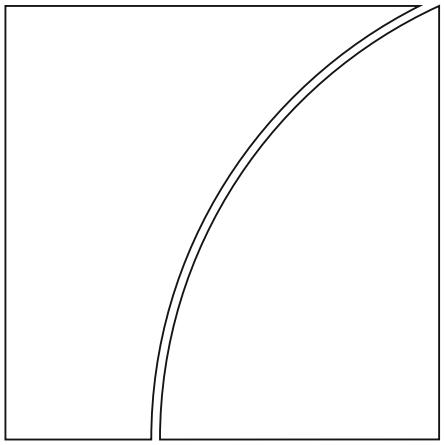

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by Yin-Wong Cheung, Robert N McCauley and Chang Shu

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Keywords: international currency; FX turnover; renminbi internationalisation; international financial centre.

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Geographic spread of currency trading: the renminbi and other EM currencies

Yin-Wong Cheung, Robert N McCauley and Chang Shu[1]

Abstract

This paper studies the ongoing diffusion of renminbi trading across the globe, the first such research of an international currency. It analyses the distribution in offshore renminbi trading in 2013 and 2016, using comprehensive data from the *Triennial Central Bank Survey of Foreign Exchange and Over-the-Counter Derivatives Market Activity*. In 2013, Asian centres favoured by the policy of renminbi internationalisation had big shares in global renminbi trading. In the following three years, renminbi trading seemed to converge to the spatial pattern of all currencies, with a half-life of seven to eight years. The previously most traded emerging market currency, the Mexican peso, shows a similar pattern, although it is converging to the global norm more slowly. Three other major emerging market currencies show a qualitatively similar evolution in the geography of their offshore trading. Overall the renminbi's internationalisation is tracing an arc from the influence of administrative measures to the working of market forces.

Keywords: international currency; FX turnover; renminbi internationalisation; international financial centre.

JEL classification: C24, F31, F33, G15, G18.

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1. Introduction

How does a currency grow from a largely national or regional role into a global role? One aspect of this is its trading geography. What is the path along which a currency's trading evolves from localised trading to global trading?

No doubt, the US dollar, the Deutsche mark (DM) and the Japanese yen in their turns all went through a process whereby their trading diffused across the globe. The end-result is evident in the 2016 *Triennial Central Bank Survey of Foreign Exchange and Over-the-Counter Derivatives Market Activity* (henceforward the 2016 Triennial Survey). For example, the geographic distribution of US dollar trading and that of the Japanese yen resemble each other, despite the disparity of their respective international roles and the number of time zones that separate the two home countries.

However, the diffusion of these major currencies took place before reasonably comprehensive surveys of foreign exchange (FX) turnover began in 1989. These surveys nowadays span over 50 jurisdictions, albeit at only a triennial frequency. The short span of consistent, comprehensive data makes it impossible to document the geographic diffusion of trading of the yen or Australian dollar.

The last two Triennial Surveys available make it possible to analyse the recent internationalisation of emerging market currencies. In the 2013 Triennial Survey, a broad range of jurisdictions reported turnover in emerging market currencies. This marked a break from the 2010 survey, in which only some reporting jurisdictions provided detail on such currencies. Therefore, our analysis of the internationalisation of the renminbi and other emerging market currencies depends on two snapshots: 2013 and 2016.

Our hypothesis is that a currency undergoing internationalisation experiences a characteristic evolution of its geographical distribution of trading outside its home jurisdiction. In particular, it approaches the global geographical distribution of trading observed for the overall FX market. Given the US dollar's vehicle role in FX trading (Krugman (1984)), with it serving as one of the currencies in almost 90% of trades, the geographical distribution of dollar trading nearly matches that of overall trading. As other currencies become more broadly traded, they close the gap between their original geography of trading and the global distribution of FX trading by centre.

In particular for the renminbi, Ehlers and Packer (2013) found that its offshore trading was concentrated in Asia in 2013. Cheung and Yiu (2017) found that the distribution of renminbi trading was affected by the size of the financial markets in the host jurisdiction, as well as the bilateral foreign direct investment (FDI) flow with China. Contrary to Cheung (2015), the role played by policy variables, such as People's Bank of China swap lines, emerged as modest. Whatever the factors that accounted for the 2013 distribution, our approach is to try to account for the change between the surveys of 2013 and 2016 of a given centre's share of renminbi trading. We hypothesise that the distribution of renminbi trading worldwide is converging to that of all currencies.

To our knowledge, this conception of the geographical diffusion of an internationalising currency is a novelty of this article. Like Griliches (1957), we describe a diffusion process with three parameters: the initial conditions, which we observe,

the speed of diffusion, which we infer from the data, and the ultimate endpoint, which we posit.[2]

The closest work to ours is that of Eichengreen et al (2016). They find that submarine fibre optic cables lead to a loss of market share of the home FX market and a gain by offshore centres. In the light of these findings, Mehl (2017, p 38) interprets the euro area's loss of market share in trading the euro against other currencies and London's parallel gain as reflecting "London's trading cables". We take the onshore-offshore split as given and model the change in the offshore distribution.

To anticipate, we find that between 2013 and 2016 the renminbi's turnover diffused from Asia to the rest of the world. It did so in a manner consistent with convergence to the geographical distribution of global FX trading that has resulted from market forces. If policy had given the two Asian financial centres, Hong Kong SAR (henceforward Hong Kong) and Singapore, head starts, they both lost market share to London and New York – the world's two leading FX trading centres.

How fast might the convergence go? At the rate of 2013–16, it would take seven to eight years. That translates to two to three Triennial Surveys.

A question immediately arises: is the renminbi convergence unique? To demonstrate that something different was happening with the renminbi, we follow Cheung and Yiu (2017) and repeat the exercise with the Mexican peso (MXN).[3] The Mexican peso is worthy of analysis because it was the most traded emerging market currency before the renminbi surpassed it in the 2016 Triennial Survey. We find that the Mexican peso is also diffusing from its regional base in the Americas, but at a slower rate.

We also repeat the analysis for all of the emerging market currencies with widely reported turnover. In this context, we follow Cheung and Yiu (2017) by adding controls for the change in trade and FDI relations between the currency's home country and that of the trading centre, as well as for financial and real aspects of the centre. We find that the trading of three other emerging market currencies is diffusing according to our hypothesis. And the renminbi and peso results are robust to the inclusion of the controls.

The rest of the paper is organised in five parts. The second section provides an overview of the geography of currency trading, which establishes a norm for a major currency. The third section briefly reviews renminbi internationalisation, highlighting its transition from a heavily regional profile of trading. The fourth section reports regression analysis which tests whether the trading patterns for the renminbi and the Mexican peso are converging to that of major currencies. The fifth section repeats the exercise for all of the well reported emerging market currencies, adding controls to test the robustness of our results. The sixth section concludes.

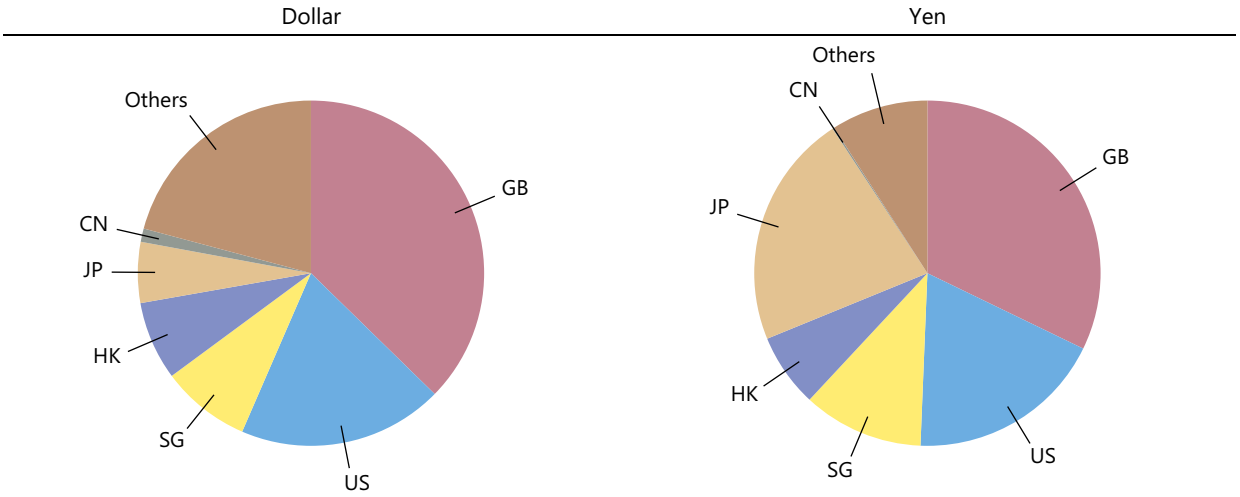
[2] The analogy would be stronger if we were investigating the renminbi share of global trading, but instead we are investigating the distribution of renminbi trading, whatever its overall level.

[3] These currencies are the next ones on the emerging market currency hit parade from the Triennial, neglecting the Hong Kong and Singapore dollars, which, much like sterling, have an FX trading centre as their home jurisdiction.

2. Overview of the geography of currency trading

Our starting point is the remarkable similarity of the trading of the dollar and yen across centres. Tokyo's FX market closes before New York opens and New York closes before Tokyo opens. The dollar was on one side of 88% of all FX trades in April 2016; the yen on only 22%. The dollar is used globally to denominate about half of all trade; the yen is used to denominate only a fraction of Japan's trade. It would be easy to imagine that the geographical distribution of trading in the dollar and yen must differ considerably. They do not. In Graph 1, the distribution of trading of the dollar in the left-hand panel shows more trading in New York (blue-coloured slice labelled US) than does trading in the yen in the right-hand panel. The yen in the right-hand panel shows more trading in Tokyo (tan-coloured slice labelled JP) than does trading in the dollar in the left-hand panel. Fair enough: there is a bias to trading the home currency. But the distributions of the trading of these two currencies in London (reddish-coloured slice labelled GB), Singapore (yellow-coloured slice labelled SG) and Hong Kong (purple-coloured slice labelled HK) are remarkably similar.

Turnover by centre for the dollar and yen, 2016 Graph 1



Source: BIS (2016).

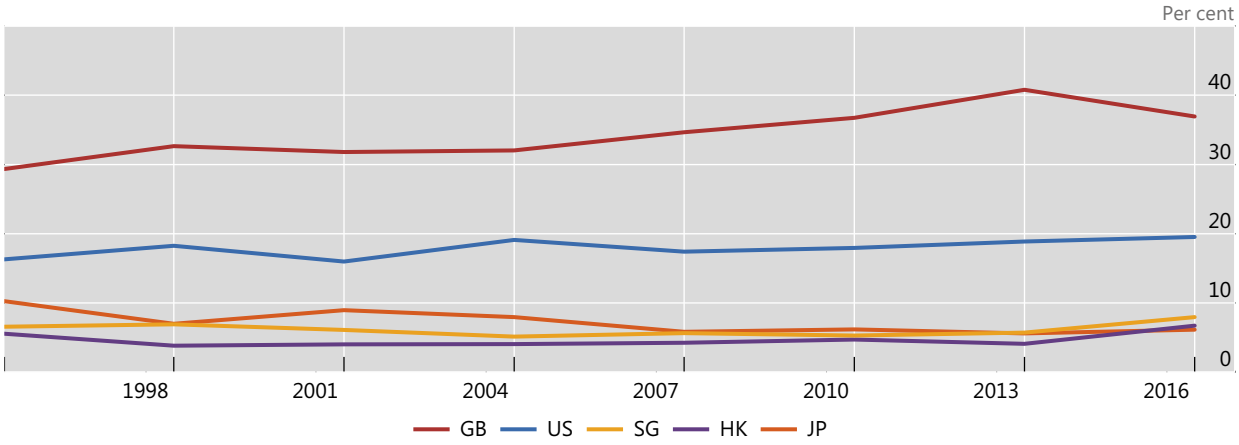
Notes: GB is Great Britain; US, United States; SG, Singapore; HK, Hong Kong SAR; JP, Japan; CN, mainland China.

The geographic distribution of FX trading shows considerable stability. Looking across the eight Triennial Surveys from 1995 through 2016, London and New York have remained #1 and #2 (Graph 2).[4] Among the Asian centres, Tokyo has lost share, while Singapore and Hong Kong have gained. The top five accounted for 77% of turnover (on a net-gross basis) in 2016. Despite the addition of new reporting countries, their joint share has risen over the years from about two thirds. This reflects the rise in the offshore share of trading across currencies.[5]

[4] Looking across lines of business, Cassis (2006) puts New York ahead of London. London's particular strength in foreign exchange can be ascribed to its time zone advantage.

[5] Over time, the share of offshore trading in currencies has tended to rise; see McCauley and Scatigna (2011), Ehlers and Packer (2013), Eichengreen et al (2016) and Mehl (2017).

Foreign exchange turnover shares of the top five centres Graph 2



Source: BIS (2016).

Notes: GB is Great Britain; US, United States; SG, Singapore; HK, Hong Kong SAR; JP, Japan.

Some readings of the 2016 Triennial Survey ascribed London's loss of market share to the growth of renminbi trading elsewhere. While Moore et al (2016) gave no attention to the geography of trading, the press did, with a headline, "London's grip on global FX trading hit by Asia" (Martin (2016)). Hutton and Kent (2016) reported market intelligence that ascribed less trading in London to the growth in trading of emerging market currencies such as the renminbi, the Mexican peso and the Korean won. However they emphasised London's pre-eminence in renminbi trading outside of Asia and hinted at our hypothesis:

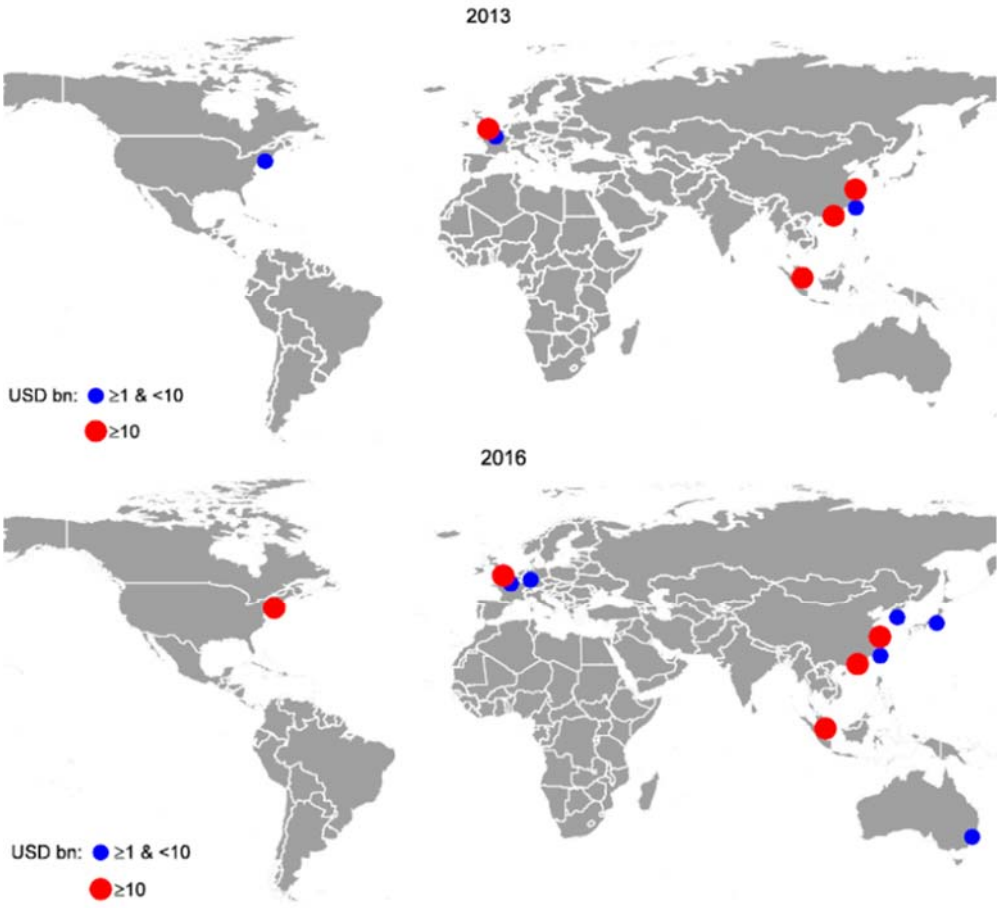
> Outside of the Asian centres of Hong Kong, China and Singapore, which naturally are the home to most of this activity [renminbi trading], the United Kingdom is now the largest centre for RMB [renminbi] trading. Historically, London has been the major centre for FX turnover, perhaps accounting for its standing within RMB turnover (Hutton and Kent (2016, p 227)).

3. The diffusion of renminbi trading, 2013–16

This section describes the diffusion of the renminbi trading in the three years from April 2013 to April 2016. The following section reports our regression analysis that points to convergence of the renminbi's trading to the geographical distribution of the trading of all currencies.

Graph 3 shows where the renminbi traded over $1 billion or over $10 billion per day in 2013 and 2016. In 2013, only the Mainland, Hong Kong, Singapore and London centres traded over $10 billion per day, while Chinese Taipei, Paris and New York all traded in the $1 billion–$10 billion range. In 2016, turnover in New York had climbed to over $10 billion per day, while Tokyo, Seoul, Sydney and Frankfurt had joined the $1 billion–10 billion club.

Renminbi turnover spreads from Asia between 2013 and 2016 Graph 3

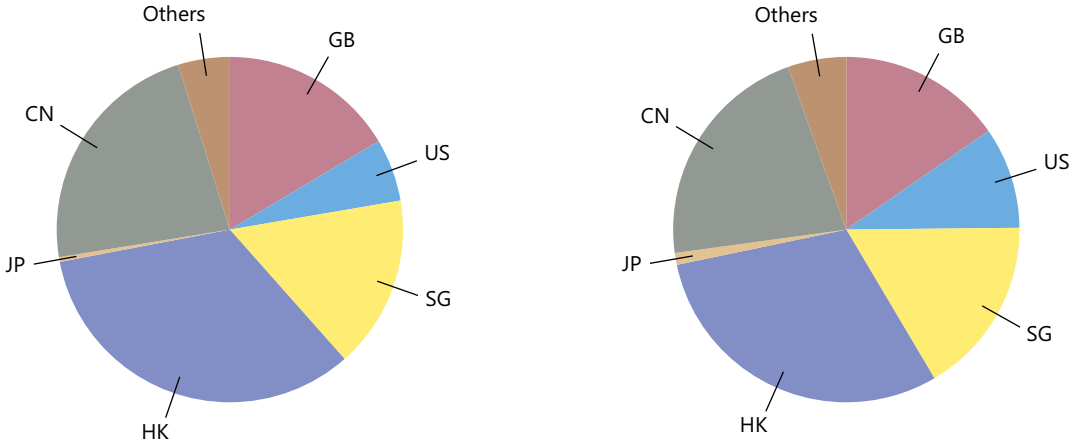


Source: BIS (2016).

While this evidence shows diffusion, it does not necessarily support the hypothesis that the diffusion is taking renminbi trading towards a particular endpoint in terms of its geography of trading. Recall, we are not following Griliches (1957) in analysing the rise of renminbi trading as a share of trading in all currencies; rather we are modelling the geographic distribution of renminbi trading. Moreover, the diffusion is also occurring within Asia and the Pacific.

So we consult the shares as we did with Graph 1, this time comparing renminbi turnover by centre in 2013 and 2016 (Graph 4). Is renminbi turnover distributed more like that of a major currency such as the dollar or yen over time? So it seems: the major centres of London and New York gained at the expense of the regional centres, Hong Kong and Singapore.

Turnover of the renminbi by location, 2013 and 2016 Graph 4



Source: BIS (2016).

Note: GB is Great Britain; US, United States; SG, Singapore; HK, Hong Kong SAR; JP, Japan; CN, mainland China.

4. Convergence of renminbi and Mexican peso trading

While Graph 4 is consistent with our convergence story, the acid test is a cross-sectional analysis of the change in a centre's share of renminbi trading between 2013 and 2016. Our "error-correction" hypothesis is that centres that have more (less) than their share of renminbi trading will lose (gain) share. The norm for the warranted share is simply the centre's share of turnover for all currencies.

We estimate the following:

$$Y_{i,2016} - Y_{i,2013} = \alpha + \beta (Y_{i,2013} - X_{i,2013}) + \gamma (X_{i,2016} - X_{i,2013}) + \delta (Y_{i,2013}/X_{i,2013}) + \varepsilon_t , \quad (1)$$

where $Y_{i,2016} - Y_{i,2013}$ is the change in centre i's share of offshore renminbi trading between 2013 and 2016; α is the constant; $Y_{i,2013} - X_{i,2013}$ is the gap between centre i's share of offshore renminbi trading and its share of all-currency trading; $X_{i,2016} - X_{i,2013}$ is the change in centre i's share of al currency trading; and $Y_{i,2013}/X_{i,2013}$ is centre i's renminbi trading as a share of its all-currency FX trading in 2013.

Our key finding is that the estimated coefficient on the gap between a centre's renminbi share and all-currency share is negative (Table 1). This finding points to convergence of the renminbi trading to the global norms dominated by the major currencies. When allowance is made for a given centre's gain or loss of global market share, the coefficient on the gap is larger in absolute value, suggesting faster convergence. The coefficient of –0.22 suggests a convergence process with a half-life of seven to eight years after controlling for the change in a centre's overall FX trading share in 2013–16. A centre's ratio of renminbi to all-currency trading in 2013 does not play much of a role.

Convergence of renminbi trading

Dependent variable is change in a centre's share of renminbi trading, 2013–16 Table 1

	(1)	(2)	(3)
Gap between centre's RMB and all-currency share	–0.088**	–0.221***	–0.221***
	(0.042)	(0.023)	(0.037)
Change in centre's all-currency share 2013–16		1.523***	1.525***
		(0.222)	(0.247)
Centre's RMB share of all-currency trading 2013			0.002
			(0.039)
Constant	0.000	0.000	–0.002
	(0.110)	(0.051)	(0.045)
Adjusted R^2	0.351	0.858	0.855
No. of obs.	51	51	51

[1] *** indicates significance at the .01 level; ** at the .05 level.

Sources: BIS (2013, 2016); authors' calculations.

We repeat the analysis of the renminbi's diffusion for the Mexican peso, the second most traded emerging market currency (Table 2). We find that the peso is also going through a process of geographical diffusion. This finding is consistent with reports that the Bank of Mexico intervened in Asian hours in the peso/dollar rate in early 2017 (Yuk (2017)). This was reportedly a change from previous occasions when it intervened only during New York/Chicago/Mexico City hours.[6]

Convergence of Mexican peso trading

Dependent variable is change in a centre's share of MXP trading, 2013–16 Table 2

	(1)	(2)	(3)
Gap between centre's MXP and all-currency share	–0.076**	–0.065***	–0.066***
	(0.03)	(0.02)	(0.02)
Change in centre's all-currency share 2013–16		–0.206	–0.204
		(0.156)	(0.155)
Centre's MXP share of all-currency trading 2013			0.00000
			(0.00001)
Constant	0.044	0.049	0.043
	(0.052)	(0.05)	(0.047)
Adjusted R^2	0.412	0.486	0.478
No. of obs.	51	51	51

[1] *** indicates significance at the .01 level; ** at the .05 level.

Sources: BIS (2013, 2016); authors' calculations.

[6] While there has been discussion of official Chinese intervention in the renminbi/dollar rate in Hong Kong, we are not aware of any reports of such intervention in London or New York.

That said, the process for the Mexican peso differs in important ways from that of the renminbi. The speed of the process is slower for the Mexican peso. Trading in the Mexican peso does respond to a centre's overall increase in share, as it does in the case of the renminbi. And the variance of the changes in the location of Mexican peso trading that a simple diffusion process accounts for is much smaller. (As with the renminbi, the centre's 2013 share of Mexican peso trading in all trading is insignificant.) Overall, one is tempted to associate the more laissez-faire approach of the Mexican authorities to peso internationalisation – one recalls the ECB policy of neither encouraging nor discouraging the euro's international use – with the leisurely pace of peso trading's geographic diffusion.

5. Extension: other EM currencies and controls

This section extends the analysis of the renminbi and Mexican peso to other EM currencies and follows Cheung and Yiu (2017) in introducing controls. These include changes in a centre's economic relationship with China and its own characteristics.

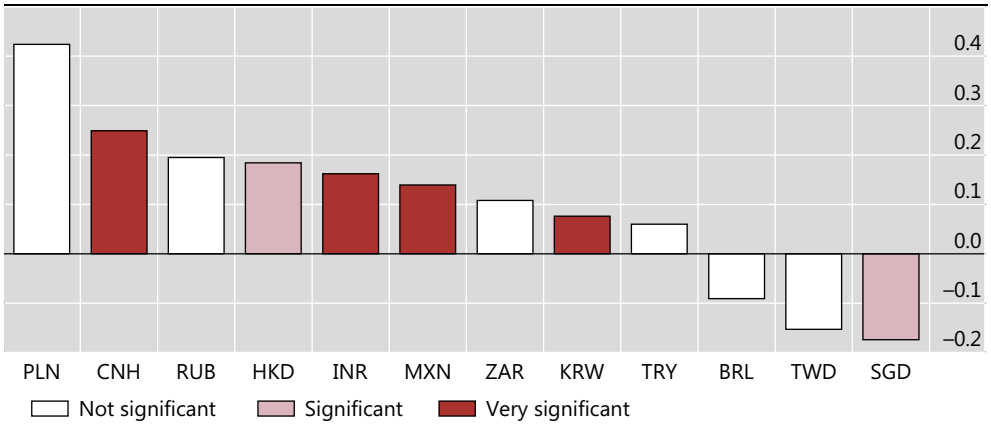
We find that the renminbi's convergence to the geographical distribution of all currencies' trading is the fastest among those showing statistical significance (Graph 5). In addition to the renminbi and Mexican peso, the Hong Kong dollar, Indian rupee and Korean won show statistically significant convergence. It is worth noting that the diffusion of Indian rupee and Korean won trading is occurring largely through trading of the non-deliverable forward (McCauley and Shu (2016)). Only the Singapore dollar gives weak evidence for divergence.

Table 3 shows the results including five controls adapted from Cheung and Yiu (2017). In addition to the variables specified in equation 1 above, which are shown in the first two columns, the third column shows the coefficient on the growth of FX turnover in the centre as a share of the centre's GDP. Then follow the change in GDP growth rate in the centre, and the change in the ratio of private credit to GDP for the centre. Then follow the bilateral relationship variables: the change in the share of foreign direct investment between the centre and the currency's home country and

Renminbi diffusing most quickly

Coefficient on gap between a centre's share trading of respective currency and its share of all currencies

Graph 5



Source: Table 3, negative of gap coefficient in first column.

the change in the share of bilateral trade between the centre and the currency's home country.

The major take-away is that the convergence parameters for the renminbi and the Mexican peso are robust to the inclusion of the controls. The convergence coefficient for the Mexican peso increases in absolute value, although the significantly negative coefficients on the bilateral direct investment and trade variables are anomalous. (That the change in the centre's overall share loses significance in the presence of the growth of FX turnover relative to GDP is more understandable.)

Convergence of EM currency trading to all-currency distribution

Dependent variable is change in centre's share of trading of respective EM currency, 2013–16 Table 3

	2013 gap: centre's share of trading of currency – all currencies	Change in centre's all-currency share	FX market growth	Macro controls: change				Constant	R^2	No of obs.
				GDP growth	Priv credit	Bilateral FDI	Bilateral trade			
RMB	–0.249	1.622	0	0.006	0.001	–0.002	0.051	–0.025	0.900	41
	(–13.009)**	(11.523)**	(–0.041)	(0.881)	(0.233)	(–0.426)	(1.669)	(–0.203)		
BRL	0.091	0.504	0.04	0.05	–0.005	–0.166	1.976	0.813	0.842	31
	(1.729)	(1.430)	(3.512)**	(1.819)	(–0.425)	(–1.152)	(2.374)*	(2.083)*		
HKD	–0.184	1.291	–0.013	–0.023	–0.015	0.3	1.788	–0.383	0.495	35
	(–2.749)*	(3.586)**	(–1.075)	(–1.545)	(–2.118)*	(0.729)	(3.180)**	(–1.598)		
INR	–0.162	1.338	–0.013	0.013	0.008	–0.089	–0.254	0.065	0.849	34
	(–8.356)**	(8.329)**	(–2.327)*	(1.072)	(1.441)	(–0.649)	(–1.203)	(0.342)		
KRW	–0.076	0.282	0.005	0.001	0.003	–0.187	0.234	–0.108	0.784	33
	(–2.959)**	(1.355)	(1.152)	(0.178)	(0.758)	(–1.843)	(1.676)	(–0.948)		
MXN	–0.139	0.064	0.011	0.004	–0.001	–0.261	–1.482	0.031	0.917	31
	(–10.991)**	(0.552)	(2.881)**	(0.476)	(–0.157)	(–6.435)**	(–3.138)**	(0.284)		
PLN	–0.424	0.577	0.03	0.014	0.001	–0.14	0.176	0.336	0.38	32
	(–1.994)	(1.036)	(1.996)	(0.385)	(0.043)	(–0.610)	(0.543)	(0.656)		
RUB	–0.195	–0.274	0.007	0.028	–0.007	–0.011	0.462	0.456	0.376	29
	(–0.932)	(–0.265)	(0.518)	(1.083)	(–0.555)	(–0.113)	(1.546)	(1.171)		
SGD	0.174	1.78	–0.061	–0.063	–0.003	–1.007	–0.267	–1.122	0.899	35
	(2.147)*	(6.316)**	(–4.660)**	(–3.104)**	(–0.331)	(–6.022)**	(–0.689)	(–3.735)**		
TRY	–0.06	0.888	0.002	0.015	–0.003	0.017	0.097	0.269	0.835	31
	(–1.002)	(2.644)*	(0.365)	(0.989)	(–0.394)	(0.279)	(0.489)	(1.186)		
TWD	0.153	0.702	–0.037	–0.013	–0.038	–0.229	–1.914	–0.109	0.62	33
	(0.953)	(0.611)	(–1.731)	(–0.329)	(–1.616)	(–0.490)	(–1.895)	(–0.176)		
ZAR	–0.108	0.03	0.012	0.019	0.001	0.061	1.267	0.191	0.667	34
	(–1.476)	(0.167)	(1.611)	(1.448)	0.068	(1.1015)	(5.671)**	(0.968)		

Notes: *t* statistics in parentheses. *** indicates significance at the .01 level; ** at the .05 level; * at the .10 level. RMB: Chinese renminbi; BRL: Brazilian real; HK: Hong Kong dollar; INR: Indian rupee; KRW: Korean won; MXN: Mexican peso; PLN: Polish zloty; RUB: Russian rouble; SGD: Singapore dollar; TRY: Turkish lira; TWD: Taiwan dollar; ZAR: South African rand.

Sources: See Cheung and Yiu (2017); BIS for private credit variable; authors' calculations.

6. Conclusions

In this paper, we demonstrate that the location of trading of the renminbi diffused in 2013–16 from Asian centres to which policy had given first-mover advantages. Trading seems to be converging to the geographical pattern of all currencies. While another widely traded emerging market currency, the Mexican peso, shows a similar pattern, its speed of convergence is slower. Other emerging market currencies, notably the Hong Kong dollar, the Indian rupee and the Korean won show a qualitatively similar pattern of geographical diffusion in their offshore trading.

Overall, our results support the view of Kindleberger (1974), writing on the question of what financial centre would prevail in a Europe with a single currency – a question of eerie relevance today, as Brexit is debated. He wrote: "Government policy can accelerate or slow down the emergence of a given city as the primary financial centre, but it can probably not change the outcome." We paraphrase: while the strategy of renminbi internationalisation may have given a head start to Hong Kong and other Asian trading centres, if the renminbi becomes a key international currency, market forces, not policy, will determine where it is traded.

References

Bank for International Settlements (2013): "Foreign exchange turnover in April 2013", *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity*, September.

——— (2016): "Foreign exchange turnover in April 2016", *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity*, September.

Cassis, Y (2006): *Capitals of capital: the rise and fall of international financial centres 1780–2009*, Cambridge University Press.

Cheung, Y-W (2015): "The role of offshore financial centers in the process of renminbi internationalization", in B Eichengreen and M Kawai, *Renminbi internationalization: achievements, prospects, and challenges*, Asian Development Bank Institute and Brookings Institution, pp 207–35.

Cheung, Y-W and M Yiu (2017): "Offshore renminbi trading: findings from the 2013 Triennial Central Bank Survey", *International Economics,* vol 152, December, pp 9–20.

Ehlers, T and F Packer (2013): "FX and derivatives markets in emerging economies and the internationalisation of their currencies", *BIS Quarterly Review*, December, pp 55–67.

Eichengreen, B, R Lafarguette, and A Mehl (2016): "Cables, sharks and servers: technology and the geography of the foreign exchange market", *NBER Working Papers*, no 21884, January.

Griliches, Z (1957): "Hybrid corn: an exploration in the economics of technological change", *Econometrica*, vol 25, no 4, October, pp 501–22.

Hutton, A and E Kent (2016): "The foreign exchange and over-the-counter interest rate derivatives market in the United Kingdom", *Bank of England Quarterly Bulletin,* December, pp 224–37

Kindleberger, C (1974): *The formation of financial centres: a study in comparative economic history,* International Finance Section, Princeton University, *Princeton Studies in International Finance,* no 36, November.

Krugman, P (1984): "The international role of the dollar: theory and prospect", in J Bilson and R Marston (eds), *Exchange rate theory and practice*, University of Chicago Press, pp 261–78.

Martin, K (2016): "London's grip on global FX trading hit by Asia", *Financial Times*, 1 September.

McCauley, R and M Scatigna (2011): "Foreign exchange trading in emerging currencies: more financial, more offshore", *BIS Quarterly Review*, March, pp 67–75.

McCauley, R and C Shu (2016): "Non-deliverable forwards: impact of currency internationalisation and derivatives reform", *BIS Quarterly Review*, December, pp 81–93.

Mehl, A (2017): "The euro and the geography of the foreign exchange market", in European Central Bank, *International role of the euro*, July, pp 28–38.

Moore, M, A Schrimpf and V Sushko (2016): "Downsized FX markets: causes and implications", *BIS Quarterly Review*, December, pp 35–51.

Yuk, P K (2017): "Banxico defends peso for second straight day", *Financial Times*, 6 January.

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