

The Impacts of Policy Infrastructures on the International Use of the Chinese Renminbi

A Cross-Country Analysis

ABSTRACT

Despite burgeoning research on the internationalization of the Chinese renminbi, there has been surprisingly little systematic analysis of how the renminbi is actually used in foreign markets. This study provides a cross-country analysis of renminbi use in offshore foreign exchange markets, with special attention to the effects of the cooperative policy measures adopted by China and foreign states to promote the renminbi's international use. We find that a country's participation in the Renminbi Qualified Foreign Institutional Investor scheme (which expands its renminbi investment opportunities) and its establishment of an offshore renminbi clearing bank (which provides better renminbi payment services), but not its entry into a renminbi–local currency swap agreement, facilitate use of the renminbi in its foreign exchange markets. States have played a significant role in the rise of the renminbi as a newly internationalizing currency.

KEYWORDS: international currency, offshore renminbi clearing bank, renminbi currency swap, renminbi internationalization, RQFII

INTRODUCTION

International use of the Chinese currency, the renminbi (RMB), has grown significantly since the global financial crisis of 2008. According to SWIFT, a global payment services provider, the RMB rose to become the

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Asian Survey, Vol. 60, Number 2, pp. 221–244. ISSN 0004-4687, electronic ISSN 1533-838X. © 2020 by The Regents of the University of California. All rights reserved. Please direct all requests for permission to photocopy or reproduce article content through the University of California Press's Reprints and Permissions web page, <https://www.ucpress.edu/journals/reprints-permissions>. DOI: <https://doi.org/10.1525/AS.2020.60.2.221>.

fourth-most-used global payment currency in August 2015, from 35th in October 2010, even overtaking the Japanese yen, although it has slipped somewhat since then, fluctuating between fifth and seventh. Reflecting the elevated international status of the RMB, in November 2015 the International Monetary Fund (IMF) announced its inclusion, effective October 2016, in the currency basket of the Special Drawing Right, an international reserve asset issued by the IMF, along with the US dollar (hereafter dollar), the euro, the British pound, and the yen.

In parallel with the notable progress in RMB internationalization (RMBI), research on it has also exploded. Surprisingly, however, there have been few systematic studies of the *actual use* of the RMB in *foreign markets*. Most of the studies of RMBI have focused on the domestic conditions in China for RMBI (see e.g. Chen and Cheung 2011; Chey and Li 2020; Cohen 2012, 2015, 2019; Dobson and Masson, 2009; Eichengreen 2013; Helleiner and Malkin 2012; Lee 2014; McDowell and Steinberg 2017; Otero-Iglesias and Vermeiren 2015; Prasad 2017; Subacchi 2017; Subramanian 2011; Wu, Pan, and Wang 2010). There is no doubt that Chinese domestic conditions are important influences on RMBI, but use of the RMB has differed substantially across countries. Each month, SWIFT announces the “top 15 offshore RMB economies” by examining countries’ shares in total global RMB payments, which reveals noticeable cross-country differences. In January 2019, for instance, Hong Kong, the UK, the US, Australia, and Japan accounted for 77%, 5.3%, 2%, 1.2%, and 0.7%, respectively, of the RMB’s international use. To grasp more accurately how RMBI has been evolving, greater attention should thus be paid to the RMB’s actual use in foreign economies. And going further, we need to address which factors have led to the cross-country differences in international use of the RMB.

Against this backdrop, this study provides a cross-country analysis of RMB use, focusing on foreign exchange (FX) markets. And in investigating the causes of the cross-country differences in RMB use, we draw special attention to the effects of the cooperative policy measures introduced by China and foreign states to promote the RMB’s international use. More specifically, we examine three core policy infrastructures set up to facilitate use of the RMB in foreign markets: RMB–local currency swap agreements (RMB swap lines), Renminbi Qualified Foreign Institutional Investor (RQFII) quotas, and offshore RMB clearing banks. A country’s RMB swap line with China is one reliable channel through which it can acquire RMB liquidity, and is thus expected to expand

RMB use in that country. The RQFII scheme grants investment quotas to licensed foreign institutional investors for investment in stocks and bonds in mainland China using offshore RMB. It therefore expands foreigners' RMB investment opportunities, and thus their incentives for holding and using the RMB. And an offshore RMB clearing bank offers clearing services for RMB transactions in the foreign country, providing RMB liquidity to banks that join its clearing system. It thus reduces the costs of settlement for RMB transactions. Observers have noted the significance of these policy measures for RMBI, but empirical research to quantify their actual impact is still lacking. Our study offers one of the first systematic analyses in this respect.

The introduction of these RMB policy infrastructures in a given country is the outcome of explicit policy cooperation between its own government and the Chinese government.¹ Thus, by examining their impacts on RMB use in foreign economies, we can illuminate whether states have played a significant role in the initial phase of RMBI. In the current early stages of its internationalization, the inherent economic attractiveness of the RMB still lags far behind that of the incumbent leading international currency, the dollar, particularly in convenience of use. The RMB's initial rise as a new international currency may thus require strong policy support from governments, and an investigation of states' roles in RMBI is hence desirable. But we also consider the impacts of various other economic and political factors, along with the RMB policy infrastructures, on the international use of the RMB.

Ultimately, we find that the RQFII scheme and RMB clearing banks do facilitate RMB use in foreign economies, but see no significant impacts of RMB swap lines on such use. More specifically, the share of the RMB in total FX turnover is 1.69 percentage points higher in a country that both participates in the RQFII scheme and has an RMB clearing bank. This difference is notable, given that the average share of the RMB in total FX turnover of the countries in our data set (which excludes Hong Kong) is about 1%. These findings highlight the significant role of states in RMBI, in particular through policy cooperation between China and foreign countries, although not all cooperative policy measures have contributed to it. We also show that a country's export ties with China boost the use of the RMB in its

1. These policies are initiated by the Chinese government, but the foreign governments must agree in order for them to be implemented in their own nations.

FX markets, which suggests a significant influence of market forces on RMBI as well.

The rest of this paper is organized as follows. The next section reviews the literature, and the following two sections then explicate the design of our empirical study, after which the subsequent section discusses its results. The final section summarizes the major findings and notes their implications.

LITERATURE REVIEW

Most of the studies of RMBI mainly analyze its feasibility, that is, whether the RMB will ultimately develop into a major international currency, with the potential to displace the dollar. Some authors use quantitative methods, by taking as the main determinants of RMBI China's economic conditions, such as its share in global output and trade, its financial market development, and its price level (Lee 2014, Subramniam 2011). Other studies are more qualitative. Some authors mainly examine the Chinese economic conditions for RMBI (Chen and Cheung 2011; Cohen 2012, 2015; Dobson and Masson 2009; Subacchi 2017; Wu, Pan, and Wang 2010). Others draw attention to the political factors that may affect RMBI, including domestic actors' preferences in China regarding RMBI, as well as the impacts of China's domestic political institutions, such as its authoritarian political regime (Chey and Li 2020; Eichengreen 2013; Prasad 2017; Helleiner and Malkin 2012; McDowell and Steinberg 2017; Otero-Iglesias and Vermeiren 2015). Still others address the role of China's international power in RMBI or stress the geopolitical ambition of the Chinese government as the chief driving force behind RMBI (Chey 2013, Cohen 2019).

Despite these variations in their methodologies and arguments, however, most of these studies focus on the domestic conditions in China, the issuer of the RMB, and thereby use "supply-side" approaches to the study of RMBI (Chey 2015). As a result, the actual use of the RMB in foreign economies remains greatly underexplored. There is of course no denying the substantial influence of domestic conditions in China on RMBI. Yet, as noted earlier, the RMB's use is markedly uneven across foreign countries. This clearly suggests that RMBI is also shaped by factors other than Chinese domestic conditions. For a better understanding of the determinants of RMBI, the factors behind these differences in RMB use across countries must thus also be taken into account.

In fact, a few recent studies have increasingly paid attention to how foreign countries have coped with RMB. Chey's (2015) in-depth research on South Korean RMB use is one of the first in this research strand and shows that the Korean government's policy measures to support Korean RMB use have led to heightened interest among domestic actors in using the RMB. Chey (2019) also offers a detailed investigation of RMB use in Japan. A paper by Liao and McDowell (2015) conducts a cross-country analysis that reveals which countries have established RMB swap lines with China, while Chey, Kim, and Lee (2019) carry out another cross-country analysis of the factors influencing the level of the overall policy infrastructure supporting RMB use in a country. Another study by Liao and McDowell (2016) explores the factors that have led central banks to hold RMB-denominated assets in their reserves. But these studies do not analyze the actual use of the RMB in foreign markets, focusing rather on foreign governments' policies toward the RMB as their dependent variables.

Another group of studies examines the co-movement of the RMB and other currencies. Several authors claim that an RMB bloc has already emerged in East Asia (Fratzcher and Mehl 2014; Ito 2017; Subramaniam and Kessler 2013), although others contend that the dollar's status as the anchor currency in East Asia has not yet been challenged by the RMB (Kawai and Pontines 2016). But these studies pay little attention to how policy measures adopted to facilitate the international use of the RMB have affected the formation of RMB blocs. In fact, most do not systematically analyze the causes of co-movement of the RMB and other currencies.

Recent research by He, Korhonen, Guo, and Liu (2016) builds a model that estimates a currency's use in the global FX market. Yet, while the predictions of this model work fairly well for seven international currencies (US dollar, euro, yen, British pound, Swiss franc, Canadian dollar, and Australian dollar), there is a wide gap between the model predictions and the actual geographic distributions of international RMB use. This suggests that in order to analyze the actual international use of the RMB, attention should be turned to factors not covered in their model. Importantly, although their model does examine diverse economic, political, and cultural conditions in the country using international currencies as well as the issuing countries, it does not address the impacts of policy measures aimed at promoting the international use of a certain currency. The impacts of such policy measures are the principal focus of our study.

RESEARCH DESIGN

Given the data limitations (discussed in detail below), this study employs a crossnational research design using ordinary least squares to investigate the determinants of RMB use in a foreign economy. The model is specified as

$$\text{RMBuse}_i = \alpha + \beta(\text{RMBpolicy}_i) + \gamma E_i + \mu P_i + \tau X_i + \varepsilon_i$$

where RMBuse_i denotes the level of RMB use in country i ; RMBpolicy_i is a set of variables indicating the policy measures implemented in country i to facilitate RMB use; E_i is a group of variables reflecting the economic relations of country i with China; P_i is a set of variables that reflect the two countries' political relations; X_i is a group of variables controlling for other factors that might also affect RMB use; and ε is a disturbance term.

Measurement of RMB Use

To measure the RMB use in a country we examine the share of the RMB in its daily average FX turnover, which reflects, among the three functions of money, the currency's function as a medium of exchange.² We focus on use of the RMB in FX markets because, to our knowledge, this is the only area in which cross-country data on RMB use are available. Indeed, one of the chief reasons for the limited research on RMB use in foreign markets so far seems to have been the lack of cross-country data. But the recent Triennial Central Bank Surveys of the Bank for International Settlements (BIS) provide cross-country data on FX turnover by currency, including the RMB, although the number of countries covered is quite limited. For our main models, we use the data from the latest survey (2016), in which 48 economies (excluding China but including Taiwan and Hong Kong) reported data on the RMB. This number is not ideal for quantitative analysis. But the BIS data are the *only* available cross-country data on RMB use, and although they have limitations, our study is one of the first cross-country analyses of the RMB's international use.

As our measure of RMB use in a country's FX markets we use the share of RMB transactions (*RMBshare* in our regression models), rather than their sheer volume, since our main question is about which countries' market

2. The other two functions of money are as a unit of account and as a store of value. For more on the monetary functions of an international currency, see Chey (2012).

TABLE I. *Shares of RMB in FX Turnover (daily average %), by Country, April 2016*

<i>Rank</i>	<i>Country</i>	<i>RMB share</i>	<i>Rank</i>	<i>Country</i>	<i>RMB share</i>
1	Hong Kong	17.659	25	Belgium	0.148
2	Taiwan	14.997	26	Poland	0.121
3	Singapore	8.224	27	South Africa	0.071
4	South Korea	5.519	28	Mexico	0.059
5	Malaysia	2.643	29	India	0.047
6	Indonesia	2.417	30	New Zealand	0.040
7	United States	1.906	31	Finland	0.030
8	Australia	1.781	31	Chile	0.027
9	United Kingdom	1.627	31	Czech Republic	0.026
10	Germany	1.356	34	Denmark	0.012
11	Philippines	0.931	34	Austria	0.011
12	Thailand	0.787	34	Norway	0.007
13	Canada	0.715	37	Turkey	0.004
14	Japan	0.706	38	Argentina	0
15	France	0.579	38	Bahrain	0
16	Brazil	0.451	38	Bulgaria	0
17	Italy	0.438	38	Colombia	0
18	Switzerland	0.432	38	Greece	0
19	Portugal	0.415	38	Ireland	0
20	Luxembourg	0.348	38	Latvia	0
21	Russia	0.262	38	Lithuania	0
22	Spain	0.221	38	Peru	0
23	Netherlands	0.186	38	Romania	0
24	Sweden	0.181	38	Slovakia	0

SOURCE: Authors' calculations from Bank for International Settlements, *Triennial Central Bank Survey: Global Foreign Exchange Market Turnover in 2016* (Basel, 2016).

actors are more interested in using the RMB. Using the volume of RMB transactions in a country could be misleading, as it is likely to depend on the country's economic size. Table 1 shows the RMB's share of FX turnover across countries in April 2016. The share is highest in Hong Kong, followed by Taiwan, Singapore, South Korea, and Malaysia.

We considered using the *change* in the RMB's share of FX turnover between 2010 and 2016 as our measure of RMB use, since 2010 data on RMB

share are also available through the BIS. This measure would have the advantage of catching any increase or decrease in a country's RMB use during that time. However, 2010 data on RMB transactions are reported for only 25 economies. We thus use the 2016 data on RMB share for our main regression models, while using the change between 2010 and 2016 only in supplementary models to check robustness.

Factors of Primary Interest: RMB Policy Infrastructures

Our principal interest is to explore the actual effects of policy infrastructures aimed at supporting the use of the RMB in foreign markets. As mentioned, we focus on three specific policies: the establishment of an RMB swap line (*SWAP*), participation in the RQFII scheme (*RQFII*), and the establishment of an offshore RMB clearing bank (*RCB*), which are the major policy infrastructures that help promote the RMB's international use. Each is a dichotomous variable, which we code as 1 for a country if it had been implemented in that country by the end of 2014, and 0 otherwise. In our baseline model we analyze the separate impact on *RMBshare* of each of the three variables. However, in additional models we develop alternative measures that may capture the effects of these policies more precisely, as we discuss in detail in a later section.

Variables for Economic and Political Relations

In addition to RMB policy infrastructures, we also investigate the impacts of a country's economic and political relations with China on its RMB use. The literature on currency internationalization generally stresses the positive effect of a country's transactional networks in the world economy on its currency's internationalization (Chey 2012, 52–53). We thus examine whether a country's economic ties with China influence its use of the RMB, considering both trade and investment relations (denoted by *Trade* and *Investment*, respectively, in our regression models). Indeed, several empirical studies suggest a positive relationship between a country's economic integration with another country issuing an international currency and its use of that currency. For example, Subramanian and Kessler (2013) show that a country whose trade is deeply integrated with China is more likely to peg its currency to the RMB, while He, Korhonen, Guo, and Liu (2016) find that bilateral trade and

capital flows significantly affect the international use of currencies. Given this, we expect RMB use to be greater in countries with close trade or investment relations with China.

Meanwhile, a significant body of research finds that a country's security ties with foreign countries influence its use of international currencies (Cohen 2015, 2019; Eichengreen, Mehl, and Chitu 2017; Helleiner 2008; Liao and McDowell 2015; Momani 2008; Posen 2008). And Liao and McDowell (2016) argue that a country's ideological distance from China affects its central bank's choice of reserve currencies. Thus, we also analyze the effect of a country's political relations with China on its use of the RMB. But we have reservations about the likelihood of any substantial effects of such factors on RMB use by *market* actors, whose main behavioral motivations tend to be profit-seeking, although those factors may affect foreign governments' policies concerning the RMB. To examine a country's political relations with China, we consider two factors. One is whether the country is involved in a territorial dispute with China (*Territorialdispute*). The other is whether the country has a security/defense treaty with the US (*TreatywithUS*), given that China has no formal allies other than North Korea and that a state with a close security relationship with the US, China's main political and military rival, may prefer the dollar over the RMB.³

Other Control Variables

Finally, we also control for some domestic characteristics of a country that may affect its RMB use. These control variables include the presence of a major international financial center (*Financialcenter*), the size of its ethnic-Chinese population (*Chinesepopulation*), its geographical distance from China (*Distance*), the size of its gross domestic product (*GDP*), and whether it is a member of the eurozone (*Eurozone*).

We anticipate that RMB use will be higher in a country possessing a more developed international financial center, as it will tend to have more advanced financial systems and markets, which reduce the obstacles to using the RMB.

3. Meanwhile, although Liao and McDowell (2016) reported a significant relationship between a country's ideological distance from China and its central bank's choice of reserve currencies, in our preliminary analysis (binary regressions), a country's ideological distance from China did not significantly affect RMB use in its FX market. Therefore, we do not include ideological distance in our regression models.

Meanwhile, given the finding by He, Korhonen, Guo, and Liu (2016) that language and cultural factors have significant effects on the use of major international currencies, we control for these factors by adding the size of the country's Chinese population to our models. Greater geographical distance between a country and China could reduce its use of the RMB. A country's GDP might also influence its RMB use, as a larger country is likely to have more interactions with China. We also control for membership in the eurozone, because in our models each eurozone member country is treated as holding a bilateral RMB swap line with China.

To sum up, we describe our baseline regression model as

$$\begin{aligned} RMBshare_i = & \alpha + \beta_1 SWAP_i + \beta_2 RQFII_i + \beta_3 RCB_i + \gamma_1 Trade_i \\ & + \gamma_2 Investment_i + \mu_1 Territorialdispute_i + \mu_2 TreatywithUS_i \\ & + \tau_1 Financialcenter_i + \tau_2 Chinesepopulation_i + \tau_3 Distance_i \\ & + \tau_4 GDP_i + \tau_5 Eurozone_i + \varepsilon_i \end{aligned}$$

DATA

This section describes the data used for our empirical analysis. Note that our data set excludes Hong Kong (although we do include it in one model for robustness checks), because the city is actually a part of China, rather than a foreign region, despite its administrative independence.

Dependent Variable

RMBshare

is the percentage share of the RMB in the daily average FX turnover in a country in April 2016. The data are from the BIS *Triennial Central Bank Survey: Global Foreign Exchange Market Turnover in 2016*.

RMB Policy Infrastructures

Given that the dependent variable uses data from April 2016, and that there is usually a lag before a policy has its intended effect, we examine the use (or not) of the three RMB policy infrastructures (*SWAP*, *RQFII*, and *RCB*) as of the end of 2014. At that time, 27 central banks had RMB swap lines with China—one of them being the European Central Bank, with its 19 member nations. Nine economies were participating in the RQFII scheme, and 11 had

established RMB clearing banks. Of the 48 economies in this study's data set, 29 have RMB swap lines with China (since each eurozone member nation is treated as having one), seven have RQFII quotas, and eight have RMB clearing banks. All of the data are from China's central bank, the People's Bank of China.

Economic Relations Variables

Trade

We use the percentage share in its GDP of the sum of a country's exports to and imports from China to measure its trade ties with China.

Investment

A country's investment relations with China are measured by the percentage share in its GDP of the sum of its outstanding stocks of FDI in and from China.

The data on trade, investment, and GDP come from the IMF's Direction of Trade Statistics, the UN Conference on Trade and Development's FDI Statistics, and the IMF's World Economic Outlook database, respectively.

Political Relations Variables

Territorialdispute

This is a dichotomous variable, coded 1 if the country has a territorial dispute(s) with China, and 0 otherwise.

TreatywithUS

A country with a security/defense treaty with the US is coded 1, and a country without one, 0.

The data on territorial disputes and security/defense treaties are from the US Central Intelligence Agency and the US Department of State, respectively.

Other Variables

Financialcenter

We build a categorical variable, measured on a seven-point scale, based on rank in the *Global Financial Centres Index 18*, published by Long Finance in September 2015. The index ranks cities, rather than the countries they are in, so we rank each country on the basis of the rank given to its city. Where

multiple cities of a country appear in the index, the highest rank given is used. Countries ranked 1 to 10, 11 to 20, 21 to 30, 31 to 40, 41 to 50, and 51 to 60 are coded 6, 5, 4, 3, 2, and 1, respectively, and a country not in the top 60 is given a code of 0. This categorical variable enables a greater number of observations, as the index includes only 61 economies.

Chinese population

We measure the size of a country's ethnic-Chinese population using data from the 2013 *Economic Year Book on Overseas Chinese*, published by the Overseas Community Affairs Council, a Taiwanese government agency. The variable is log-transformed.

Distance

The data on countries' geographical distances from China are from the CEPIL.

GDP

This is from the IMF's World Economic Outlook database, as mentioned earlier. It is log-transformed.

Eurozone

This is a dummy variable, coded 1 if a country is a eurozone member and 0 otherwise.

Variables, data sources, and descriptive statistics are provided in the appendix.

EMPIRICAL RESULTS AND DISCUSSION

In this section we discuss the results of our regression analyses.

Outcomes of the Baseline Model

The results of our baseline model are presented in the first column of Table 2. Possession of an RMB clearing bank (*RCB*) has a significant and positive impact on RMB use, while neither an RMB swap line (*SWAP*) nor RQFII participation (*RQFII*) have significant effects. Of the control variables, only trade with China has a significant effect, with its influence being positive, as anticipated.

However, the correlation between *RQFII* and *RCB* is as high as 0.77, which might somewhat distort the regression results. In fact, in most countries, participation in the RQFII scheme and establishment of RMB clearing banks took place nearly simultaneously. And only one country in our data set

TABLE 2. *Factors Affecting RMB Use in Foreign Exchange Markets*

	<i>Baseline model</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 3</i>
<i>RMB policy</i>				
RMB swap line (SWAP)	-0.228 (-0.40)			
RQFII	-1.867 (-1.65)			
RMB clearing bank (RCB)	3.760 (3.36)***			
SWAP + RQFII + RCB		0.379 (1.14)		
SWAP			-0.655 (-1.09)	
RQFII + RCB			0.958 (2.25)**	
SWAP				-0.252 (-0.48)
RQFII & RCB				1.693 (2.39)**
RQFII without RCB				1.072 (0.80)
RCB without RQFII				4.780 (4.54)***
Trade	0.274 (5.27)***	0.319 (5.53)***	0.296 (5.27)***	0.268 (5.61)***
Investment	-0.270 (-0.91)	0.235 (0.84)	0.185 (0.69)	-
Territorial dispute	-0.723 (-0.85)	-0.170 (-0.18)	-0.382 (-0.41)	-0.677 (-0.86)
Treaty with the US	-0.484 (-1.02)	-0.527 (-0.99)	-0.665 (-1.30)	-0.656 (-1.51)
Financial center	-0.064 (-0.47)	-0.080 (-0.52)	-0.119 (-0.81)	-0.182 (-1.47)
Chinese population	-0.057 (-0.38)	-0.151 (0.92)	-0.057 (-0.35)	-0.093 (-0.67)
Distance	-0.001 (-1.17)	-0.000 (-0.88)	-0.000 (-0.98)	-0.000 (-1.44)
GDP	-0.057 (-0.38)	0.590 (1.75)*	0.468 (1.43)	0.637 (2.39)**
Eurozone	0.023 (0.04)	-0.036 (-0.06)	0.495 (0.77)	-0.099 (-0.17)
Observations	43	43	43	43
Adjusted R^2	0.766	0.693	0.720	0.801

*10%, **5%, ***1% significance.

NOTE: t values in parentheses

has an RQFII quota but not an RMB clearing bank. The effect of RQFII may thus not be revealed completely by the baseline regression model.

Alternative Measures for RMB Policy Infrastructures

We therefore design three additional models, Models 1, 2, and 3, which adopt alternative measures to better capture the effects of the three RMB policy infrastructures.

In Model 1 we create a composite variable, $SWAP+RQFII+RCB$, which catches the aggregate effect of all three RMB policy infrastructures in a country (not their individual impacts). A value of 3 is assigned to the variable for a country that has all three policies in place, 2 if any two of them have been introduced, and so on. This allows us to avoid the multicollinearity problem, although there is a cost in the loss of information about each policy's individual effects. In this model we focus on analyzing whether a higher number of RMB policy infrastructures increases RMB use in the FX market.

In Model 2 we build a partial composite variable $RQFII+RCB$ and test its effect, along with the impact of $SWAP$, since of the three RMB policy infrastructures only $RQFII$ and RCB are highly correlated.⁴ We assign a value of 2 to this partial composite variable where a country has both $RQFII$ and RCB , 1 if it has either one, and 0 when it has neither. This model does not distinguish the individual effects of $RQFII$ and RCB , but centers on their aggregate impact.

In Model 3, to avoid the multicollinearity problem and also to maximize utilization of the information available from our data, we introduce three additional RMB policy measures, together with $SWAP$:

- $RQFII\&RCB$, which is coded 1 where both $RQFII$ and RCB are present, and 0 otherwise;
- $RQFII\textit{without}RCB$, which we code 1 where $RQFII$ is present while RCB is not, and 0 otherwise;
- $RCB\textit{without}RQFII$, which is coded 1 where there is an RCB but no $RQFII$ participation, and 0 otherwise.

In these three additional models all of the control variables remain unchanged, except that Model 3 excludes *Investment* due to its substantial and significant correlation (0.71) with $RCB\textit{without}RQFII$.⁵ The results of regression in these models are also presented in Table 2.

In Model 1, the composite variable $SWAP+RQFII+RCB$ does not have a significant effect on use of the RMB in FX markets, which means that the addition of an RMB policy infrastructure does not necessarily lead to any growth in RMB use. This is not surprising given the regression result for our

4. The correlation between $SWAP$ and $RQFII$ is 0.33, while that between $SWAP$ and RCB is 0.24.

5. When Model 3 includes *Investment* its regression results are almost identical with those when the model excludes it, except that *Investment* itself shows a significant negative impact.

baseline model: that of the three RMB policy infrastructures, only an RMB clearing bank has a significant effect. But it does not entail that any of the three RMB policy infrastructures is ineffective. In fact, as will be discussed shortly, the other two additional models show significant impacts for both RQFII participation and an RMB clearing bank.

In Model 2, *RQFII+RCB* positively and significantly affects RMB use, while the effect of *SWAP* remains insignificant. This suggests that either participation in the RQFII or establishment of an RMB clearing bank increases RMB use, and that in a country that has already achieved either one the addition of the other also increases RMB use.

Model 3 shows significant and positive impacts on *RMBshare* from both *RQFII&RCB* and *RCBwithoutRQFII*, but not from *SWAP* or *RQFIIwithoutRCB*. This shows the effects of the three RMB policy infrastructures more precisely: use of the RMB tends to grow in a country that has both an RQFII quota and an RMB clearing bank, and also in a country that has established an RMB clearing bank but does not have an RQFII quota; but a country's participation in the RQFII scheme while it lacks an RMB clearing bank does not significantly affect its RMB use. The coefficient of *RQFII&RCB* is 1.69, meaning that the share of the RMB in the FX market tends to be 1.69 percentage points higher in a country that has both an RQFII quota and an RMB clearing bank than it is in the other countries.

The *RCBwithoutRQFII* coefficient is 4.78. But there are only two countries in our data set that have RMB clearing banks but do not participate in the RQFII scheme, so the coefficient should not be overemphasized, even though it shows a significant effect on *RMBshare*. Note also that the insignificance of *RQFIIwithoutRCB* may be because of there being only one country that participates in the RQFII scheme but does not host an RMB clearing bank, which prevents any clear conclusion with regard to the effect of that variable.

Given the results of the three alternative models, we conclude that a country's establishment of an RMB clearing bank, or this together with its participation in the RQFII scheme, significantly increases the use of the RMB in its FX markets, although the effect of RQFII participation itself is not clear due to the insufficient number of observations.

At this point, one might consider the possibility of the reverse relationship between RMB policy infrastructures and RMB use, that is, whether it was the level of RMB use in the country that drove its decisions to introduce RMB

TABLE 3. *Analysis of Reverse Relationship between RMB Policy and RMB Use*

	<i>DV:</i>			
	<i>DV: SWAP</i>	<i>DV: RQFII</i>	<i>DV: RCB</i>	<i>SWAP+RQFII+RCB</i>
RMB share in 2010	-0.026 (-0.17)	0.064 (0.46)	0.137 (0.85)	0.388 (1.26)
Financial center 2010	0.017 (0.23)	0.180 (2.70)**	0.080 (1.03)	0.293 (1.97)*
Observations	24	24	24	24
Adjusted R^2	-0.092	0.23	0.105	0.191

*10%, **5%, significance.

NOTE: t values in parentheses.

policy. This question is not totally groundless, given that RMBI began to take off in the early 2010s. We check by running four supplementary ordinary least squares regressions, setting as their respective dependent variables the three RMB policy infrastructures (*SWAP*, *RQFII*, and *RCB*) and the composite variable *SWAP+RQFII+RCB*, with the RMB's share in total FX turnover in 2010 (*RMBsharein2010*) as the independent variable. As mentioned earlier, we have only 25 economies reporting 2010 RMB shares. We thus minimize the number of control variables included in the regressions, adopting just one, *Financialcenter2010*, which is a country's rank as an international financial center in March 2010, per *Global Financial Centres 7*.⁶ We control for the impact of this variable since a country's RMB policy infrastructures are the outcomes of bilateral cooperation between its government and the Chinese government and since the Chinese government is highly likely to prefer to cooperate with countries that host developed international financial centers, which may provide better platforms for the international use of the RMB. The results of these regression analyses are reported in Table 3: early RMB use had no significant impact on a country's establishment of any of the three RMB policy infrastructures.

Meanwhile, the insignificant impact of an RMB swap line, seen persistently in all models, may be due in part to two factors. First, some countries may intend to use RMB swap lines to improve their financial stability during crises, since they increase FX liquidity at such times, rather than to boost use

6. This variable is constructed using the same method as for *Financialcenter*.

of the RMB in times of tranquility (Chey 2013, 365). Second, the interest rate of an RMB currency swap is based on the Shanghai Interbank Offered Rate, so the cost of using a swap tends to be higher than that of borrowing RMB in the Hong Kong RMB market, and the actual positive effects of RMB swap lines in facilitating RMB use may thus be constrained. In fact, the activation of RMB swap lines is in practice greatly limited in most countries other than Hong Kong (Prasad 2017, 280–81). According to the People's Bank of China (2017), by the end of 2016 foreign central banks and monetary authorities had drawn only 11% of the total RMB funds available to them through their RMB swap lines with it.

With regard to the control variables, trade with China has a significant and positive effect on RMB use in the FX market in all three additional models, while GDP significantly and positively influences it in Models 1 and 3. None of the other control variables show any significant impacts in any of the models.

Robustness Checks

We conduct robustness checks with two sets of supplementary models. First, based on Model 2—which does not have a serious problem of multicollinearity between the RMB policy variables and any control variables, while allowing us to distinguish the effects of *SWAP* from those of *RQFII* and *RCB*—we build and test three new models (Models 4 to 6). Table 4 reports the results. In Model 4 we include Hong Kong in our data set. This model excludes *Investment*, however, as that variable is almost perfectly correlated (0.94) with another control variable, *Trade*, when the data set includes Hong Kong.⁷ *RQFII+RCB*, which counts the presence of both an RQFII quota and an RMB clearing bank in a country, continues to have a significant positive effect on the dependent variable, while the effect of an RMB swap line remains insignificant. Trade with China has a constant significant and positive effect. We also find that, with the addition of Hong Kong, the coefficient of *Chinese population* becomes significant and positive.

In Models 5 and 6 we disaggregate a country's trade ties with China into its export and its import relations with China, respectively. A country's export

7. In the data set excluding Hong Kong, the correlation between *Trade* and *Investment* is a mere 0.15, and is not statistically significant.

TABLE 4. Additional Models Based on Model 2

	<i>Model 4</i> (inclusion of Hong Kong)	<i>Model 5</i> (trade: exports)	<i>Model 6</i> (trade: imports)
<i>RMB Policy</i>			
SWAP	-0.785 (-1.12)	-0.477 (-1.03)	-0.896 (-1.11)
RQFII + RCB	1.339 (2.82)***	0.71 (2.13) **	1.499 (2.69) **
Trade	0.095 (6.34) ***	0.503 (8.23) ***	0.180 (1.16)
Investment	–	0.320 (1.54)	0.109 (0.30)
Territorial dispute	0.095 (6.34)	-1.058 (-1.46)	1.158 (0.99)
Treaty with the US	0.989 (1.00)	-0.479 (-1.21)	-1.128 (-1.66)
Financial center	-0.002 (-0.01)	-0.145 (-1.28)	-0.006 (-0.03)
Chinese population	0.304 (2.01) *	-0.069 (-0.59)	0.371 (1.83) *
Distance	-0.000 (-0.60)	-0.0001 (-2.07) **	-0.000 (-0.48)
GDP	-0.295 (-1.04)	0.534 (2.22) **	-0.375 (-0.93)
Eurozone	0.492 (0.67)	0.267 (0.493)	0.478 (0.55)
Observations	44	43	43
Adjusted R^2	0.795	0.834	0.49

*10%, **5%, ***1% significance.

NOTE: t values in parentheses.

relations with China (as measured by the percentage of its GDP accounted for by exports to China) have a significant positive impact on RMB use in its FX market, but its import ties with China (measured by the percentage of its GDP of imports from China) do not. As to the impacts of RMB policy infrastructures in these two models, *RQFII+RCB* continues to show significant and positive effects in both of them, while *SWAP* remains insignificant. Additional findings of note concerning these two models are a significant negative effect of geographical distance from China and a significant positive effect of GDP in Model 5, as well as a significant positive effect of the ethnic-Chinese population in Model 6. None of the other variables show any significant influences on RMB use.

Second, we use an alternate measure of RMB use: the change in the RMB's share in FX turnover between 2010 and 2016. As noted above, this measure has the merit of capturing an increase/decrease in a country's RMB use during the period, especially given that 2010 was close to when RMBI began. Adopting

TABLE 5. *Additional Models Using Changes in RMB Shares*

	<i>Model 7</i>	<i>Model 8</i>	<i>Model 9</i>	<i>Model 10</i>
<i>RMB policy</i>				
RMB swap line (SWAP)	-0.734 (-1.07)			
RQFII	-1.697 (-1.63)			
RMB clearing bank (RCB)	2.739 (3.00)***			

SWAP + RQFII + RCB	0.087 (0.27)			

SWAP			-1.216 (-1.66)	
RQFII + RCB			0.690 (1.60)	

SWAP				-0.596 (-0.97)
RQFII & RCB				0.682 (0.95)
RQFII without RCB				0.412 (0.32)
RCB without RQFII				4.238 (4.11)***

Trade	0.252 (7.51)***	0.288 (7.70)***	0.263 (7.06)***	0.241 (7.90)***
GDP	0.490 (1.80)*	0.405 (1.43)	0.231 (0.82)	0.605 (0.248)**

Observations	25	25	25	25
Adjusted R^2	0.799	0.714	0.747	0.839

*10%, **5%, ***1% significance.

NOTE: t values in parentheses.

this variable as the new dependent variable, we revise our baseline model and Models 1, 2, and 3 to build Models 7, 8, 9, and 10, respectively. To reiterate, however, using this new dependent variable results in just 25 observations. In these four revised models we therefore minimize the number of control variables, and include only those that showed significant effects at least once in our baseline model and Models 1 to 3: *Trade* and *GDP*.

The regression results appear in Table 5. *RCB* has a significant positive impact on the new dependent variable in Model 7, while *RCBwithoutRQFII* does so in Model 10. These outcomes support our finding in previous models that a country's establishment of an RMB clearing bank facilitates the use of the RMB in that country. Meanwhile, consistent with the results of all

previous models, an RMB swap line does not show significant impacts in any of Models 7 to 10. RQFII and all of the composite RMB policy variables including it— $SWAP+RQFII+RCB$, $RQFII+RCB$, $RQFII\&RCB$, and $RQFIIwithoutRCB$ —are also not significant in the four revised models; yet, given the small numbers of observations in the models, this result should be not overstressed to reject the significance of RQFII for use of the RMB. As to the control variables, *Trade* shows a significant and positive effect in Models 7 through 10, while *GDP* does so only in Models 7 and 10.

CONCLUSION

Despite the recent substantial growth in research on RMBI, the actual use of the RMB in foreign markets has rarely been analyzed in the literature. This study provides one of the first cross-country analyses of RMB use in foreign economies, focusing on the use of that currency in the FX markets. We find that two particular RMB policy infrastructures, participation in the RQFII scheme and establishment of an RMB clearing bank, effectively promote the international use of the RMB, while, contrary to the conventional expectation, RMB swap lines do not. These findings suggest that the RMBI to date is largely due to foreign states' policy cooperation with China—even if not all cooperative policies have had their intended effects—and thereby highlights the role of states in the RMBI process. This study does not, however, argue that market forces have been irrelevant to the recent rise of the RMB. Rather, it has shown as well that a country's trading ties with China (particularly exports to China) lead to increased use of the RMB in its markets. The internationalization of the RMB has been shaped by both states and markets.

One caveat in this study is that the numbers of observations in our regression models are limited, constraining the empirical analysis. We would like to stress, however, that, to our knowledge, the data on the international use of the RMB employed in this research are the *only* cross-country data available that allow systematic quantitative analysis, and this study is one of the first to conduct such an analysis, even if the data have some limitations.

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APPENDIX

TABLE A1. *Variables and Data Sources*

<i>Variable</i>	<i>Source</i>
RMB share	Bank for International Settlements
RMB share in 2010	Bank for International Settlements
Change in RMB share	Bank for International Settlements
SWAP	People's Bank of China
RQFII	People's Bank of China
RCB	People's Bank of China
Trade	IMF Direction of Trade Statistics, IMF World Economic Outlook
Investment	UNCTAD, IMF World Economic Outlook
Territorial dispute	CIA
Treaty with the US	US Department of State
Financial center	<i>Global Financial Centres Index 18</i> (Long Finance, 2015)
Financial center 2010	<i>Global Financial Centres 7</i> (City of London, 2010)
Chinese population	2013 Economic Year Book on Overseas Chinese (Taiwan: Overseas Community Affairs Council, 2013)
Distance	CEPII
GDP	IMF World Economic Outlook
Eurozone	European Commission

TABLE A2. *Descriptive Statistics*

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min.</i>	<i>Max.</i>
RMB share	47	1.015	2.565	0	14.997
RMB share in 2010	25	0.323	0.370	0	3.141
Change in RMB share	25	1.378	2.994	-0.299	13.827
<hr/>					
<i>RMB policy</i>					
SWAP	47	0.617	0.491	0	1
RQFII	47	0.149	0.360	0	1
RCB	47	0.170	0.380	0	1
SWAP + RQFII + RCB	47	0.936	0.965	0	3
RQFII + RCB	47	0.319	0.695	0	2
RQFII & RCB	47	0.128	0.337	0	1
RQFII without RCB	47	0.021	0.146	0	1
RCB without RQFII	47	0.043	0.204	0	1
<hr/>					
<i>Trade</i>	47	6.418	7.06	1.643	34.887
Exports	47	3.034	4.672	0.139	26.147
Imports	47	3.384	2.870	0.940	14.453
Investment	47	0.234	0.942	-0.0205	6.152
<hr/>					
Territorial dispute	47	0.128	0.337	0	1
Treaty with the US	47	0.681	0.471	0	1
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Financial center	47	2.894	2.267	0	6
Financial center 2010	25	4.44	1.417	2	6
Chinese population	44	11,506	2,591	5,298	16,965
Distance	46	8226.979	4174.677	955.651	19297.47
GDP	47	26.961	1.334	24.188	30.489
Eurozone	47	0.319	0.471	0	1

NOTE: Hong Kong is excluded from the dataset.