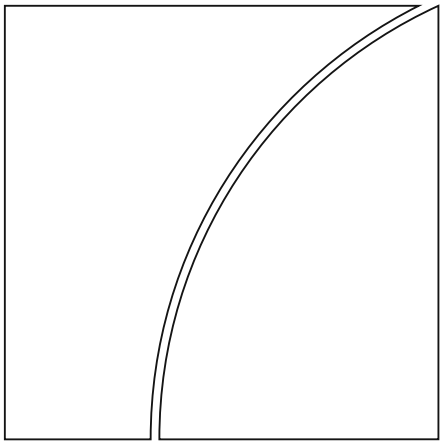

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by Guonan Ma and Robert N McCauley

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Is China or India more financially open?

Guonan Ma and Robert N McCauley[1]

Abstract

Measures of de facto capital account openness for China and India raise the question whether the Chinn-Ito measure of de jure capital account openness is useful and whether the Lane-Milesi-Ferretti measure of de facto openness ranks the two countries correctly. We examine eight dimensions of de facto capital account openness. Four measures based on onshore and offshore prices test the *law of one price*. Among the four quantity measures, we introduce two new ones into the debate: the openness of *consolidated* banking systems and the internationalisation of currencies. Generally, the measures show both economies becoming more financially open over time. In six of the eight dimensions, the Indian economy appears to be more open financially. Nevertheless, policy continues to segment onshore and offshore markets in both and policymakers face challenges in further financial integration.

Keywords: Capital account openness; financial integration; law of one price; foreign exchange market; currency internationalisation; Chinn-Ito; Lane-Milesi-Ferretti.

JEL: F23, F31, F36, F65, G15.

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Contents

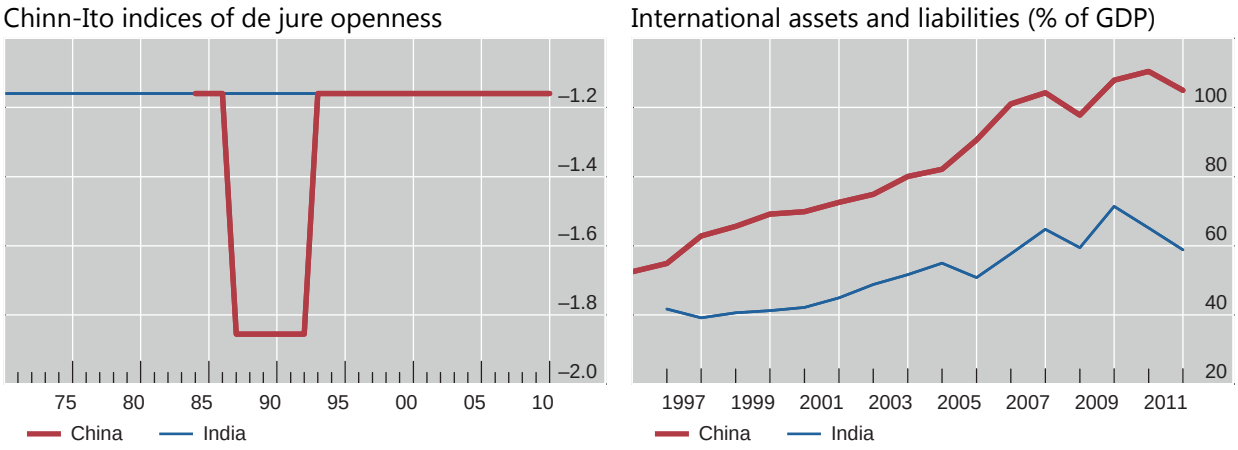
1. Introduction

The world has a huge stake in China's and India's integrating their finances into global markets. Any mishap akin to the 1990s' Asian financial crisis would hurt the world economy. These economies are travelling a road lined with memorials to victims of previous accidents.

The role of capital inflows in enabling a credit and asset price boom and bust in the United States and the interest-rate and balance-sheet responses of major central banks have renewed interest in capital controls.[2] Recent research places them in a broad policy context.[3]

Much analysis uses the Chinn-Ito (2008) index, an interval, *de jure* measure derived from four on-off variables in the IMF *Annual Report on Exchange Arrangements and Restrictions* (Graph 1, left-hand panel). For *de facto* openness, "the most widely used measure" (IMF (2010, p 51)) is the ratio of the sum of international assets and liabilities to GDP (Lane and Milesi–Ferretti (2003, 2007), Graph 1, right-hand panel).

Capital account openness of China and India: de jure and de facto measures — Graph 1



Sources: IMF IFS; IMF WEO; the Chinn-Ito index from http://web.pdx.edu/~ito/Chinn-Ito_website.htm; Lane and Milesi-Ferretti (2007) from http://www.philiplane.org/EWN.html.

We question whether these measures appropriately track the progress and relative position of China and India on the road to international financial integration.[4] We disagree with Chinn-Ito that China and India are both stalled on the road and agree with Lane-Milesi-Ferretti that both are moving forward, that is, opening up. Like Gupta Sen (2010), Patnaik and Shah (2012, p 195), rightly criticise Chinn-Ito for "not adequately captur[ing] the gradual easing of capital controls, since it continues to give the same score unless all restrictions [in any dimension]

[2] See Bernanke et al (2011); on capital controls, see Ostry et al (2010, 2011a, b) and Magud et al (2011).

[3] See Glick and Hutchison (2009), Aizenman et al (2010, 2011), Kohli (2011), Hutchison et al (2012) and Patnaik and Shah (2012).

[4] See Lane and Schmuckler (2007) and Aizenman and Sengupta (2011).

are removed". Moreover, we question whether Chinn-Ito (tied) or Lane-Milesi-Ferretti (China ahead) gets their relative position right.

We reach these conclusions by gathering in one place six existing de facto measures and by proposing two new measures. These new measures of ***internationalisation of consolidated banking systems*** and ***currency internationalisation*** both use BIS data. For our four price-based measures, we analyse average deviations from the law of one price. For most of the measures, we offer cross-country benchmarks as well as bilateral comparisons.

We advance three hypotheses, two in the time series (ts) and one in the cross-section (xs):

- Hts1: Lane-Milesi-Ferretti is right: both China and India are opening.
- Hxs1: Chinn-Ito and Lane-Milesi-Ferretti are wrong: India is more open than China.
- Hts2: Both China *and* India remain some distance from financial openness.

Sections 2-9 present evidence on each dimension. Sections 2-5 measure integration based on onshore and offshore prices: currency forwards, money, bond and equity markets. Sections 6-9 compare the links between investment and savings flows, ratios of external positions and flows to activity, foreign bank shares and currency internationalisation. Section 10 assembles the measures; Section 11 concludes.

2. Onshore and offshore foreign exchange forwards

We first contrast forward foreign exchange rates in Shanghai or Mumbai to those traded offshore in Hong Kong, Singapore, or Tokyo. Capital mobility tends to equalise onshore and offshore forward rates. Thus, the currency with smaller differences in rates at home and abroad is more financially open. We define cross-border price gaps so that a positive value indicates that contracts are cheaper onshore. For currency forwards, a positive gap means that a dollar fetches more renminbi or rupee in Shanghai or Mumbai than offshore.

As Liu and Otani (2005) argued, this measure benefits from using directly observed prices. But our comparison can only start when China inaugurated its onshore forward currency market in 2003. Since traders can access the domestic forward currency market only on the basis of "real demand", ie underlying transactions backed by trade documents, domestic forward rates can differ from those in the offshore non-deliverable market, where all comers can transact.[5]

We define the onshore-offshore forward currency gap as:

$$\text{Forward currency gap}_t = (F_t - NDF_t)/S_t \quad (1)$$

where F_t is the onshore forward; NDF_t is the non-deliverable offshore forward; and S_t is the onshore spot exchange rate, all expressed as domestic currency per US dollar. A positive forward premium gap indicates the respective currency is cheaper, that is, priced for less appreciation or more depreciation, onshore than offshore.

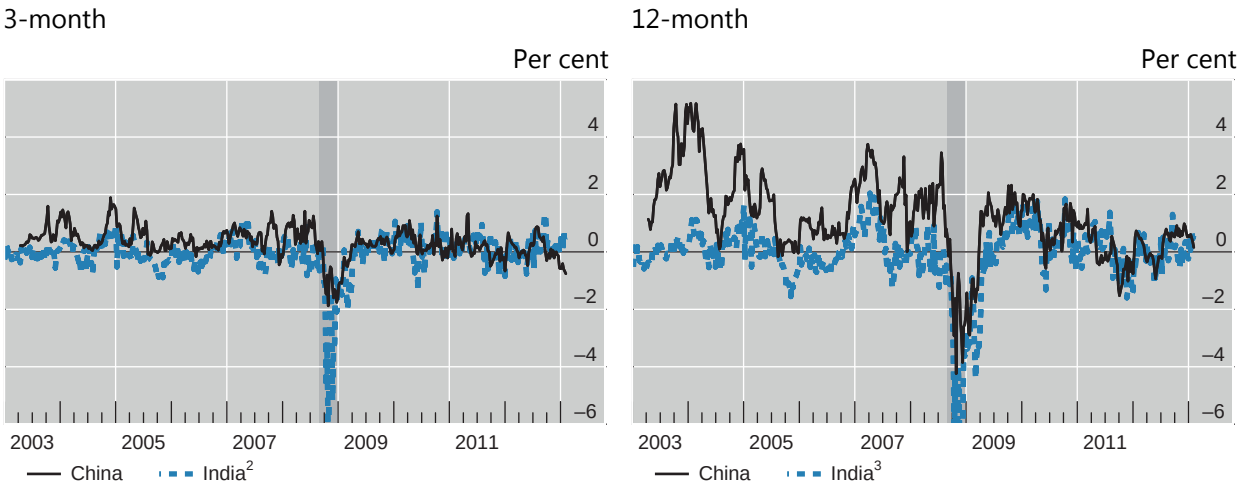
[5] On NDFs, see Ma et al (2004), Misra and Behera (2006) and Ma and McCauley (2008a,b).

Graph 2 strikes the eye with how both currencies became cheap offshore after the Lehman failure, both at the three-month (left-hand panel) and 12-month tenor (right-hand panel). It is also striking how expensive the longer forward of the renminbi used to be offshore where speculators paid up in anticipation of its move from 8.2 to 6.2 per dollar. Even after the global financial crisis, the renminbi forward remained on average cheaper onshore as compared to the rupee.

Table 1 confirms that the average of these gaps for the renminbi and rupee fell noticeably after the crisis, suggesting that both economies are opening. Hutchison et al (2011) cite currency futures trading in India since 2008 as easing arbitrage, and trading of deliverable ("CNH") renminbi forwards in Hong Kong since 2010 could be doing likewise. However, the average of absolute values, which picks up the turbulence in the rupee market since the crisis, does not show the rupee gap getting smaller. On balance, trading of currency forwards suggests that India is more financially open than China, though China is catching up.

Onshore foreign exchange forward less offshore NDF[1]

As a percentage of spot rate — Graph 2



[1] Shaded area indicates the global financial crisis period of September through December 2008. [2] Minimum at -7.88% on 24 October 2008. [3] Minimum at -11.70% on 24 October 2008.

Sources: Bloomberg; CEIC.

If currency forwards suggest that both economies are opening and India remains more open than China, albeit with a shrinking lead, how far do they have to go? The euro/dollar trades, except in the most extreme markets, at the same rate in Frankfurt and in New York. Among currencies with an NDF, the Korean won has the biggest and most integrated market. Post-crisis, the rupee forward gap is as narrow as that of the won, although its larger average absolute value at the 12-month tenor points to weaker arbitrage (Table 1). If rupee forwards look as integrated as won forwards, renminbi forwards are less so, though close to a benchmark of six other NDF currencies.

Onshore less offshore foreign exchange forward premiums[1]

As a percentage of the spot — Table 1

	3-month			12-month		
	Pre-crisis	Post-crisis	Full sample	Pre-crisis	Post-crisis	Full sample
Simple average						
CNY[2]	0.5126	0.1716	0.3301	1.8510	0.4732	1.1954
INR	–0.0399	–0.0144	–0.1114	0.0297	–0.0591	–0.1682
KRW	–0.3007	–0.0307	–0.1978	–0.1263	–0.1318	–0.1509
Benchmark[2,3]	*–0.1310*	*0.1240*	*–0.0492*	*–0.3393*	*0.3115*	*–0.1055*
Average of absolute value						
CNY[2]	0.5303	0.2909	0.4542	1.8549	0.8842	1.4779
INR	0.2579	0.3033	0.3479	0.4476	0.7215	0.6964
KRW	0.4365	0.2358	0.3757	0.4676	0.3150	0.4322
Benchmark[2,3]	*0.5827*	*0.3849*	*0.4911*	*1.1579*	*0.8056*	*0.9613*

[1] Daily data of forward premium gap is calculated as the difference between onshore forward and offshore non-deliverable forward as a percentage of spot price. Closing at Tokyo 8pm for Asian currencies; at London 6pm for Russian rouble; at New York 5pm for Brazilian real and Colombia peso. The full sample period is between 6 Jan 2003 and 30 June 2012; the crisis period is between September and December 2008. [2] Data start 7 April 2003 for renminbi (CNY), 7 January 2004 for Colombian peso, 12 January 2012 for Russian rouble. [3] Benchmark of currencies with nondeliverable forwards; average of Brazilian real, Colombian peso, Indonesian rupiah, the Philippine peso, Russian rouble and Taiwan dollar.

Source: Bloomberg; Reuters.

3. Onshore and offshore short-term interest rates

We next compare short-term yields onshore and offshore. Otani and Tiwari (1981) compared yen yields in Tokyo and offshore, and Frankel (1992) prescribed such comparisons to test for capital mobility. Prior to the expansion of offshore renminbi banking in 2010, we do not observe offshore yields, rather we infer yields from NDFs, assuming that they are priced off of dollar Libor, a reasonable assumption before the crisis.[6]

$$NDF_t = S_t(1+i_t)/(1+r_t^{\$}) \quad (2)$$

where i is the implied offshore interest rate on the home currency and $r_t^{\$}$ dollar Libor. Rearranging terms, we extract the implied offshore interest rate:

$$i_t = NDF_t^*(1+r_t^{\$})/S_t - 1 \quad (3)$$

[6] The global financial crisis broke down covered interest parity (Baba and Packer (2009)), observationally equivalent to pervasive capital controls. With a global "dollar shortage" (McGuire and von Peter (2009)), US dollar Libor cannot safely be inserted into Equation 3. Mancini and Ranaldo (2011) test interest rate parity without Libor and Chen (2013) infers dollar yields from regional benchmarks. If dollar yields were equal onshore and offshore, and forwards were priced off of interest differentials, our yield gaps would simply be transformations of the forward gaps above. But onshore dollar yields can and do deviate from offshore levels.

The onshore-offshore money yield gap is defined as $(r_t - i_t)$, where r_t is the directly observed onshore three-month bank rate[7] or a 12-month government bill rate. If $(r_t - i_t)$ differs significantly from zero, the offshore market is segmented from the onshore. A positive money yield gap indicates that money market instruments are priced cheaper (yield more) onshore. A smaller mean of the absolute yield gap points to greater financial openness.

Money market yield gaps have narrowed for both economies (Graph 3). Ma et al (2004) and Kohli (2011) found that this happened for the rupee in the early 2000s. The renminbi gap has narrowed since the global financial crisis. Again, India's gaps average closer to zero.

In sum, each and every pairwise comparison strongly suggests that cross-border arbitrage continued to have freer play in India to keep yields in line (Table 2). On balance, onshore and inferred offshore money rates, like trading of currency forwards, identify India as more financially open than China, though its lead has been narrowing.

Onshore money market yield less offshore NDF-implied yield[1,2]

In basis points — Graph 3

1 Weekly data. For China: 3-month (12-month) NDF, 3-month CHIBOR (one-year PBOC bill auction yield before July 2008; secondary market yield thereafter), and 3-month (12-month) LIBOR. For India: 3-month (12-month) NDF, 3-month Mumbai interbank offer rate (364-day treasury bill implicit yield), and 3-month (12-month) LIBOR. 2 Shaded area indicates the global financial crisis period of September through December 2008. 3 Minimum at -3310.89 bps on 24 October 2008.

Sources: Bloomberg; CEIC.

Again, the benchmark won suggests that both renminbi and rupee money remain some distance from integration. In particular, onshore and offshore rupee yields remain farther apart than their won counterparts even though the won gaps widened after the crisis (and before the crisis relative to 2003-04 (Ma et al (2004, p 90)). If the rupee has a way to go, the renminbi has still farther.

[7] We thank Joshua Felman for suggesting that we follow Hutchison et al (2011) and use the 3-month Mumbai interbank offered rate. Our conclusion differs from theirs not because of facts, but rather their method.

Onshore money market yield less offshore NDF-implied yield[1]

In basis points

Table 2

	3-month			12-month		
	Pre-crisis	Post-crisis	Full sample	Pre-crisis	Post-crisis	Full sample
Simple average						
CNY	436.8	400.9	393.8	381.1	255.3	310.3
INR	148.0	203.7	148.9	101.5	122.1	98.4
KRW	49.5	125.7	96.0	67.2	122.1	96.5
Average of absolute value						
CNY	437.0	430.0	433.3	381.1	294.3	343.8
INR	192.7	228.8	221.6	132.1	160.4	149.8
KRW	76.6	136.8	120.1	68.5	122.8	98.2

[1] Daily data. Domestic rates for China are three-month CHIBOR and one-year PBC bill auction yield before July 2008 and secondary market yield thereafter; for India are 3-month MIBOR and 364-day treasury bill implicit yield; for Korea 3-month certificate of deposit rate and 1-year treasury bond secondary-market yield; Offshore yields inferred from 3- and 12-month NDFs and US dollar LIBOR. The full sample period is between May 27, 2003 and June 30, 2012; the crisis period is between September and December 2008.

Sources: Bloomberg; CEIC.

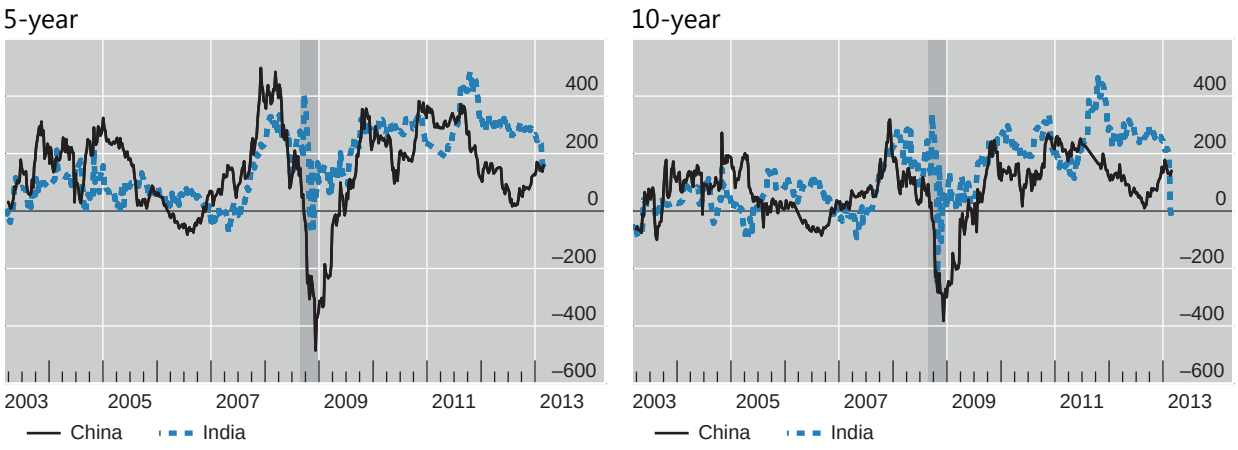
4. Onshore and offshore bond yields

We also test the integration of bond markets. In both currencies, offshore market participants can enter into long-term nondeliverable cross-currency swaps. Instead of, in effect, exchanging dollars against renminbi or rupee over three or twelve months, market participants can in effect borrow or lend renminbi or rupee at a fixed rate for five or ten years against floating-rate dollars.

In the local currency bond markets, increasing integration is not obvious. Graph 4 shows the onshore five- and ten-year government bond yield less the offshore nondeliverable cross currency swap of the same maturity (note that the vertical range of Graph 4 is a third that of Graph 3). The positive readings thus indicate bonds are generally priced cheaper onshore than offshore. Contrary to the evidence of other prices, the average absolute renminbi gap has widened a bit, while the average rupee gap has widened noticeably. Thus, these readings oddly show little effect of opening-up policies, whether allowing issuance of renminbi bonds offshore by Chinese firms, allowing offshore banks to invest in the Chinese interbank bond market, or allowing progressively more non-resident investment in Indian domestic bonds.

Domestic government bonds less non-deliverable cross-currency swaps[1]

In basis points — Graph 4



[1] Shaded area indicates the global financial crisis period of September through December 2008.

Source: Bloomberg.

Domestic government bonds less non-deliverable cross-currency swaps[1]

In basis points — Table 3

	5-year			10-year		
	Pre-crisis	Post-crisis	Full sample	Pre-crisis	Post-crisis	Full sample
Simple average						
CNY	143.82	180.82	144.60	67.02	109.13	72.41
INR	94.84	274.55	163.01	57.24	219.75	122.70
KRW	63.48	167.08	107.65	48.60	173.82	100.93
Average of absolute value						
CNY	154.03	217.01	180.87	83.32	145.25	111.19
INR	99.16	274.55	166.08	71.80	219.93	132.21
KRW	63.48	167.08	107.65	48.62	173.82	100.94

[1] Full sample period is between 28 March 2003 and 30 June 2012; the crisis period is between September and December 2008.

Source: Bloomberg

Not consistent with our other findings, the bond yield gap has become narrower for the renminbi than the rupee since the crisis (Table 3).[8] While the full sample indicates greater financial openness for India than China, China has caught up with India.

Revisiting the benchmark, Korea (McCauley and Ma (2009, p 202)), puts the widening of the spreads since the crisis in a different light. The renminbi spreads widened after the crisis by much less than the won spreads and at the 10-year

[8] Comparing bank yields to sovereign yields onshore accepts a credit mismatch in order to use the liquid government bond market as the representative onshore yield. Since the Chinese sovereign is the stronger credit, this mismatch tends to bias the comparison towards finding a smaller gap for China.

maturity became narrower than those for the won. These observations can be read to carry the suggestion that the development of the renminbi bond market in Hong Kong is integrating the renminbi bond markets.

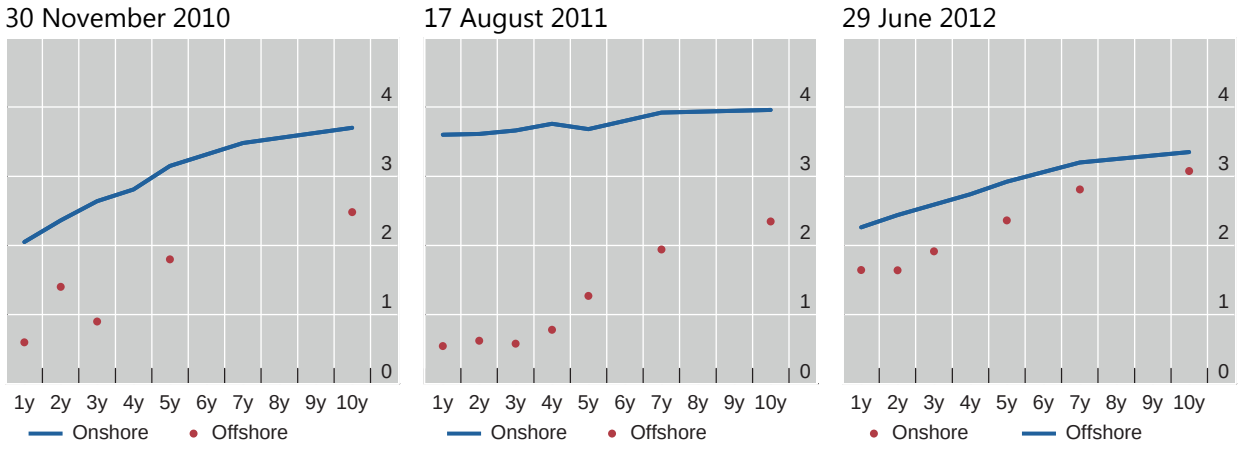
In a natural experiment, the Chinese government's sale of bonds to investors in Hong Kong SAR (henceforward Hong Kong) highlights the segmentation of the renminbi bond market. In Graph 5, the line plots the Chinese government bond yield curve in Shanghai, while the dots plot the yields on the offshore renminbi-denominated Chinese government bonds. Same obligor, same currency and same maturity: but foreign investors can to date more easily buy the offshore bonds. At issue on 30 November 2010 and 17 August 2011, the Ministry of Finance achieved strikingly lower yields than those prevailing onshore. By mid-2012 the yields had to some extent converged, more reflecting conjunctural developments than stronger arbitrage.[9] Even this narrower difference underscores the segmentation of the onshore market from its growing offshore counterpart.

On balance, the evidence from currency forwards, money markets and bond markets suggests that the Chinese and Indian economies are becoming more financially open. The evidence on all three markets points to greater financial integration of India than China for the full sample of 2003-2012, with China catching up in recent years. Moreover, these three fixed-income instruments are generally cheaper onshore than offshore for both China and India, indicating that on average both economies face pressure from non-residents wishing to invest in the countries. The Korean won as a benchmark suggests that India has some way to go in its opening up, and China still more.

Chinese government renminbi bond yields, onshore and offshore

In per cent

Graph 5



Source: Bloomberg.

[9] For one thing, the slowdown in the Chinese economy caused the domestic yield curve to shift down, and it would have taken negative offshore yields at the short end to maintain the spread. In addition, the risk-off mode in global markets squeezed speculative demand for the offshore bonds. Most important, offshore investors lost confidence that the renminbi was a one-way bet against the dollar, as shown by the NDF.

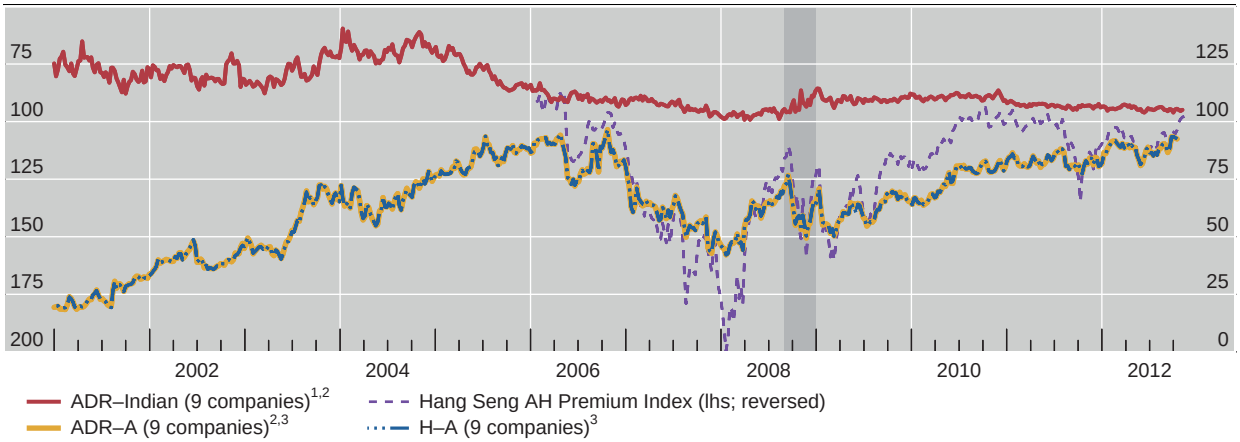
5. International integration of equity markets

The Chinese and Indian authorities have also run natural experiments by allowing firms to list their shares both on exchanges in Shanghai or Mumbai and in Hong Kong or New York. Onshore and offshore trades take place in different currencies, but a free flow of capital would ensure only minor differences in prices. Deviations from the law of one price therefore point to markets segmented by official limits on foreign shareholdings in domestic markets. Following Levy-Yeyati et al (2009), we analyse the difference between onshore and offshore share prices and the speed of their convergence.

We construct indices of shares that are cross-listed in Shanghai, Hong Kong and New York, on the one hand (Peng et al (2008)), and Mumbai and New York on the other. We weight individual share price differentials by market capitalisations in Hong Kong and Mumbai. We define the price gap as the ratio of the offshore to onshore prices: a ratio greater than 100 indicates that the share trades cheaper onshore than offshore. Our Chinese index in Graph 6 resembles the commercial "Hang Seng China AH [A, Shanghai, H, Hong Kong] Premium Index".[10]

Ratios of overseas share prices to equivalent local share prices

In per cent; weekly average — Graph 6



[1] Average of ICICI Bank, Wipro, Dr Reddy's Laboratories, HDFC Bank, Sterlite Industries (India), Mahanagar Telephone Nigam, Tata Motors, Tata Communications and Infosys Technologies weighted by their domestic market capitalisation. [2] Ratio of Asian closing to New York opening on the same day. [3] Average of China Eastern Airlines, China Life Insurance, China Petroleum & Chemical, China Southern Airlines, Guangshen Railway, Huaneng Power International, Sinopec Shanghai Petrochemical, Aluminum Corporation of China and Petro China weighted by their Hong Kong market capitalisation. Shaded area indicates the global financial crisis of September through December 2008.

Sources: Bloomberg; authors' calculations.

[10] One channel for portfolio equity inflows is to let non-residents invest in the domestic stock market; another is to allow firms to list their shares overseas. China limits the first channel's inflows via the Qualified Foreign Institutional Investor (QFII) scheme (in which quotas have generally been fully used until recent years). India imposes neither quota nor a minimum investment period on inflows by registered Foreign Institutional Investors (FIIs). For the second channel, most Indian public companies have chosen to list locally ("M shares") first and then some have later listed in New York with American depository receipts (ADR). In contrast, Chinese blue chip firms typically opted first to list in Hong Kong ("H-shares"), and then, in some cases, subsequently to list in Shanghai ("A shares") and, in a few cases, in New York (ADR).

Ratios of overseas share prices to local share prices and convergence speed

Table 4

	H-A ratio 41 dual-listed companies	H-A ratio 9 triple-listed companies	ADR-A ratio 9 triple-listed companies	ADR-H ratio 9 triple-listed companies	ADR-India ratio 9 dual-listed companies
Average ratio (%)[1,2]					
Pre-crisis	53.11	53.30	53.30	99.89	129.74
Post-crisis	84.83	75.20	75.18	99.98	108.71
Full sample	62.00	59.34	59.33	99.91	123.68
Estimated half-life (days)[2,3]					
Pre-crisis	231	115	115	1	36
Post-crisis	69	99	86	0.4	13
Full sample	231	138	115	1	49

[1] Ratio of overseas share price to equivalent local share price for cross-listed companies; weighted average based on Hong Kong market capitalisation for China and at domestic capitalisation for India. See Graph 6 for further information. [2] The full sample period is between 15 March 1999 and 30 June 2012; the crisis period is between September and December 2008 [3] Based on estimation of equation (4) in the text; see Annex 1 for details.

Sources: Bloomberg; authors' estimations.

A threshold observation is that the line for India lies above 100, while the lines for China lie below 100. Indian shares, like renminbi and rupee currency forwards and fixed income products, tend to be cheaper onshore. By contrast, Chinese shares trade at a premium in Shanghai over their prices in Hong Kong or New York. Chinese investors wish they could buy Chinese equities at Hong Kong or New York prices.

Table 4 confirms that price differentials have tended to narrow since the global financial crisis. Before the crisis, Indian shares in New York traded at a 30% premium, while Chinese shares in Hong Kong traded at a discount of more than 45%. After the crisis, the New York premium narrowed to 5% and the Hong Kong discount to 15%-25%. While the Indian equity market is much more internationally integrated than that of China, it has a long way to go when measured against the close alignment of prices of Chinese shares in Hong Kong and New York. Similarly, the Indian equity market has a way to go when compared to the sample 0.12% mean difference between onshore and offshore share prices for emerging markets in Levy-Yeyati et al (2009, p 441).

Table 4 also reports estimates of the half-life of the convergence of onshore and offshore shares prices to their centres of gravity for the period before and after the crisis. This half-life is estimated from the following equation (Peng et al (2008)):

$$\Delta q_{i,\,t} = \alpha + \beta q_{i,\,t-1} + \Sigma\, \varphi_n\, \Delta q_{i,\,t-n} + \varepsilon_{i,\,t} \qquad (4)$$

where $q_{i,t}$ is the logarithm of the overseas-local share price ratio for the cross-listed companies, Δ is the first difference operator. Since the estimated $\beta < 0$, the speed of convergence, or half-life of a shock, to the premium can be taken as $-\ln(2)/\ln(1+\beta)$. Table 4 shows that, for both the Chinese and Indian markets, the half-life fell after the crisis, indicating more integration (see Annex 1). Again on this measure, the Chinese equity market remained five times more segmented than the Indian equity market. In contrast to the instantaneous arbitrage between New York and Hong

Kong,[11] that between New York and Mumbai takes weeks and that between Hong Kong and Shanghai, months.

6. Feldstein-Horioka analysis of saving and investment

To assess the effective, macroeconomic openness of the two economies, we measure how closely changes in investment track changes in savings for China and India. Feldstein and Horioka (1980) argued that capital mobility permits domestic investment and saving to diverge and in the limit show little relationship.

We estimate a simple variant on Feldstein (1983, p 136):

$$(\Delta I_t)/GDP_{t-1} = \alpha + ß\ (\Delta S_t)/GDP_{t-1} \qquad (5)$$

where I, S and GDP are investment, saving and gross domestic output. The beta from such regressions for 1994-2011 (limited by Chinese data) are plotted in Graph 7, left-hand panel, with the estimate plotted with solid lines including ever longer sample periods (the recursive estimate) and the estimate plotted with dashed lines covering a rolling 10-year period.

The Chinese economy emerges as increasingly open. Its recursive estimate suggests that the more than one-to-one association of investment and savings fell to about 0.9. What is more, the last ten-year rolling regression estimate, ending in 2011, shows that the change in China's investment tended to be less than half of the change in its savings.[12] On the rolling estimate, the Chinese economy is as open as Blanchard and Giavazzi (2002) found the euro area economies to be in the early years of monetary union (Graph 7, right-hand panel).

Saving and investment emerge as more tightly linked in India.[13] Both Indian saving coefficients rose from about 0.8 to over 0.9. But the difference may arise to some extent from the different constraints on deficit and surplus countries. Emerging economies running deficits face a risk of a sudden reversal of capital flows, constraining deficits more than surpluses. If deficit countries use policies to keep the current account deficit within a threshold, these can produce observations equivalent to those produced by weak international financial integration.[14] The Tarapore Report (Reserve Bank of India (2006)) starts the relevant section, "Since the 1990-91 crisis, during which a CAD [current account deficit] of 3 per cent turned out to be unsustainable, …." And it concluded, "should the CAD/GDP ratio rise substantially over 3 per cent there would be a need for policy action".

[11] Or a sample average of one to two days for emerging markets in Levy-Yeyati et al (2009, p 444).

[12] We found more extreme results following Feldstein (1983): $\Delta(I_t/GDP_t) = \alpha + ß\ \Delta(S_t/GDP_t) + \varepsilon_t$. China's recursive parameter rises to 0.7 in the mid-2000s before falling to 0.3; India's rises from 0.6 to 0.75. China's rolling parameter falls from one in 2006 to -0.2 in 2011; the Indian one rises to a plateau over 0.8 in the 2000s.

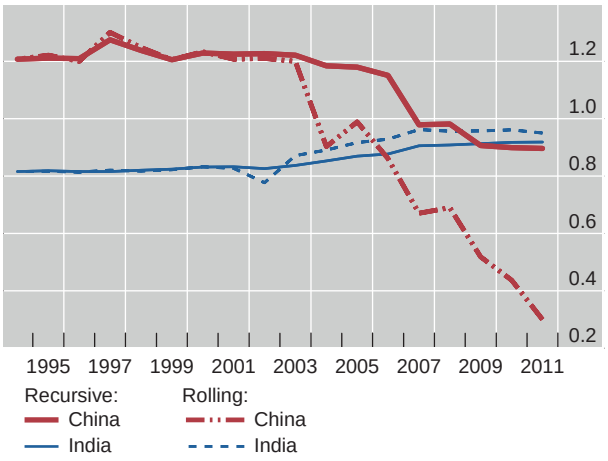
[13] Examining data for 1950-2009 for India and 1978-2009 for China, the error-correction analysis of Bordoloi and John (2011) finds a long-term parameter of 0.89 for India and 0.80 for China.

[14] As was pointed out by Fieleke (1982), Tobin (1983), Summers (1988) and Bayoumi (1990). See also Shah and Patnaik (2007).

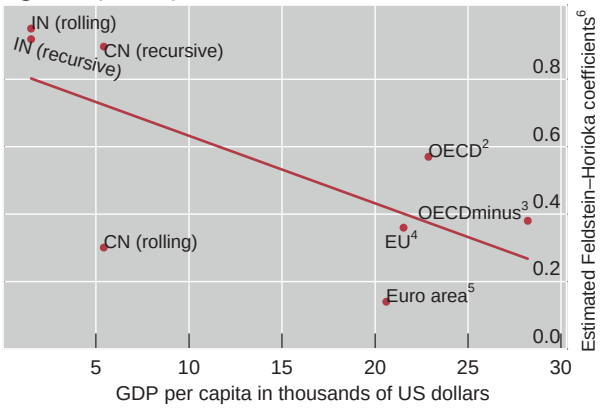
Estimated Feldstein-Horioka coefficients

Graph 7

Time series regression for China and India[1]



Against per capita GDP



[1] Plots ß from equation (5) in text. Recursive regressions start with 1984 data and end in the year indicated by the x-axis. Rolling regressions cover 10-year windows that end in the year indicated by the x-axis. The F-statistics, log likelihood ratio and Wald statistics all confirm a break point around 2000. The nulls that ß equals to unity for subsample of 1984-2000 and zero for the subsample of 2001-2011 are both accepted. [2] 30 OECD members as of 2001, i.e. current members excluding Chile, Estonia, Israel and Slovenia. [3] OECD members as of 2001 excluding Czech Republic, Hungary, Korea, Luxembourg, Mexico, Poland, Slovakia and Turkey. [4] 14 EU members as of 2001. [5] 11 countries having adopted euro by 2001. [6] Sample is 2002–2011 for rolling regression of China and India; 1984–2011 for recursive regression of China and India; 1991–2001 for OECD, OECD minus, EU and euro area.

Source: IMF *WEO*; Blanchard and Giavazzi (2002); authors' estimates.

While Indian policy seeks to limit its current account deficit, the Chinese authorities have enjoyed more room for manoeuvre. Most tellingly, policy in China in 2008-09 reinforced the erosion of its surplus. Then, the government could stimulate domestic investment in the face of falling exports and let the current account surplus narrow sharply for both reasons.

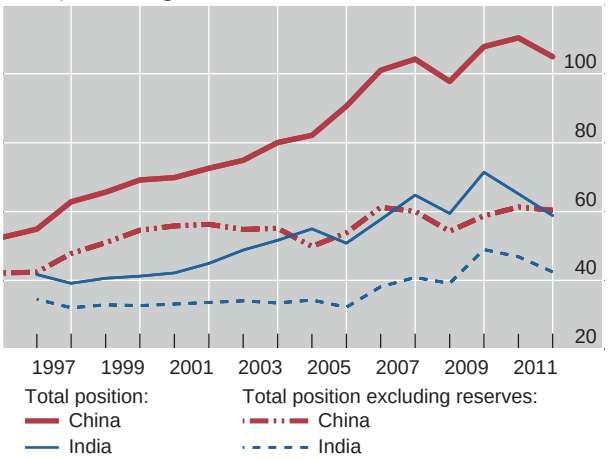
While financial integration in principle is unrelated to the sign of the current account, in practice integration with a surplus may run fewer risks than integration with a deficit. All that said, the Feldstein-Horioka analysis suggests that China is more financially open than India.

7. Generalised Lane-Milesi-Feretti: external positions or flows

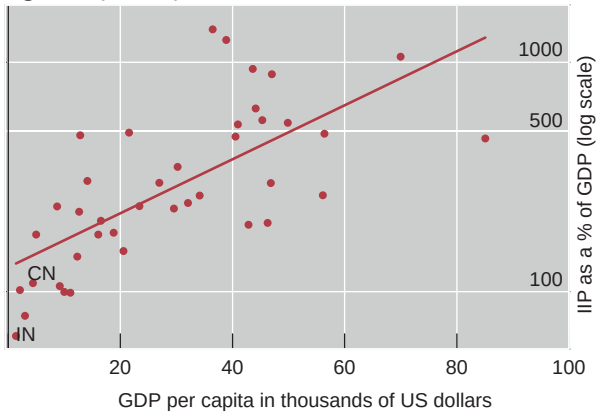
Another set of measures is based on either gross external positions or cross-border flows, relative to domestic output. As noted, the Lane-Milesi-Feretti ratio of gross external positions to activity show China more open than India. The difference has tended to widen over the years and now stands at about 40% of GDP (Graph 8, left-hand panel, solid lines).

International investment positions[1] Graph 8

As a percentage of GDP



Against per capita GDP as of 2010[2]



[1] Sum of assets and liabilities. [2] Sum of assets and liabilities, including reserves. Sample includes major emerging economies and OECD members excluding Ireland and Luxembourg. Logarithm to the base 10 of ratio of international investment position to GDP.

Sources: CEIC; IMF *IFS*; IMF *WEO*; Lane and Milesi-Ferretti (2007) from http://www.philiplane.org/EWN.html.

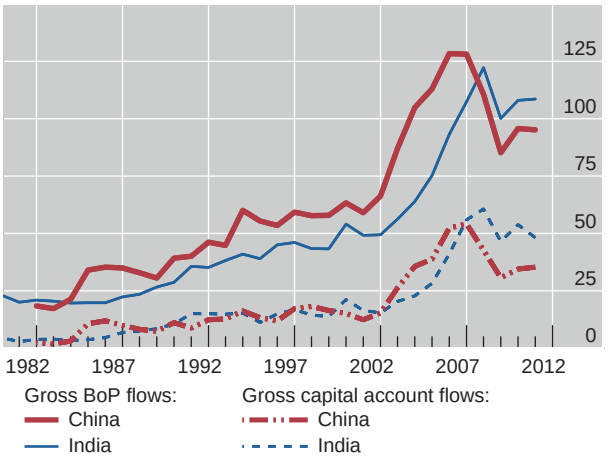
China and India are only half as far apart when we focus on positions other than reserve assets (Graph 8, left-hand panel, dotted lines). That said, both economies are relatively closed on this measure, at least in comparison with a benchmark linear relationship between GDP per capita and openness (Graph 8, right-hand panel).

As a consequence of the greater importance of the buy and hold official sector in China and of the greater openness of India's stock market, the *flow* version of this measure gives quite a different perspective (Shah and Patnaik (2010)). In particular, the Indian economy has pulled ahead in the intensity of its cross-border interactions with the rest of the world. That is, China's ratio of recorded current and capital account flows to GDP long led that of India, but, as pointed out by Patnaik and Shah (2012), and in contrast to Aizenman and Sengupta (2011), India's ratio nosed ahead after the global financial crisis (Graph 9, left-hand panel, solid lines). In the aftermath of the crisis, China's big domestic demand boost increased its denominator even as weak trade reduced the numerator, as part of healthy rebalancing. But since then, higher turnover of private investors' holdings of Indian portfolio equities as compared to China's reserve assets and direct investment liabilities—that is, capital flows—has put India ahead by a nose on the flow measure (Graph 9, left-hand panel, dashed lines).

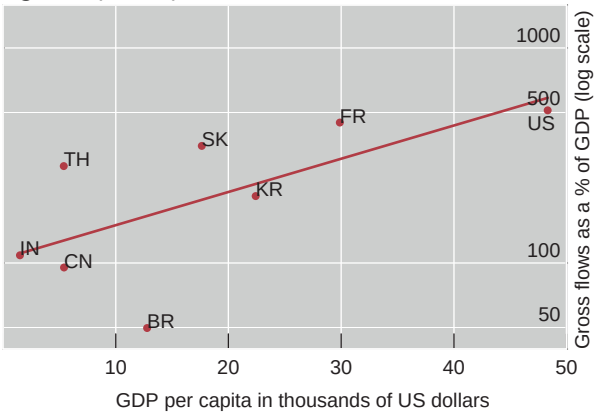
All in all, our preferred flow measure shows a clear stronger trend towards opening up by the two economies than does the stock measure. Owing to the change from IMF Balance of Payments Manual 4 to 5, few countries report the gross portfolio flows that would allow us to benchmark China and India as clearly on the flow measure as on the stock measure. The scant available evidence suggests that both countries have a way to go, and China has further to go than India (Graph 9, right hand panel).

Gross balance of payment flows[1] Graph 9

As a percentage of GDP



Against per capita GDP; as of 2011[2]



[1] Sum of credit and debit flows of current account and capital account. [2] Except France, as of 2003, due to unavailable data. Logarithm to the base 10 of ratio of gross balance of payment flows to GDP.

Sources: CEIC; IMF *WEO*.

8. Consolidated banking market integration

Whereas the last section used data that treat the nation or territory and residence therein as the unit of analysis, this section takes the multinational bank as the unit of analysis. This perspective captures bank strategies that have long since gone beyond international lending.

Multinational banks now plant footprints in individual markets by building up deposits in local currency in order to fund local mortgages, consumer credit and corporate loans (McCauley et al (2012)). Before the global financial crisis, the CGFS (2004) and others stressed the benefits that foreign banks could confer on local markets. Since the crisis, de Haas and van Lelyveld (2013), for instance, focus on how foreign banks taking losses elsewhere could crunch local credit.

In either case, the credit share of BIS-reporting banks in a given country measures openness in an important way. The question is not, how much do borrowers in China or India owe to non-resident banks, but how big is the foreign bank footprint in China or India? As in McCauley et al (2002) and McGuire and Tarashev (2005a,b and 2008), the answer combines BIS reporting banks' international (cross-border) claims on non-banks *and* their locally booked claims in the numerator. The latter includes two credit stocks that are not captured in the international investment position: foreign-currency credit funded with local foreign-currency deposits and local currency credit. The denominator is the sum of domestic credit to nonbanks from the IMF's *International Financial Statistics* and BIS reporting banks' cross-border claims on non-banks.

On this measure, the evidence for the two economies opening is not clear (Graph 10, left-hand panel). China's foreign bank share did rise from over 1% to not quite 4% after it joined the WTO, but has since fallen back to 2-3%. Meanwhile,

India's share rose from around 10% in the 1990s to a peak near 20% before the global financial crisis, and has since fallen to about 15%. Nevertheless, we interpret these declines to reflect less changes in host policy than retrenchment by some international banks.

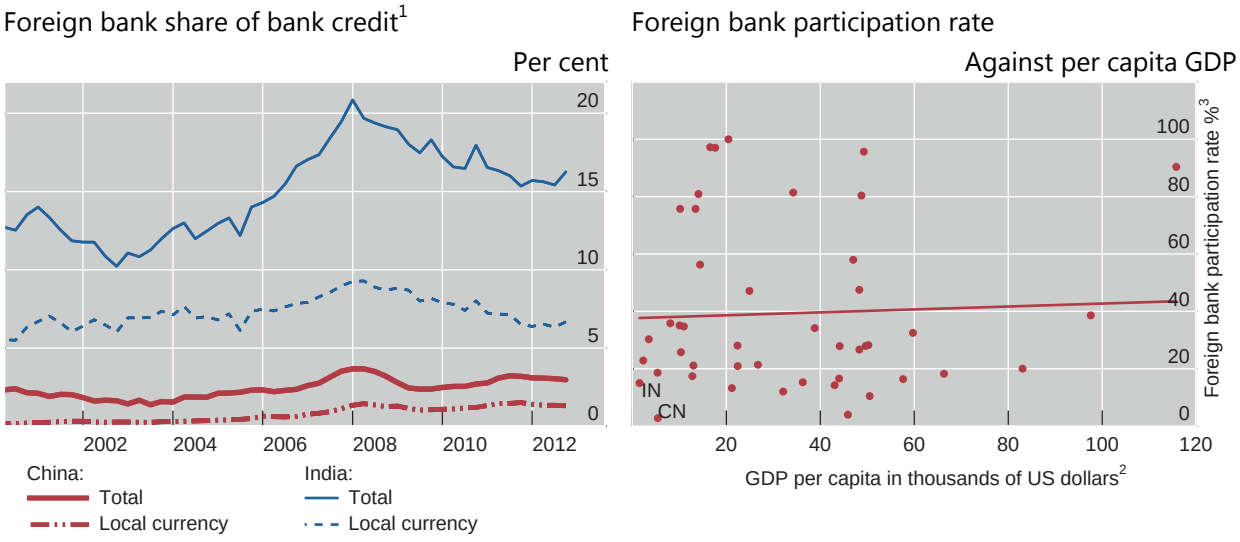
In any case, the data on the foreign bank presence clearly support the hypothesis that India is more open than China. Foreign banks have carved out a banking market share in India five times the size of their share in China, both as a result of local currency lending and as a result of other, mostly dollar lending. Even with China's much larger domestic banking sector relative to GDP, the contrast would remain if GDP is used as denominator.

In terms of ranking within the G20, China ranks last, while India ranks 16. Only Japan among big economies has a foreign bank share in single digits. Several years ago, one might have argued that foreign bank entry had taken a distinctively Chinese path, in the form of minority shareholdings and operational cooperation with the big four state-owned commercial banks. Under pressure to raise capital, however, big global banks have tended to take profits on their minority stakes, while the revelations during the global financial crisis may have left Chinese bankers less sure that they have much more to learn from the global banks.

Unlike our other quantity measures, there is not much of a relationship between the foreign bank share and GDP per capita (Graph 10, right-hand panel). A proper benchmark for this measure awaits further study. Any benchmark, however, is likely to show China an outlier in the tiny size of the foreign bank footprint and India not too far from the norm.

Foreign banks in China and India

Graph 10



[1] Foreign bank claims on non-banks in domestic and foreign currency as a percentage of domestic credit and cross-border claims on non-banks. [2] As of 2011. [3] As of 2012 Q2.

Sources: IMF *IFS*; BIS *International Banking Statistics*.

9. Internationalisation of the domestic currency

How much is the domestic currency used in international transactions? Again, this question differs from Lane-Milesi-Ferretti's question: how big are a country's external assets and liabilities? If an economy's fixed income assets and liabilities were all denominated in foreign currency, it could score high on Lane-Milesi-Ferretti's measure but low on currency internationalisation.

Following Cohen (1971) and Kenen (1983), a currency's international use can follow the lines of the archetypal uses of money. As medium of exchange, a currency can be used to invoice international trade or as a vehicle currency in trading currencies. As store of value, it can denominate deposits or bonds, including those held in official reserves. As unit of account, it can denominate trade or financial instruments.

We compare the Chinese and Indian currencies' use in the foreign exchange market.[15] Drawing on the BIS triennial central bank survey of foreign exchange turnover, we compute the ratio of currency trading to the economy's international trade. The transactions measured in the numerator straddle the medium of exchange (for deliverable renminbi and rupee) and the unit of account (non-deliverable forwards that are settled in US dollars).

Strictly speaking, this is a measure of the balance of financial and real economy use of a currency ("financialisation"), rather than the balance of offshore and onshore use of a currency ("internationalisation"). However, an increasing share of financial transactions goes hand in hand with increasing trade outside the currency's home country. Three quarters of the trading in the most internationalised currencies, like the US or Australian dollar, occurs outside of the home country, a higher share than less used currencies (McCauley and Scatigna (2011, p 72)).

Comparing the 2007 and 2010 triennial surveys, transactions in both the renminbi and the rupee are rising in relation to their underlying current account transactions. In Graph 11, right-hand panel, the dots for the renminbi and the rupee have moved up in the logarithmic scale relative to where they appear in Graph 11, left panel.

In addition, on this measure, the renminbi lags the rupee. Reported renminbi turnover rose from the neighbourhood of the economy's trade in 2007, while reported turnover of the rupee rose from above ten times the country's trade. Another way of making the same point is that the dollar value of trading in the renminbi and rupee were not far apart in these surveys, despite the much larger size of the Chinese economy and international trade.

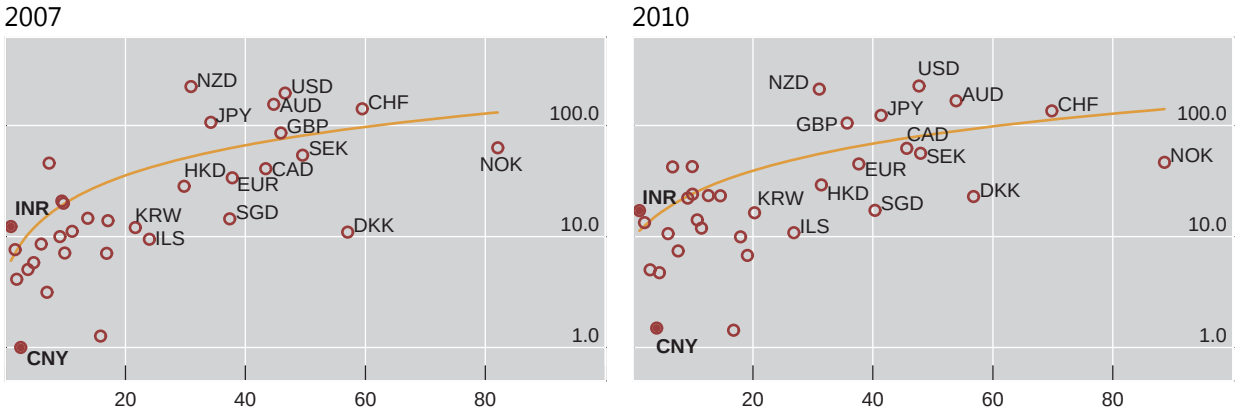
Finally, the tendency of this ratio of currency trading to international trade to rise with GDP per capital (in Kuznets curve fashion) furnishes us with a very clear benchmark. The renminbi is well below the least squares curve (allowing a square term) with an underdeveloped currency market, given its trade and income. And if

[15] Admittedly, we do not compare the use of the two currencies to denominate trade, and it is fair to say that with about a tenth of China's trade denominated in renminbi, China is way ahead on this measure. But recent analysis of this phenomenon raises the possibility that it is as related to cross-border differences in exchange rates as to the convenience of importers and exporters (Garber (2011) and McCauley (2011)). Another important measure of currency internationalisation might be its influence on the values of other currencies.

the renminbi trading is an outlier on the down side, rupee currency trading is a smaller outlier on the up side, with its ratio rising over time with income.

The unheralded rupee internationalisation has proceeded as far or even farther than the much discussed renminbi internationalisation. However, we expect the April 2013 survey to show a major increase in the renminbi turnover given the rise in the deliverable offshore trading that has occurred in the last several years (McCauley (2011)).

Ratio of foreign exchange turnover to trade in relation to GDP per capita Graph 11



Horizontal axis: GDP per capita, in thousands of US dollars; vertical axis: ratio of foreign exchange turnover to trade, semi-logarithmic scale. Foreign exchange turnover includes not only over-the-counter but also exchange-traded turnover, which is most significant for the Brazilian real, the Indian rupee and the Korean won.

Sources: IMF; FOW TRADEdata; Futures Industry Association; Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity; authors' estimates.

10. Combining the measures

Stepping back, we summarise the evidence from our eight measures of the financial integration.[16] Once again, Table 5's columns ask four questions: (1) Is China or (2) India evidently becoming more financially open? (3) Is India more open than China? (4) And how open are these two economies in relation to some meaningful benchmark? In the first three columns of Table 5, a strong affirmative answer is indicated with dark shading, a weak affirmative answer with light shading, and a negative answer with no shading.

In the first column, the (red) shading signifies that China is evidently becoming more open, judging by pricing in the forward currency market, money market and the equity market and by the turnover in the foreign exchange market (currency internationalisation). Only the bond yields suggest movement towards a greater onshore-offshore gap, and even here the latest pricing of the offshore bonds sold by the government can be read as suggesting more integration. In the second column, the evidence of greater integration for India (in green) since the crisis is

[16] Data reduction is an option (OECD (2005)). But Dawes (1979) holds that even improper linear models are conducive to robust decisions.

confined to the equity market – our clearest evidence – and turnover in the foreign exchange market (currency internationalisation). There is even evidence for wider gaps in money and bond markets for India post-crisis, possibly associated with market dislocations. However, the widening of the yield gap in the money market has not reversed the progress that Ma et al (2004) demonstrated in the early 2000s for India.

As indicated in the third column of Table 5, the evidence responds fairly consistently to the question of whether India is more integrated. All four price-based measures, covering currency, money, bond and equity markets, suggest the greater integration of India in global finance. T-tests and ANOVA F tests confirm that the larger averages of Chinese on/offshore price gaps are statistically different from their Indian counterparts (see Annex 2). In addition, the flow version of the Lane-Milesi-Ferretti measure, our consolidated foreign bank share measure and the currency internationalisation measure also identify the Indian economy as more integrated. Only the rolling Feldstein-Horioka coefficient identifies China as the more open economy. But this finding may reflect less integration per se than asymmetric market and policy responses to current account deficits and surpluses. On balance, India is more financially open than China.

Summary of findings on financial openness of China and India

Table 5

	More integrated since crisis:		India more Integrated? (3)	Integration vs benchmark? (4)
	China? (1)	India? (2)		
Foreign exchange forward gap				IN like Korea
Short-term yield gap[1]				IN wider Korea
Bond yield gap[1,2]				IN wider Korea
Equity price gap				IN wider than HK
Feldstein-Horioka				CN rolling like EU
Lane-Milesi-Ferretti, flow version[3]				IN at benchmark
Foreign bank share				IN below average
Currency internationalisation				IN at benchmark

[1] India less integrated post-crisis. [2] China less integrated post crisis on absolute value measure. [3] Note long-term trend to more integration before the crisis in both stock and flow measures. Red is for China and green for India. Dark shading indicates the evidence supports a strong positive answer, light shading, a weak positive answer, and blank indicates a negative answer.

First four rows based on t-tests and ANOVA F tests reported in Annex 2. Foreign exchange forward gap is the difference between onshore and offshore forwards. Short-term yield gap is the difference of onshore money market yield and offshore NDF-implied yield. Bond yield gap is the difference between domestic government bond yields and non-deliverable cross-currency swap spreads. Stock price gap is the ratio of the offshore to local share price for cross-listed companies.

Source: Authors' estimations.

We summarise in words how far China and India have to go in the last column of Table 5. The integration of India's onshore and offshore forward exchange markets is on a par with that of Korea's currency markets, although its money and bond gaps remain wider. By the tough standard of integration set by Chinese firms that are cross-listed in New York and Hong Kong, India's equity market integration has some way to go. While both China and India appear to be macroeconomically closed according to the Feldstein-Horioka analysis, the most recent observation of the rolling regression for China puts it on a par with the EU in Blanchard and Giavazzi (2002). On the original Lane-Milesi-Ferretti measure, China and India are

both below the benchmark, but on the flow version India seems to be more or less at benchmark (albeit one based on few observations). On the foreign bank share, India is in the fourth quintile of the G20 but still well below average—though a proper benchmark for this remains to be established. Finally, the rupee's foreign-exchange turnover (as a proxy for its internationalisation) is about at the benchmark—and we expect the renminbi to catch up in the April 2013 survey. All in all, the more financially open Indian economy still has a way to go—and a fortiori so too does the Chinese economy.

11. Conclusion

We challenge Chinn and Ito's index, which suggests that China and India restrict capital flows to a similar extent. And we question Lane and Milesi-Ferretti's ranking of China as the more open economy. We hope that researchers will use these measures with greater care, even scepticism, and will look for new measures.

The Chinn-Ito measure in particular is not clearly fit for the purpose to which it is often put. Moreover, there is little reason to think that "the most finely gradated" (Quinn et al (2011 p 492)), measure of Schindler (2009) does not suffer from the same fundamental drawback. Looking at types of regulation does not reveal how restrictive they are, much less how restrictive they are in practice. De facto is the way to go.

Why is India more financially open than China? Part of the answer must be a mix of policy aspiration and necessity. For instance, the Indian authorities may have sought to improve their equity market by opening it to foreign investors, but clearly the permitted inflows have, with great variability, financed India's current account deficits. Another part of the answer may be the rigour with which the controls are enforced. Structurally, the long-standing multinational operations of Indian private firms can use intra-firm transactions, including the leads and lags of trade finance, to arbitrage onshore and offshore markets, albeit evidently with a lag (Subramanian (2009, p 224)). China's state-owned firms are only at an early stage of going global, and their managers may be subject to different discipline. Similarly, the larger footprint of global banks in Indian banking gives them bigger balance sheets to arbitrage markets. Future research could weigh these explanations.

Whatever the cause of this long-standing difference, our evidence suggests that the Chinese economy has of late been moving faster and more consistently in the opening direction. As a policy intention, the paced internationalisation of the renminbi has no counterpart in India. By creating a pool of renminbi bank accounts and bonds outside of the Chinese mainland and allowing for offshore delivery of the renminbi, this policy is also punching holes in the capital controls through which arbitrage transactions can pass.

An important conclusion of our study, however, is that on most measures both economies have a way to go. Policymakers would not be safe in the assumption that impediments to onshore/offshore arbitrage no longer bind. Instead, policy continues to segment onshore and offshore markets in both cases. Policymakers in each country face challenges in further financial integration.

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Annex 1
Econometric analysis of onshore-offshore equity price premium

To analyse the size of the onshore-offshore price gaps and their dynamics, we estimate Equation (4). As a measure of the average cross market share price premium, $\alpha = 0$ would suggest that the price gap has a zero mean and the share prices of cross-listed companies will eventually equalise. On the other hand, $\alpha \neq 0$ would imply long-run or persistent premium/discount. An estimated $ß \geq 0$ would mean the price gap $q_{i,t}$ is non-stationary, implying persistent or explosive price divergence. On the other hand, $ß < 0$ indicates price convergence, with the speed of convergence given by the half-life of a shock to the premium as $-\ln(2)/\ln(1+ ß)$. Therefore, while $\alpha = 0$ and $ß < 0$ can be interpreted as long-term price equalisation, $\alpha \neq 0$ and $ß < 0$ represent a case of non-explosive but persistent cross-market share price premium. The separate regressions for the full sample (Table A1-1), the pre-crisis sample (Table A1-2) and the post-crisis sample (Table A1-3) are reported below.

Stock share price premium and convergence of cross-listed companies[1] Table A1-1

	H-A premium 41 dual-listed companies	H-A premium 9 triple-listed companies	ADR-A premium 9 triple-listed companies	ADR-H premium 9 triple-listed companies	ADR-India premium 9 dual-listed companies
	(1)	(2)	(3)	(4)	(5)
α	-0.262***	-0.378***	-0.381***	-0.051***	0.104***
	(0.025)	(0.062)	(0.066)	(0.010)	(0.023)
β	-0.003***	-0.005***	-0.006***	-0.552***	-0.014***
	(0.000)	(0.001)	(0.001)	(0.009)	(0.002)
φ_1	-0.020***	-0.012	-0.051***	-0.179***	-0.293***
	(0.004)	(0.008)	(0.009)	(0.009)	(0.007)
φ_2	-0.048***	-0.037***	-0.038***	-0.089***	-0.174***
	(0.003)	(0.008)	(0.008)	(0.007)	(0.007)
Half-life (days)	233.1	128.3	114.0	0.9	48.6
Adjusted R^2	0.004	0.004	0.007	0.359	0.101
DW statistics	2.001	1.988	1.998	2.010	2.023
# of observations	77,025	14,881	14,006	20,712	17,806

[1] The estimation equation is $\Delta q_{i,t} = \alpha_i + ß q_{i,t-1} + \Sigma \varphi_n \Delta q_{i,t-n} + \varepsilon_{i,t}$, where $q_{i,t}$ is the logarithm of the overseas-local share price differential for the cross-listed companies, Δ is the first difference operator, and n stands for lags to be determined by Campbell and Perron (1991)'s top-down t-test approach. Daily panel data of Asian closings and New York opening of the same day. See Graph 6 for further information. The sample period is between March 15, 1999 and June 30, 2012. Standard errors are shown in parenthesis. *** indicates 1% significance.

Sources: Bloomberg; authors' estimations.

Onshore less offshore foreign exchange forward premiums before the crisis[1]

Table A1-2

	H-A premium 41 dual-listed companies	H-A premium 9 triple-listed companies	ADR-A premium 9 triple-listed companies	ADR-H premium 9 triple-listed companies	ADR-India premium 9 dual-listed companies
	(1)	(2)	(3)	(4)	(5)
α	-0.291***	-0.453***	-0.422***	-0.069***	0.197***
	(0.036)	(0.091)	(0.095)	(0.014)	(0.034)
β	-0.003***	-0.006***	-0.006***	-0.515***	-0.019***
	(0.000)	(0.001)	(0.001)	(0.011)	(0.002)
φ_1	-0.031***	-0.030***	-0.061***	-0.183***	-0.253***
	(0.005)	(0.011)	(0.012)	(0.010)	(0.009)
φ_2	-0.054***	-0.050***	-0.054***	-0.082***	-0.157***
	(0.004)	(0.010)	(0.011)	(0.009)	(0.009)
Half-life (days)	254.9	125.1	110.9	1.0	35.3
Adjusted R^2	0.005	0.006	0.009	0.339	0.084
DW statistics	1.999	1.980	1.986	2.037	2.055
# of observations	46,430	81,39	7,707	13,980	11,452

[1] The estimation equation is $\Delta q_{i,t} = \alpha_i + \beta q_{i,t-1} + \Sigma \varphi_n \Delta q_{i,t-n} + \varepsilon_{i,t}$, where $q_{i,t}$ is the logarithm of the overseas-local share price differential for the cross-listed companies, Δ is the first difference operator, and n stands for lags to be determined by Campbell and Perron (1991)'s top-down t-test approach. Daily panel data of Asian closing and New York opening of the same day. See Graph 6 for further information. The sample period is between March 15, 1999 and August 29, 2008. Standard errors are shown in parenthesis. *** indicates 1% significance.

Sources: Bloomberg; authors' estimations.

Onshore less offshore foreign exchange forward premiums after the crisis[1]

Table A1-3

	H-A premium 41 dual-listed companies	H-A premium 9 triple-listed companies	ADR-A premium 9 triple-listed companies	ADR-H premium 9 triple-listed companies	ADR-India premium 9 dual-listed companies
	(1)	(2)	(3)	(4)	(5)
α	-0.614***	-0.367***	-0.419***	-0.018	0.235***
	(0.056)	(0.097)	(0.106)	(0.013)	(0.036)
β	-0.010***	-0.007***	-0.008***	-0.805***	-0.051***
	(0.001)	(0.002)	(0.002)	(0.021)	(0.005)
φ_1	-0.034***	-0.041***	-0.057***	-0.106***	-0.369***
	(0.006)	(0.013)	(0.013)	(0.018)	(0.013)
φ_2	-0.037***	-0.013	-0.017	-0.070***	-0.190***
	(0.006)	(0.013)	(0.013)	(0.013)	(0.013)
Half-life (days)	66.2	101.6	89.8	0.4	13.2
Adjusted R^2	0.007	0.004	0.006	0.447	0.163
DW statistics	2.012	2.011	1.992	1.944	1.986
# of observations	27,877	6,166	5,762	6,182	5,868

[1] The estimation equation is $\Delta q_{i,t} = \alpha_i + \beta q_{i,t-1} + \Sigma \varphi_n \Delta q_{i,t-n} + \varepsilon_{i,t}$, where $q_{i,t}$ is the logarithm of the overseas-local share price differential for the cross-listed companies, Δ is the first difference operator, and n stands for lags to be determined by Campbell and Perron (1991)'s top-down t-test approach. Daily panel data of Asian closing and New York opening of the same day. See Graph 6 for further information. The sample period is between January 1, 2009 and June 29, 2012. Standard errors are shown in parenthesis. *** indicates 1% significance.

Sources: Bloomberg; authors' estimations.

Annex 2
Tests for the equality of average price gaps

Test on equality of mean between pre-crisis and post-crisis, by instrument[1] Table A2-1

	China		India	
	t-test	Anova F-test	t-test	Anova F-test
Forward premium gap				
3-month	9.97***	99.42***	-0.22	0.05
12-month	12.92***	167.05***	1.48	2.18
NDF yield gap				
3-month	1.47	2.15	-3.17***	10.06***
12-month	5.32***	28.32***	-1.65*	2.72*
Bond price gap				
5-year	-2.71***	7.35***	-21.79***	474.89***
10-year	-5.91***	34.89***	-19.17***	367.46***
Stock price gap				
ADR-local	-3.09***	9.52***	10.69***	114.32***
H-local	-3.10***	9.64***		

[1] Weekly data. Pre-crisis period is from 26 May 2003 to 31 August 2008; post-crisis period is from 5 January 2009 to 30 June 2012. * and *** indicate that the null of equal mean is rejected at the 10% and 1% significance level respectively. Forward premium gap is the difference between onshore and offshore forwards as a percentage of spot. NDF yield gap is the difference of onshore money market yield and offshore NDF-implied yield; in basis points. Bond yield gap is the difference between domestic government bond yields and non-deliverable cross-currency swap spreads; in basis points. Stock price gap is the logarithm of the overseas-local share price differential for the cross-listed companies.

Sources: Bloomberg; CEIC; authors' estimations.

Test on equality of mean between pre-crisis and post-crisis, by instrument[1]

Absolute value — Table A2-2

	China		India	
	t-test	Anova F-test	t-test	Anova F-test
Forward premium gap				
3-month	7.30***	53.24***	-0.97	0.93
12-month	9.97***	99.35***	-4.82***	23.21***
NDF yield gap				
3-month	0.60	0.36	-2.66***	7.10***
12-month	4.06***	16.46***	-2.68***	7.16***
Bond price gap				
5-year	-5.66***	32.07***	-22.04***	485.97***
10-year	-11.18***	124.93***	-19.08***	364.08***
Stock price gap				
ADR-local	3.09***	9.52***	10.69***	114.32***
H-local	3.10***	9.64***	--	--

[1] Weekly data. Pre-crisis period is from 26 May 2003 to 31 August 2008; post-crisis period is from 5 January 2009 to 30 June 2012. *** indicates that the null of equal mean is rejected at the 1% significance level. Forward premium gap is the difference between onshore and offshore forwards as a percentage of spot. NDF yield gap is the difference of onshore money market yield and offshore NDF-implied yield; in basis points. Bond yield gap is the difference between domestic government bond yields and non-deliverable cross-currency swap spreads; in basis points. Stock price gap is the logarithm of the overseas-local share price differential for the cross-listed companies.

Sources: Bloomberg; CEIC; authors' estimations.

Test on equality of mean between China and India, by instrument[1]

Table A2-3

	t-test			Anova F-test		
	Pre-crisis	Post-Crisis	Full sample	Pre-crisis	Post-Crisis	Full sample
Forward premium gap						
3-month	17.22***	4.19***	10.96***	296.47***	17.53***	120.14***
12-month	21.89***	4.88***	14.99***	479.16***	23.84***	224.83***
NDF yield gap						
3-month	13.21***	8.77***	12.71***	174.55***	76.90***	161.48***
12-month	15.50***	7.33***	14.71***	240.37***	53.71***	216.49***
Bond price gap						
5-year	5.68***	-6.78***	-1.91	32.30***	45.93***	3.65
10-year	0.48	-8.87***	-6.38***	0.23	78.66***	40.67***
Stock price gap						
ADR-A vs. ADR-M	-39.91***	-33.66***	-51.63***	1592.53***	1133.21***	2665.84***
H-A vs. ADR-M	-39.85***	-33.61***	-51.58***	1587.96***	1129.43***	2660.48***

[1] Weekly data. Full sample period is from 27 May 2003 to 30 June 2012 while the crisis period is from September to December 2008. *** indicates that the null of equal mean is rejected at the 1% significance level. Results of the Satterthwaite-Welch t-test and the Welch F-test that allow for different variances between subgroups are equivalent to those of the standard t-test and ANOVA F-test and are therefore not reported in the table. Forward premium gap is the difference between onshore and offshore forwards as a percentage of spot. NDF yield gap is the difference of onshore money market yield and offshore NDF-implied yield; in basis points. Bond yield gap is the difference between domestic government bond yields and non-deliverable cross-currency swap spreads; in basis points. Stock price gap is the logarithm of the overseas-local share price differential for the cross-listed companies.

Sources: Bloomberg; CEIC; authors' estimations.

Test on equality of mean between China and India, by instrument[1]

Absolute values — Table A2-4

	t-test			Anova F-test		
	Pre-crisis	Post-Crisis	Full sample	Pre-crisis	Post-Crisis	Full sample
Forward premium gap						
3-month	9.91***	2.97***	0.13	98.17***	8.85***	0.02
12-month	18.21***	10.52***	2.57**	331.71***	110.65***	6.62**
NDF yield gap						
3-month	11.99***	13.17***	11.57***	143.72***	173.57***	133.86***
12-month	14.38***	16.48***	10.78***	206.87***	271.67***	116.18***
Bond price gap						
5-year	7.04***	2.16**	-5.46***	49.55***	4.67**	29.83***
10-year	1.18	-3.30***	-7.56***	1.39	10.88***	57.21***
Stock price gap						
ADR-A vs. ADR-M	17.95***	26.99***	21.23***	322.34***	728.43***	450.80***
H-A vs. ADR-M	17.94***	26.97***	21.19***	321.94***	727.25***	449.18***

[1] Weekly data. Full sample period is from 27 May 2003 to 30 June 2012 while the crisis period is from September to December 2008. ** and *** indicate that the null of equal mean is rejected at the 5% and 1% significance level respectively. Results of the Satterthwaite-Welch t-test and the Welch F-test that allow for different variances between subgroups are equivalent to those of the standard t-test and ANOVA F-test and are therefore not reported in the table. Forward premium gap is the difference between onshore and offshore forwards as a percentage of spot. NDF yield gap is the difference of onshore money market yield and offshore NDF-implied yield; in basis points. Bond yield gap is the difference between domestic government bond yields and non-deliverable cross-currency swap spreads; in basis points. Stock price gap is the logarithm of the overseas-local share price differential for the cross-listed companies.

Sources: Bloomberg; CEIC; authors' estimations.

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