

## **The determinants of renminbi internationalisation: an empirical analysis of renminbi foreign exchange trading**

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## **ABSTRACT**

The purpose of this dissertation thesis is to identify factors influencing the international use of the Chinese currency renminbi (RMB). We are using the share of RMB foreign exchange trading in offshore markets to measure for international currency use utilizing data from the BIS Triennial Central Bank Surveys. The chosen method of identifying determinants of offshore RMB trading is a pooled ordinary least squares regression using unbalanced panel data for fifty countries in 2013, 2016 and 2019. We find that economic and political links to China are the most important factors influencing RMB trading. Bilateral FDI, presence of FTAs and participation the Belt & Road scheme all increase RMB use, while engaging in a dispute with China causes a decrease. China's policies aimed at incentivising RMB use, namely bilateral swap agreements, RQFII quotas, and RMB clearing banks, also promote global RMB use. We further studied whether RMB trading is determined by the same factors in low and high income countries. The findings suggest that low income countries mostly benefit from an increase in ease of realising RMB transactions, which reflects their generally lower financial sophistication. On the other hand, in high income countries RMB trading is mainly promoted through investment; the RQFII scheme, bilateral FDI and Belt & Road participation all have a positive effect.

**Key words:** *renminbi internationalisation, international currency, foreign exchange turnover, offshore renminbi trading*

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## Contents

<b>Introduction</b> .....	1
<b>Section 1: Theoretical background</b> .....	3
International currency definition .....	3
A brief overview of the internationalization process .....	4
<b>Section 2: Literature review</b> .....	10
<b>Section 3: Data, methodology and preliminary analysis</b> .....	15
RMB use measurement .....	15
Preliminary analysis of variables .....	16
Correlation matrix .....	21
<b>Section 4: Model results</b> .....	23
<b>Section 5: Discussion and future research</b> .....	29
<b>References</b> .....	31

## Introduction

The global financial crisis of 2007-2008 revealed the weak resilience of economies against fluctuations in the US Dollar-centric international monetary system. The crisis triggered difficulties with valuating and settling international trade, especially in East Asia, due to the shortage of USD-denominated liquidity. This moment in history marks the start of decreasing global economic integration, which has only been exacerbated by the COVID-19 pandemic (Irwin 2020) and Russia's invasion in Ukraine (Giles 2022). The reliance of increasingly multipolar systems on a single currency pose a threat to the global monetary system's stability. This prompted the Chinese government in 2009 to start the process of reforming its exchange rate system and promoting internationalization of its currency, yuan, otherwise known as renminbi (RMB), in order to limit China's and its trading partners' reliance on the US Dollar. Since 2009 China has undertaken many steps in an effort to promote RMB internationalisation. This includes, among others, the establishment of offshore RMB clearing banks, expansion of the bilateral currency swap agreements network with foreign central banks, and creation of RMB investment quotas to ease foreign investors' access to Chinese capital markets. The use of the currency has irrefutably increased since the inception of this process. In January 2012, RMB only accounted for 0.25% of all global payments, while in the same month in 2022 the share increased to 3.2% (SWIFT 2011, 2022). Another measure showing the increase in RMB use is the currency's trading in foreign exchange markets. The RMB foreign exchange turnover was 285 billion US Dollars in 2019, which represents an 866% increase since 2010 (BIS 2010, 2019). However, there is currently not enough evidence to determine whether the increase can be attributed to China's efforts or whether it is other forces driving the internationalisation process. The purpose of this study is therefore to explore the progress China has made in internationalising its currency and to identify determinants aiding or inhibiting the process in regard to RMB use in offshore markets.

The growing importance of China's trade and investment outflows in the global economy and its increasing economic and financial integration with the rest of the world are drawing more attention to the role of its currency. The internationalization of the RMB is of great importance to the global financial and monetary system, especially considering countries that might come to rely on the RMB in their international transactions. This includes Asian countries with close ties to China, as well as African countries that receive a great deal of loans from China through the Belt and Road scheme. The pressing question of whether RMB could challenge the US Dollar's dominance has recently resurfaced in the light of Russia's invasion in Ukraine. The sanctions imposed on Russia have sent the rouble down 30% this year. However, despite the strategic and trading links China has with Russia, the renminbi has remained stable. In Q1 of 2020, the share of US dollar transactions between

China and Russia fell under 50%, while RMB settlement rose to about a quarter. RMB assets also make 13% of Russia's foreign reserves. This might boost the role of the yuan in the global financial system, as more people are starting to view it as a safe haven asset separated from the global market turmoil. There have been other recent signs of progress. The RMB overtook the Japanese yen as the fourth most used global payments currency, and the RMB globalisation index by the Standard Chartered Bank has reached a new all-time high. The importance of China's payment system CIPS may also increase, as Russia's limited access to SWIFT might force them to use the Chinese payment system instead. As the western nations once again make access to the dollar more difficult, incentives to rely on the Chinese RMB increase for other developing countries, not just Russia. A great deal of discussion surrounds the RMB, with some opinions asserting that the demise of the dollar as the dominant currency is imminent and that the RMB might be the one to replace it.

RMB becoming an international currency would create extensive implications for the international monetary system. Therefore, it's important to understand which factors are driving this transformation. The majority of studies done so far have focused on determining how international RMB is, and the feasibility of it becoming a truly international currency in the future. This study assumes that RMB has already become more international in the past decade based on a quantitative preliminary analysis of the Society for Worldwide Interbank Financial Telecommunication (SWIFT) and Bank for International Settlement (BIS) data, and a qualitative study of policy breakthroughs in RMB internationalisation. The aim of this study is to determine which factors have aided the internationalisation process using a pooled ordinary least squares (POLS) regression. The BIS Triennial Central Bank survey foreign exchange turnover data is used as a measure of international use of RMB. The focus is therefore on offshore market determinants of internationalisation, rather than China's domestic factors. This topic has not been explored extensively in the body of currently available academic literature. The aim of this dissertation is to expand upon current research by using the most recent data, as well as including past data to conduct a panel analysis. We will also show that the internationalisation process is determined by different factors in low and high-income countries.

The rest of this paper is organised as follows: Section 1 provides a theoretical background of currency internationalisation and a brief overview of the RMB internationalisation process thus far. Section 2 summarises empirical research related to RMB internationalisation. Section 3 builds upon findings from Section 2, describing the data and model used in this dissertation, and section 4 summarizes results from the regression. Finally, section 5 concludes this paper and proposes potential future research to further explore the topic of RMB internationalisation.

## Section 1: Theoretical background

### International currency definition

In order to evaluate the RMB internationalisation process, it is first necessary to understand the characteristics of an international currency. Kenen (2011) defines it as a currency which is held and used beyond the borders of the country issuing the currency. The most important characteristic of an international currency is that it's used by non-residents to realise their transactions, rather than just by residents of the issuing country.

Chinn and Frankel (2005) and Yu (2012) present a comprehensive list of functions a currency should serve to be considered international, building upon the classic domestic functions of money by introducing international applications. Based on their work, Table 1 summarizes these functions.

**Table 1:** *The functions of an international currency*

Function of money	Public use	Private use
Store of value	International reserves	Currency substitution (private dollarization) and investment (portfolio allocation)
Medium of exchange	Foreign exchange market intervention	Vehicle currency, invoicing trade agreements and financial transactions, settlement currency
Unit of account	Anchor for pegging local currency	Denominating trade and financial transactions

Chinn and Frankel (2005) propose three categories of international currency's functions. Namely, they should serve as a store of value, medium of exchange, and a unit of account. They further differentiate between public and private use of an international currency. Central banks use an international currency as a reserve currency and as a vehicle currency in foreign exchange interventions. Smaller countries can choose to peg their domestic currency to an international currency in order to stabilize its exchange rate. Private agents can choose to use an international currency instead of domestic for currency substitution or hold it in cash and deposit accounts. They can further utilize an international currency to invoice and settle their trade without it being either party's domestic currency. Lastly, an international currency is used to denominate financial transactions and assets.

The contribution made by Yu (2012) to this matrix is to include an investment function. He also proposes that both the functions of invoicing and denominating should fall under the

unit of account category. He further argues that the most important function in relation to an international currency status is the function of an international reserve currency.

In other words, an international currency should be used in cross-border transactions, including both current and capital account transactions. Moreover, it should serve as a reserve currency. (Krugman 1980; Chinn and Frankel 2005; Goldberg and Tille 2008). An international currency is accepted and used by everyone to settle cross-border transactions of various character.

Considering the theoretical framework, RMB needs to meet certain criteria to be considered an international currency. First, the government needs to ensure the currency can be traded freely by both domestic and foreign agents. Second, Chinese and foreign firms need to be able to invoice their exports in RMB. Third, Chinese entities should be able to issue financial assets denominated in the currency in offshore markets, and foreign investors should be able to hold them. Fourth, international financial institutions need to be able to issue debt instruments within China in RMB and use RMB in their operations. Lastly, foreign central banks should be able to hold RMB as a part of their foreign reserves (Kenen 2011). The focus of this study is on the first criterion, using foreign exchange turnover as proxy for barrierless currency conversion in foreign exchange markets.

### **A brief overview of the internationalization process**

Krugman (1980) argues that dominant economies' currencies should be used as vehicle currencies in settlement of international trade and financial operations. The US dollar (USD) is currently the preferred currency for settling international trade and investment, as well as a reserve currency. The Japanese yen was a strong contestant for becoming the next truly international currency two decades ago, but Japan was not successful in the internationalisation process. China, being the world's second largest economy, is the next natural aspirant for internationalizing its currency.

Despite the Chinese authorities officially announcing the start of the internationalisation process in 2009, the first indications of their ambitions could be seen as early as 1994, when China started liberalising the yuan's exchange rate. In 1996 yuan became fully convertible under the current account. This was followed by a switch to a managed floating exchange system with a peg against a basket of currencies in July 2005. The next step in liberalising the yuan's exchange rate happened in 2013, when the People's Bank of China's governor announced a progressive withdrawal from regular market interventions (Uppal and Mudakar 2020). Also in 1994, the China Foreign Exchange Trade System (CFETS) was created. The CFETS is a subdivision of the Chinese central bank - The People's Bank of China (PBOC) - which supports interbank trading and foreign exchange operations. Throughout the years, the CFETS has improved the trading mode of RMB against various

currencies and launched direct trading between RMB and other currencies in interbank foreign exchange trading (PBOC 2021). In 2003, China implemented what can be considered the initial RMB promotional policy by establishing the first RMB clearing bank outside mainland China in Hong Kong. An offshore RMB deposit market was created in Hong Kong in 2004 with certain limitations on the amounts deposited. Hong Kong continued to be a testing ground for different policies aimed at promoting RMB use in the years to follow, due to its unique cultural, political, and economic links to China. The policies were first introduced in Hong Kong before being extended to other offshore markets. (Cheng, Grimm, Westermann 2021)

After officially committing to the internationalisation process in 2009, China started encouraging the use of RMB in trade settlement through a pilot cross-border trade settlement with Hong Kong (Eichengreen and Kawai 2015). The scheme originally only applied to five Chinese cities and then expanded to the rest of China in 2011. The first bilateral currency swap agreement easing the process of accessing RMB liquidity was signed between the PBOC and the Hong Kong Monetary Authority in 2009 (Liang 2020). Trading of RMB on the spot and forward market in Hong Kong was officially endorsed in July 2010 (Cheung, Yiu 2017). This series of policies also reversed the slow-paced growth of deposit volumes in Hong Kong.

By the end of 2011, the aggregated trade volume settled in RMB tripled in comparison to the previous year to 2.08 trillion yuan, according to the PBOC. Due to yuan appreciation trends, most of the trade settled in the RMB were imports, until late 2011. A structural change occurred at this time and the settlements of exports and imports became more balanced. By 2012 all trade of Chinese import and export enterprises, as well as offshore trading partners, was to be settled in RMB.

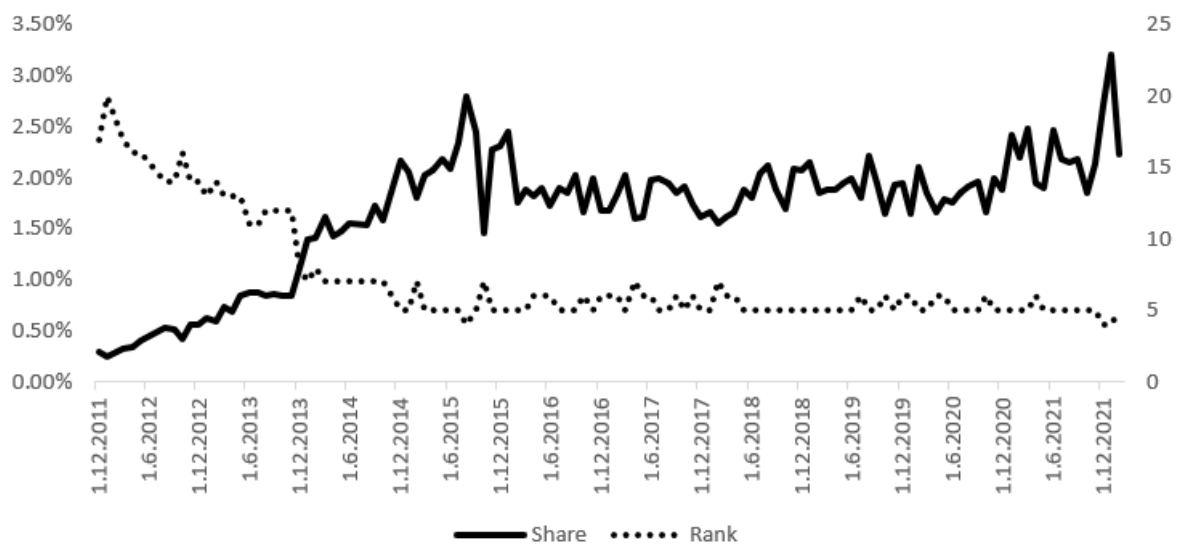
Financial markets need to gain depth, width, and liquidity and become more open to foreign investors to naturally increase the use of a country's currency. While China sought to elevate its currency to an international status its capital account of the balance of payments, as well as the entirety of its financial system, were subject to much larger control than any other country that had previously attempted to internationalize its currency (Eichengreen and Kawai 2015). The result was that the Chinese financial market was generally regarded as shallow and underdeveloped (Cruz, Gao and Song 2014). Since 2012, the process of RMB internationalization mostly became the process of capital account liberalization, as the stringent regulations imposed on the capital account were hampering the internationalization process (Yu 2012). In order to expand its financial markets, China has introduced three important promotional policies, sometimes referred to as the "three gifts"; the establishment of offshore RMB clearing banks, an expansion of RMB currency swap agreements with foreign central banks, and the creation of the RMB Qualified Foreign



Institutional Investor (RQFII) scheme. The RQFII scheme allows foreign institutional investors to invest in Chinese equity and debt markets using offshore RMB in the scope of granted quotas. China has further appointed additional promotional policies, including; the Shanghai – Hong Kong stock-connect and bond-connect programmes, issuance of RMB denominated equities in overseas markets, issuance of dim-sum and panda bonds, Qualified Foreign Institutional Investor (QFII) quotas, and the Belt and Road Initiative (BRI) (Cheng, Grimm, Westermann 2021). In 2016, China launched the Shenzhen – Hong Kong stock-connect programme. They also introduced the Qualified Domestic Institutional Investor scheme which allowed domestic investors to invest in foreign markets. China was expected to launch the Qualified Domestic Individual Investor 2 (QDFII2) scheme in 2015 but has not done so until this day due to capital outflow restrictions imposed during this year. The establishment of the QDII and QFII schemes was made possible due to previously mentioned accumulation of RMB in offshore deposit accounts. In 2019 the RQFII and QFII schemes were merged, followed by removal of the quotas in 2020, further easing the access into China's capital markets for foreign investors.

The growing importance of RMB in global markets as a result of these policies, combined with China's economic power, prompted the IMF to include the RMB in its SDR basket of currencies in 2015 along with the US Dollar, Euro, Japanese Yen and the British Pound. The inclusion came into effect on October 1<sup>st</sup> 2016 (Uppal and Mudakar 2020). Moreover, in 2015 China launched the Cross-Border Interbank Payment System (CIPS), a China specific payment system to rival SWIFT. Chinese financial institutions and companies conducting international business use CIPS to facilitate RMB clearing and settlement (SWIFT 2019b). In August 2015 the share of RMB as a world payment currency reached an all-time high of 2.79% assuming the position as the fourth most used global currency for the first time (SWIFT 2015). In the same month, the PBOC announced that it would modify the RMB central parity formation mechanism and would no longer publish a daily reference price of the RMB, essentially adopting a less managed floating exchange rate regime. The announcement led to a one-off devaluation of the currency. To limit the subsequent outflow of capital and capital repatriation, China had to strengthen capital controls once again, which hampered the internationalisation process by deterring foreign investors from engaging in business involving RMB. (Cheng, Grimm, Westermann 2021). This led to RMB dropping from the fourth most used payments currency to the fifth in September, and further to the seventh place in October. Using data from the SWIFT RMB Tracker, Figure 1 shows the development of RMB as a global payments currency since December 2011 until February 2022. It is apparent that the imposed regulations had a long-lasting impact, as it wasn't until December 2021 that RMB reached the fourth position again. In January 2021, the share of RMB as a world payments currency reached a new all-time high of 3.2%.

**Figure 1:** Share and rank of RMB as the global payments currency.



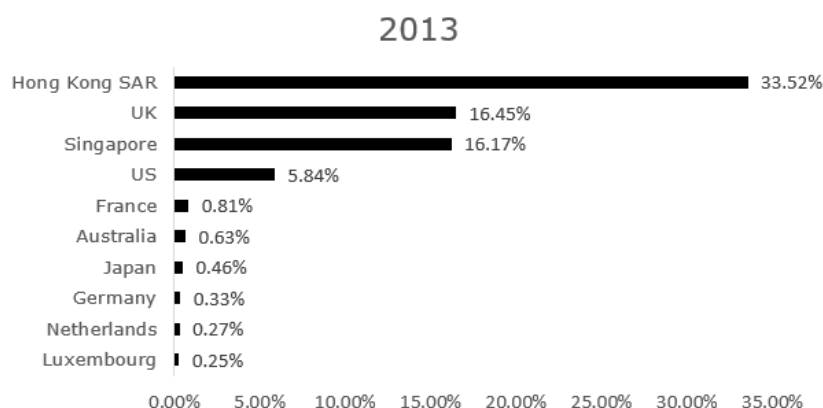
More complications in the RMB internationalisation process arose during Donald Trump's presidency, when a trade dispute between China and the USA began. The introduction of trade tariffs and modifications in global supply chains offset by the dispute have negatively impacted China's interaction with the rest of the world. Besides the dispute with the US, China has also engaged in other diplomatic conflicts, namely with South Korea, Japan, Australia and Singapore. South Korea has decided to deploy a US based military system, which led to sanctions against South Korean businesses in China (Han 2019). A territorial dispute surrounding the Diaoyu/Senkaku Islands triggered sanctions against Japanese businesses and negatively impacted trade between the two countries (Li and Liu 2019). Australia warned of growing influence of China on its politics, and demanded investigation into the origin of the Covid-19 virus. China has consecutively imposed tariffs of certain Australian agricultural products. Lastly, Singapore conducted a training exercise in Taiwan, which led to nine armoured vehicles being seized by China when they were being transported through Hong Kong. China also did not invite Singapore to join BRI in 2017. These disputes have led to other countries being deterred by China's assertive diplomatic approach, reassessing their ties with China and their engagement in RMB related business. These events have not completely stalled the internationalisation process, but it can be assumed that this would have had a negative effect. (Cheng, Grimm, Westermann 2021)

It is now apparent that RMB internationalisation has made significant progress since its inception in 2009 after the Global Financial Crisis of 2007-2008. The total foreign exchange turnover of RMB has been on the rise since 2010, reaching 29.2 billion USD in 2010, 119.6 billion USD in 2013, 202.1 billion USD in 2016, and 285 billion in 2019. This represents a shift from the twenty first position in currencies with highest foreign exchange trading

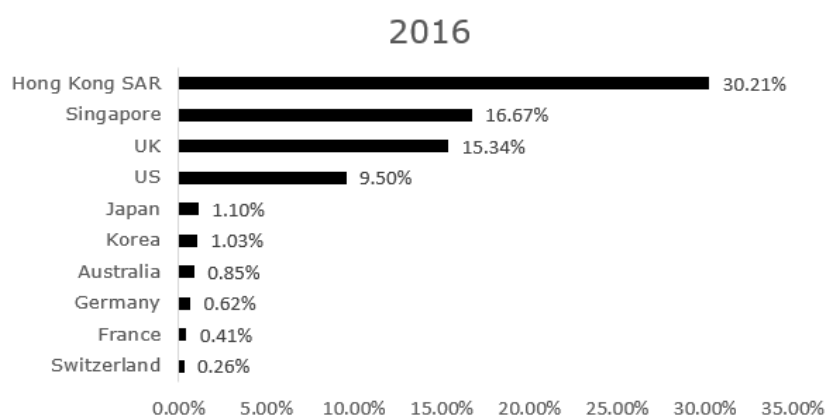
turnover in 2010, to the ninth in 2013, and finally to the eighth in 2016 and 2019. However, considering the fact that China is the second largest world economy, the turnover is still relatively low and represents just about 2% of the total foreign exchange turnover on average. On the other hand, USD, being the currency of the largest world economy, contributes to about 44% of total foreign exchange turnover on average. Other currencies consistently overtaking RMB in the share of total foreign exchange turnover are the Euro, Japanese Yen, British Pound, Australian Dollar, Swiss Franc, and Canadian Dollar. Batten and Szilagyi (2016) prove that despite the economic size of China, the role of RMB in the global financial system remains modest.

Another question posing itself in terms of the international role of RMB is the dominant role of Hong Kong in international use of the currency. Figures 2, 3 and 4 depict the top ten countries in terms of RMB foreign exchange turnover share throughout 2013, 2016 and 2019. During the observed period, Hong Kong maintains the first place in terms of RMB turnover share, although the share has been slightly decreasing. However, Cheung, Grimm and Westermann (2021) propose that in the case of RMB internationalisation, the initial regional trading pattern will converge over time towards a global foreign exchange trading pattern. Cheung, McCauley and Shu have already provided evidence of this being the case in their 2019 study. However, considering the BIS data, RMB turnover share distribution has not changed significantly over the years, with Hong Kong, UK, Singapore and US consistently realising the majority of RMB trading (not considering China). The London foreign exchange market is currently an important proponent of RMB foreign exchange trading, accounting for 15.68% of all RMB foreign exchange trading in 2019, making it the largest RMB offshore market outside of Asia. According to the SWIFT June 2019 data, the UK in fact replaces Hong Kong as the country handling the largest share of RMB trading with 33.79%, whilst Hong Kong only accounts for 19.22%. The most recent SWIFT RMB tracker in February 2022 shows that the share of RMB foreign exchange trading in UK has increased to 36.74%, suggesting the importance of foreign exchange market size for RMB trading (SWIFT 2022). London has the largest foreign exchange market in the world, accounting for about 40% of total global foreign exchange trading in 2019. The position of London allows RMB trading to grow organically with minimal political and institutional intervention (SWIFT 2019a). The importance of Hong Kong seems to be diminishing according to the SWIFT February 2022 data, as it has been pushed to the third position of countries with highest RMB turnover share, only accounting for 8.05% of all RMB spot foreign exchange transactions. The country with the second highest RMB turnover share is currently the US with 15.24%.

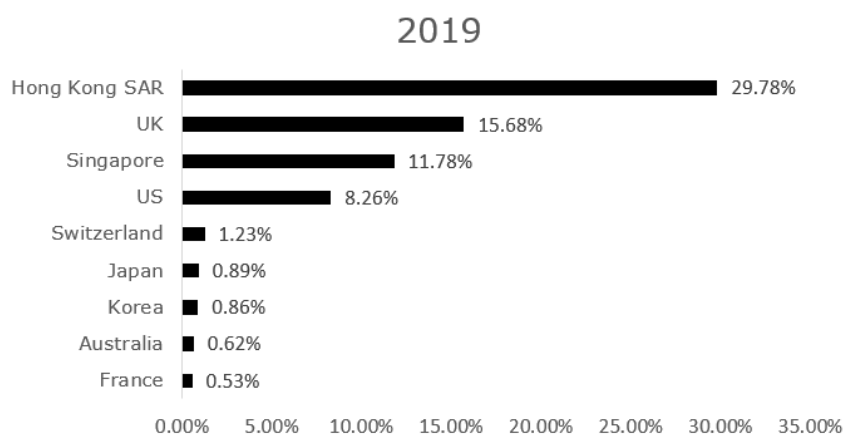
**Figure 2:** Top ten currencies in terms of RMB foreign exchange trading share in 2013 (excluding China). Data from the BIS Triennial Central Bank Survey 2013



**Figure 3:** Top ten currencies in terms of RMB foreign exchange trading share in 2016 (excluding China). Source: Data from the BIS Triennial Central Bank Survey 2016



**Figure 4:** Top ten currencies in terms of RMB foreign exchange trading share in 2019 (excluding China). Source: Data from the BIS Triennial Central Bank Survey 2019



China's current course of action in internationalizing RMB is the gradual lifting of capital account restrictions and development of its financial markets. Past efforts were primarily aimed at providing international access to China's corporations, whilst now they focus on broadening the role of international investors. China is also bolstering its presence in international markets, with an example being that China is currently South Korea's largest bond issuer in the Asia-Pacific region (Batten and Szilagyi 2016).

## **Section 2: Literature review**

An extensive body of academic research has thus far focused on the RMB internationalisation process, but it seldom includes an econometric analysis due to previous lack of available data. Most of the authors rather focus on the potential of RMB becoming an international currency based on China's domestic political and economic environment, and historical development of the internationalisation process (Eichengreen 2011; Subramanian 2011; Kenen 2011; Gao and Yu 2011). There seems to be a stronger focus on domestic conditions in China over the determinants of RMB use in offshore markets (Cohen 2012; Lee 2014; Ottero-Iglesias and Vermeiren 2015). Some of the quantitative metrics expanding the qualitative research are the cross-border spot foreign currency transactions (Kenen 2011), the number and volume of bilateral swap arrangements between China and other countries' central banks, volume of offshore RMB deposits (Gao and Yu 2011; Chen and Cheung 2011), and volume of RMB denominated bonds (Gao and Yu 2011; Chen and Cheung 2011; Gao, Song and Cruz 2014). Some studies use statistical methods while evaluating domestic factors influencing the use of the RMB, such as the size of the China's economy and trade, price levels, and degree of financial markets development (Lee 2014; Subramanian 2011).

Batten and Szilagyi (2016) find that the RMB has become more international in the years preceding their study, mostly in response to China's deregulatory policies. They also highlight the importance of international financial centres, with most of the money-market and foreign exchange market transactions undertaken by non-residents being done in London and New York. However, most RMB transactions are still primarily conducted with counterparties with significant cultural and social links to China, such as Hong Kong, Macau, and Singapore. The results from the authors' model suggests a stabilization of the momentum of RMB internationalisation. These findings are supported by other authors, such as Hua (2010), Tung, Wang and Yeh (2012), Shu, He and Cheng (2015) and Eichengreen and Kawai (2014).

Another group of studies focuses on foreign governments' approach towards the RMB. Chey, Kim and Lee (2019) focus on the overall infrastructure of policies enhancing RMB usage in their cross-country analysis, while Liao and McDowell (2015) focus only on the

currency swap agreements between China and other countries. More of Chey's research looks at individual countries and their policies towards RMB. In his 2014 study Chey analyses South Korean government policies and their impact on interest of domestic agents to use the RMB in their transactions. In 2018, Chey conducted similar research, this time focusing on Japan. These studies mostly utilize different government policies as their dependant variables.

A model built by He, Korhonen, Guo, and Liu (2016) attempts to estimate RMB's geographical distribution in the offshore foreign exchange market. However, this study does not consider the effect of various policies aimed at promoting RMB usage but instead focuses on political, cultural, and economic determinants. A similar study has been conducted by Cheung, McCauley and Shu (2019), where the authors analyse the geographical distribution of offshore RMB trading using the 2013 and 2016 BIS Triennial Central Bank Survey data. They find that in 2013 the Asian region had a disproportionately large share on the overall RMB trading due to China's policy focus in this region. However, in later years the RMB trading pattern seems to have started following the trading pattern of other currencies, implying the diminishing effect of policy measures and the increasing role of market forces.

When considering the case of USD, its popularity in global transactions is complemented and supported by offshore markets. RMB has been progressively used more overseas, due to China's efforts. Anecdotal evidence implies that the usage was initially concentrated in the Asian region and progressed to the rest of the world over time (Cheung, Grimm, Westermann 2021). Various authors have eventually started conducting quantitative empirical research into determinants of RMB internationalisation with focus on offshore markets and their links to China, rather than just China specific or foreign country specific determinants. This shift in research was made possible due to accumulation of relevant data from the BIS Triennial Central Bank Survey and the RMB world payments currency tracker by SWIFT. The global use of RMB is not distributed equally, therefore non-domestic factors influencing the internationalisation process must exist. This is apparent from Section 2, where it is demonstrated that RMB usage differs significantly across countries, and it is thus important to conduct a cross-country analysis of the determinants. Three main groups of possible determinants can be distinguished in most studies: China's RMB internationalisation promoting policies, the influence of the links of offshore markets to China, and country specific determinants.

Park (2010) argues that a long-term determinant of an international currency is its use in denominating financial assets which are held by non-residents, rather than in invoicing and settling trade. Yu (2012) further supports this argument by expressing that China should encourage non-residents to hold yuan denominated debt, such as panda bonds or dim-

sum bonds. Dim-sum bonds are yuan denominated bonds issued in Hong Kong, whilst panda bonds are yuan denominated bonds sold by non-residents in China. Shu, He and Cheng (2014) present evidence of the RMB's growing influence in the Asia-Pacific region, while highlighting the increasing importance of financial channels in this process. They propose that one of the key factors in RMB internationalisation is making RMB-denominated assets attractive to foreign investors. They stress the importance of the development of the corporate bond market, as well as relaxing controls over the stock market. China has made some progress in this field in the years after this study was published, notably by establishing the RQFII, QFII and QDII quotas, and stock-connect and bond-connect programmes. The RQFII policy specifically should increase the attractiveness of holding RMB outside of China in order to be able to purchase RMB denominated assets. Cheung, Grimm and Westermann (2021) find that the size of RQFII quotas, but not participation in the scheme itself, do extend a positive effect on offshore RMB trading. Chey and Hsu (2020) on the other hand, observe that countries which participate in the RQFII scheme do have a higher share of RMB foreign exchange market turnover, but only if a clearing bank was established simultaneously.

Bilateral currency swap arrangements and establishment of RMB clearing banks in offshore markets should promote RMB usage by providing easy access to RMB liquidity and therefore supporting trade settlement. Central bank liquidity swap arrangements are used by the PBOC to provide liquidity to its foreign counterparty. PBOC provides RMB liquidity to foreign central banks in exchange for foreign currency. Offshore RMB clearing banks facilitate clearing of RMB transactions, making it easier for banks that joined the clearing system to obtain RMB liquidity and reduce settlement costs. Park (2010) predicted that entering in to swap arrangements with foreign central banks should promote RMB usage based on theoretical evidence. Chey and Hsu (2020) demonstrate positive effect of clearing bank establishment even without RQFII scheme participation, but not of bilateral currency swap agreements. Cheung, Grimm and Westermann (2021) on the other hand, find the implementation of these policies to have no effect on the volume of RMB foreign exchange market trading in observed countries. Cheung, McCauley and Shu (2019) support this argument by demonstrating that rather than policy measures, market forces determine where the currency is traded. Liu, Wang and Woo (2019) find that policy measures only support the direct use of RMB. In accordance with other authors, McDowell (2019) also concludes that China has been ineffective in using the bilateral swap agreements to promote trade settlement.

It can be anticipated that economic and political links to China will also influence RMB trading. Cheung and Yiu (2017) suggest positive influence of bilateral FDI on RMB trading, however, bilateral trade seems to be insignificant. This result does not necessarily mean

the unimportance of bilateral trade but can be the result of co-movements between FDI and trade variables according to the authors. In a gravity model constructed by Liu, Wang and Woo (2019) FDI supports the vehicle currency role for USD and EUR, while in the case of the RMB only the number of users increases due to larger bilateral FDI, rather than trading volume. Cheung, Grimm and Westermann (2021) were able to confirm a positive relationship between bilateral trade and RMB foreign exchange turnover, only in the short-run, while the impact of FDI was insignificant. Chey and Hsu (2020) support the positive effect of bilateral trade in their research, whilst investment expressed as outstanding FDI stocks and FDI to and from China as share of GDP seems to have no impact.

Another important link between China and the rest of the world in the context of RMB internationalisation is the Belt & Road Initiative (BRI). The BRI is a multinational development plan created in 2017 aimed at connecting China with North Africa and Eurasia. China plans to invest one trillion US dollar into an infrastructure of roads, ports, canals, bridges, and rail lines in over sixty countries over a ten year period. This plan also involves investment into financial services, technology, utilities, and other areas. The initiative is a proponent of the emerging role of the RMB. Increasing financial flows between China and the host countries create ramifications for the host countries in terms of managing their international reserves and exchange rates. Ideally, China would want to use RMB denominated debt for the investments and promote trade settlement in RMB with the host countries. However, most BRI financing is currently done in the US dollar. Therefore there is a two-way relationship between RMB internationalisation and the BRI. China wants to use the BRI project to promote RMB usage, but the success of the scheme depends on RMB internationalisation, as using US dollars is more expensive and riskier than using the sovereign currency. Since the US dollar is still the dominant currency used by China in its investment and trade, PBOC must intervene in the foreign exchange market to maintain the value of RMB. In order to ensure confidence in RMB, it needs to regulate the capital account, which is inhibiting RMB internationalisation (Liang 2020). However, there seems to be evidence to support the positive role of BRI in RMB internationalisation. The number of financial institutions using RMB as a payment currency has risen by almost 21% from July 2017 to July 2019 in Africa and Middle East (SWIFT 2019a). On the other hand, Cheung, Grimm and Westermann (2021) find that participation in the BRI initiative has no significant effect on RMB usage.

An important determinant of RMB globalisation also seems to be the political climate between China and other countries. Cheung, Grimm and Westermann (2021) find that the share of offshore RMB trading decreased between 2016 and 2019 in countries that had entered into a dispute with China. However, this negative effect is mitigated by the volume of bilateral trade between the two countries. The bilateral trade variable is not significant



on its own, however it does become significant in interaction with the dispute variable. In a study conducted by Chey and Hsu (2020), territorial dispute has no observable effect on RMB usage.

Other potentially influential factors are the participation in the China Foreign Exchange Trade System (CFETS) and the presence of Free Trade Agreements (FTAs). Inclusion of a currency in the CFETS should make it easier for countries to exchange their currency for the RMB and therefore promote usage. Extension of the FTA network will most likely lead to trade expansion, which will create the need to choose an invoicing and settlement currency. This creates the opportunity for China to push the RMB internationalisation agenda (Park 2016). Very few authors have thus far focused on CFETS and FTAs as determinants of RMB internationalisation. Cheung, Grimm and Westermann (2021) have included them in their model and found both to have no significant effect on RMB foreign exchange trading.

The economic size of a country is likely to impact RMB usage, as bigger countries can be expected to interact with China more. Chey and Hsu (2020) find a positive influence of GDP as a proxy for economic size. Cheung and Yiu (2017) on the other hand find the economic size and growth potential of the reporting country to have no influence on RMB usage. Since both authors use a different set of both dependant and explanatory variables which can create different interactions, this relationship needs to be tested further.

It is also useful to consider how advanced the financial markets of the counterparties are in RMB trading. Cheung and Yiu (2017) find that countries with larger foreign exchange and equity markets, but not bond markets, have a higher reported share of RMB foreign exchange trading. They support these findings by also using the aggregate Financial Development Index developed by the IMF in their model as well. Countries with higher degree of financial development generally report higher RMB usage. The positive effect of the size of the countries' equity markets and its level of financial development have also been observed in a study conducted by Cheung, Grimm and Westermann (2021). They also find that with an increase in a country's global foreign exchange market share, the share of RMB trading also increases.

Finally, it needs to be said that empirical research is still quite scarce on this topic and the effect of many factors is still mostly inconclusive. We are hoping to expand upon this subject and offer more insight into RMB internationalisation determinants by using a larger sample than previously conducted studies, as well as distinguishing between determinants in low and high-income countries.

### Section 3: Data, methodology and preliminary analysis

In this study we will be using a pooled ordinary least squares regression to investigate the factors influencing the RMB internationalisation process proxied by RMB's use in offshore foreign exchange trading. Our hypothesis states that due to unequal distribution of RMB trading across the globe, RMB internationalisation is determined by specific factors in offshore markets on top of China's domestic conditions. We expect to find a mix of policy, economic and political, and country specific factors to have an influence on the RMB internationalisation process. Previous studies do not offer conclusive evidence of the impact of RMB internationalisation determinants proposed by theory. Therefore, in this study we will attempt to confirm or disprove the effects of previously conducted research using an extended dataset.

This study utilizes unbalanced panel data for 50 countries reported in the BIS survey over three periods. The total number of observations should therefore be 150, however, as some data was unavailable, the total number of observations is 75.

The specification of the model is as follows:

$$RMBshare_i = \alpha + \beta P_i + \gamma L_i + \mu C_i + \varepsilon$$

Where  $RMBshare_i$  represents the degree of RMB use in foreign exchange market transactions for country  $i$ ,  $P_i$  reflects a set of policy measures implemented between country  $i$  and China,  $L_i$  is a set of variables indicating economic and political relationships of country  $i$  with China,  $C_i$  stands for a set of variables measuring economic and financial conditions in country  $i$ , and  $\varepsilon$  stands for the error term.

#### RMB use measurement

This model will follow the research design of Chey and Hsu (2020) and use the percentage share of daily average RMB foreign exchange market turnover on the total daily average foreign exchange market turnover for each respective country. The data used to construct this variable is the foreign exchange market trading data from the 2013, 2016 and 2019 BIS Triennial Central Bank Surveys. Preceding studies have either only used cross-sectional data from one year (Chey and Hsu 2020; Cheung and Yiu 2017), or differences between two years (Cheung, Grimm and Westermann 2021). Therefore, this model is using a larger number of observations to produce more accurate results, and control for effects of changing conditions in the observed countries over time. Using the share of RMB trading instead of the sheer volume is more accurate, because larger countries will have an overall larger volume of foreign exchange market trading. Since the purpose of this study is to find country specific determinants, using volumes could produce skewed results.

Using the BIS data does produce a smaller sample than ideal for a regression, but to our knowledge it is the only relevant data available for measuring the RMB foreign exchange turnover in offshore markets and was utilized in various previous studies (Chey and Hsu 2020; Cheung, Grimm and Westermann 2021; Cheung and Yiu 2017; Cheung, McCauley and Shu 2019). The SWIFT foreign exchange data would be more viable, as they are reported monthly and would therefore produce a larger sample. However, the full data is not publicly available. The freely available SWIFT RMB monthly tracker only lists the five top countries in terms of RMB turnover share, which would produce a skewed sample since the top countries do not change overtime as was shown in Section 2.

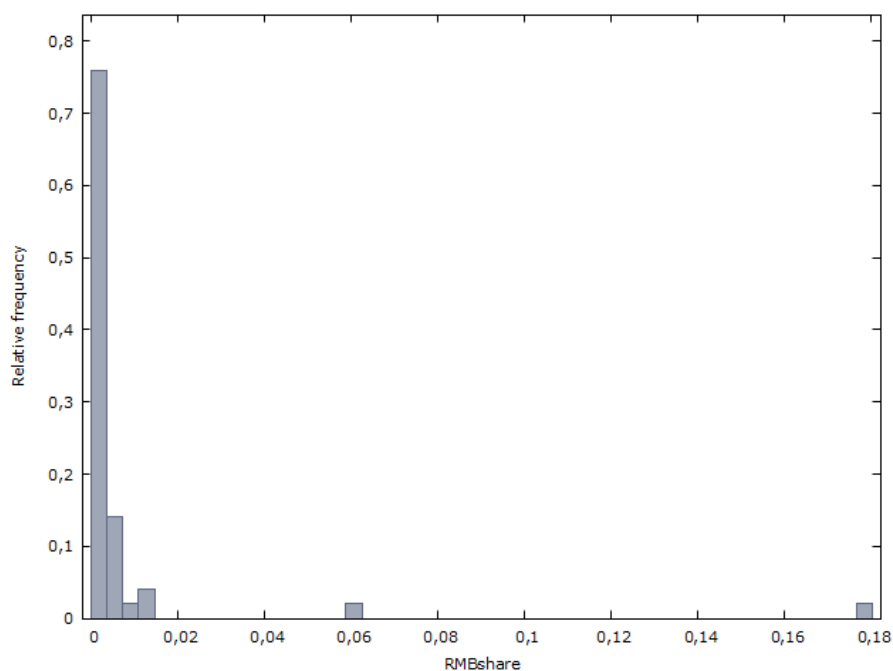
This variable represents the medium of exchange role of an international currency. Krugman (1980) argues that the three functions of an international currency are often not separable and create self-reinforcing dynamics. Transaction costs become progressively lower, and convertibility increases with expanding degree of internationalisation. This entices the use of the currency in other functions, which retroactively reinforces the use within the previous function. Therefore, it is not necessary to look at each respective function separately. With an increased use of foreign currency in the foreign exchange market, transaction costs and exchange rate risk reduce. This effect might create positive externalities, which will incentivise alternative use of the currency. Prasad (2016) states that the choice of currency for denomination and settlement of trade is also affected by the scope in which it can be used in international financial transactions, with foreign exchange turnover also being a good indicator of a currency's potential to become a vehicle currency. A similar observation of international currency functions blending was made by Ito, McCauley and Chan (2015), who find that currency movements and an increased use of a currency in trade invoicing leads to a shift in currency composition of official reserves. Therefore, the RMB turnover in foreign exchange markets is a good way of measuring the progress of RMB internationalisation, despite not directly encompassing all international currency functions.

### **Preliminary analysis of variables**

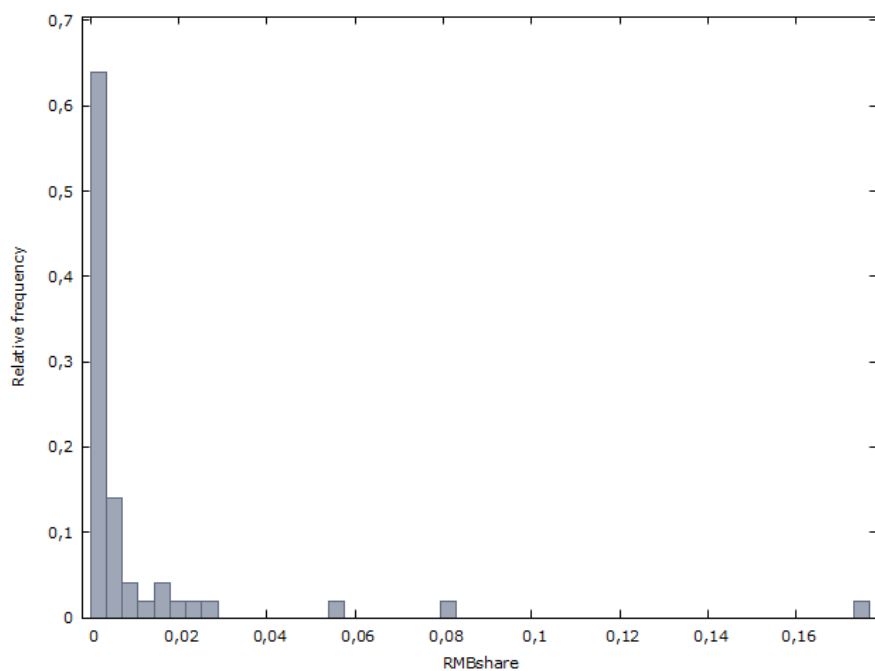
It is apparent from Figures 2, 3 and 4 in the previous section that the share of RMB foreign exchange trading does not have an equal global distribution, with just four countries - Hong Kong, the UK, Singapore and the US representing 65.5% of all RMB foreign exchange trading in 2019. It can therefore be expected that the dependant variable will not follow the normal distribution, since most countries in the sample will have a very small share of RMB foreign exchange market turnover, and with only a few having a larger share, such as Hong Kong. Figures 5, 6 and 7 show that this is true for all years since the dependant variable is heavily skewed to the right during all three observed periods, with RMB foreign exchange market turnover being very close to 0% in most countries. The distribution

becomes less skewed in 2016 and increases again slightly in 2019. In 2013, RMB foreign exchange market turnover was lower than 0.3% in 78% of the observed countries. In 2016 it was only 64% and in 2019 58% of countries. The only country with a share consistently higher than 17% is Hong Kong, making the country an obvious outlier.

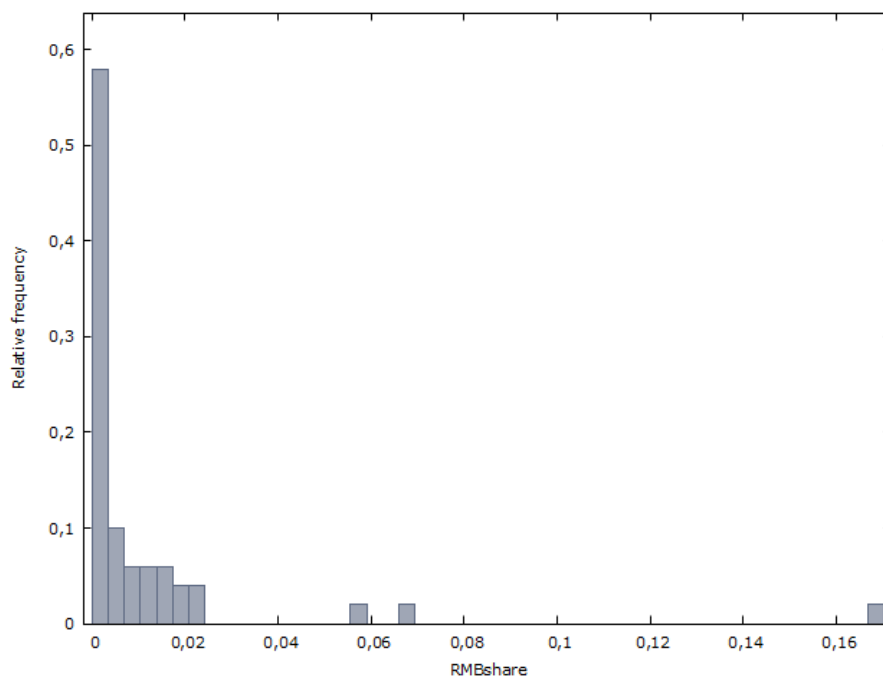
**Figure 5:** Frequency distribution of the dependant variable in 2013. Source: Output from a statistical software



**Figure 6:** Frequency distribution of the dependant variable in 2016. Source: Output from a statistical software



**Figure 7:** Frequency distribution of the dependant variable in 2019. Source: Output from a statistical software



The descriptive statistics in Table 2 provide more evidence of RMB use in foreign exchange market transactions increasing over the years, with the mean increasing from almost 0.7% in 2013 to 1.06% in 2019. The median value indicates that this increase was not caused only by increase in RMB foreign exchange market trading in countries with already high shares in the beginning of the observed period, but rather by an increase in RMB trading across countries.

**Table 2:** Descriptive statistics of the dependant variable

<b>Year</b>	<b>Mean</b>	<b>Median</b>	<b>Std.Dev.</b>	<b>Min.</b>	<b>Max.</b>	<b>Skewness</b>	<b>N</b>
All	0.0091	0.0007	0.0269	0.0000	0.1802	5.0815	150
2013	0.0067	0.0003	0.0266	0.0000	0.1802	5.8692	50
2016	0.0101	0.0009	0.0281	0.0000	0.1766	4.7001	50
2019	0.0106	0.0018	0.0265	0.0000	0.1702	4.8077	50

The main goal of this study is to determine which factors influence the share of RMB foreign exchange market trading, and by proxy, promote RMB internationalisation in offshore markets. Based on theoretical predictions and empirical findings we have identified a set of potential factors used as explanatory variables in the model. The full definitions and data sources for all variables, including the dependant variable, are presented in Table 3.

**Table 3: Definitions, data source and expected effect of variables used in the regression**

<b>Variable name</b>	<b>Description</b>	<b>Data source</b>	<b>Expected effect</b>
RMB share	Share of daily average RMB foreign exchange market trading on the total daily average RMB foreign exchange market trading in millions of USD	BIS Triennial Central Bank Survey	Dependant variable
<b>P<sub>i</sub> - RMB promotional policies implemented between country <i>i</i> and China</b>			
Bilateral swap agreements	Binary variable, 1 indicates the existence of a BSA between China and country <i>i</i>	PBOC, various news sources	+
RQFII	Number of RQFII and QFII participants for country <i>i</i>	China Securities Regulatory Commission	+
RMB clearing bank	Binary variable, 1 indicates the existence of a RMB clearing centre in country <i>i</i>	PBOC	+
<b>L<sub>i</sub> - political and economic links between country <i>i</i> and China</b>			
BRI	Binary variable, 1 indicates participation of country <i>i</i> in BRI	Council on Foreign Relations	+/-
FDI	Sum of outward and inwards FDI stock positions between country <i>i</i> and China normalized by GDP of country <i>i</i>	IMF Coordinated Direct Investment Survey	+
Bilateral trade	Sum of export and imports of goods between country <i>i</i> and China normalized by GDP of country <i>i</i>	IMF Directions of Trade	
Dispute	Binary variable, coded 1 for USA, South Korea, Australia, Japan and Singapore for relevant years	Various news sources	-
FTA	Binary variable, 1 indicates the existence of and FTA between country <i>i</i> and China	Ministry of commerce, China	+
CFETS	Binary variable, 1 indicates the inclusion of country <i>i</i> 's currency in the CFETS basket of currencies	CFETS	+
<b>C<sub>i</sub> - economic and financial conditions in country <i>i</i></b>			
Economic size	Natural logarithm of GDP in current millions of USD	World Bank World Development Indicators	+
Size of equity market	Total equity market capitalisation of the largest equity market as of April of the relevant years in millions of USD normalized by GDP of country <i>i</i>	The World Federation of Exchanges	+
Share of global foreign exchange trading	Total daily average foreign exchange market turnover of country <i>i</i> to total daily foreign exchange market turnover	BIS Triennial Central Bank Survey	+
Financial Development	Financial development index	IMF	+

The promotional policy related variables are all policies proposed by the Chinese government, but they must be agreed to by both China and a foreign party. Therefore, the

policy related variables are not China specific determinants, rather they represent the role of non-residents in RMB internationalisation in response to China's initiatives.

#### *Bilateral swap agreement (SWAP)*

Since we are using a larger dataset than previous studies, we will be testing the bilateral swap agreements variable for a positive effect proposed by theory, despite previous empirical research finding this variable insignificant.

#### *RQFII*

An important characteristic of an international currency is its use in denomination of financial assets which are held by non-residents. Therefore, the expansion of the RQFII scheme to more international participants should extend a positive effect on RMB internationalisation.

#### *RMB clearing bank (Clearing\_bank)*

Similarly to bilateral swap agreements, the establishment of a RMB clearing bank should ease the process of acquiring RMB liquidity for non-residents and therefore promote trade settlement in the currency, aiding the internationalisation process.

Aside from targeted promotional policies, it can be expected that economic and political links to China will have more of an organic impact on growth or decrease of currency use. The strength of these effects can further be compared to policy effects, to determine whether the internationalisation process is more significantly driven by market forces or China's policy efforts.

#### *BRI*

The relationship between BRI participation and RMB internationalisation is currently inconclusive. In theory, China should be able to promote use of RMB denominated debt and RMB trade settlement in countries receiving funds via the scheme. However, most of the financing is still currently done in USD, which forces China to intervene in the foreign exchange market to maintain the value of the RMB. This mechanism inhibits the possibilities of further opening the capital account, which is essential in the currency internationalisation process. Therefore, it is important to determine which effect is currently stronger by including the BRI variable in the model.

#### *FDI (FDI\_GDP), Bilateral trade (Trade)*

Larger volumes of investment and trade flows between China and a particular country create more opportunity for China to promote denominating the transactions in RMB. This mechanism is also closely connected to the possibilities generated by the BRI.

### *Dispute*

China's aggressive diplomatic policy approach and trade sanctions imposed on or by China in the light of disputes with the US, Japan, Korea, Singapore, and Australia should inhibit the RMB internationalisation process.

### *FTA*

Including more countries in the FTA network should lead to trade expansion, which allows China to push for trade settlement in RMB.

### *CFETS*

Participation in CFETS eases the process of engaging in the RMB foreign exchange market, as well as accessing RMB denominated debt. Therefore, we can expect a positive effect of the CFETS variable.

The last set of variables is comprised of control variables measuring the economic and financial strength of the observed countries. There is no direct link to China's internationalisation efforts, but it can be expected that more financially and economically developed countries will in general be more active in foreign exchange market trading of the RMB.

### *Economic size ( $I\_GDP$ )*

Larger economies are expected to have more economical interactions with China, since it's the second largest world economy and largest trading nation. Previous empirical research is inconclusive when it comes to the expected effect on RMB use, but based on theory a positive impact can be expected.

### *Size of equity market ( $Equity\_market\_GDP$ ), share of global foreign exchange market ( $FX\_share$ ), financial development ( $FDEV$ )*

This set of control variables represents the degree of financial integration and development of the observed countries. It can be expected that countries with a more developed financial sector are more likely to have a higher share of RMB usage.

We have also considered including variables indicating participation in CIPS and the stock-connect and bond-connect programmes, but country-by-country data is unavailable for these two variables.

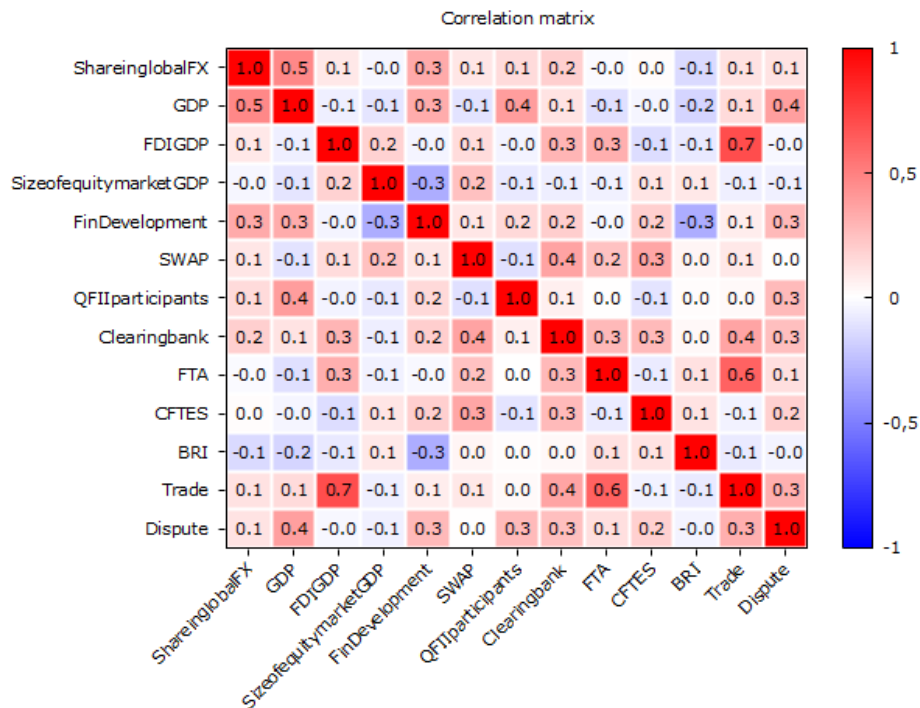
## **Correlation matrix**

As the last part of the preliminary analysis of variables used in the model, a correlation matrix is presented in Figure 8. The analysis allows us to determine whether the variables



can be expected to extend unique effects on the dependant variable or whether any variables are significantly correlated and therefore capture a similar effect.

**Figure 8:** Correlation matrix of the explanatory variables



Overall, most of the variables are not significantly correlated and should therefore be kept in the model. In accordance with observations made by Cheung and Yiu (2017), there seems to be a higher degree of positive correlation between the FDI and Trade variables. Trade is also positively correlated with the FTA variable. However, as the variables are not perfectly positively correlated, the Trade variable will be used in the regression.

## Section 4: Model results

In this section we will present the results of the pooled OLS regression in Tables 4 and 5. The regressions have been conducted using the Gretl statistical software.

**Table 4:** Regression results – determinants of RMB use in foreign exchange markets (full sample)

Dependant variable	RMBshare <sub>i</sub>	ln_ RMBshare <sub>i</sub>
No. of observations	75	102
No. of categories	39	37
<b>Variable</b>	<b>Baseline model</b>	<b>Model 1</b>
Const.	-0.0242 (0.1002)	-18.2944 (8.85e-06)***
SWAP	0.0029 (0.2511)	0.7697 (0.0690)*
RQFII	0.0001 (0.0290)**	
RQFII_participation		0.7697 (0.0572)*
Clearing_bank	-0.0002 (0.9318)	0.8431 (0.0630)*
BRI	0.0017 (0.5064)	1.3346 (0.0033)***
FDI_GDP	0.0509 (2.87e-025)***	
Trade	-0.0274 (0.2989)	
Dispute	0.00827 (0.1123)	-1.2003 (0.0969)*
FTA	0.0209 (1.70e-07)***	1.8472 (0.0033)***
CFETS	-0.0014 (0.5565)	0.1194 (0.7471)
I_GDP	0.0015 (0.2031)	0.9431 (8.05e-05)***
Equity_market_GDP	0.0001 (0.3920)	
FX_share	0.0302 (0.0696)*	
FDEV	0.0075 (0.2437)	0.5086 (0.6833)
I_FDI_GDP		0.3088 (0.0259)**
I_Equity_market		0.4485 (0.0027)***
I_Trade		0.3116 (0.4470)
I_FX_share		0.1295 (0.421)
Adjusted R <sup>2</sup>	0.8887	0.7033

Note: P-values for the t-statistics are stated in parentheses. \* denotes  $0.1 > p\text{-value} > 0.05$ ; \*\* denotes  $0.05 > p\text{-value} > 0.01$ ; \*\*\* denotes  $0.01 > p\text{-value}$

The Baseline model results in Table 4 seem to indicate that economic links with China have the most significance for RMB use in offshore trading. FDI has the largest positive effect, supporting the hypothesis that China is promoting RMB use in its inward and outward investment flows. BRI however does not play a major role in promoting RMB use through FDI. Trade settlement still plays an important role in RMB use, as FTA expansion extends

a significant positive effect. On the other hand, the trade variable is insignificant, possibly confirming Cheung and Yiu's (2017) findings about trade's co-movements with FDI. Among the policy variables, only the number of institutions participating in the RQFII scheme seems to have a positive impact on RMB use. The only determinant of RMB use that is not directly influenced by the country's interaction with China is the size of the foreign exchange market. This result seems to be in accordance with trading data from SWIFT, where the UK takes the largest share of RMB trading due to London being the largest foreign exchange market. The model is statistically significant as a whole, with the F statistic having a p-value of  $6.77e-43$ . However, we would expect more variables to have a significant impact based on previous empirical research and theory. Upon further inspection we find that the Baseline model violates the assumptions of a BLUE OLS estimator. White's test reveals that the model does not suffer from heteroskedasticity, but the Wooldridge test for autocorrelation in panel data shows that autocorrelation is present in the model, which is a common issue with POLS models. The estimator is still unbiased, but the standard errors and test statistics are no longer valid. We therefore conducted a Hausman test to determine whether a fixed effects (FE) or random effects (RE) model would be suitable for our dataset. The test results suggests that FE is more suitable than RE. Using FE does eliminate the autocorrelation issue, however, after conducting a modified Wald test for groupwise heteroskedasticity we had to reject the null hypothesis that the units have a common error variance. Therefore, an FE estimator is not suitable and different modifications of the Baseline model are necessary.

As we have shown in the previous section, the distribution of the dependant variable is significantly positively skewed. After analysing the frequency distribution of the explanatory variables, we find this to be the case for the FDI\_GDP, FX\_share and Equity\_market\_GDP variables as well. In order make the distribution more symmetrical and improve the validity of our statistical analysis, we transform these variables into their natural logarithms and construct Model 1. Upon preliminary results from Model 1, we have also decided to modify the RQFII variable into a dummy to measure for participation, rather than quantifying the number of participants. This transformation did not create the collinearity issues with other policy related variables that some previous empirical research encountered. The modifications made to the Baseline model have improved the results significantly, with five additional variables gaining significance and only one previously significant becoming insignificant. It can also be assumed that the test statistics are valid, as the model does no longer suffer from autocorrelation, nor have we encountered an issue with heteroskedasticity.

The results from Model 1 in Table 4 suggest that RMB use is determined partly by all factor groups, although economic and political links still play the most significant role. FDI volume

and the FTA network maintained their significant effects. The importance of FDI volume is supported by Cheung and You (2017), as well as Liu, Wang and Woo (2019). On the other hand, Cheung, Grimm and Westermann (2021) and Chey and Hsu (2020) find that trade, not FDI volume has a significant effect. Volume of trade is not significant under our model. However, FTA is, suggesting conformity with previous research. Under Model 1, the BRI variable also gains significance. Our results suggest that China's efforts to promote RMB internationalisation through this scheme are successful, thus refuting the hypothesis of BRI inhibiting RMB internationalisation due to capital account restrictions. Only Cheung, Grimm and Westermann (2021) have previously tested the effect of this variable, without confirming its significance. Therefore, the effect of this variable remains inconclusive when comparing our and Cheung, Grimm and Westermann's (2021) results. Engaging in a dispute with China negatively affects RMB use, as they are usually accompanied by trade sanctions and create a negative sentiment toward China from non-affected countries, deterring them from using the currency. Our results are in accordance with a study conducted by Cheung, Grimm and Westermann (2021). Chey and Hsu (2020) find this variable insignificant. However, the authors only use the data from the 2016 BIS Triennial Central Bank Survey, which does not take into account the disputes between China and the US, nor with South Korea. The magnitude of effects of the BRI, FTA and Dispute variables are also the largest out of all significant variables. The expansion of the FTA network has the strongest effect on RMB use – signing an additional FTA should result in a 184% increase in RMB turnover share. However, it needs to be noted that while this seems like a large increase, most countries have a very low RMB share. If we apply this increase to the median value, the share will increase from 0.18% to about 0.33%.

All policy measures also gain significance, with both bilateral swap agreements and the establishment of clearing banks increasing RMB use by easing access to RMB liquidity and promoting ease of trade. Participation in the RQFII scheme, on the other hand, promotes the use of currency in financial markets, suggesting that over the years the RMB has been progressively changing its status from a currency solely used for trade settlement into a currency also used for denomination of financial assets. Our findings differ from results presented by Chey and Hsu (2020) and Cheung, Grimm and Westermann (2021). Chey and Hsu (2020) support the relevance of clearing banks, but RQFII quotas only become significant in interaction with clearing banks. Under our model, these variables are significant even if not interacting with each other. Cheung, Grimm and Westermann (2021) find policy variables to have almost no effect on RMB use, with only the size of the RQFII quotas extending a significant effect. The disparities can be attributed to differing sample sizes, since Chey and Hsu (2020) and Cheung, Grimm and Westermann (2021) use a smaller dataset, and use of different set of control variables. The focus of Cheung, Grimm and Westermann (2021) is on characteristics of foreign exchange markets, and according

to them, these already capture all significant effects on RMB use, making other control variables insignificant. As several authors have highlighted the importance of an international currency being used for financial assets denomination over trade settlement, we can assume that the RMB has made progress in acquiring the status of an international currency since the inception of the process. The effects of the policy variables are almost identical in magnitude. An inclusion of an additional country into either of the schemes results in an about 80% increase in RMB foreign exchange turnover share. Overall, we can conclude that China's promotional policy measures do have a positive effect on RMB internationalisation.

Lastly, the economic and financial conditions in the observed countries also partly explain the degree of RMB use. The hypothesis that economically larger countries engage in more interactions with China and therefore should have a higher share of RMB use seems to hold up under Model 1. Countries with more developed and sophisticated financial markets, proxied by the market capitalization of their largest equity market, also seem to engage in more RMB trading, which is accordance with findings of Cheung and You (2017) and Cheung, Grimm and Westermann (2021). However, the effect of these variables compared to the economic and policy variables is modest. Somewhat surprisingly, the size of the foreign exchange market does not seem to be a factor influencing RMB trading share under this model.

The Baseline model and Model 1 both include all available data from the BIS Triennial Central Bank Surveys, which encompasses all countries willing to participate in the survey. However, our additional hypothesis is that RMB use will be determined by different factors in low and high-income countries. Results from Model 1 indicate that RMB use has been gaining significance in financial transactions on top of its initial primary use in trade invoicing and settlement. Access to China's equity markets through the RQFII scheme, as well as investment flows, have a significant positive impact on RMB use. Low-income countries generally do not have well developed financial systems; therefore we can expect low-income countries to still use RMB predominantly for trade invoicing and settlement. On the other hand, high-income countries with sophisticated financial markets should have more incentive to use RMB in financial transactions.

We conducted two more regressions in order to test for these hypothetically differing effects. Using GDP per capita as a measure of a country's income level we have ordered the observed countries from lowest to highest income, India being the country with lowest and Luxembourg the country with highest income. Model 2 includes the first half classified as low-income, while Model 3 includes the other half which represents high-income countries. The first sample includes 19 countries, while the second consists of only 18 due to missing data. The model design will otherwise be the same as in Model 1, including both

the policy and economical and political links variables, as well as the control variables. The results from both regressions are displayed in Table 5.

**Table 5 :** Regression results – determinants of RMB use in foreign exchange markets (split sample)

Dependant variable	Ln_RMBshare <sub>i</sub>	ln_ RMBshare <sub>i</sub>
No. of observations	52	50
No. of categories	19	18
<b>Variable</b>	<b>Model 2</b>	<b>Model 3</b>
Const.	–25.8130 (0.0454)**	–13.2601 (0.0005)***
SWAP	0.1310 (0.8454)	1.8016 (0.0006)***
RQFII_participation	–1.2674 (0.1627)	0.9807 (0.0311)**
Clearing_bank	1.5212 (0.0664) *	0.1475 (0.7546)
BRI	0.2745 (0.7174)	1.5831 (0.0055)***
FTA	1.8393 (0.0667)*	1.0693 (0.1125)
CFETS	1.4220 (0.0431)**	–0.1011 (0.8040)
I_GDP	1.1099 (0.1166)	0.5237 (0.0192)**
FDEV	2.4397 (0.2331)	2.8172 (0.1741)
I_FDI_GDP	0.2362 (0.3841)	0.4658 (0.0033)***
I_Equity_market	0.4004 (0.0828)*	0.3911 (0.1771)
I_Trade	0.9224 (0.3922)	0.1687 (0.6642)
I_FX_share	–0.7737 (0.0806)*	0.4488 (0.0075)***
Adjusted R <sup>2</sup>	0.5771	0.8589

*Notr: P-values for the t-statistics are stated in parentheses. \* denotes 0,1>p-value>0,05; \*\* denotes 0,05>p-value>0,01; \*\*\* denotes 0,01>p-value*

RMB use in low-income countries seems to be primarily determined by the ease of executing RMB transactions rather than one of the previously identified factor groups. This assumption is supported by the significant positive effect of the clearing bank, FTA and CFETS variables. Participation in the CFETS facilitates easier access to the RMB foreign exchange market and RMB lending. Signing an FTA with China reduces trade barriers, making it easier and cheaper to realise trade with China, and giving China the opportunity to promote trade settlement in RMB. Sicular, Yang and Gustafsson (2018) calculated that the middle-class population in China in 2018 was around 344 million. 2019 forecast predicted that in 2022 the middle-class population in China should increase significantly and reach 550 million. The implication is an increase in the purchasing power of Chinese consumers, which grants imports a larger role in Chinese economy. Therefore, China has more influence over the currency used in trade settlement and a preference for the RMB can be expected (SWIFT 2019b). The presence of a clearing bank positively influences RMB use by easing the process of settling RMB payments. However, we cannot determine

whether the ease of executing RMB transactions is more important in relation to trade or financial transactions based on the results.

On the other hand, participation in CFETS is the most insignificant variable in the high-income sub-sample. The variable was also insignificant in the aggregated model, which is in accordance with results of Cheung, Grimm and Westermann (2021). This result, in combination with a significant positive impact of the foreign exchange market share in high-income countries, implies that CFETS participation is only effective in countries with less developed foreign exchange markets and has no effect otherwise. Similarly, presence of FTAs and clearing banks has no impact on RMB use in high-income countries, suggesting that the ease of executing RMB transactions does not bolster RMB internationalisation in countries with a higher degree of economic strength and financial sophistication. Both economic size and the share in foreign exchange turnover have a significant positive effect in high-income countries. This might imply that RMB use is more determined by market forces in high-income countries than in low-income countries.

The significant positive impact of the size of the equity market suggests that the level of financial development of low-income countries impacts RMB use to a certain degree, hinting at the rising importance of financial transactions in RMB internationalisation in this sub-sample. The importance of factors supporting RMB use in capital market transactions is however slightly more apparent in high-income countries. Both bilateral FDI and BRI participation are highly significant, suggesting that China is successful in promoting RMB use in capital account transactions. The results also suggest that it is more beneficial for RMB internationalisation if high-income countries join the BRI, as the effect only gains significance in the high-income sub-sample, despite the share of low-income countries joining the initiative being higher. More sophisticated RMB promoting policies also seem to have a stronger effect in high-income countries, with RQFII participation and the expansion of bilateral swap agreements extending a positive effect on RMB use.

However, it needs to be said that there is a disparity between promotional policy presence in low and high-income countries. By 2019, only three low-income countries had been granted access to the RQFII scheme compared to fifteen high-income countries. As for bilateral swap agreements, the ratio was ten to eighteen. This discrepancy suggests that it might not be that RMB use promotional policies are not successful in low-income countries, but that not enough low-income countries implement these policies. Therefore, including more low-income countries in the policy schemes can possibly entice RMB use in low-income countries, as they often have limited access to global capital markets. On the other hand, the reason for not including more low-income countries in the RQFII and BSA schemes could be caused by limited trustworthiness of investors and central banks from

low-income countries. Therefore, the effect of including them in the policy schemes could also have a non-desired reverse effect on RMB internationalisation.

Results from Models 2 and 3 imply that our hypothesis of RMB internationalisation being determined by different factors in low and high-income countries was correct. The only factor influencing RMB use in both groups is the share of the countries' foreign exchange market, although this effect is reversed. The results for this variable are difficult to interpret, as there is no obvious reason for low-income countries with larger foreign exchange market turnover to trade less RMB. The lower  $R^2$  in Model 2 indicates that there might be other variables not considered in our research design that specifically affect RMB use in low-income countries. This assumption in combination with a smaller sample size due to lack of available data might explain the unexpected sign for `I_FX_share`. On the other hand,  $R^2$  in Model 3 is higher than in the summative Model 1, which implies that the chosen set of variables is more representative of high-income countries. This assumption is also supported by the fact that the `I_FX_share` variable was not significant under the full sample, despite previous empirical research and theory suggesting a positive significant impact. The effect is confirmed under the high-income sub-sample regression.

## **Section 5: Discussion and future research**

In this paper we used a POLS regression to determine which factors influence RMB foreign exchange turnover in offshore markets and therefore promote RMB internationalisation. The results from the aggregate model show that economic and political links with China have the most significant impact on RMB use when we do not take the country's income level into account. Increase in bilateral FDI, existence of FTAs and participation in BRI all increase RMB turnover, while engaging in a dispute with China impacts RMB turnover negatively. Low-income countries are more incentivised to use RMB when the ease of executing RMB transactions increases, which reflects the lower sophistication of their financial markets. High-income countries on the other hand do not benefit from the increased ease of executing RMB transactions. Chinese authorities should rather focus on allowing high-income countries freer access to its capital market to promote RMB internationalisation.

China's promotional policies are also effective on aggregate, since their aim is to ease access to RMB liquidity and China's capital markets, as well as to ease the process of trade settlement in RMB. The presence of clearing banks is more beneficial in low-income countries, while high-income countries increase RMB turnover if they participate in the RQFII scheme and have a bilateral swap agreement with the PBOC. However, fewer low-income countries participate in the latter two policy schemes, which would explain why they do not extend a positive impact on RMB use. This opens the possibility for China to



include more low-income countries in their policy schemes to promote RMB internationalisation. Lastly, RMB use is in part also determined by financial and economic conditions in the observed countries. However, the effects of this are quite modest, with 1% increase in any of the control variables resulting in less than 1% increase in RMB turnover share.

The results obtained from the POLS regression are subject to certain limitations, mostly related to data availability. Since data is only available triennially, the possibility of evaluating the effects of explanatory variables in different sub-periods is limited. This data is either not available or the split would create unequal samples. Data unavailability does not allow us to take into account the effect of the Covid-19 pandemic, which negatively impacted the global perception of China, so we should expect a decrease in RMB related transactions. We should also expect different determinants of RMB use in Asian and non-Asian countries since economic, political, and social links are stronger in the Asian region. However, there are only ten countries from the Asian region in our sample of all fifty reporting countries, meaning the regression results would become skewed if we split the sample. The construction of the dependant variable itself does not fully represent all international uses of the currency. It would be more beneficial to use SWIFT data, as it records the use of a currency in different transaction types. This data is unfortunately not available to the public. According to Krugman (1980), functions of international currency often create self-reinforcing dynamics and it is therefore not necessary to consider all of them. However, determining whether the self-reinforcing dynamics exist in the case of RMB is beyond the scope of our research. These limitations can be eliminated in future research when more data becomes publicly available. Lastly, our findings related to determinants in low and high income countries cannot be compared to previous research, as there is currently none. We hope future research will be able to offer more insight and either confirm or refute our findings.

China is currently the largest developing country and trading nation, and the second largest economy after the US. Past development of currencies of countries this size, integration, and sophistication, such as the US Dollar and British Pound, suggest that the RMB should become a global currency. However, despite a staggering increase in RMB foreign exchange turnover since 2010 in absolute terms, in relative terms the RMB still only accounted for about 2% of the total turnover in 2019. Similarly, only 2.23% of global payments were settled in RMB in February 2022. Our results suggest that there are several factors which should in fact increase RMB use, with just one factor – engaging in disputes with China – causing a decrease. However, the magnitude of these effects is quite modest in absolute terms. Expansion of the FTA network, which has the largest significant effect on RMB use, only results in an increase of the median RMB share from 0.18% to 0.33%. This suggests

that despite China's efforts, conditions inhibiting RMB from becoming a global currency are still present. Cruz, Gao and Song (2014) and more recently Ma and Wang (2020) suggest China's financial markets are not deep, liquid and broad enough to promote RMB internationalisation. China also still imposes strict control on outbound capital (Yeung 2019). This implies that China's efforts to promote RMB internationalisation through its financial links and promotional policies might not be enough to rise RMB to an international currency status unless China eases the controls on its capital account. However, the evidence obtained in this paper is not sufficient to confirm this hypothesis and should be explored further in future research.

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