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Carmen Reinhart

Harvard Kennedy School

Vincent Reinhart

The American Enterprise Institute

Takeshi Tashiro

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*Does Reserve Accumulation Crowd Out Investment?**

Carmen M. Reinhart
Harvard University

Vincent Reinhart
The American Enterprise Institute

Takeshi Tashiro
Ministry of Economy Trade and Industry, Japan and RIETI

Abstract

It is understood that investment serves as a shock absorber in times of crisis. The duration of the drag on investment, however, is perplexing. For the Asian economies we study, average investment/GDP is about 6 percentage points lower during 1998-2014 than its average level in the *decade* before the Asian crisis; the decline is greater if China is excluded. We document how in the wake of crisis home bias in finance increases markedly as public and private sectors look inward when external financing becomes prohibitively costly or undesirable from a financial stability perspective. Reserve accumulation involves an official institution (i.e., the central bank) funneling domestic saving abroad and thus competing with domestic borrowers in the market for loanable funds. We suggest a broader definition of *crowding out* and *leakages*, driven importantly by rising home bias in finance and by official capital outflows. We present evidence from Asia and advanced European economies with managed currencies to support this interpretation.

JEL E2, E5, F30, F4, G15, H6

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1. Introduction

The literature on early warnings of financial crises identifies overvalued currencies, widening current account deficits, large capital inflows, rising leverage, and low and declining international reserves as precursors to disaster.¹ These patterns prevailed in innumerable emerging market crises and (with the exception of the depletion of international reserves) also preceded most of the recent financial crises in the advanced economies.² The mechanics were described by Calvo (1998) as a sudden stop of external finance. When current account deficits can no longer be financed by borrowing from abroad, sharp output declines and the scarcity and high cost of finance combine to produce often dramatic adjustments. In particular, as the current account balance swings from deficit to surplus, the brunt of this adjustment usually falls on investment.³

The Latin American debt crisis of 1981-82 was influential in fostering an understanding of why a prolonged investment slump follows a deep crisis.⁴ Kaminsky and Pereira (1996) show that public and private saving rates fell sharply in Latin America from 1982 to 1988, implying that current account deficits were closed by even larger declines in investment. In that episode, at least, investment was importantly crowded out by a rising share of public and private consumption.⁵ We would add that the decline in measured domestic saving was also exacerbated by *leakages* to the domestic system in the form of private capital flight, which escalated in the region to record highs.⁶

The Asian crisis of 1997-1998 was most acute in Indonesia, Korea, Malaysia, the Philippines, and Thailand. Yet, investment as a share of GDP fell across the board in the major Asian economies in 1998.

¹ See Bussiere et al, (2013), Frankel and Saravelos (2012) and Gourinchas and Obstfeld (2012) for recent analyses of early warnings as well as the comprehensive discussions of the existing literature therein.

² Gourinchas and Obstfeld (2012) observe that the only notable difference between the emerging and advanced economies is that the output declines during currency crisis were larger in emerging markets.

³ Recall the current account balance equals saving minus investment.

⁴ Diaz Alejandro (1983) was among the first to single out this problem.

⁵ In the Kaminsky and Pereira (1996), the increases of public and private consumption (as a share of GDP) were of comparable magnitudes.

⁶ See Claessens, (1997) for a comprehensive analysis of the capital flight magnitudes involved.

In Indonesia, the investment-GDP ratio was nearly halved, falling from 32 percent in 1997 to 19 percent the following year. The decline in investment-GDP ratios among the advanced economies since 2007 has also been drastic. For instance, from 2007 to 2014, Ireland’s investment-GDP ratio fell 10 percentage points. Unlike Latin America in the 1980s (or modern-day United States), post-1997 Asia is a region of high domestic saving rates. There is little to suggest private capital flight has been a significant leakage in the past decade. Hence, it is unlikely that the many of factors that drove the investment slump during Latin America’s lost decade have been at work in Asia (but both regions turned inward for financing sources in the post-crisis era).

While it is not difficult to understand the role of investment as a shock absorber at the time of crisis, it is perplexing why it takes so many years after the crisis to recover—if it recovers at all. For the nine Asian economies in this study, average investment/GDP is about 6 percentage points lower during 1998-2014 than its average level in the *decade* before the crisis; if China and India are excluded, the estimated decline exceeds 8 percent.⁷ Over the same pre- and post-crisis sample the decline in growth is 2.5 percent for all countries and 3.3 percent if China and India are excluded.⁸

In this paper, we aim to shed light on some of the factors that may account for the sharp and sustained decline in investment as a share of GDP in many Asian countries since the events of 1997-1998. While the evidence does not support “one size fit all” explanations, the topic and our findings may have broader resonance outside Asia. China and India (for different reasons) appear to be in the cusp of a significant investment correction; other large emerging markets, such as Brazil may be similarly placed; and much of Europe and the US are entering their seventh or eighth year of an investment slump.

⁷ The countries are: China, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, and Thailand.

⁸ This growth comparison, showing lower growth during the era of high reserves is not at odds with the finding in Bussiere et al (2013) that emerging markets with higher reserves performed better (in terms of output) during the global financial crisis of 2008-2009. The period we are comparing spans 26 years (11 years through 1997 and 1998 to 2012); our focus is on the long-term growth performance.

It is not our goal to offer a comprehensive model of the determinants of investment.⁹ We focus on finance and examine trends that affect the availability of domestic funding for investment and the allocation of the pool of domestic saving. The old concepts of *crowding out* and *leakages* are central to our analysis, but re-defined here to be more encompassing.

As for crowding out, home bias in finance increases markedly in the wake of crisis, as governments look inward when external financing becomes prohibitively costly or altogether impossible. Even in milder cases, when capital market access is not lost, governments may seek the relative stability of captive domestic audiences, such as pension funds, insurance companies and domestic banks to lessen roll-over risk. Put starkly, before the crisis, global financial markets funded domestic investment, exactly following the prior of Feldstein and Horioka (1980) in their test of capital mobility. Post-crisis, this access shuts and domestic investment is constrained by domestic saving.

In cases where the government is running substantial and/or rolling over a large stock of debt, these activities would fall under the conventional definition of crowding out. Most Asian economies, however, have neither large public debts nor high budget deficits (with a few obvious exceptions) so conventional crowding out is insufficient to explain the investment drop. The second force at work is leakages, or the redirection of domestic saving away from domestic capital formation as a consequence of an increase in home bias. In particular, three features distinctly mark the rise of home bias in Asia.

First, the process has not been symmetric, as issuing liabilities to the rest of the world (ROW) is avoided while acquiring assets (reserves) from the ROW is actively pursued. Second, the acquisition of assets is selective, favoring safe, low-yield assets. And third, the accumulation of these assets is not left in the hands of the private sector, but orchestrated by the official sector via central banks. As a

⁹ Young (1995)'s hypothesis that the East Asian growth miracle may have well been "primarily the result of one-shot increases in output brought about by the rise in participation rates, investment to GDP ratios, and educational standards and the transfer of labor from agriculture to other sectors (e.g. manufacturing) with higher value added per worker" may be a primary explanation for the slowdown. But the fact remains that the Philippines and Japan (which were at very different phases of the development cycle) posted sustained and sharp declines in investment as well. As we discuss here, all these countries also experienced a shift in policy that importantly altered the allocation of domestic saving.

consequence of the desire to keep a tight lid on current account deficits and encourage surpluses, foreign exchange reserves accumulated on an unprecedented scale, representing a leakage of domestic saving in funding investment.¹⁰ A good deal has been written on the motives for holding reserves, for instance, Obstfeld, Shambaugh, and Taylor (2010) stress self-insurance. Supporting this view, we sketch a slice of Asia's history with credit events (or near-credit events) and quantify the lack of adequate reserve cover at these critical moments. The lesson learned from the experience was to accumulate reserves for the insurance motive described above.¹¹ An added impetus to this build-up followed from official *fear of floating* that is not asymmetric. That is, leaning against the wind of an appreciation has been an important driver of reserve accumulation after the 2007-2009 financial crisis.¹²

Our narrative stresses official action. Modelling reserve accumulation via a precautionary motive on the part of households or investors (Caballero and Krishnamurthy, 2009 and Carroll and Jeanne, 2009) misses the point that both the timing and magnitude of the acquisition of foreign assets are determined by the central bank (i.e., the official sector). Indeed, according to the U.S. Treasury International Capital System of data, about two-thirds of the Treasury securities held abroad at the end of the first quarter of 2015 were in official hands. Furthermore, Warnock and Warnock's (2009) careful study of this phenomenon point out that the reported figures significantly understate actual official holdings, as oil exporters and other central banks and governments purchase US Treasuries through offshore centers. The dominant role played by official entities in uphill capital flows is also extensively documented in Alfaro, Kalemli-Ozcan, and Volosovych (2013). Aizenman and Lee (2006) offer a theoretical framework closer to this reality, exploring the actions of a central concerned about possible runs.

¹⁰ See Filardo and Yetman (2012) for a longer list of the consequences of Asian reserve accumulation.

¹¹ See Aizenman and Lee (2006) and also Calvo, Izquierdo, and Loo (2012).

¹² Calvo and Reinhart (2002); Aizenman and Lee (2006) find the "mercantilist" motive statistically significant but quantitatively small relative to self-insurance, but their sample does not extend to recent post subprime years. Jeanne (2012) also emphasizes the fear of floating motive in or in this particular instance "fear of appreciation" (see Levy-Yeyati and Sturzenegger, 2007 for compelling documentation of this tendency in emerging markets for the pre-crisis period)

Some studies have stressed the social costs associated with this policy, which is closer to our theme in this paper. Rodrik (2006) focused on the income loss associated with acquiring assets that deliver a lower yield than the interest cost of borrowing abroad. Mohanty and Turner (2006) went further, suggesting that sustained reserve accumulation fuels domestic credit booms, asset price bubbles, and introduces distortions in the banking system. Filardo and Yetman (2012) provide evidence on those concerns and suggest compelling reasons why the taxes often associated with sterilized intervention can funnel activity in to the riskier and nebulous world of shadow banking.¹³

Jeanne (2012), who connects the accumulation of reserves in a financially repressed economy (closed capital account) to forced saving, lower consumption, and welfare losses, comes closer to the “cost of reserve accumulation” we are interested in investigating. To our knowledge, these and other related papers have not made a connection between the sustained reserve accumulation and the persistent and significantly lower levels of investment in the region.¹⁴ Put differently, reserve accumulation involved an official institution (i.e., the central bank) funneling domestic saving abroad and thus competing with domestic borrowers in the market for loanable funds. We suggest a broader definition of *crowding out*, driven by official capital outflows, is applicable to most of the Asian economies (and a significant number outside Asia) in varying degrees. In principle, reserve accumulation could also crowd out private consumption (as in the case of China) or public consumption. Our focus on total (private and public) investment is driven by the large and persistent declines we have already described.

The paper proceeds as follows. The next section examines the evolution of the current account and investment in a 26-year window around the Asian crisis of 1997-1998; for comparative purposes, we present the corresponding macroeconomic data for Europe and the United States from the 10 years prior to the 2007-2009 crises to the present. In Section 3, we use our historical data on the level and

¹³ On the use of reserve requirements to sterilize capital inflows see Reinhart and Reinhart (1999) and Cordella, Vegh, and Vuletin (2013).

¹⁴ This is not to suggest that some declining investment ratios have other important drivers relating to technological change and the transition to a more mature stage of development. We would observe that, by 1991, Japan was considered a mature economy and that Singapore did not lag far behind.

composition of debt to document the rise of home bias and Section 4 presents and reinterprets the evidence on reserve accumulation as a source of *crowding out*. The hybrid Asian experiences, which encompass high debt-current account surplus Japan and low debt-current account deficit Indonesia, are discussed in the context of the home bias-crowding out framework. We provide evidence from the cross section of countries that shows the accumulation of reserves over selected periods is associated with changes in domestic investment. We also show that changes in reserves have predictive power for subsequent changes in investment in aggregate regional data. Concluding remarks focus on further research and speculate to what extent elements of the Asian experience are present elsewhere.

2. Crises and Investment: The Long Aftermath

The literature on sudden stops (see, Calvo, 1998) and capital flow surges (Reinhart and Reinhart, 2009) has documented the sharp reversals of the current account that take place at crisis times, including the famous Asian crisis episode of 1997-1998. In this section, we document current account reversals that *persist* well after the financial crisis is over. Linked by an accounting identity, we connect the current account reversal to a change in investment; the corresponding exercise for growth is presented in the appendix. To set the stage for the discussion on the connection between domestic and external debt and reserves, we review episodes of the Asia's brush with default and restructuring (or near default).

2.1. Basics

The simple rules of double-entry accounting ensure that, excluding statistical discrepancies, the capital account surplus or net capital inflow (denoted by KA) is related to the current account surplus (denoted by CA) and to the official reserves account RA of the balance of payments (BOP) through the identity,

$$CA + KA + RA \equiv 0.$$

Notice that $RA < 0$ implies an accumulation of reserves by the monetary authority. A property of the current account is that it measures the economy's net foreign wealth. A country that runs a current account surplus must have a capital account deficit (private capital outflow) and or an increase in reserves (an official outflow). Another related identity is that the current account surplus equals the difference between national savings and national investment,

$$CA \equiv S - I.$$

Again, note that these are identities. Their economic significance looms larger when outside forces work to influence one of their components so as to set in motion adjustments to the other elements to maintain the identities over time.

2.2. External balances

Table 1 presents selected developments for the current account (relative to nominal GDP) for two groups of countries: the nine Asian economies of our focus (China sampled for both the mainland and Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand); and a comparison group comprised of European economies and the United States. For Asia, we compare 1987-1997 (the 11-year period in the run-up to the Asian crisis) with 1998-2014. We avoid extending the comparison further back, as Asia was also in crisis in the earlier part of the 1980s. For the Europe and US sample, we compare the 1997-2007 pre-crisis with the seven years (2008-2014) since. Table 1 reports the peak deficit level and year it was recorded from 1980 to 2014. The memorandum items in each of the two subsections of the table report the pooled means for the relevant periods before and after the crisis, incorporating that the variances of the two samples are unknown and may be unequal.

Table 1. Current account balances, selected countries, 1980-2014
relative to nominal GDP, percent

	Change from:		Peak deficit: 1980-2014		2014
	1987 to 1997	1997 to 2014	Level	Year	
Asia					
* China, P.R.: Mainland	-6.0	-2.1	1.3	2001	2.0
China, P.R.: Hong Kong	-12.0	5.9	-6.3	1995	1.6
India	0.4	-0.1	-4.8	2012	-1.4
* Indonesia	1.0	-1.5	-6.2	1983	-3.0
* Japan	-1.2	-1.7	-1.0	1980	0.5
* Korea, Republic of	-7.9	8.1	-8.9	1981	6.3
* Malaysia	-14.0	10.6	-13.3	1982	4.6
* Philippines	-3.6	9.2	-7.8	1982	4.4
Singapore	15.7	3.9	-13.1	1980	19.1
* Thailand	-1.3	5.8	-8.5	1990	3.8
Memo: Asia, excluding China	1987 to 1997	1998 to 2014	<i>Difference</i>		
Average level	-0.2	5.2	5.4		
Number of observations	88	136			
Europe and the United States					
	Change from:		Peak deficit: 1980-2014		latest
	1997 to 2007	2007 to 2014	Level	Year	2014
Austria	5.8	-1.6	-5.1	1980	1.8
Belgium	-1.2	-2.6	-4.1	1981	1.6
Denmark	0.1	4.9	-5.1	1986	6.3
Finland	0.0	-5.8	-5.2	1991	-0.6
France	-3.6	-0.1	-2.1	1982	-1.1
* Germany	7.4	0.6	-1.7	2000	7.5
* Greece	-9.1	14.9	-14.5	2008	0.9
* Iceland	-11.3	18.4	-23.2	2006	4.7
* Ireland	-8.8	11.5	-13.4	1981	6.2
* Italy	-4.0	3.2	-3.6	1981	1.8
* Netherlands	0.2	4.1	-1.0	1980	10.3
Norway	6.1	-3.8	-6.0	1986	8.5
* Portugal	-3.6	10.3	-14.5	1981	0.6
* Spain	-9.6	9.8	-9.6	2007	0.1
Sweden	5.0	-2.6	-3.2	1992	6.3
Switzerland	1.4	-3.0	-0.5	1980	7.0
* United Kingdom	-2.6	-2.8	-5.5	2014	-5.5
* United States	-3.3	2.6	-5.8	2006	-2.4
Memo:	1997 to 2007	2008 to 2014	<i>Difference</i>		
Average level	0.8	1.1	0.4		
Number of observations	198	126			

Notes: An asterisk denotes the start of common banking crises, 1997-98 for Asia (except in Japan, which began in 1992) and 2007-09 for other advanced economies.

Sources: World Bank, World Development Indicators, IMF, World Economic Outlook, and Reinhart and Rogoff (2009).

In the decade running up to the Asian financial crisis of 1997-98, the current account balances in 7 of the 10 economies listed in the first column deteriorated, some to a sizable degree. This is consistent with the observation in Reinhart and Reinhart (2009) that wide current account deficits (or capital inflow bonanzas) are predictive of crisis. In the seventeen years since, current account balances mostly improved. Indeed, for the group as a whole and as shown as the memo item, the current account went from a small average deficit of 0.2 percent of nominal GDP to a surplus of 5.2 percent, a difference that is statistically significant. As a consequences of this improvement, eight of the ten economies in the Asian sample posted current account surpluses in 2014 (the rightmost column). The importance of the financial crisis in understanding the contours of the current account balance is seen in columns three and four, which for the period 1980 to 2014 list the largest current account deficit (or smallest surplus) and the year it was recorded. For eight of the Asian economies, large deficits were a pre-crisis affair.

We observe the United States and the advanced economies of Europe in the bottom panel of the table over a briefer window after the financial crisis of 2008-09. In the ten years prior to the crisis, current account balances deteriorated in 10 of 18 economies only to have the same proportion improve in the subsequent seven years. The average current account balance relative to GDP rose 0.4 percentage points in the post-crisis period, a difference, however, that does not differ statistically from zero. If we limit the sample to the ten nations that had a banking crisis (those marked with an asterisk), the net gain across the pre- and post-crisis sample rises to 1.7 percentage points, a statistically significant change. Considering the entire period from 1980 to 2014, only one country, the United Kingdom, posted its peak deficit after the crisis. As for the most recent observations, as seen in the rightmost column, 14 of the 18 economies ran current account surpluses in 2014.

The main message from Table 1 is that Asia's past became other advanced economies' present. Current account deficits are a feature of the pre-crisis boom and narrow, often turning into surpluses, in the aftermath. That is, the natural experiment for an economy is the sudden unwillingness of foreigners to

fund a current excess of investment over saving, prompting other adjustments, given their linkage by important identities. We next turn to the movement of one of them, investment, around crisis events.

2.3. Economic activity in the shadow of “sudden stops”

Table 2 presents the investment/GDP ratio in the same format as Table 1, replicating the same coverage of countries and extending the time series back to 1970.¹⁵ With the exceptions of China, India, and Indonesia, the second, post-crisis, column stands out by showing large declines in investment. Europe and the US are even more uniform in this regard, as only one country, Norway with its unrepresentative oil wealth in this group, records a higher level of investment in 2014 than in 2007, and a small one at that. As with the current account, we place more weight on the pooled means reported as memorandum items. These show a 6.4 percent decline in investment for the Asian group, excluding China. The standard difference in means tests yield significant results at all standard levels of confidence.

Seven years into the aftermath of what began as the subprime crisis in the United States in the summer of 2007, the European economies and the US seem to be on a similar track. The pooled means point to a decline of 2.7 percent since the onset of the crisis. Furthermore, the magnitudes of the declines in a number of the periphery crises countries match and surpass the investment in Asia. For the banking-crisis subset of the sample, the difference in the average investment rate about doubles. The investment slump unfolds during a period of lower average growth.

¹⁵ These data are among the World Bank’s Global Development Indicators, and the longer span highlights the secular decline in capital formation in many economies—especially in the US and Europe.

Table 2. Investment, selected countries, 1970-2014
relative to nominal GDP, percent

	Change from:		Peak ratio: 1970-2014		latest 2014
	1987 to 1997	1997 to 2014	Level	Year	
Asia					
* China, P.R.: Mainland	0.4	10.2	48.3	2011	46.9
China, P.R.: Hong Kong	8.1	-10.0	34.9	1981	24.2
India	3.7	5.9	38.9	2011	31.5
* Indonesia	-7.1	1.6	44.6	1989	33.8
* Japan	-0.4	-6.3	38.8	1970	21.8
* Korea, Republic of	4.3	-8.6	41.4	1991	28.8
* Malaysia	19.9	-17.8	43.6	1995	25.2
* Philippines	7.6	-8.0	32.9	1976	19.4
Singapore	1.7	-10.6	47.0	1984	27.6
* Thailand	5.8	-8.1	42.8	1991	25.6
Memo: Asia, excluding China	1987 to 1997	1998 to 2014	<i>Difference</i>		
Average level	32.7	26.3	-6.4		
Number of observations	88	136			
Europe and the United States					
	Change from:		Peak ratio: 1970-2014		latest 2014
	1997 to 2007	2007 to 2014	Level	Year	
Austria	-1.7	-1.5	33.3	1980	23.1
Belgium	2.3	-2.8	30.4	1974	21.9
Denmark	3.3	-6.0	28.7	1973	19.3
Finland	3.6	-5.0	37.0	1974	20.4
France	4.8	-2.1	29.0	1974	22.0
* Germany	-2.0	-1.8	32.6	1970	18.9
* Greece	3.7	-16.0	49.1	1973	10.6
* Iceland	8.3	-13.7	39.4	1974	16.0
* Ireland	5.9	-10.7	32.5	1979	17.4
* Italy	2.9	-5.6	29.4	1974	16.5
* Netherlands	-0.8	-3.4	29.8	1970	18.7
Norway	2.4	1.5	38.9	1976	28.8
* Portugal	-3.4	-8.2	38.2	1982	14.9
* Spain	9.0	-11.9	31.6	1974	19.5
Sweden	4.4	-1.3	33.3	1970	23.3
Switzerland	-0.5	-0.5	32.8	1990	23.6
* United Kingdom	-0.6	-1.3	26.8	1989	17.7
* United States	0.0	-2.6	25.1	1984	19.8
Memo:	1997 to 2007	2008 to 2014	<i>Difference</i>		
Average level	23.3	20.6	-2.7		
Number of observations	198	126			

Notes: An asterisk denotes the start of common banking crises, 1997-98 for Asia (except in Japan, which began in 1992) and 2007-09 for other advanced economies.

Sources: World Bank, World Development Indicators, IMF, World Economic Outlook, and Reinhart and Rogoff (2009).

Table 3 replicates a third time the format used in the prior two tables. For the Asian economies in the upper panel, in only two cases (Indonesia and the Philippines) is growth higher in the post-crisis period compared to the ten years before the crisis. Indeed, for the sample excluding China, the growth rate is 2.7 percentage points lower on average. For the same sample, the current estimate of trend growth is 1.7 percentage points below the performance from 1987 to 1997. In both cases, these shortfalls differ significantly from zero and represent a large cumulative loss in output. Also witness to the shadow cast by crisis, only two of the ten economies posted peak economic growth in the years after the crisis.

The story of poor performance post crisis is told more starkly for the US and European economies in the bottom portion of the table. In all 18 cases shown in the first and second columns, growth from after the crisis was subpar relative to the performance before the crisis. Indeed, in seven cases, average growth in the latter period is negative, implying that Denmark, Finland, Greece, Ireland, Italy, Portugal, and Spain have not recovered from their initial recessions. The poor pace of growth seems to be a feature of the long run, in that the estimate of trend in column three is below that seen from 1998 to 2007 for 17 out of 18 countries. And this does not owe exclusively to the effects of the deep downturn immediately after the crisis in most countries pulling down the seven-year average because in all 18 cases real GDP growth in 2014 (the last column) lies below the pre-crisis performance. The group averages show the systematic nature of the shortfall. Relative to the average for 1998 to 2007, the expansion of real GDP was 3.2 percentage points lower in the past seven years. Moreover, the estimated trend going forward is, on average, 1.2 percentage points under the performance from 1998 to 2007. Both declines differ statistically from zero.

Table 3. Real GDP growth, selected countries, 1970-2014

	Average, percent		Trend Growth ¹	Maximum, 1970-2014		
	1987 to 1997	1998 to 2014		percent	year	2014
Asia						
* China	10.1	9.5	6.3	19.4	1970	7.4
Hong Kong SAR, China	5.8	3.4	3.5	16.2	1976	2.3
India	5.7	7.1	7.7	10.3	2010	7.2
* Indonesia	6.8	4.1	6.0	9.9	1980	5.0
* Japan	3.0	0.6	0.7	8.4	1972	-0.1
* Korea, Rep.	8.8	4.2	3.7	14.8	1973	3.3
* Malaysia	8.9	4.4	5.0	11.7	1973	6.0
* Philippines	3.8	4.6	6.0	8.9	1973	6.1
Singapore	9.2	5.2	3.2	15.2	2010	2.9
* Thailand	8.5	3.1	3.9	13.3	1988	0.7
Memo: Asia, excluding China	1987 to 1997	1998 to 2014	Trend	Difference	1998 to 2014	Trend
Average level	6.9	4.2	5.1	from 1987-97	-2.7	-1.7
Number of observations	88	136	24	average		
Europe and the United States						
	Average, percent		Trend Growth ¹	Maximum, 1970-2014		
	1997 to 2007	2008 to 2014		percent	year	2014
Austria	2.6	0.6	1.2	9.3	1970	0.3
Belgium	2.5	0.6	1.5	7.4	1970	1.0
Denmark	2.1	-0.5	2.2	6.1	1976	1.0
Finland	3.9	-0.7	1.7	7.7	1972	-0.1
France	2.4	0.3	1.8	6.9	1970	0.4
* Germany	1.7	0.7	1.3	5.7	1990	1.6
* Greece	4.0	-4.1	3.0	11.0	1970	0.8
* Iceland	5.0	0.2	2.7	13.1	1971	1.8
* Ireland	6.7	-0.3	2.5	10.8	1997	4.8
* Italy	1.5	-1.3	1.1	9.0	1970	-0.4
* Netherlands	2.8	0.0	1.8	13.6	1970	0.9
Norway	2.7	0.9	2.0	6.1	1984	2.2
* Portugal	2.3	-1.1	1.2	16.5	1970	0.9
* Spain	3.9	-0.7	1.7	8.1	1972	1.4
Sweden	3.4	0.9	2.4	11.2	1970	2.1
Switzerland	2.4	1.4	1.9	5.1	1980	2.0
* United Kingdom	3.0	0.5	2.1	10.4	1970	2.6
* United States	3.2	1.1	2.1	7.3	1984	2.4
Memo:	1997 to 2007	2008 to 2014	Trend	Difference	2008 to 2014	Trend
Average level	3.1	-0.1	1.9	from 1997-07	-3.2	-1.2
Number of observations	198	126	54	average		

Notes: ¹ Average real GDP growth for 2018 to 2020 in the IMF World Economic Outlook (4/2015).

An asterisk denotes the start of common banking crises, 1997-98 for Asia (except in Japan, which began in 1992) and 2007-09 for other advanced economies.

Sources: World Bank, World Development Indicators, IMF, World Economic Outlook, and Reinhart and Rogoff (2009).

Having shown that current account surpluses and lower investment ratios and growth are the post-crisis “new normal,” we now turn to the crisis episodes that prompted the policies of self-insurance via large scale reserve accumulation. The sketch presented here of past crisis only serves to highlight the gap between international reserve “cover” then and now.

2.4. Disasters and near disasters

Table 4 presents a list of external credit events in the form of outright default, debt restructuring, or “near train wrecks” (in that the country was on the verge of default). This list does not include banking, currency, and inflation crises; the dates for these can be found in Reinhart, (2013). Two features of the table are noteworthy. First, with the exception of Indonesia’s external debt in 1998, none of the debt ratios at the time of crises seem obviously high—certainly not by advanced economy standards. Indonesia’s external debt/GDP ratio in 1997 was 63.2 percent, an implosion in the rupiah and a sharp decline in GDP drove the debt ratio higher by nearly 100 percent in less than a year. In seven of the 11 episodes shown external debt levels would have met the Maastricht criteria. This is not news, in that Reinhart, Rogoff and Savastano (2003) show that, in a more inclusive sample, the 60 percent ceiling in the Maastricht Treaty would not have been binding in advance of more than half of the defaults since 1970. Second, as the last column reveals, while external debt might not have been alarming in its own right, the central bank did not have the reserves to back even a quarter of the outstanding debt stock at the time the crisis broke out. In nearly half the cases, the reserve backing amounted to less than 10 percent of the hard currency debt. Calvo and Mendoza (1996) showed that the common focus on reserves-to-import ratios was not especially useful to convey vulnerability to financial crises and that reserves should be compared to the potential stock of liabilities these have to back (such as M2 or external debt, or at least the short-term component of debt).

The crisis experience sets the stage for both a policy that redirects government borrowing toward the domestic market and a central bank that strives to build a foreign exchange war chest as a financial

stability policy tool. To what extent private external borrowing was discouraged through “macroprudential” measures or more explicit capital controls has varied considerably across countries and across time.

Table 4. Credit Events (Restructuring, Default and Near-Default), Debt and International Reserves: 1958-2013
(debt as a percent of GDP)

Country	External credit events "near" defaults, <i>italics</i>	Total External Debt (public plus private)	Central Government Debt			Reserves/ External debt
			External	Domestic	Total	
India	1958	12.7	2.3	12.7	15.0	n.a.
	1969	15.2	2.5	15.2	17.7	8.1
	1972-1976	13.8	2.5	24.3	26.8	9.1
	1989-1990	25.2	8.0	15.7	23.7	5.1
Indonesia	1966-1970 ¹	46.9	n.a.	n.a.	n.a.	3.4
	1998-2000	158.7	56.5	10.5	67.0	15.0
	2002	65.5	35.0	35.3	70.3	24.2
Korea	1979-1980	34.9	7.6	3.8	11.4	12.9
	1997-1998	26.5	3.0	7.0	10.0	14.9
Philippines	1983-1992	72.9	22.8	11.3	34.1	3.1
Thailand	1997-1998	72.7	9.5	0.7	10.2	23.9 ²
Memorandum item:						
Average 2013 reserve-external debt ratio for India, Indonesia, Korea, Philippines and Thailand.						88.6

Sources: Bloomberg, International Monetary Fund, *International Financial Statistics* and *World Economic Outlook*, League of Nations, Statistical Abstract (various issues), Park (2005), Reinhart and Rogoff (2009), Reinhart (2010), United Nations (1948) and *Yearbook*, various issues, *International Debt Statistics*, World Bank, <http://data.worldbank.org/data-catalog/international-debt-statistics>, (October, 2013) World Bank, Quarterly External Debt Statistics, (QEDS), <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/EXTDECOEDS/0,,menuPK:1805431~pagePK:64168427~piPK:64168435~theSitePK:1805415,00.html>

¹As no data is available for 1966, we report 1970.

²The amount of reserves reported by the Bank of Thailand did not net out US dollar reserves borrowed in the forward market; non-borrowed reserves were significantly lower.

3. The Return of Home Bias

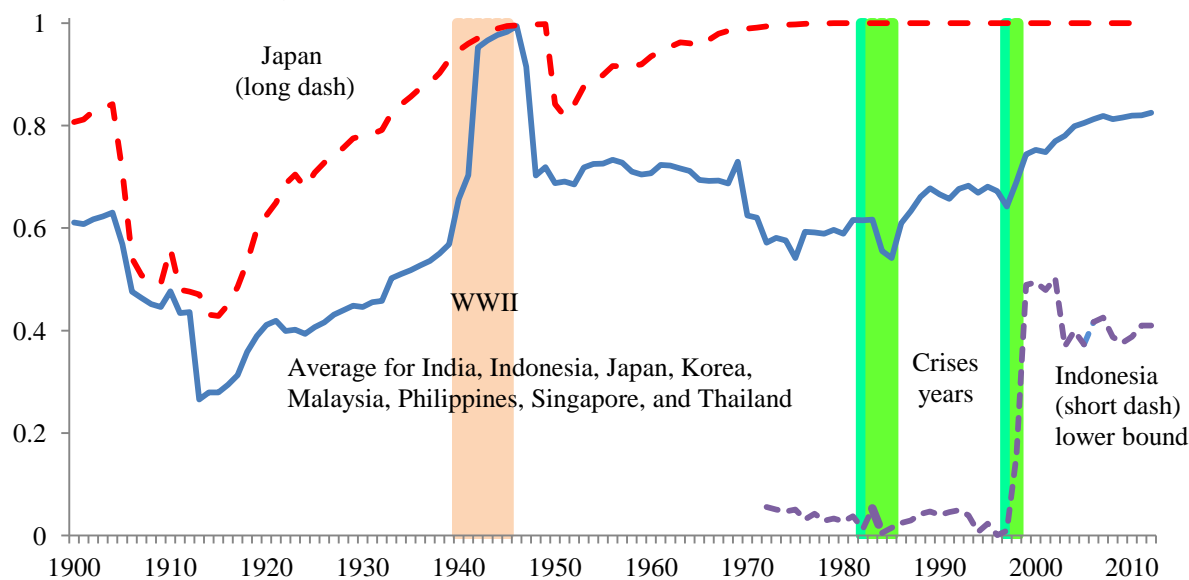
Home bias in finance has many dimensions, so it is impossible to measure it by a single indicator or even a handful of indicators. We do not use the term as in the original work of French and Poterba (1991) to describe low shares of foreign equity in domestic portfolios or low shares of foreign bonds in private domestic portfolio. We focus on “liability home bias” as a preference for borrowing domestically (and usually in the domestic currency) post 1997-1998 crisis. In what follows, we focus primarily on the internal-external composition of government debt as well as the evolution of external total debt (public

plus private) in comparison to domestic credit to the private sector.

3.1. Domestic and external public debt

The analysis here builds on Reinhart and Rogoff (2011), who trace out the long (and forgotten) historical evolution of domestic public debt. The debt series begin as early as 1835 for “British” India and 1872 for Japan; for Korea and Thailand the starting date is 1913; for Malaysia and the Philippines it is the 1940s and so on. The data for China is the least comprehensive in every dimension, both in terms of time frame and coverage (See Reinhart (2013)). Figure 1 traces the share of domestic central government debt; as such the range of variation is bounded by zero and one. The solid line is the average for eight of the nine economies (China is excluded); the long dash plots the ratio for Japan, which is the country with the highest share of domestic debt for the most extended period of time while the short dash is the time series for Indonesia, which recorded the most significant dependence of external borrowing right up to the 1997 crisis (and even subsequently).

Figure 1. Share of Domestic Debt in Total Central Government Debt: Seven Asian Economies, 1900-2012



Sources: Detailed sources for each country are provided in the *Asia Chartbook*, Reinhart (2013).

Notes: The shaded areas encompass WWII and year in which three or more of the seven Asian economies included experienced systemic banking crises; these two episodes span 1982-1985 and 1997-1998.

On the basis of average, it is evident that, with the exception of the financial autarky imposed by World War II, Asian governments relied heavily on external financing. In the period of financial repression and capital controls during Bretton Woods, home bias was higher than in the more liberal international capital markets of the late 1970s and beyond. During the multiple crises in Asia during 1980-1986 (these were not as synchronous as 1997-1998), about 40 percent of government debt was external. After that crisis the pendulum began to swing toward domestic debt and after the 1997-1998 episode, the share of domestic debt edged higher still. The average shows the share of domestic debt hovering around 80 percent but that largely reflects that Indonesia and the Philippines still rely far more heavily on external debt than the others. For Japan and Singapore domestic debt is the whole story. At present, domestic debt accounts for 90 percent or more of the total in India, Korea, Malaysia and Thailand.

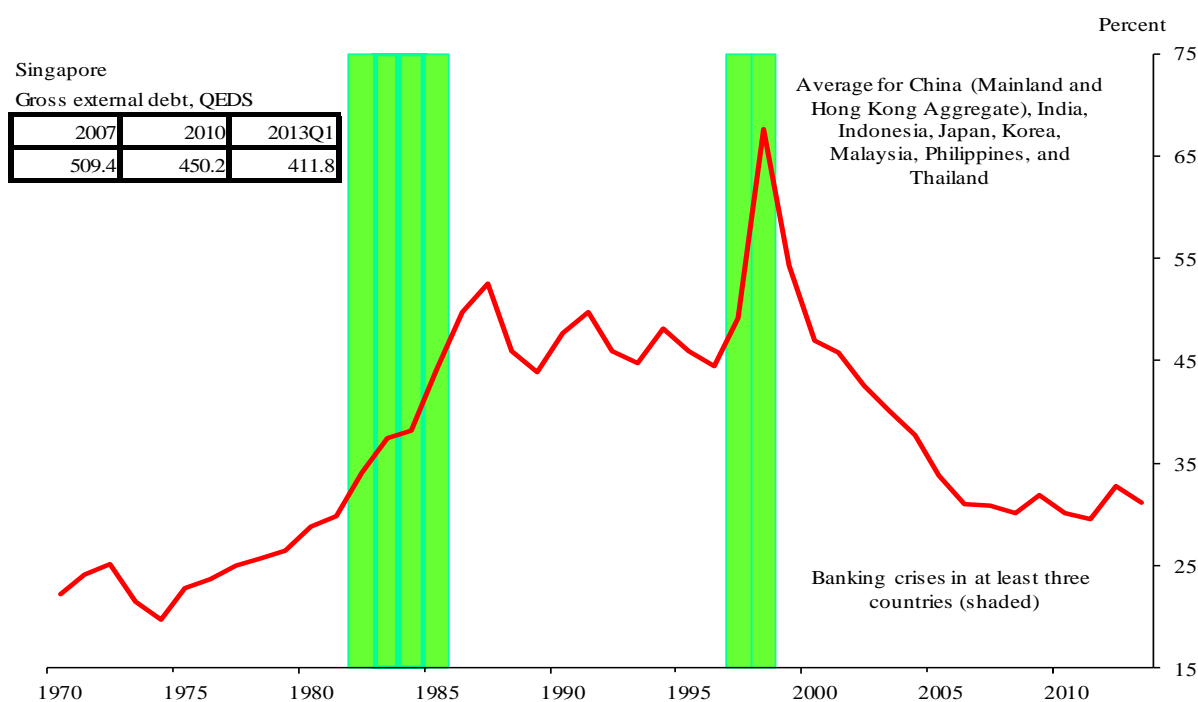
3.2. Total (public and private) external debt

The preceding evidence is confined to the central government. Historically, a substantial part of the external borrowing has come from other sectors of government, such as enterprises and, of course, the private sector. To ascertain how total public and private external indebtedness has evolved, we plot the average external debt/GDP ratio for eight of the nine economies over 1970 to 2013:Q1. Singapore, which ranks 4th in the Global Financial Centres Index is the obvious outlier and is excluded from the average shown.¹⁶ Singapore's gross external debt, which is a multiple of GDP, is shown in the inset of Figure 2. Of the 69 countries that participate in providing quarterly gross external debt data in the joint IMF-World Bank QEDS exercise, only six report higher external debt ratios than Singapore: Iceland, Ireland, Luxembourg, Malta, Mauritius and Netherlands. (Some are or were offshore centers). For China, we report the aggregate external debt of Hong Kong and Mainland relative to combined GDP.

¹⁶ http://en.wikipedia.org/wiki/Global_Financial_Centres_Index

In line with the home bias re-direction, total external debt has been halved since 1987 and hovers around 30 percent. While deleveraging usually follows a deep crisis, the debt reduction, as we shall see, has been far more pronounced for external debt. Indeed, several countries in the region are concerned about an internal credit boom.

Figure 2. Total (Public plus Private) External Debt: Selected Asian Economies, 1970-2014
(percent of GDP)



Sources: International Monetary Fund, World Economic Outlook, Reinhart and Rogoff (2009), Reinhart (2010), World Bank (2013), *International Debt Statistics*, Washington DC <http://data.worldbank.org/data-catalog/international-debt-statistics>, and World Bank, Quarterly External Debt Statistics, (QEDS), <http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/EXTDECQEDS/0,,menuPK:1805431~pagePK:64168427~piPK:64168435~theSitePK:1805415.00.html>

3.3 Hidden debts, contingent liabilities and private credit

The broad debt picture would not be complete without a discussion of domestic credit to the private sector, with its history of past booms and bust and where significant vulnerabilities have re-

emerged.¹⁷ As with the composition of public debt and the extent of external private and public indebtedness, there is considerable cross-country variation within our sample, but the general prevailing pattern (with the exceptions of the Philippines and Indonesia) is that domestic levels are high by their own historical standards, if not by a broad cross-country comparison. The Japanese ratio is the highest (above 260 percent), exceeding its previous peak in 1996. The banking crisis in Japan began in 1991 and, unlike most severe banking crisis, deleveraging was slow and partial. Indeed, the debt ratio never dipped below 215 percent (see Asia Chartbook, Reinhart, 2013). Korea's drastic external deleveraging after the crisis has no obvious domestic counterpart, as domestic credit ratio continued to climb. At 162 percent as of 2014, credit/GDP is only slightly below the 159 percent peak in 2008. Thailand and Malaysia have also experienced a marked rebound in domestic private credit, especially connected to household debt. China, while still classified as a low-income country, has a domestic credit ratio that is at par with advanced economies; these data reflect the growth of domestic credit in the "formal" banking sector. Hong Kong's average annual increase in credit/ GDP during 2007-2014 exceeded Ireland's during the decade before the crisis (1997-2007) and has only been surpassed by Iceland's credit boom over the pre-crisis decade (Figure 4). Credit ratios are at all-time highs for Hong Kong, India, Singapore and the group as a whole (Figure 3).¹⁸

A missing component in this analysis is domestic securitized debt, which varies in importance with the size of the domestic bond market across these countries. Also, important "hidden debts" for the case of China are provincial liabilities often contracted through the burgeoning shadow banking sector in that country and directly tied to real estate activity. To the extent that central banks issue their own debt to facilitate open market operations or to sterilize the effects of large purchases of foreign exchange

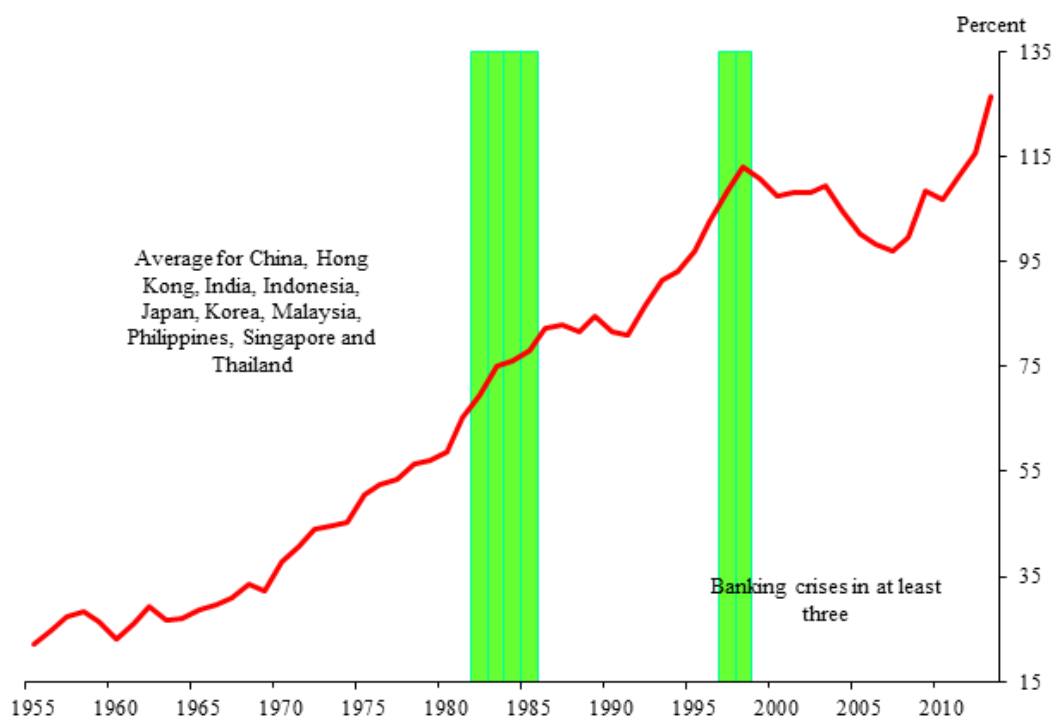
¹⁷ For a historic dimensions of these credit cycles, see Schularick and Taylor (2009)—Japan is in their sample; for the interaction between capital flows, credit and crisis (including the nine Asian economies covered here, see Mendoza and Terrones (2012).

¹⁸ In Figure 5, Hong Kong is not combined with Mainland China, as for external debt in Figure 2.

reserves, this type of domestic debt is also not quantified here.¹⁹ In Malaysia, there are ongoing discussions of hidden debts in the form of an assortment of off-balance sheet expenditure involving government enterprises.

We have not yet discussed public debts as whole but observed that these have become increasingly domestic, as external debt levels have declined and the share of domestic debt in the total pie has risen. The preceding discussion highlighted the growing private domestic debts. Taken together, the implication is that for Asia's largest economies domestic leverage is an issue of some concern. Banking crises need not have an external dimension.

Figure 3. Domestic Credit, Restructuring and Banking Crises, 1955-2014
(end-of-period as a percent of GDP)



Sources: International Monetary Fund, *World Economic Outlook*, *International Financial Statistics*, Reinhart and Rogoff (2009), Reinhart (2010), World Bank, *International Debt Statistics*, Washington DC, and World Bank, *Quarterly External Debt Statistics (QEDS)*

¹⁹ For example, the issue of including central bank debt in public sector debt statements is under discussion in Korea, <http://www.koreaherald.com/view.php?ud=20130702000679>.

3.4 Original sin and debt intolerance

The discussion that follows revolves around seven (excluding Japan and Singapore) of the nine sample countries. On the surface, the preceding discussion would suggest that the challenges posed by “original sin” in Eichengreen, Hausmann and Panizza (2005) have been overcome in this sample. Before jumping to that conclusion, we note that the full original sin phenomenon, as described by the authors, had two dimensions: first, the inability of governments to borrow domestically, (in the domestic currency) long term at fixed rates; second, the inability of governments to borrow in their own currency abroad (i.e, debt issues under international law).

We have presented evidence that governments turned inward in their funding pattern, but there is considerable variation within the group. China and India have had historically a significant domestic debt market (understandably given their size and inward development strategy for many decades). Korea, Malaysia, and Thailand, which relied extensively on external funding (had both dimensions of original sin) have shifted overwhelmingly to domestic debt fulfilling the criteria described above. Indonesia (see Figure 1) and the Philippines have also shifted markedly to domestic funding, but external debt still accounts for about half of central government debt.

We have also documented the more generalized pattern of declining external debt and rising domestic debt encompassing the private sector and other layers of government. This trend is silent, however, on the external dimension of whether these governments placed domestic currency debt in international capital markets, nor have we examined the currency composition of debt issues under external law. In sum, the domestic strand of original sin has significantly diminished, but that is about all that can be said.

Our analysis is equally silent on whether *debt intolerance* has been overcome or not, as external debt levels are low by historical standards. Table 4 is a reminder that crises often occurred at low (and sometimes extremely low) levels of external debt, which is the essence of debt intolerance. Since the

spring of 2013, the central banks of India and Indonesia have lost a substantive amount of reserves in efforts to stem a slide in the currency; India has introduced measures to limit capital flight. As of the end of 2014 India and Indonesia's total external debt amount to 22.3 and 32.9, respectively.

4. Crowding Out Redefined

The preceding discussion highlighted why the inward turn in private and public funding may increase the possibility of crowding out investment. In this section, we revisit the old concept of "crowding out" as it applies to Asia. Importantly, we redefine and broaden the concept of crowding out to the official sector at large, which includes central banks. In light of this broader definition of the official sector, we ask whether the record reserve accumulation that took root at the time of crisis in much of Asia is related to the persistently lower levels of investment since 1997-1998. Put differently, has central bank reserve accumulation been crowding out private investment in the past 15 years?

4.1. Conventional crowding out

Crowding is usually understood as the process when increased government borrowing displaces investment spending. If the government is competing with the private sector for a limited supply of loanable funds, then the higher public borrowing 'crowds out' private investing. This crowding out can occur via rising cost of borrowing for firms, or it can occur without rising interest rates if the government receives preferential access to the supply of loanable funds. Financial regulation can (and often does) tilt the balance in favor of government debt; financial repression does this more explicitly, often through directed credit.²⁰ Crowding out is typically a pressing policy concern when the public and private sectors' access to international capital markets is limited or non-existent, when government new financing needs are large, and when the government has to roll over large debts on a continual basis. To this list we would

²⁰ See Reinhart and Sbrancia (2015).

add the obvious point that when foreign saving cannot be tapped, the smaller the pool of domestic saving (other things equal), the greater the problem of crowding out.

As with other indicators, the range of variation in public debt profiles within the region is vast, both in terms of debt levels and their composition. Table 1, which provides a snapshot of the public debt in selected countries in the region, highlights this diversity. Public debt/GDP levels range from around 25 percent for Indonesia and China (the latter is likely an understatement) to Japan's record near 250 percent. These extremes support obvious point that the fiscal policy challenges faced by these countries are of a very hybrid nature.

Table 5. Central Government Debt: Selected Asian Economies
(as a percent of GDP)

	China ¹	India	Indonesia	Japan	Korea	Malaysia	Philippines	Singapore	Thailand
Start of coverage	1984	1835	1972	1872	1913	1949	1948	1963	1913
Average, all years	13.0	28.8	35.6	50.0	15.2	44.6	35.4	67.6	17.2
Peak year	2010	1945	2000	2012	1938	1987	2004	2012	1986
Peak level	33.5	79.5	95.2	209.7	35.8	106.0	74.4	111.4	40.1
Average, 1980-2013	13.0	38.0	41.7	100.5	19.4	57.8	55.3	82.7	24.7
Change 2007-2013	3.307	0.2	-10.0	45.4	3.4	12.2	-6.5	21.1	6.3
2013	22.9	40.3	20.9	208.7	33.1	52.3	47.4	108.4	30.3
Memorandum item:									
General government									
Start of coverage	1984	1991	2000	1970	1990	1990	1994	1990	1996
2013	22.9	67.2	26.2	243.5	35.7	57.0	41.2	107.8	47.1

Sources: Detailed sources are provided in the *Asia Chartbook*.

¹ For China, General Government Debt is used in lieu of Central Government Debt

4.2. Central bank crowding out

The build-up of foreign exchange reserves began immediately after the Asian crisis of 1997-1998 but became especially marked since 2000-2001. The pace picked up markedly, when China accelerated its purchases of foreign exchange to an unprecedented scale. The premise explored here is an extremely simple one and connected to the balance of payments identity and the definition of the current account.

We have presented evidence that most governments in the region have shifted, in varying degrees, from external financing to domestic financing and that the private sector, especially households,

have entered domestic credit markets forcefully. Prior to the crisis, both public and private sectors were relying on foreign saving. Taken together, these observations suggest that more players were competing for domestic saving in post-1997 crisis Asia. These trends by themselves would, perhaps, have more modest implications for domestic investment, if it were not coupled with a macroeconomic policy objective of building an insurance war chest of foreign exchange reserves and avoiding current account deficits (or fickle foreign saving), if at all possible. Possibly, *fear of floating* combined with *fear of current account deficits* to produce a prudential reaction to severe crisis.

A reserve buildup is an official capital outflow, funneling domestic saving abroad. The decision to intervene or not and at what pace to accumulate reserves is determined by an official institution (the central bank in most countries) and is distinct from the process of the private sector's allocation of saving. Accordingly, we broaden the definition of crowding out to include the central bank under the umbrella of the public sector. That is, we are interested in a net macroeconomic outcome, the current account balance, plus a policy decision, reserve accumulation, as a measure of the resources absorbed and not available to fund investment. Ironically, under fixed exchange rates, annual changes in reserves relative to GDP were smaller (except in the immediate vicinity of a crisis) than those observed under "floating exchange rates" since 1997.^{21 22} Furthermore, under fixed exchange rates, reserve changes were more symmetric (years of reserve losses alternating with reserve accumulation) than post 1997. If reserve purchases are sterilized to some degree, as is most often the case, it is done by increasing reserve requirements or by open market sales of government or central bank bills (or bonds).²³ In the narrower conventional definition of crowding out, the government issues more debt; in the more encompassing definition, the government need not as the central bank—either by selling its holdings of government debt or by selling its own sterilization bonds—does so.

²¹ Commodity price booms and busts were also associated with larger-than-normal fluctuations in reserves.

²² Standard textbook definitions of floating exchange rates do not involve foreign exchange market intervention and a common simplifying assumption is that reserve changes are zero.

²³ See Reinhart and Reinhart (1999) and Cordella, Vegh and Vuletin (2013).

In the debt crisis of the 1980s in Latin America, private capital flight funneled domestic saving abroad, to the detriment of investment in the region. We do not suggest that from a *macroprudential* and *signaling* standpoint, central bank accumulating reserves and capital flight are comparable. Foreign exchange purchases create a backing for foreign currency debt in times of stress, and more generally, for the monetary aggregates (M2), as in Calvo and Mendoza (1996) and Obstfeld, Shambaugh and Taylor (2010). Large current account deficits (or capital flow bonanzas to use the term of Reinhart and Reinhart, 2009) are precursors of crises, so avoiding these has a distinct financial stability objective. But the fact remains that whether the outflows are official or private, a slice of domestic saving is directed to the purchase of foreign assets in lieu of domestic investment. In the case of capital flight, this wealth held outside the country is difficult or impossible to tax; in the case of reserves, given the low yield of the assets purchased and domestic foreign interest rate differentials, quasi-fiscal losses have often been significant.²⁴

4.3. Not all that glitters is gold

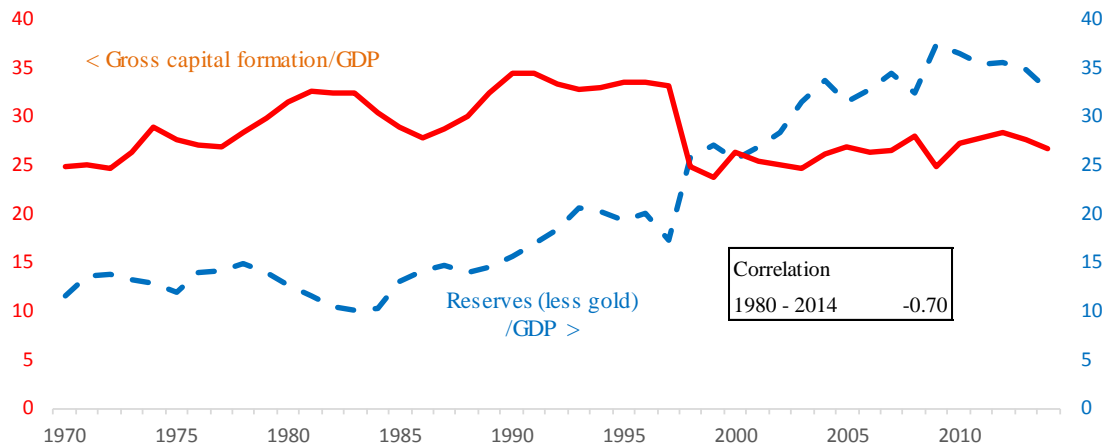
Figure 4 presents some summary information on the core phenomenon to be investigated, the reserve build-up in Asia. We provide information on the eight Asian economies in the sample, along with China and its province Hong Kong, which we report separately. International reserves (less gold), expressed as a share of GDP, averaged across our eight-country sample is plotted in the upper panel, plotted as the dashed line, and measured along the right axis.²⁵ Reserves relative to GDP had been on an upward trend from 1970 to 1997, not inconsistent with economies limiting exchange-rate strength to fuel export-led growth—i.e., a mercantilist motive. The level and trend picked up noticeably in 1998, as the insurance afforded by more reserves appeared more attractive after a severe financial crisis. As is evident in the table at the lower left, reserves relative to GDP increased since 1997 in all ten entries, all in double-digit amounts when scaled to nominal activity. The minimum level of reserves (the first column) is

²⁴ See for instance, Mohanty and Turner (2006), Rodrik (2006).

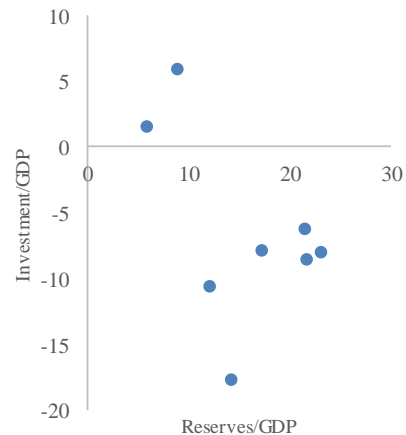
²⁵ We take an average of ratios, a topic discussed in more detail in Reinhart, Reinhart, and Rogoff (2015) because our focus is on official decisions in national economies. Taking the ratio of total reserves to regional GDP skews the discussion to the behavior of the largest economy in the group, which in Asia excluding China is Japan.

decidedly below the most recent observations (the last column) and set a long time ago (the second column).

Figure 4. Asian economies, excluding China: Gross Capital Formation and Reserves relative to GDP, percent



	Reserves relative to GDP, percent		Changes in reserves and investment relative to GDP, %, from 1997 to 2014	
	Minimum, 1970-2014	Change	1997-2014	2014
	level	year		
India	0.5	1990	9.0	14.8
Indonesia	1.6	1970	6.4	12.2
Japan	1.9	1992	20.8	26.7
Korea, Republic of	1.4	1974	21.7	25.3
Malaysia	10.9	1984	14.3	35.0
Philippines	1.7	1984	17.3	25.3
Singapore	51.5	1983	12.0	83.3
Thailand	4.0	1983	23.1	40.5
Memo:				
China	0.8	1980	22.7	37.2
Hong Kong SAR, China	31.9	1990	61.1	113.4



Source: World Bank, World Development Indicators, IMF, World Economic Outlook, and authors' calculations.

The most instructive observation to us, however, is the association of reserves with the average ratio of gross investment to GDP, the solid line in the upper panel measured along the left axis. (This is the aggregation of the data shown in Table 2.) Investment and reserves tend to move inversely in general and the crisis-driven jump in reserves was associated with a sharp drop in investment. Over the period from 1980 to 2014, the two series exhibit a correlation of -0.70. In interpreting the correlation, however, it is important to remember that these are linked via the balance of payments accounting identity. An

increase in official outflows (reserve accumulation), however, could just as plausibly translate to a reduction in the consumption-GDP ratio (public, private, or both) as in China post-2001. While reserve intervention/accumulation is a policy choice, it is improbable that it is not connected to a policy reaction function of one form or another, a point made by Obstfeld (1982).

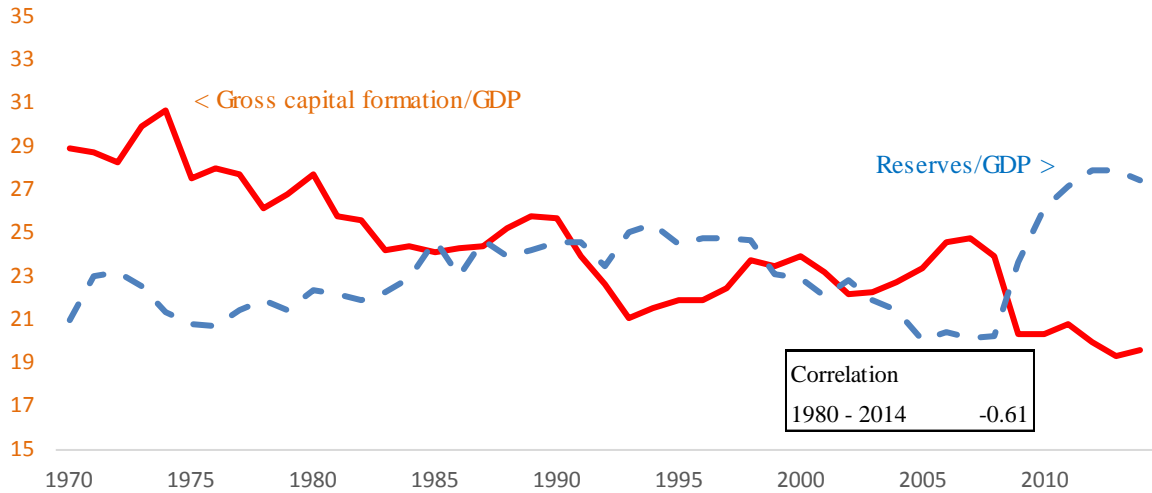
While 1997-1998 was the most severe crisis (by a number of metric) and certainly the most synchronous, it was not the only crisis in Asia since 1980. Indeed from 1980 to 1985, in addition to the Korean debt crisis (no default or restructuring ensued) of 1979-1980 and the default by the Philippines in 1983 (as was seen earlier in Table 3), there were systemic banking crises in Korea in 1983, and in Malaysia in 1985, Philippines in 1981, Singapore in 1982 and Thailand in 1983.²⁶ These crises did not produce as sharp a change in public policy attitudes toward the external sector as did the later crises, specifically as regards the danger of current account deficits and the desirability of a generous pool of foreign exchange reserves. So, while there is a sharp downturn in investment (which falls five percentage points between 1983 and 1986), the post crisis recovery in reserves is neither as sharp nor sustained as post 1997

China stands out with a significant build-up in reserves and an almost 10 percentage point gain in the average investment ratio post 1997. The “space” for simultaneous reserve accumulation and higher investment in the case of China was largely accommodated by a sharp decline in household consumption that leave the consumption share of households in 2013 at around 34 percent of GDP, roughly one half the US share and more than two standard deviations lower than the Asia average. Lardy (2008) and (2012) has connected the decline in household consumption (and household income) share of GDP in China to the large reserve build-up post 2000 in combination with financial repression. Jeanne (2012) formalizes this connection.

²⁶ See Kaminsky and Reinhart (1999), Park (2005) for a comparison of the two Korean crises and Athukorala (2010), who reviews the mid-1980s and 1997-1998 crises in Malaysia and the turbulence of 2008.

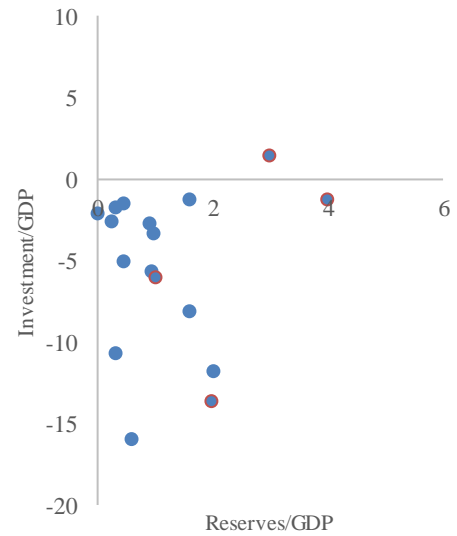
As for the eight economies in our core sample, the bottom right panel plots the pairwise combination of the change in reserves (along the horizontal axis) versus the change in the ratio of investment to GDP (along the vertical axis) from 1997 to 2014. In six out of eight cases, a reserve build-up matches up with declines in investment. Figure 5 repeats these comparisons for Europe and the United States, which shares with the previous figure both a crisis-driven ramp-up of reserves and a negative association between reserves and investment. Indeed, the correlation between the two lines almost matches that of the Asian sample. The range of variation, however, is about half in the Asian case. In the country-by-country comparison in the bottom half of the table, 8 of the 18 countries posted the low in their reserves levels after the crisis, most likely on valuation effects as the dollar value of euro holdings sank. All 18 accumulated reserves from 2008 to 2014, but there is a subset of five double digit gains. Denmark, Iceland, Norway, Sweden, and Switzerland stand apart because they have their own currencies but their economic activity aligns closely with the euro area. The purchase of reserves reflects some degree of fear of floating (in the Calvo and Reinhart, 2002, sense) as authorities leaned against the pressure of their currencies tending to appreciate *via-a-vis* the euro given the strains in the currency union. This process was most manifest in Switzerland, as the Swiss National Bank accumulated the reserve equivalent of seven months of annual national income to bring the reserve/GDP ratio to 71 percent in 2014. Note that the countries with more managed currencies also have the five largest warchests of reserves in the group. Across the group, the buildup in reserves after the crisis was almost uniformly associated with declines in the investment-to-GDP ratio.

Figure 5. Europe and the United States: Gross Capital Formation and Reserves relative to GDP, percent



	Reserves relative to GDP, percent		Changes in reserves and investment relative to GDP, %, from 2007 to 2014	
	Minimum, 1970-2014	Change		
	level	year	1997-2014	2014
Austria	2.0	2009	0.5	3.2
Belgium	1.8	2008	0.9	3.1
<i>Denmark</i>	1.9	1976	11.2	21.4
Finland	1.4	1976	0.5	3.2
France	1.0	1970	0.0	1.7
Germany	1.1	2008	0.3	1.6
Greece	0.1	2008	0.6	0.8
<i>Iceland</i>	3.1	1974	12.5	24.6
Ireland	0.3	2007	0.3	0.6
Italy	0.6	1975	0.9	2.2
Netherlands	1.2	2008	1.0	2.2
<i>Norway</i>	5.3	1977	-2.2	13.0
Portugal	0.5	2008	1.6	2.1
Spain	0.8	2008	2.0	2.8
<i>Sweden</i>	1.5	1970	4.6	10.1
<i>Switzerland</i>	8.2	2008	61.7	71.0
United Kingdom	1.1	1970	1.6	3.2
United States	0.2	1971	0.3	0.7

Changes in reserves and investment relative to GDP, %, from 2007 to 2014



Note: The five countries in italics maintain larger reserves, in part, to manage their currencies.

Source: World Bank, World Development Indicators, IMF, World Economic Outlook, and authors' calculations.

4.4. Temporal patterns

Our reading of the time series of reserves and investment is that they are contemporaneously linked. A negative correlation is evident over time and across economies that stabilize their exchange rate. A next step is assessing the temporal pattern of that relationship. Which comes first, a change in reserves or investment, or is all contemporaneous? Among the difficulties in establishing the link is that we have not offered a formal model, the official behavior that importantly helps to produce the association may be changeable, and regulation and the overall cost of finance varies over time and across region, as do exchange rate arrangements. Also, available observations are annual and we should logically limit our sample to the post-Bretton-Woods period.

In this section, we document the time-series association between reserves and investment for Asia, excluding China, and the five European nations with relatively larger and more variable reserves reflective of their efforts to smooth fluctuations of their exchange rates (Denmark, Iceland, Norway, Sweden, and Switzerland). In most of these economies, there have been massive increases in reserves, suggesting a need to scale those stocks to some nominal magnitude. Accordingly, our variables of interest are the regional averages of the ratios of reserves and investment to GDP (which will appear shortly in tables as R/Y and I/Y , respectively). This normalization should do much to make those variables stationary. Indeed, by definition, I/Y is bounded between 0 and 100 percent.²⁷

Given the importance of the time trend, we estimated two sets of vector autoregressions (VAR) using the reserve and investment ratios with two lags, a time trend, and dummies for the dates of the region's respective financial crises, 1998 and 2008. The results are reported in detail in Appendix Table 1 and summary statistics directly relevant to our concern about temporal precedence are provided in

²⁷ Still, despite the normalization, it cannot be rejected in most cases that the series are nonstationary, at least as judged by an augmented Dickey-Fuller tests using two lags of the dependent variable. However, the ADF test has lower power and, when we include a trend term, tended more toward rejecting nonstationarity. We also tested the residuals from an auxiliary regression of the investment ratio on the reserve ratio, the simplest test of cointegration conceivable. It is rejected, although less so for the Asian sample, which is why we did not opt for a vector error correction mechanism.

Table 6. The top of the table lists the two equations in R/Y and I/Y in the VARs estimated separately for the two regions. The top row for each region lists the F-test of excluding all lagged variables. The second row lists the consequences of using only lags of the dependent variable in each equation. As is evident, knowing the history of investment is not especially useful in predicting the path of reserves. This is consistent with the view that the reserve accumulation is largely a policy decision of the central bank. In contrast, knowing the history of reserves better helps to explain the evolution of investment, and in a statistically significant way for Asia. That is, reserves are temporally precedent to, or Granger-cause, investment.

Table 6. Tests of exclusions of blocks of explanatory variables in the VARs
Estimated with 2 lags over the annual sample, 1973 to 2014

$$\begin{aligned} \left(\frac{R}{Y}\right) &= e + f \times time + g \times d_Asia + a_1\left(\frac{R}{Y}\right)_{-1} + a_2\left(\frac{R}{Y}\right)_{-2} + b_1\left(\frac{I}{Y}\right)_{-1} + b_2\left(\frac{I}{Y}\right)_{-2} + u_{R/Y} \\ \left(\frac{I}{Y}\right) &= h + i \times time + j \times d_Control + c_1\left(\frac{R}{Y}\right)_{-1} + c_2\left(\frac{R}{Y}\right)_{-2} + d_1\left(\frac{I}{Y}\right)_{-1} + d_2\left(\frac{I}{Y}\right)_{-2} + u_{I/Y} \end{aligned}$$

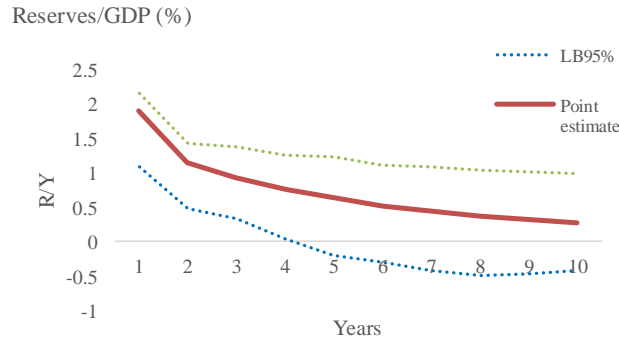
	in the equation explaining:	
	<u>R/Y</u>	<u>I/Y</u>
Asia, excluding China		
No lags useful	20.31	33.56
Only own lags useful	2.81	4.03
Advanced European economies with managed currencies		
No lags useful	41.40	12.76
Only own lags useful	1.12	1.95

Source: International Monetary Fund, IFS (international reserves) and WEO and World Bank, WDI (investment), authors' calculations.

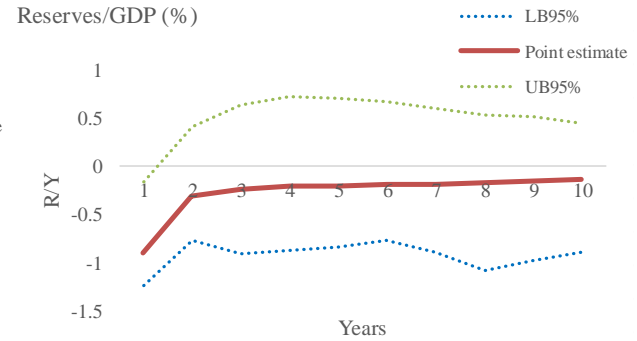
The final figure plots the impulse-response function from the Asian VAR, with reserves at the top of the causal order consistent with them being the product of a policy decision. A one-standard-deviation upward shock to reserves is associated with a pronounced and persistent decline in investment, although not much confidence can be taken from that point estimate after a couple of years.

Figure 6. Asia, excluding China: Response to a 1 standard deviation shock

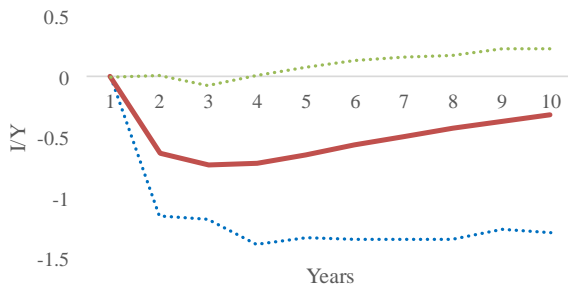
To reserves relative to GDP



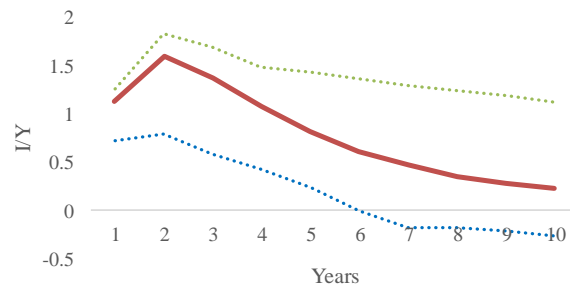
To investment relative to GDP



Investment/GDP (%)



Investment/GDP (%)



Source: International Monetary Fund, IFS (international reserves) and WEO and World Bank, WDI (investment), and authors' calculations.

V. Concluding Remarks

Much has been said about the macroprudential rationale for holding sufficient foreign currency reserves to cover short term liabilities. There is less agreement on how broad that coverage should be, especially if there is the potential for hidden debts and implicit guarantees on private sector liabilities. As a consequence, the concept of an optimal level of reserves is debatable. As reserve accumulation picked up momentum around 2000-2001, a number of studies have also emphasized that there is no free lunch. Reserve accumulation carries costs. Calvo's (1991) "perils of sterilization," written well before the Asian crisis, focused on the higher nominal interest rates that result from the central bank's effort to sterilize reserve accumulation.²⁸ Other perils, ranging from creating distortions in the banking sector, fueling

²⁸ This has not been the case in the most recent period of heavy financial repression in China, as discussed in Lardy (2008).

credit booms, and impairing central bank balance sheet, have been considered, not to mention the financing disadvantage of holding low-interest-rate safe assets.

The point emphasized in Bussiere, et al. (2013 and 2015) that reserve accumulation and capital controls may be best viewed as complements (rather than substitutes) has resonance to the analysis presented here. They found the greatest resilience to the global shock of 2008-2009 was among countries with high reserves and less than open capital account. In the longer horizon focus of this paper, the parallel would be that countries with relatively more pervasive capital account barriers may have a better chance of limiting the “crowding out effects” of reserve accumulation (official outflows) on investment. This may be because the controls themselves limit private outflows or capital flight--a leakage (to the extent, of course the measures are effective), because the magnitude of the desired the reserve accumulation is smaller (as the controls also insulate the domestic economy form external shocks), or a combination of the two.

The global consequences of this reserve build-up have been debated under various heading's, including Bernanke's saving glut and the attendant risks to capital-importing countries, prominently including the United States. Bernanke (2005) argued that interest rates in advanced economies were held down by a glut of saving from Asian economies. To this we would add that Asian investment has been held down because governments have been absorbing domestic saving to purchase the securities of the rest of advanced economies.

Then, there is the eternal quest in the international finance literature on how to measure capital mobility.²⁹ For one, the reserve buildup is potentially a large and variable leakage between domestic saving and investment. Thus a test of the mobility of capital in the spirit of Feldstein and Horioka might conclude capital flows freely because national investment is not constrained by saving. Indeed, domestic investment may be crowded out from using domestic saving because of the government's decision to build reserves. Interest parity conditions are silent on the volume of official to official versus private

²⁹ Obstfeld (1995) provides a comprehensive tour of this literature and Obstfeld, Shambaugh, Taylor (2010) also deal with some of these issues.

international capital flows, a phenomenon convincingly documented in Alfaro, Kalemli-Ozcan, and Volosovych (2013) and our discussion of rising post-crisis home bias.

We are not aware of other studies addressing this particular tradeoff between the size of the security blanket and the price in terms of the medium term growth consequences it may carry. It is relevant for Asia, not just because China and India have grown so large, but because several of the other countries have their own challenges, ranging from Japan's gargantuan public debt to signs of internal household credit booms in some of the other former crises countries as discussed. Perhaps the investment slump in Asia has been largely overlooked because, after all, investment ratios there are still among the highest world wide—but the post-crisis decline has been substantial.

Of course, the problem of dwindling investment is also a compelling policy challenge for many of the advanced economies facing large public and private debt overhangs. Indeed, it is an acute problem in the cases of periphery Europe, where capital market access remains limited at best and an ongoing credit crunch unfolds. In much of Europe, finance has turned inward and banks, pensions, and insurance are largely in the business of buying domestic government bonds and ever-greening significant levels of moribund private debt. Unlike Asia, however, the "leakage" draining domestic saving is not coming from central bank purchases of foreign assets as a rainy day fund is built. As Eichengreen, et.al. (2013) convincingly illustrate, much of Europe's post-crisis experience to date aligns more closely with Latin America's lost decade. To their analysis we would add that, like Latin America in the 1980s, capital flight from the periphery remains a drain on its domestic saving.

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Appendix Table 1. **Vector autoregressions**
 estimated with 2 lags over the annual sample, 1973 to 2014

$$\begin{aligned} \left(\frac{R}{Y}\right) &= e + f \times time + g \times d_{Asia} + a_1 \left(\frac{R}{Y}\right)_{-1} + a_2 \left(\frac{R}{Y}\right)_{-2} + b_1 \left(\frac{I}{Y}\right)_{-1} + b_2 \left(\frac{I}{Y}\right)_{-2} + u_{R/Y} \\ \left(\frac{I}{Y}\right) &= h + i \times time + j \times d_{Control} + c_1 \left(\frac{R}{Y}\right)_{-1} + c_2 \left(\frac{R}{Y}\right)_{-2} + d_1 \left(\frac{I}{Y}\right)_{-1} + d_2 \left(\frac{I}{Y}\right)_{-2} + u_{I/Y} \end{aligned}$$

	in the equation explaining:			
	R/Y		I/Y	
	<i>coefficient</i>	<i>standard error</i>	<i>coefficient</i>	<i>standard error</i>
Asia, excluding China				
constant	6.55	4.90	3.02	3.75
time	1.29	1.52	-2.90	1.16
dummy for Asian crisis	0.21	0.10	-0.08	0.08
$R/Y(-1)$	0.34	0.24	0.51	0.18
$R/Y(-2)$	0.36	0.23	-0.44	0.17
$I/Y(-1)$	-0.56	0.25	1.40	0.19
$I/Y(-2)$	0.33	0.26	-0.48	0.20
Adjusted R²	0.96		0.82	
Advanced European economies with managed currencies				
constant	-8.47	4.99	12.37	3.96
time	1.73	1.67	-0.26	1.33
dummy for global crisis	0.13	0.05	-0.11	0.04
$R/Y(-1)$	1.20	0.19	0.02	0.15
$R/Y(-2)$	-0.35	0.20	0.10	0.16
$I/Y(-1)$	0.08	0.23	0.90	0.18
$I/Y(-2)$	0.15	0.24	-0.29	0.19
Adjusted R²	0.93		0.82	

Source: International Monetary Fund, IFS (international reserves) and WEO and World Bank, WDI (investment), and authors' calculations.