offshore RMB in Hong Kong, two early reforms were critical. First, in 2009 the PBC launched a pilot scheme (completed in 2010) that allowed selected Chinese importers to pay for their imports in RMB using banks in Hong Kong, thereby carving out a channel for RMB to flow out of China. Banks in Hong Kong were then permitted to open direct correspondent accounts with mainland banks allowing these funds to flow back to the mainland.

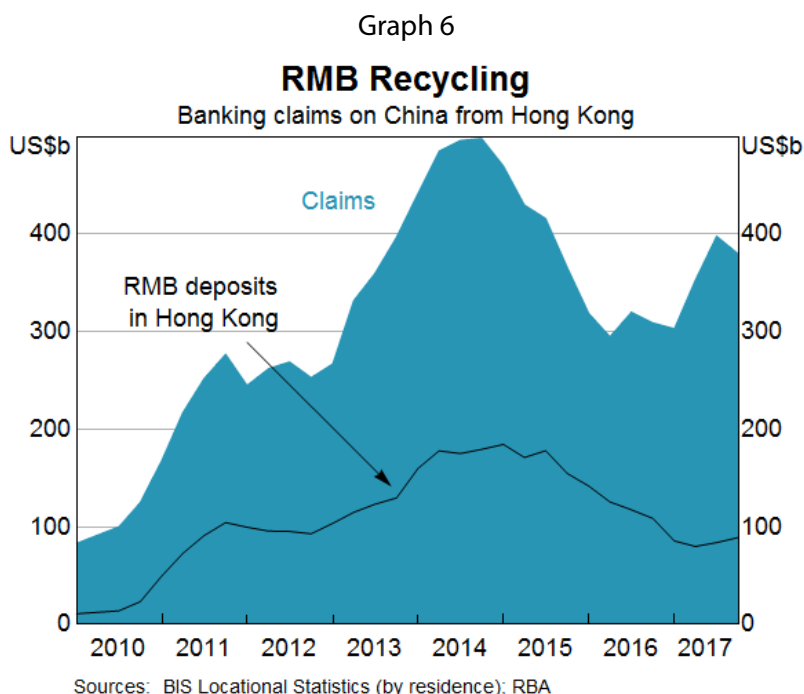
Second, in 2010, all restrictions on establishing corporate RMB deposit accounts in Hong Kong were removed. This allowed foreigners to accumulate offshore RMB deposits obtained through export receipts.



As a result, the offshore pool of RMB increased rapidly over 2010 to 2015, driven by RMB trade settlements.

### RMB recycling and capital account opening

The establishment of this offshore pool of RMB was indeed effective in applying pressure to further open China's capital account. Channels were opened to make it easier for offshore Chinese banks looking to transfer their RMB deposits back to their domestic branches (Cockerell and Shoory 2012). The authorities also built connections between the onshore and offshore RMB markets through various pilot schemes that permitted lending between Hong Kong and the mainland and vice versa. Bond proceeds from issuance of dim sum bonds were also permitted to be repatriated back to the mainland with approval from the PBC. As a result, total banking-related claims on China increased significantly. As these claims were related to the recycling of offshore RMB deposits back to the mainland as loans (HKMA 2014), they tended to move closely with trends in the offshore pool of RMB (Graph 6).



The authorities also opened up a number of new channels for foreigners looking to invest their offshore RMB deposits in Chinese financial markets. These included the RMB Qualified Foreign Institutional Investor program and direct access to the onshore bond market for selected foreign investors. Schemes were also put in place to allow RMB outflows, including the RMB Qualified Direct

Institutional Investor Program. A number of two-way investment schemes were also initiated, such as the stock connect programs (and later the bond connect program) linking Hong Kong and mainland markets.

## Rate reform

Hand in hand with these reforms, domestic interest rates were gradually liberalised. The freer movement of RMB across borders posed competitive challenges to both benchmark lending and deposit rates. This added impetus to local financial market developments that were pushing in the direction of freeing up interest rates. For example, the development of saving instruments that offered higher returns than traditional bank deposits – such as Wealth Management Products – had become a popular way of getting around deposit rate ceilings. The authorities also allowed banks to issue negotiable certificates of deposit, which had prices that were market determined. An increase in shadow bank lending was also enabling the banks to bypass formal lending restrictions.

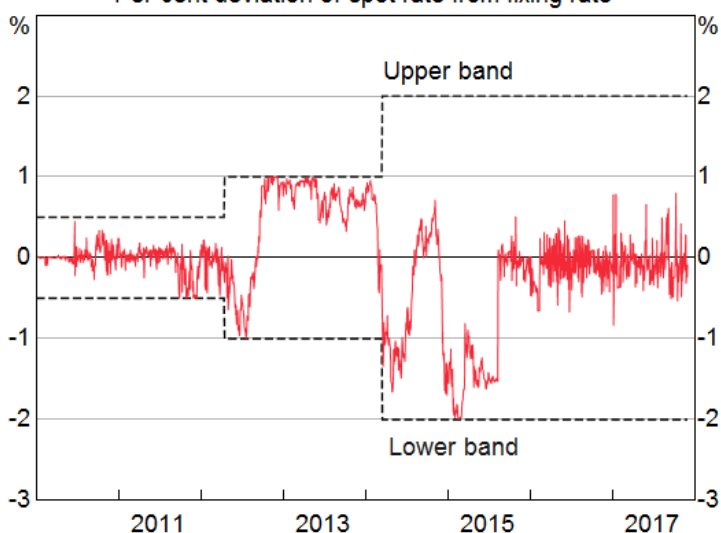
To allow banks more scope to compete on lending rates, the bank lending rate floor was removed in mid 2013. And to add flexibility to the controlled deposit ceiling, the authorities gradually eased the cap on deposit rates. By late 2015, the cap was removed entirely, freeing up interest rates on both loans and bank deposits.

The exchange rate was also slowly liberalised. In early 2012, the RMB's trading band against the US dollar was widened from  $\pm\frac{1}{2}$  per cent to  $\pm 1$  per cent and then to  $\pm 2$  per cent in early 2014 (Graph 7). In August 2015, the PBC also increased the transparency of the RMB's daily fixing rate around which the RMB can trade within the  $\pm 2$  per cent band.

Graph 7

### RMB Trading Band against US Dollar\*

Per cent deviation of spot rate from fixing rate



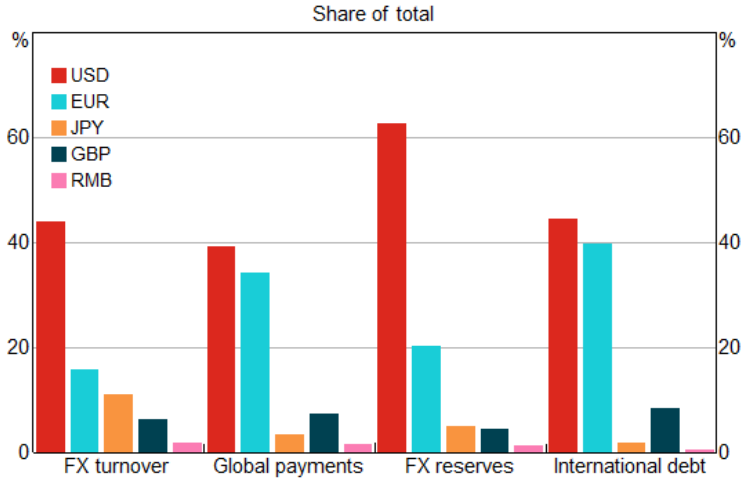
\* Positive deviation indicates RMB appreciated relative to fix  
Sources: Bloomberg; China Foreign Exchange Trade System

## Trends in RMB Usage

Looking back, the RMB has made considerable progress towards becoming an international currency over the past decade. A move further towards being a truly global currency would be supported by an open capital account, with scope for the currency to be used in a way that is commensurate with China's size in the global economy. The RMB accounts for about 2 per cent of global foreign exchange (FX) turnover; 1½ per cent of global payments; ¼ per cent of global official sector FX reserves; and a negligible amount of international debt securities outstanding (Graph 8).<sup>[6]</sup> In contrast, China accounts for almost 20 per cent of global output and over 10 per cent of global trade. Important in this respect is that developments in RMB usage have been driven not only by longer-term 'structural factors', but also more cyclical 'speculative factors'.

Graph 8

### A Snapshot of International Currency Use



Sources BIS; IMF; RBA; SWIFT

### Structural factors

Since the decision to allow RMB trade settlements in 2009, Chinese firms have naturally sought to invoice more of their trade in RMB. In the presence of capital controls in China, the establishment of offshore RMB ‘centres’ have made it easier for such transactions to take place.<sup>[7]</sup> Invoicing trade in local currency terms has enabled Chinese firms to better manage their exchange rate risks. There is also a strong case for foreign firms to trade in RMB. Private sector estimates suggest that Chinese importers have added as much as 5 per cent to their foreign currency invoices to hedge against unfavourable exchange rate movements (Eichengreen, Walsh and Weir 2014). By invoicing in RMB, international firms are also able to improve trading relationships and access new trading opportunities.

For Australia, these structural factors have led to a steady increase in the share of our merchandise trade *invoiced* in RMB, though from a low base (Graph 9). Around 2.5 per cent (\$1.5 billion) of our merchandise imports from China are invoiced in RMB and around 0.5 per cent (\$0.6 billion) of our exports. The local pool of RMB deposits is broadly consistent with these numbers, fluctuating between \$4–8 billion.

Graph 9

### Australia's Trade Invoiced in RMB

Share of merchandise trade with China



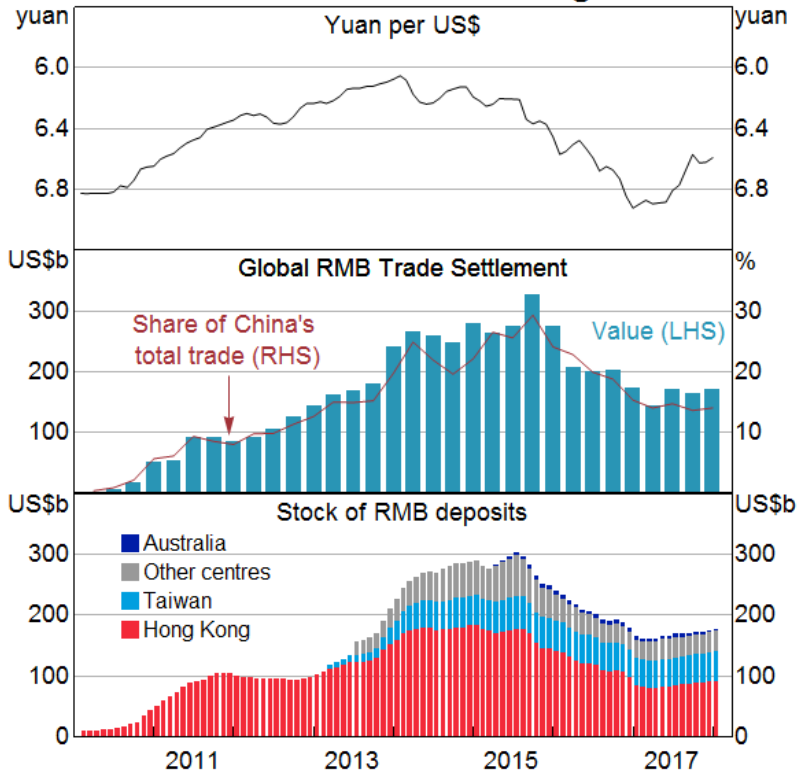
Sources: ABS; RBA

#### Speculative factors

But globally, changes in the stock of RMB offshore – most of which is held in Hong Kong – has, in large part, been driven by ‘speculative factors’, in particular expectations regarding the path of the RMB. The amount of global trade settled in RMB and related changes in the stock of offshore RMB deposits have shown a strong association with the value of the RMB against the US dollar (Graph 10). This pattern has been driven by Chinese firms’ willingness to adjust their use of the RMB to settle trade in line with their expectations for the value of the RMB.

Graph 10

### Cross-border RMB Usage

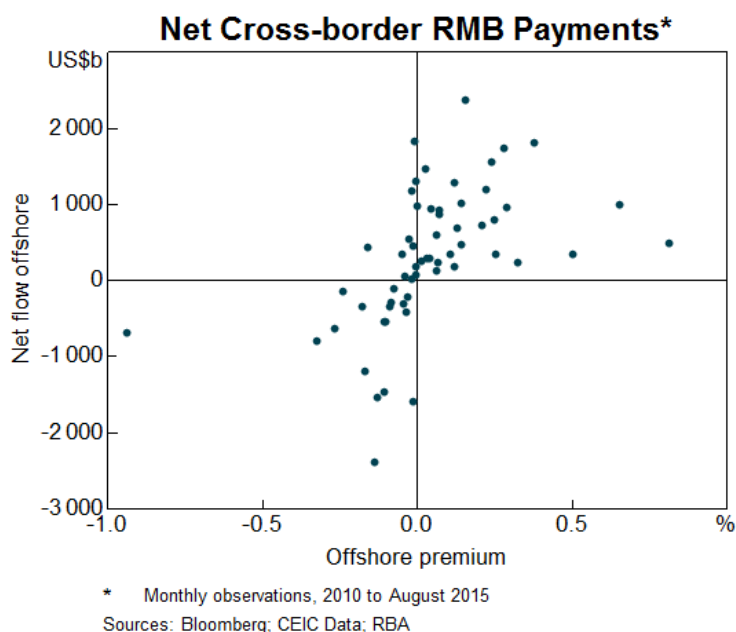


Sources: Bloomberg; CEIC Data; RBA

Over the period 2010 to 2015, Chinese firms' RMB payments for imports were larger than their RMB receipts from exports. This led to a net outflow of RMB that ultimately supplied the offshore market with RMB deposits, which increased from virtually zero in 2010 to over US\$300 billion by 2015. These trade-related flows were driven by expectations that the RMB would appreciate.

These expectations made the value of the RMB in the offshore (CNH) market worth more than in the onshore (CNY) market. (Two markets exist for the RMB because the authorities have allowed the offshore pool of RMB to be freely traded and delivered offshore in Hong Kong by all entities for any purpose.) This naturally drove a net flow of RMB to where it was worth more in the offshore market. These speculative flows resulted in a strong positive association between the offshore premium (CNH premium over CNY) and the flow of RMB from onshore to offshore (Graph 11).

Graph 11



By contrast, over the period 2015 to 2017, Chinese firms' use of the RMB to settle import payments declined, regardless of the level of the offshore premium. This occurred as expectations for the path of the RMB shifted to a likely depreciation after the PBC increased the role of the market in determining the value of the RMB in August 2015. As a result, the value of the RMB in the freely traded offshore market became cheaper than its value in the onshore market, stemming the flow of RMB offshore and naturally driving RMB back onshore. Over this period, the stock of offshore RMB deposits halved in value, representing a significant retracement in progress towards internationalising the RMB.

### Shifting policy priorities

The authorities' focus on internationalisation of the RMB has not always been consistent, as other policy priorities have, at times, taken precedence – for example, addressing concerns about leverage within the financial system.

When the RMB was expected to depreciate, RMB internationalisation also became more difficult to support as a policy. From mid 2014 to the end of 2016, the RMB depreciated by 10 per cent against the US dollar, private capital outflows were around US\$1 trillion and active PBC reserve sales to support the value of the currency were around US\$0.8 trillion (McCowage 2018). Of note, in early 2016, the PBC intervened in the offshore market by buying RMB in the Hong Kong spot foreign

exchange market. This led to a large reduction in the supply of RMB in this market and the overnight interest rate for interbank RMB loans in Hong Kong briefly spiked to almost 70 per cent. The PBC also introduced measures that increased the costs and risks of holding RMB offshore, including the introduction of a reserve requirement on offshore RMB deposits. To many, this signalled the PBC's willingness to temporarily 'sacrifice' the offshore market in order to manage expectations for the value of the RMB (Kroeber and Long, 2016).

More recently, however, as the value of the RMB began to appreciate over 2017, the value of China's RMB trade settlements and the stock of RMB deposits have started to pick up again. The Chinese authorities have also taken steps to replenish the offshore RMB market. These have included removing the reserve requirement it had imposed on offshore RMB deposits and allowing selected offshore banks to swap their onshore bonds for RMB cash in the mainland interbank market (in so-called 'repo' transactions).

It is likely that the role of speculative factors in determining RMB usage patterns will recede as the RMB-US dollar exchange rate becomes more market determined and so more volatile. Faced with this reality, Chinese firms will be less inclined to adjust their RMB usage patterns in line with their expectations for the path of the exchange rate. Instead, increased currency volatility is likely to give rise to an increase in RMB usage for genuine risk management purposes (Chinn and Ito 2015).

## RMB Usage in the Asian Region

Looking to the future, Asia, and east Asia in particular, looms as a 'natural habitat' for the RMB to develop into a widely used international currency (Eichengreen and Lombardi 2017).

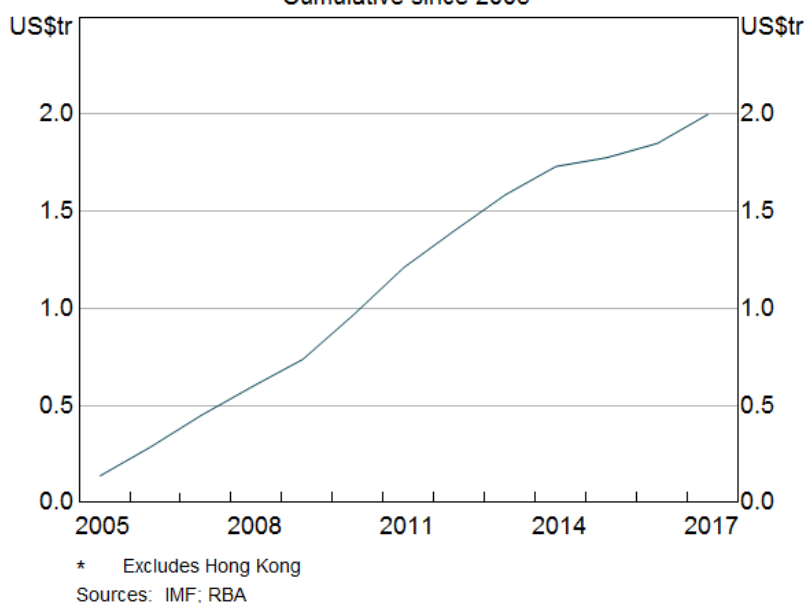
On the capital account, China has strong trade ties with its Asian neighbours and is a net importer from the region (Graph 12).<sup>[8]</sup> This means that the region is well placed to naturally accumulate RMB deposits.<sup>[9]</sup> At the same time, China's Belt and Road Initiative (BRI) – a foreign policy and economic initiative involving a program of infrastructure building throughout Asia, Africa, the Pacific and Europe – is likely to become an important driver of RMB usage in Asia. Strong participation by Chinese companies in the construction of these projects will increase demand for RMB trade settlements, further promoting two-way RMB flows through the current account.



Graph 12

## China's Net Imports from Asia

Cumulative since 2005



The BRI could also increase RMB financing flows to the region given the large value of the program. Indeed, the Chinese authorities are promoting the use of the RMB for BRI project financing (Global Times 2018, and Tan 2018).

Closer links to China mean that movements in the RMB should become more relevant for Asian exchange rate markets. For example, the currencies of Asian economies in the same production chain as China are likely to respond to global demand shocks in the same way as the RMB. The currencies of large commodity exporters to China are also likely to respond to Chinese news in the same way as the RMB. Closer links to China also create an incentive for those in the region with managed exchange rates to stabilise the local currency against the RMB, which would help to avoid a loss of competitiveness associated with exchange rate misalignments. These stronger ties should, in turn, encourage central banks in the region to hold more foreign exchange reserves denominated in RMB and provides context for the region's numerous RMB swap facilities with the PBC.

### An embryonic RMB bloc in Asia?

To explore whether an RMB bloc – a group of currencies that move closely with the RMB – is already developing in the Asian region, we examine the co-movement of these economies' exchange rates

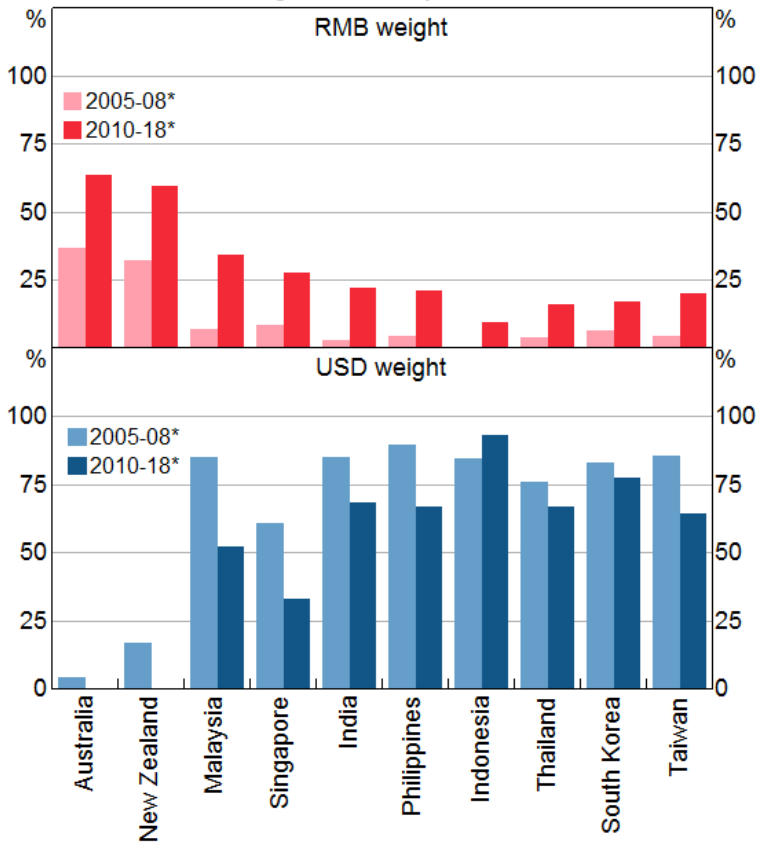
plus the Australian and New Zealand dollars (our sample currencies), with the currencies in the IMF's SDR basket of major reserve currencies, including the RMB. A high co-movement with any given reserve currency indicates that any news that affects that reserve currency's relative price also affects the relative price of the currency in our sample in a similar way. The measured co-movement could reflect a decision to manage the exchange rate of the sample currency with reference to a basket containing the reserve currencies (for example, in the case of Singapore) or be driven by the market (for example, in the case of Australia). The empirical estimation establishes the 'weights' of the reserve currencies in representing the changes in each sample currency. These weights reflect the relative co-movement between the sample currency and the major reserve currencies; a reserve currency that has a higher co-movement with the sample currency will have a higher weight. (For more details on the procedure followed see [Appendix A](#).)

The longer-term trend suggests the Asian monetary system is becoming bipolar, influenced by both the US dollar and the RMB. The RMB has started to move more closely with Asian economies' exchange rates. This is shown in Graph 13, which plots the estimated weights of the RMB in each Asian currency's basket over two periods when the RMB was not fixed to the US dollar.<sup>[10]</sup> Nevertheless, the US dollar is still by far the most important anchor currency for most economies in the region. Any news that affects the relative price of the RMB now also affects the relative price of the Australian and New Zealand dollars in a way that is commensurate with the large weight of the RMB in their trade baskets. It is also important to note that the low weight of the US dollar in the Australian and New Zealand baskets does not mean that movements in the US are not relevant for Australia and New Zealand. Rather, it shows these currencies react in a very similar way to the RMB in response to US-centric shocks.

Graph 13

### The Rise of the RMB in Asia

Weight in currency baskets



\* Periods when the RMB was not fixed to the USD: 21/07/2005 to 30/06/2008 and 17/06/2010 to 30/04/2018

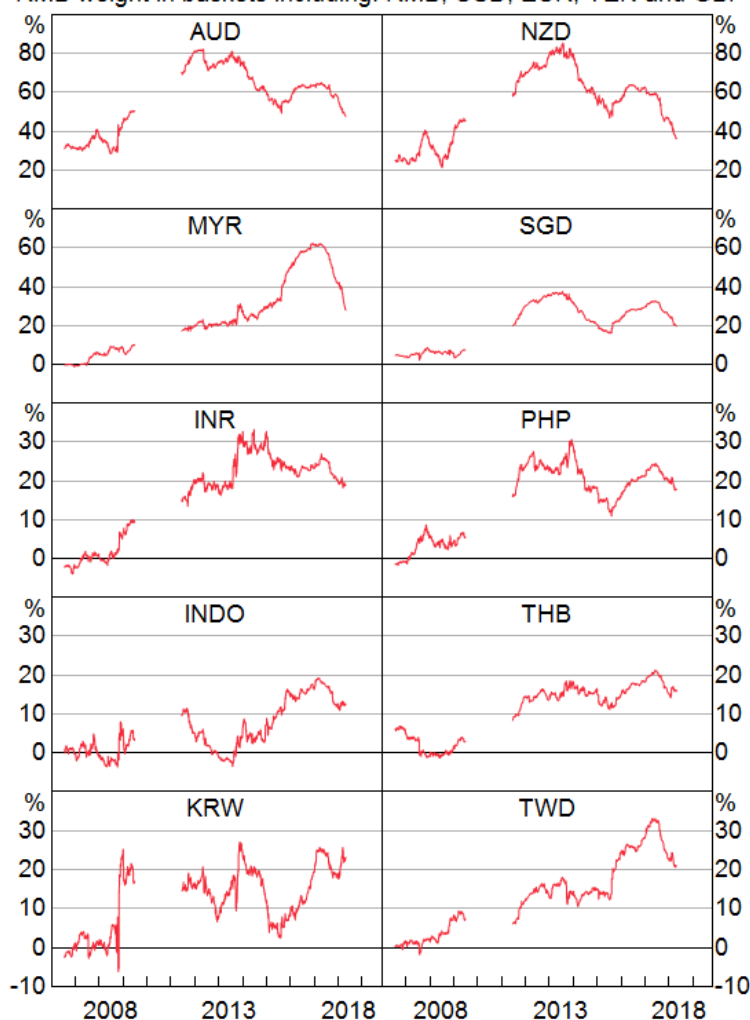
Sources: Bloomberg; RBA

While it appears that an embryonic RMB currency bloc is developing in Asia, the bloc is far from stable. The size of the RMB bloc has declined almost uniformly over recent years, as shown in Graph 14, which plots the daily evolution of the RMB's weight in each basket. These dynamics are likely to have been driven by two factors.

Graph 14

### The Rise of the RMB in Asia\*

RMB weight in baskets including: RMB, USD, EUR, YEN and GBP



\* Estimated from daily rolling two-year regressions; adjusted for the period when the RMB was pegged to the USD

Sources: Bloomberg; RBA

First, trade is a key determinant of currency co-movements (Oomes and Meissner 2008). When economies that have similar exchange rate patterns increase their trade with each other, the co-movement of their currencies tends to increase. These 'trade network externalities' – which are especially relevant for the Asian region given their production links (Berger-Thomson and Doyle 2013) – reflect that the trends in the size of the RMB bloc relate to changes in the share of China's trade denominated in RMB (Graph 10).

Second, trends in the size of the RMB bloc in Asia also appear to reflect the way authorities manage the exchange rate (McCauley and Shu 2018). For instance, since the RMB's effective peg to the US dollar was dropped in 2010 there has been more two-way flexibility in the value of the RMB, which coincided with an increase in the RMB's co-movement with Asian currencies. As the Chinese authorities exercised more control over the exchange rate in 2017, there was marked fall in co-movement of the RMB with other Asian currencies.

## Conclusion

An important theme from this article is that the internationalisation of the RMB has to be viewed in the broader context of China's financial and economic reforms. The first phase of the policy push (spanning 2009 to 2015) served as a catalyst for important financial reforms in China. These reforms have allowed market forces to play a more decisive role in the allocation of resources in the economy, and further opened China up to the rest of the world.

If China continues to gradually open the capital account and move towards a more flexible exchange rate, the second phase of internationalisation could see the RMB emerge as a widely used regional currency in Asia. If this occurs, the accumulation of RMB deposits and the recycling of these back into Chinese markets will significantly increase direct financial linkages between the Asian region and China. As a small open economy with an already liberalised capital account, Australia will also likely attract an increased volume of financial flows from China, and a more internationalised RMB should see it feature somewhat more prominently in Australian economic and financial transactions accordingly. It is reasonable to expect these developments will generate a range of benefits from greater access to capital, as well as some possible financial stability challenges if the volatility of capital flows increases, over the medium term.

## Appendix A Estimating Currency Co-movements with the RMB

The equation by Frankel and Wei (1994) is the starting point to estimate the co-movement of the RMB and other major international currencies with Asian currencies, the Australian dollar and New Zealand dollar:

$$\Delta \left( \frac{x}{n} \right)_t = \theta_0 + \theta_{USD} \Delta \left( \frac{USD}{n} \right)_t + \theta_{RMB} \Delta \left( \frac{RMB}{n} \right)_t + \theta_{EURO} \Delta \left( \frac{EUR}{n} \right)_t + \theta_{JPY} \Delta \left( \frac{JPY}{n} \right)_t + \theta_{GBP} \Delta \left( \frac{GBP}{n} \right)_t + u_t \quad (1)$$

Here,  $x$  denotes an individual Asian currency in terms of a common numeraire currency ( $n$ ). Daily data is used, denoted by time period ( $t$ ). As such,  $\Delta \left( \frac{x}{n} \right)_t$  captures the daily percentage change of a sample currency against the common numeraire currency.

The weights on each reserve currency are given by the coefficient estimates ( $\theta_{USD} \dots \theta_{GBP}$ ). Like other studies, the Canadian dollar (CAD) is used as the numeraire as it is a floating currency with no controls on capital flows. The results are robust to using an alternatively floating currency – the Chilean peso – as the numeraire.

The problem with just estimating Equation (1) is that the correlation between the change in the US dollar and the RMB is very high, even outside of periods when China pursued a US dollar peg. To overcome this, the two-step regression method of Kawai and Pontines (2016) is used.

In the first step, movements in the RMB that are independent from movements in other major reserve currencies are obtained as the residuals from the following regression:

$$\Delta \left( \frac{RMB}{CAD} \right)_t = \beta_0 + \beta_{USD} \Delta \left( \frac{USD}{CAD} \right)_t + \beta_{EUR} \Delta \left( \frac{EUR}{CAD} \right)_t + \beta_{JPY} \Delta \left( \frac{JPY}{CAD} \right)_t + \beta_{GBP} \Delta \left( \frac{GBP}{CAD} \right)_t + w_t. \quad (2)$$

The residuals from estimating Equation (2) ( $\hat{w}_t$ ) are then included on the right-hand side of the standard Frankel-Wei regression instead of actual movements in the RMB:

$$\Delta \left( \frac{x}{CAD} \right)_t = \alpha_0 + \alpha_{USD} \Delta \left( \frac{USD}{CAD} \right)_t + \alpha_{EUR} \Delta \left( \frac{EUR}{CAD} \right)_t + \alpha_{JPY} \Delta \left( \frac{JPY}{CAD} \right)_t + \alpha_{GBP} \Delta \left( \frac{GBP}{CAD} \right)_t + \alpha_{RMB} \hat{w}_t + e_t. \quad (3)$$

Next, the residuals ( $\hat{w}_t$ ) are subtracted from both sides of Equation (3) and the condition that the weights on the currencies on the right-hand side of Equation (3) add to one is imposed. That is: ( $\alpha_{USD} + \alpha_{EUR} + \alpha_{JPY} + \alpha_{GBP} + \alpha_{RMB} = 1$ ).

Doing so produces the second step regression:

$$\Delta \left( \frac{x}{CAD} \right)_t - \hat{w}_t = \alpha_0 + \alpha_{USD} \left[ \Delta \left( \frac{USD}{CAD} \right)_t - \hat{w}_t \right] + \alpha_{EUR} \left[ \Delta \left( \frac{EUR}{CAD} \right)_t - \hat{w}_t \right] + \alpha_{JPY} \left[ \Delta \left( \frac{JPY}{CAD} \right)_t - \hat{w}_t \right] + \alpha_{GBP} \left[ \Delta \left( \frac{GBP}{CAD} \right)_t - \hat{w}_t \right] + v_t. \quad (4)$$

Estimation of this regression for each Asian currency yields the RMB weight as ( $\alpha_{RMB} = 1 - \alpha_{USD} - \alpha_{EUR} - \alpha_{JPY} - \alpha_{GBP}$ ). To produce Graph 14, rolling daily regressions for each economy over a two-year window (520 days) are used.

It is important that all results for the weight of the RMB be interpreted as an upper bound. This is because the methodology assumes that all coefficients on the right-hand side of Equation (3) add to one. If this does not hold, any unexplained movements in reserve currency baskets are attributed to the RMB.

## Footnotes

- [\*] The authors are from International Department
- [1] China's foreign direct investment flows are more on par with other Asian economies. This reflects China's approach to capital account opening, which tended to favour direct investment flows before portfolio flows (Ballantyne *et al*, (2014); IMF (2017)).
- [2] Australia could be a large recipient of these portfolio flows. While of a different economic nature, Australia has been an attractive destination for Chinese outbound direct investment flows (McCowage 2018).
- [3] Some argue this benefit is not directly attributable to the US dollar's international role (McCauley 2015).
- [4] See: Prasad (2017a, 2017b); Yu (2015); Kroeber (2013) and Thornton (2012).
- [5] These reforms had been on the PBC's formal policy agenda since the early 2000s and were listed as priorities by the government in the 11th and 12th Five-Year Plans.
- [6] Caution should be adopted when interpreting data on the RMB's role as a payments currency. These data double count some transactions and they capture bank-to-bank activity rather than underlying commercial flows. For example, commercial transactions between China and the rest of the world that are intermediated through Hong Kong would be recorded as two transactions.
- [7] These offshore centres – including that of Australia – were established through the introduction of a number of initiatives, including official RMB swap facilities (of which there are around 40 globally), RMB clearing banks, direct currency trading and RMB investment schemes (see Hatzvi, Nixon and Wright (2014) for a discussion).
- [8] This excludes Hong Kong, as a large share of China's trade is exported to Hong Kong and then re-exported without being transformed in the process (Day 2015).
- [9] This assumes that the propensity to use the RMB for exports and imports is about the same. This is not necessarily the case. For example, China has a trade deficit with Australia, but a larger amount of our imports from China are denominated in RMB compared to our exports. This is because Australia's resource exports to China are mostly denominated in US dollars.
- [10] The RMB was fixed to the US dollar in 2008 in response to the financial crisis.

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