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Managing Financial Integration and Capital Mobility—
Policy lessons from the past two decades

Joshua Aizenman and Brian Pinto¹

Abstract

The accumulated experience of emerging markets over the last two decades has laid bare the tenuous links between external financial integration and faster growth on the one hand and the proclivity of such integration to fuel costly crises on the other. These crises have not gone without learning. During the 1990s and 2000s, emerging markets converged to the middle ground of the policy space defined by the macroeconomic trilemma, with growing financial integration, controlled exchange rate flexibility and proactive monetary policy. The OECD countries moved much faster towards financial integration, embracing financial liberalization, opting for a common currency in Europe, and for flexible exchange rates in other OECD countries. Following their crises of 1997-2001, emerging markets added financial stability as a goal, self-insured by building up international reserves and adopted a public finance approach to financial integration. The global crisis of 2008-09, which originated in the financial sector of advanced economies, meant that the OECD “overshot” the optimal degree of financial deregulation while the remarkable resilience of the emerging markets validated their public finance approach to financial integration. The story is not over: with capital flowing in droves to emerging markets once again, history could repeat itself without dynamic measures to manage capital mobility as part of a comprehensive prudential regulation effort.

¹ University of California and NBER; and the World Bank, respectively. This paper is part of a broader investigation at the PREM Anchor of the World Bank on financial integration and economic growth in developing countries. The views herein are entirely those of the authors. They do not necessarily represent the views of the International Bank for Reconstruction and Development/World Bank and its affiliated organizations, or those of the Executive Directors of the World Bank or the governments they represent, or the NBER.

INTRODUCTION

Emerging market countries suffered a string of severe macroeconomic crises between 1997 and 2001 starting with East Asia and then continuing with Russia (1998), Brazil (1998-99), Argentina and Turkey (2000-01). These crises coincided with a period of growing external financial integration. In spite of the reforms subsequently undertaken, few economists would have predicted that developing countries, emerging market and non-emerging market alike, would perform as well as they did during the Great Recession of 2008-09 and accompanying global financial crisis.² Not only did developing countries display considerable resilience during the crisis of 2008-09, their economic take-off, including the most populous countries China and India, has gradually led to more than half of PPP-adjusted global GDP being produced by these countries by 2010. In this sense, the crisis of 2008-09 is a tectonic shift that could unravel Bretton Woods II (BW II) and herald a move from a US-centric towards a multi-polar world.³

A widely prevalent view before the Great Recession was that global imbalances, epitomized by the current account deficits of the US funded by the surpluses of China and other emerging market economies, supported the growth of emerging markets in a sustainable way. BW II viewed global imbalances as a win-win configuration -- the allegedly superior financial intermediation of the US absorbed the excess savings of the rapidly growing countries, facilitating their growth as the US became the demander of last resort. Accordingly, the dollar standard of BW I continued its operation in a modified world of growing financial and trade integration, with the US the provider of global liquidity and global insurance services to emerging markets. The massive accumulation of international reserves (IR) was seen as the counterpart of the BW II system, whereby the US benefited from the “exorbitant privilege” of funding its fiscal and current account deficits at a lower cost, while China enjoyed export led growth. Financial liberalization and integration were viewed as a win-win process, consistent with the operations of the above regime.

With the Great Recession and global financial crisis of 2008-09 raising profound questions about the efficacy of international capital markets and the inadequate regulation even of sophisticated financial systems like that of the US, this paper provides an overview of the policy lessons from the crisis, and the impact of financial policies and capital mobility on the growth and

² See for example, Development Committee (2010).

³ The Bretton Woods System or BW I was set up 1944 to deal with post World War II challenges. This was a period when Western Europe and the US engaged in growing trade integration while maintaining capital controls. The collapse of BW I in the early 1970s coincided with a rapid financial integration of the OECD countries. This was followed by the financial opening of emerging markets in the 1990s, leading to a rapid increase in their demand for international reserves and, according to Dooley et al. (2003), to the emergence of BW II.

stability of emerging markets and the global economy. The paper starts with a selective review of the literature on financial globalization and growth. It then continues with the response of both the industrialized and developed countries to financial globalization, pointing out the stark differences. This discussion is organized around the macroeconomic trilemma, or the idea that countries can choose at most two out of the following three: an open capital account (financial integration); independent monetary policy; and a fixed exchange rate.

Next comes a review of the large accumulation of international reserves (IR) by emerging market countries. BW II is only one explanation. Arguably, the global crisis has chipped away at the credibility of the BW II, US-centric interpretation of global financial intermediation. We also discuss other explanations for IR accumulation like the buffer stock argument, mitigation of real exchange rate volatility, mercantilism reflecting concerns about relative competitiveness, and self-insurance against foreign and domestic shocks. Self-insurance with an added emphasis on financial stability and putting the fiscal house in order emerges as the most convincing explanation in a second-best world.

The discussion on IR accumulation is followed by outlining a public finance approach to financial integration based in large part on the actual response of emerging markets to their crises of 1997-2001. A provocative hypothesis is that the global crisis of 2008-09 means that the financial sector in OECD countries may have grown beyond socially desirable levels, pitting those who would reform it with a view to restricting its untrammelled growth against those with vested interests in a minimum of regulation and publicly funded bailouts; while the comparative resilience of developing countries is a tribute to the corrective measures they took after their own crises of 1997-2001. The paper ends with a summary of policy conclusions.

LITERATURE SURVEY

This selective survey is divided into two parts: the links between financial globalization and growth on the one hand and macroeconomic crises on the other.

Financial Globalization and Growth⁴

Expectations and optimism were rife at the beginning of the 1990s that growing financial integration would speed up growth in developing countries and help with income convergence. The channel through which this would happen would involve global savings being channeled into investment in capital-scarce developing countries. Aizenman, Radziwill and Pinto (2004, 2007)—APR—examined whether there was any increase in the extent to which the domestic physical stock of capital in developing countries was financed by foreign savings consequent

⁴ This section draws on chapter 7 in Pinto (Forthcoming).

upon growing financial integration. They constructed a “self-financing ratio” for the period 1991 to 2001 using a 10-year horizon for 47 developing countries and 22 OECD countries using data for the period 1981-2001. The first step was to derive an estimate of the capital stock in year t minus 10 using the national income accounts. The next step was to add the cumulative national investment over the 10-year period to this initial capital stock, and then divide this by the initial capital stock plus the cumulative national savings over the same period to obtain the self-financing ratio, with suitable adjustments made for depreciation.⁵ The purpose was to see how the self-financing ratio varied over the 1990s in response to growing financial integration and to compare the 2001 ratio with that in 1991.

APR’s main findings were first, that the average self-financing ratio for developing countries did not change much over the 1990s, global financial liberalization notwithstanding. Second, there did not seem to be a growth bonus associated with greater external financing of the domestic capital stock. To the contrary, countries with higher self-financing ratios grew significantly faster. Third, more volatile self-financing ratios were associated with lower growth; but this result disappears when a proxy for the quality of institutions was included in the cross-country regressions. But the strong, asymmetric effect of self-financing on growth remained: a rise in the self-financing ratio from 1.0 to 1.1 was associated with increasing the average per capita growth, from 2.8 percent to 4.4 percent, while a drop from 1.0 to 0.9 lowered per capita growth from 2.8 percent to 2.2 percent.⁶

Self-financed growth is not a new idea. Feldstein and Horioka (1980) wrote a seminal paper asking how internationally mobile capital really was. In regressing national investment rates on national savings rates for 21 OECD countries using data from 1960 to 1974, they consistently found coefficients close to 1.0 and stable over time. These results were evocative of a closed economy, suggesting capital was not as mobile across borders as might have been assumed; if it were, one would expect a close to zero correlation between national saving and national investment. This finding became enshrined as the “Feldstein-Horioka puzzle” and is evocative of home biases and self-financed growth.⁷

In a paper related to APR, Prasad, Rajan and Subramanian (2007)—PRS—examined the links between capital flows and growth in the financially globalized 1990s. The starting point of their enquiry was twofold: the perverse flow of capital from poor to rich countries; and the

⁵ For details and caveats, see Aizenman, Pinto and Radziwill (2004, 2007).

⁶ If the country is on average running current account surpluses, the self-financing ratio would exceed 1.

⁷ It would of course be a genuine puzzle only if there were no legal restrictions on capital flows across countries. In other words, F-H were testing de facto capital mobility. See Obstfeld and Rogoff (1996) for further discussion of the various F-H interpretations.

allocation puzzle of Gourinchas and Jeanne (2006), namely, that within the group of developing countries, net capital inflows tend to find their way to the slower-growing countries. Against this background, PRS found a positive correlation between average current account balances and average growth rates for developing countries after controlling for the standard growth determinants during 1970-2000. Moreover, they find that this correlation was driven more by savings than investment: when savings-to-GDP is included in the growth regression, the coefficient on the current account balance dropped to zero but remained virtually unchanged when the investment rate was included (recall the accounting identity national savings = current account surplus plus investment), suggesting the dominant role of savings.

The explanation PRS favor about why savings are positively correlated with growth is that financial systems tend to be under-developed in developing countries. So not all the savings are intermediated into investment and part of it gets parked abroad via current account surpluses, leading to an accumulation of foreign exchange reserves. Alternatively, foreign exchange reserves get built up either because countries want to avoid overvaluation or because they want a cushion against the volatility of capital flows.

The preceding results fly in the face of neoclassical economics, according to which capital should flow from rich to poor countries in order to equalize per capita incomes. One reason this may not happen is that expected marginal returns may not be higher in poorer countries even though they have lower capital-to-labor ratios either because of low total factor productivity or high risk or both. But even in a situation where marginal returns are higher in poorer countries, the welfare benefits of financial integration may be limited. Gourinchas and Jeanne (2006) examined financial integration in a calibrated neoclassical model and found that the welfare gains in switching from financial autarky to full capital mobility equal a paltry 1 percent increase in domestic consumption for the typical non-OECD country. This should come as a dampener to economists who may have advocated capital account openness as a way of speeding up income convergence.

The truly compelling point in Gourinchas-Jeanne is that financial integration will have a significant impact on welfare only if it contrives to substantially bridge the gap between the *levels* of total factor productivity in poor and rich countries—which goes substantially beyond simply equalizing *growth rates* or even the marginal returns to capital. For example, Gourinchas-Jeanne find that if financial integration eliminated 25 percent of the productivity gap with the US, the welfare gains for the prototypical developing country would be 50 times larger than that in the standard neoclassical model.

The big question therefore is whether financial integration can help bridge this gap and if so, what the channels would be. For example, foreign direct investment could help narrow productivity gaps through technological spillovers; but it is far from obvious that letting foreign portfolio investors into the stock market or government treasury bill market in developing countries can do this. In other words, the type of financial inflow matters, a point looked at in a detailed, disaggregated fashion by Aizenman and Sushko (2011a). They examined the differential impact of portfolio debt, portfolio equity, and FDI inflows on 37 manufacturing industries, 99 countries over 1991-2007, extending the Rajan-Zingales (1998) methodology. Net portfolio debt inflows were found to be negatively associated with growth during the mid 1990s. The magnitudes of the negative effect of surges in portfolio debt inflows on growth were substantial in the late 1990s for a number of countries. The effect of debt inflows on growth in the 2000s was rather muted. Surges in portfolio equity inflows also exhibit a negative association with aggregate growth in the manufacturing sector.⁸ Equity inflows exhibited economically significant positive impact on the growth of financially constrained industries, unlike their negative impact on the average manufacturing growth rate. FDI inflows exhibited a positive association with aggregate manufacturing growth during most of the sample period, both at the aggregate level and specifically for the industries in need of external financing.

Financial Globalization and Crises

As a point of transition between financial integration and its links with growth versus crisis, we start with the main findings in the burgeoning literature on conditions conducive to growth acceleration and economic takeoffs [see Hausmann, Pritchett, and Rodrik (2005) and Aizenman and Spiegel (2010), and the references therein]. This literature has been motivated in part by the growing global weight of emerging-market economics and the growing gap between nonemerging developing and the emerging market countries. Is financial integration conducive to sustainable takeoffs and economic growth? Aizenman and Sushko (2011b) suggest a rich and complex marginal association between various capital flows and economic takeoffs. Higher FDI inflows are associated with a higher takeoff probability relative to zero FDI inflows, and this effect is highest for the Latin America subsample. In contrast, a higher stock of short-term external debt has been associated with a substantial *negative* effect on the probability of a takeoff, and the cumulative effect of the short-term debt overhang is largest for Latin American countries. Yet, virtually all the takeoffs were associated with a rise in portfolio debt inflows. This

⁸ For instance, the inflow surge during the financial liberalization period, 1993-1994, was associated with a sharp decline in aggregate manufacturing sector growth, but a rise in the growth of relatively more financially constrained industries.

effect is substantial for Latin America, while it is virtually absent in Sub-Saharan Africa. The association between financial links through portfolio equity flows and takeoffs is negative.

The analysis of the *duration* of takeoffs shows that higher net portfolio debt inflows increase it while the opposite is true of equity inflows. In contrast, higher net FDI inflows at the time of the takeoff are associated with a lower probability that the takeoff will be sustained. This finding parallels that of Prasad, Rajan, and Subramanian (2007), who find that the positive association between FDI and economic growth observed between 1970 and 2000 no longer held between 2000 and 2004, and of Aizenman and Sushko (2011a), who find that the relationship between FDI inflows and real sector growth turns from positive to negative following prolonged periods of steady FDI inflows into a country.⁹

In sum, it is not just the degree of financial openness, but the nature of financial integration that matters for a country's prospects of embarking on and sustaining economic takeoffs. Furthermore, the complex association between FDI and economic takeoffs – direct financing is associated with greater number of takeoffs, but not with the most sustained ones – is in line with several recent studies that detect a non-linear association between the accumulation of FDI and growth.

Turning now to the financial integration-crisis link, more than any literature survey, the spate of emerging market crises after 1997 is eloquent testimony to the difficulty of avoiding macroeconomic and financial crises with an open capital account and a high degree of financial integration. In addition to these two features, countries which suffered a serious macroeconomic crisis between 1997 and 2001 were apt to exhibit a fixed exchange rate (all; explicit in some cases as part of disinflation programs, e.g. Argentina, Brazil, Russia, Turkey and implicit in the case of Thailand and other East Asian countries); unsustainable government debt dynamics (Argentina, Russia) or big jumps in government debt as a result of private sector bailouts (East Asia, Turkey); and balance sheet problems (East Asia in particular, also Argentina and Turkey, with liabilities, often short-term, denominated in US dollars and assets in local currency).¹⁰

If any set of countries stood a chance of benefiting from financial integration, surely the European Union accession countries would qualify because of the financial, product and factor

⁹ One interpretation of this result is that countries in which the economic takeoff is driven by FDI inflows converge to a new steady state faster, resulting in a shorter duration of high growth rates. Alternatively, “green” FDI may compete for financing with domestic firms, crowding incumbent firms out of local bank lending, especially if the domestic financial industry is not sufficiently developed.

¹⁰ For case studies, see Servén and Perry (2005) on Argentina, Pinto and Ulatov (2011) on Russia. An overview is contained in Gill and Pinto (2005). Aizenman and Sun (2009) document the key role of balance sheet exposure in explaining the use of international reserves by half of the emerging markets during the crisis. See also Eichengreen Hausmann and Panizza (2003) for a discussion of the implications of balance sheet exposures on the vulnerability of developing countries.

market integration bolstered by the superior institutional pull of the EU. But even here hangs a cautionary tale, compellingly illustrated by the experience of the Euro periphery countries, Greece and Portugal. Blanchard and Giavazzi (2002) argued that the large current account deficits they were running at the turn of the millennium were consistent with neoclassical income convergence. These deficits could be explained by higher returns to capital in these capital-scarce, poor countries relative to the Euro Area average, which would propel investment. In addition, higher expected growth would tend to increase consumption in line with the permanent income hypothesis and lower savings. Both factors would lead to larger current account deficits. Empirically, the authors found a growing positive link over time between income and current account balances in the euro area, with the rise in the current account deficits of the poorer countries driven more by a decline in private savings than an increase in investment—a pattern replicated in Greece and Portugal. They also found a decline in the cross-country correlation between savings and investment in the euro area, concluding that “At least for this last group, the Feldstein-Horioka phenomenon appears to have largely disappeared.” (Blanchard and Giavazzi B-G 2002 p. 149). Since the large current account deficits of Greece and Portugal were driven by convergence and integration, B-G argued that there was no immediate cause for worry.

In contrast to Greece and Portugal (but in keeping with self-financed growth) B-G noted that Ireland grew much faster by raising public and hence national savings dramatically. This enabled current account surpluses as well as higher investment rates. The eventual outcome was that Ireland’s PPP GDP per capita raced from 70 percent of the EU average in 1987 to 120 percent by 2002. Post Great Recession and as of writing this paper, all three countries are mired in a serious sovereign debt crisis—Ireland’s driven by the bailout of its private banks and Greece’s and Portugal’s by unsustainable public debt dynamics.¹¹

The idea that financial liberalization could stoke vulnerability and eventually publicly financed bailouts of the private sector was not new: the Irish crisis of 2011 is similar to East Asia’s over 1997-98, where the public finances were sustainable but contingent liabilities built up on the balance sheets of the private sector. And East Asia’s crisis in turn was eerily similar to Diaz-Alejandro’s (1985) classic description of the crises in the Southern Cone and Chile in particular over 1979-82 replete with a fixed exchange rate and costly bailouts of the private sector. From the perspective of our paper, what made a vital difference to emerging market countries were the steps they took after 2001 to self-insure, of which the most visible

¹¹ IMF (2008) chapter 6 discusses the sharp contrast between the persistent current account surpluses in emerging Asia and the current account deficits in emerging Europe, and the sustainability of both. The experience of Greece and Portugal indicates that even seemingly benign current account deficits pose the risk of a build up of serious vulnerability over time.

manifestation was the building up of IR—although, as we shall see, other equally important measures were taken.

DEVELOPING COUNTRY RESPONSE TO MACROECONOMIC VULNERABILITY

Putting the crises of the 1980s and the 1990s together, emerging markets have been on a steep learning curve. In this section we link financial stability to the broader context of the macro tradeoffs facing emerging markets and developing countries. In the 1980s, most emerging markets operated with low financial integration and rampant capital controls, strong preferences for exchange rate stability, relatively low levels of international reserves-to-GDP ratios, and active monetary policy. These patterns were modified substantially during the 1990s and 2000s.

Navigating the trilemma

A compact way of capturing the response of developing countries is to base it on the macroeconomic policy trilemma. This trilemma, or the ability to accomplish at most two out of following three policy objectives – financial integration, exchange rate stability and monetary autonomy- is a key implication of the Mundell-Fleming macroeconomic framework. A lingering challenge in applying it is that, in practice, most countries rarely face the binary choices articulated by the trilemma. Instead, countries choose the degree of financial integration and exchange rate flexibility. Aizenman, Chinn and Ito (2010) allow for this by constructing three indexes measuring the trilemma dimensions of each country. Applying these indexes, Aizenman et al. (2011) validated that the weighted sum of the three trilemma policy variables adds up to a constant, where all the weights are positive.¹² This result confirms the notion that a rise in one trilemma variable is traded off against a linear weighted drop in the sum of the other two.

Figure 1 plots the average patterns of the trilemma indexes for emerging markets, developing non-emerging market countries, and the industrialized countries, where each index is normalized to between 0 and 1 (the definitions are contained in the notes to Figure 1). The figure indicates that emerging markets have converged to the middle ground of the economic trilemma:

¹² The analysis was applied to a panel of the trilemma indices of 50 countries (32 of which are developing countries) during 1970-2006 period for which there is a balanced data set (the requirement of a balanced panel reduced the number of countries in the sample substantially). The study applies a linear regression, testing the hypothesis that the linear sum of the three indices (without a constant term) adds up to a positive constant, where all the regression coefficients are positive. The regression analysis confirms this hypothesis, with R^2 well above 0.9, for three sub-groups: Industrial Countries, Non-Emerging Developing Countries, and Emerging Market Countries. The overall results are robust to the possibility of allowing structural, endogenously determined breaks in the data (the years of 1973, 1982, 1997-98, and 2001 were identified as candidates for structural breaks, and tested for the equality of the group mean of the indexes over the candidate break points for each of the subsample groups).

controlled financial openness, managed exchange rate flexibility, and active monetary policy. In contrast, the OECD countries have opted for more polarized choices in the trilemma configuration: rapidly approaching full financial integration, and either flexible exchange rates (and active monetary policy) or a currency area in Europe (where each country gives up its monetary independence).

Between the late 1970s and the late 1980s, the level of monetary independence in industrialized and developing countries was similar. However, a divergence began in the early 1990s. While developing countries have been hovering around intermediate levels of monetary independence and slightly deviating from the cross-country average, industrialized countries have steadily become much less independent in terms of monetary policy, reflecting the decisions made by the euro member countries.¹³

Regarding the exchange rate, industrialized countries experienced a constant level of exchange rate stability until the end of the 1990s, while developing countries have been on a clear trend toward more exchange rate flexibility since the mid-1970s. After the introduction of the euro in 1999, industrialized countries drastically increased the level of exchange rate stability while developing countries continued to remain around the mid-level of exchange rate flexibility.¹⁴

Not surprisingly, industrialized countries have achieved higher levels of financial openness throughout the period. The acceleration of financial openness in the mid-1990s remained significantly higher than the cross-country average of both the full sample and developing non-emerging markets subsample. For emerging markets, there has been a marked trend towards financial openness after 1990, but only after some retrenchment during the 1980s. This would appear to be the big difference between emerging markets and developing, non-emerging markets. Indeed, the main take away from the perspective of the discussion which follows is that emerging market countries sharply increased their financial openness after 1990 while settling for moderate levels of exchange rate flexibility and monetary policy independence.

Building up International Reserves¹⁵

Despite the proliferation of greater exchange rate flexibility for developing countries noted above, the ratio of international reserves to GDP has increased substantially, as shown in

¹³ When the euro countries are removed from the industrialized countries sample, the extent of the divergence from the average becomes less marked although there is still a tendency among the non-euro countries to move toward lower levels of monetary independence.

¹⁴ The trend of the non-euro industrialized countries after the late 1990s more or less traces that of developing countries though it is a little more volatile.

¹⁵ This section draws on Aizenman (2011).

Figure 2. At the end of 1999, reserves were about 6 percent of global GDP, 3.5 times what they were at the end of 1960, and 50 percent higher than in 1990. Practically all the increase in reserve holdings has been in developing countries, mostly in East Asia (Flood and Marion 2002), with the question of whether reserve holdings were excessive being raised (Edison (2003)). Reserve accumulation continued in the 2000s, with emerging markets increasing the ratio of international reserves to GDP from single-digit percentage levels in the 1980s to 15 to 30 percent of GDP for most, with some countries exceeding 50 percent (China, Hong Kong, Singapore in 2007)—something unprecedented.

Table 1: Evolution of reserve adequacy measures

Period	Evolving adequacy measure	Influential contributors
1950s-1980	Months of imports; dealing with trade volatility	Triffin, Heller
Late 1990s-early 2000s	Short term external debt/IR, dealing with sudden stop of capital flows	Guidotti-Greenspan
2000s	M2/IR, dealing with sudden capital flight from domestic assets	Calvo Obstfeld, Shambaugh & Taylor
2000s	Hybrid; increasing with external debt/GDP, M2/GDP, country risk, and foreigners' shareholdings.	Wijnholds and Kapteyn Aizenman, Lee and Rhee
2000s	Provided a calibration cum estimation that allows estimating "optimal IR" as a function of the costs and probability of sudden stops	Garcia and Soto Jeanne & Ranciere Jeanne

This section focuses on the evolution of the underlying motives for IR accumulation by developing countries. Table 1 shows the evolution of 'reserve adequacy ratios' overtime. Under BW I, IR served mostly as a buffer to deal with trade uncertainty. Reserve adequacy was measured by months of imports with a rule of thumb considering four months of imports reasonable. This approach was suitable in a world with limited financial integration, with trade openness being the main channel for external shocks (Fischer 2001). Absent sufficient reserves, balance of payments deficits would have to be corrected through sharp contractions in investment and consumption, thereby inducing recessionary pressures. This rule of thumb gave way to the cost-benefit calculus of the buffer stock approach, which in turn was replaced by the Guidotti-Greenspan rule. Guidotti-Greenspan culminated in self-insurance as financial considerations became dominant and the growing exposure of emerging markets to sudden stops and capital

flight crises increased the demand for IR as a cushion against financial instability. We review this evolution.

Buffer stock approach

The early literature focused on IR as a buffer stock in supporting an adjustable-peg or managed-floating exchange-rate regime. Heller (1966) was the first to derive the optimal level of reserves using a cost-benefit approach.¹⁶ Frenkel and Jovanovic (1981) reformulated Heller's approach in an optimal inventory management framework balancing the macroeconomic adjustment costs incurred in the absence of reserves, or when reserves get exhausted, with the opportunity cost of holding reserves. Extensions of the buffer stock model predict that average optimal reserves depend negatively on the opportunity cost of reserves, and exchange rate flexibility; and positively on GDP, adjustment costs, and reserve volatility, driven frequently by the underlying volatility of international trade. Overall, the literature of the 1980s supported these predictions (Flood and Marion 2002).

Guidotti-Greenspan Rule

The financial integration of the 1990s made the reigning measures of reserves adequacy based on trade flows obsolete as more volatile financial flows became dominant. The presumptive candidate advanced as the new measure of adequate reserves was the Guidotti-Greenspan rule advanced in 1999: reserves needed to match short-term external debt (defined as total external debt with an original or remaining maturity less than a year plus interest due). Such a level would provide the central bank with the needed liquidity to meet the demand for foreign currency if a sudden stop prevented external refinancing of the short-term debt. Back-of-the-envelope calculations suggests that the expected benefit of following the Guidotti-Greenspan rule is about 1 percent of GDP if holding reserves equal to short-term external debt reduced the annual probability of a sharp reversal in capital flows by 10 percent (in line with Rodrik and Velasco (1999), Rodrik (2006)), and if the output cost of a financial crisis is about 10 percent of GDP, as found by Hutchison and Noy (2006). Similar results have been obtained using more elaborate models (Garcia and Soto (2004); Jeanne and Ranciere (2006)).

One challenge to the Guidotti-Greenspan rule came from the concern that it focused on exposure to external volatility in the form of a sudden stop in capital inflows. Yet, policy makers may also accumulate reserves as a buffer against internal volatility. Domestic instability may trigger internal conflicts, leading to "sudden capital flight." In these circumstances, the private

¹⁶ The benefit from holding reserves in Heller's model stems from the ability to avoid a reduction in output in case of a deficit in the balance of payments. The opportunity cost of holding reserves is the gap between the return on capital and on reserves.

sector would opt to swap domestic currency assets with assets denominated in foreign currency (Calvo (2006)). Obstfeld, Shambaugh and Taylor (2010) found that the liquid liabilities of the banking system as measured by M2 provide a good proxy for the domestic exposure to such liquidation shocks. A higher ratio of international reserves to M2 would provide a thicker cushion, thereby reducing the adverse effects of sudden capital flight on the real exchange, and possibly even reducing the probability of a sudden capital flight crisis in the first place (to the extent that such a crisis has a self-fulfilling element).

Calvo's "sudden capital flight" concerns were vividly illustrated by the Argentine financial meltdown of the early 2000s. The hope that backing the monetary base by international reserves would prevent exchange rate instability was dashed. A lesson of the Argentine crisis is that currency boards and fixed exchange rate arrangements should be supported with stringent prudential supervision, and the dynamic management of reserves. Reserves should be well above the monetary base, reflecting the entire balance sheet of the economy. Hong-Kong's experience supports this logic, suggesting that enduring fixed exchange rate regimes are feasible provided there is constant investment in credibility, including possibly by a decrease in the discretionary element of policies (see Genberg and Hui (2011)). A hefty international reserve position, well above the monetary base, and a large sovereign wealth fund, would help.

The second challenge came from an analysis of post-1998 trends in hoarding reserves, especially in East Asia. The greater flexibility of the exchange rates should have worked in the direction of reducing reserve hoarding, but the opposite was clearly happening. While the Guidotti-Greenspan rule focused on the ratio of reserves to short-term debt, Kim et al. (2005) looked at a more flexible rule based on the behavior of different types of capital flows. An application to selected Asian countries led them to conclude that the countries affected by the East Asian crisis held excessive reserves by 2003—the affected countries had already built up more than adequate reserve levels to handle a repeat of the actual capital outflows that occurred during the 1997–98 crises scaled up to 2003 values.

But a new variable crept into this debate about whether reserve holdings were really excessive: the rapidly changing structure of EMs' financial integration, which implied that future crises would not resemble earlier ones. For example, one of the countries affected by the 1997–98 crisis, Korea, lifted restrictions on foreign equity ownership in the aftermath of the crisis. In response, foreigners' shareholding as a percentage of the total market capitalization rose from 12 percent in 1997 to 40 percent by 2003. Arguably, the sizable accumulation of reserves by Korea during that period may have reflected the wish to cover short-term external debt plus some portion of the foreigners' shareholdings, with the intention of reducing the chances of large real

exchange rate depreciations associated with capital flow reversals (Aizenman, Lee and Rhee (2007)).¹⁷ This debate led to the notion of self-insurance. But before we go discuss self-insurance as a prime motive for reserve accumulation, we present its rival, the mercantilist view.

Mercantilism and relative competitiveness

The views linking the large increase in hoarding reserves to growing exposure to sudden stops associated with financial integration face a well-known contender in a modern incarnation of mercantilism (Dooley, Folkerts-Landau and Garber 2003). According to this interpretation, reserve accumulation is a by-product of promoting exports, which is needed to create better jobs, thereby absorbing abundant labor in traditional sectors. Though intellectually intriguing, this interpretation remains debatable—the history of Japan and Korea suggests the near-absence of mercantilist hoarding of international reserves during the phase of fast growth, and the prevalence of export promotion by preferential financing in targeted sectors. Floundering economic growth led to the onset of large hoarding of reserves in Japan and Korea, probably due to both mercantilist motives and self-insurance in order to deal with growing fragility of the banking system. These perspectives suggest that the massive hoarding of reserves by China is a hybrid of the mercantilist and self-insurance motives. Yet mercantilist hoarding by one country may induce competitive hoarding by other countries to preempt any competitive advantage gained by the first country, a reaction that would dissipate most competitiveness gains (Aizenman and Lee 2008). This view is supported by the interdependence of the demand for international reserves among East Asian countries (Cheung and Qian 2009).

Self-insurance

Self-insurance is a natural progression in the debate about whether emerging markets hold excessive reserves. Deeper financial integration of developing countries has increased their exposure to volatile short-term inflows of capital (or “hot money”) subject to frequent sudden stops and reversals (see Calvo 1998; Edwards 2004). The magnitude and speed of the reversal of capital flows throughout the 1997–98 East Asian financial crisis shocked most observers (Aizenman and Marion 2003). East Asian countries had been perceived as less vulnerable to the perils associated with hot money than Latin American countries. After all, these countries were more open to international trade, had sounder fiscal policies, and much stronger growth performance. In retrospect, the 1997–98 crisis exposed the hidden balance sheet vulnerabilities

¹⁷ This policy stopped around 2005, delinking reserve accumulation from increases in external borrowing [see Aizenman, 2010, “Macro Prudential Supervision in the Open Economy, and the Role of Central Banks in Emerging Markets,” *Open Economies Review*].

of East Asian countries, forcing the market to update the probability of sudden stops affecting all countries.

Against this, hoarding international reserves can be viewed as a precautionary step, a form of self-insurance against sudden stops. “Self-insurance” has several interpretations. The first focuses on international reserves as output stabilizers (Ben-Bassat and Gottlieb 1992; Aizenman and Lee 2007). International reserves can reduce the probability of an output drop induced by a sudden stop and/or curtail the depth of the output collapse when the sudden stop materializes, an argument that is in line with the Guidotti-Greenspan rule of thumb. Rodrik (2006) sets out the logic of the Guidotti-Greenspan rule precisely in terms of avoiding the costs of sudden stops. He points out that it remains a puzzle why developing countries have not tried harder to reduce short-term foreign liabilities.¹⁸

A related view of self-insurance is that hoarding international reserves is needed to stabilize fiscal expenditures in developing countries (Aizenman and Marion 2004). Specifically, a country characterized by volatile output, inelastic demand for fiscal outlays, high tax collection costs, and sovereign risk may want to accumulate both IR and external debt, a combination that allows the country to smooth consumption when output is volatile. This framework also suggests that greater political instability would reduce reserve accumulation, a result that is supported by the data. By implication, higher international reserves, other things being equal, may signal lower susceptibility to crisis, thereby reducing sovereign spreads.¹⁹

A similar angle is that reserve accumulation may lower real exchange rate volatility, in turn permitting a smoother output path and a potentially higher growth rate (Hviding, Nowak and Ricci (2004), Aizenman and Riera-Crichton (2008)). The growth literature of the 1990s identified large adverse effects of exogenous volatility on GDP and on economic growth in developing countries. An important channel transmitting or even amplifying the negative effects of such volatility would be imperfect capital markets and low levels of financial development in developing countries (Aghion et al. 2009). The mitigation of real exchange rate volatility through reserve accumulation would then help developing countries, as they are much more dependent on commodity trade, in both exports and the imports.²⁰

¹⁸ One obvious reason is that this is not a one-sided choice: the maturity and currency composition of liabilities is determined by demand and supply.

¹⁹ This may reflect the deterrent effect of higher international reserves, signaling a deeper pocket of liquidity of the central bank. See Central Bank of Chile (2009), box II.2 and De Gregorio (2011) for evidence on the positive influence of IR on changes in EMBI spreads during the subprime crisis.

²⁰ The exposure to the income effects triggered by commodity terms of trade shocks of developing countries exceeds that of the OECD countries by a factor of 3.

Obstfeld, Shambaugh, and Taylor (2010) link reserve hoarding to three factors associated with the shift discussed above in the trilemma configuration since 1990. The first factor is the “fear of floating,” manifested in the desire to tightly manage the exchange rate (or to keep fixing it) for a range of reasons--to boost trade, mitigate destabilizing balance sheet shocks in the presence of dollarized liabilities, and provide a transparent nominal anchor for inflationary expectations (Calvo and Reinhart (2002)). The second factor is the adoption of active policies to develop and increase the depth of domestic financial intermediation through a larger domestic banking and financial system relative to GDP. The third factor is complementing the deepening of domestic financial intermediation with an increase in external financial integration. The combination of these three elements increases the exposure of the economy to financial storms, in the worst case leading to financial meltdowns, as was vividly illustrated by the Mexican 1994-95 crisis, the 1997-98 East Asian crisis, and the Argentine 2001-2 financial collapse.

Notwithstanding the rising prominence of financial considerations, the debate over whether emerging markets continue to hold excessive reserves remains alive. Jeanne and Ranciere (2006) and Jeanne (2007) develop a utility-based welfare analysis of the optimal hoarding of international reserves and a calibration-cum-regression analysis that tests whether recent trends are consistent with the model’s predictions. For the typical emerging market country, the model can plausibly explain a reserves-to-GDP ratio on the order of 10 percent, close to the long-run historical average. It can justify even higher levels assuming reserves can prevent crises. The levels of reserves recently observed in the mid 2000s in many countries, particularly in Latin America, are within the range of the model’s predictions. For emerging market countries in the aggregate, however, the insurance model fails to account for the recent reserves buildup because the risk of a capital account crisis in the Asian countries, where most of the buildup has taken place, seems much too small to justify such levels of self-insurance. These results are in line with the analysis in Garcia and Soto (2004).

Notice that the results above were obtained before the global financial crisis of 2008-09, during which emerging markets acquitted themselves remarkably well. This raises the question anew of whether reserve holdings were excessive and eventually worth it, since they helped underpin resilience during the worst global crisis since World War II. We turn to this question next, starting with a public finance perspective to crisis prevention.

A PUBLIC FINANCE APPROACH TO FINANCIAL INTEGRATION

With financial factors becoming dominant during the 1990s, the macro challenges facing developing countries went beyond navigating the trilemma triangle. More financially open, financially deeper countries, with greater exchange rate stability tended to hold more reserves. Within the emerging market sample, the fixed exchange rate effect weakened in explaining reserve accumulation, but financial depth (measured by M2/GDP) grew in importance (Cheung and Ito (2009), Obstfeld et al. (2010)). Trade openness remained a robust determinant of reserve demand, though its importance diminished. The growing importance of financial factors in explaining rising international reserve-to-GDP ratios (Aizenman and Lee (2007)) is in line with a broader self-insurance view against both external and domestic shocks. Nevertheless, as noted above, the idea that emerging markets held excessive reserves persisted.

In parallel, and somewhat schizophrenically, the feasibility of EMs being able to self-insure against sudden stops was raised. Following the 1997-2001 crises, Caballero (2003) summarized the state-of-the-art on insuring EMs. His starting point was that countries can self-insure against fluctuations over the business cycle; but doing so against the ruinous effects of sudden stops was not feasible because of the extreme volatility and large size of capital flows. The necessary insurance markets and instruments did not exist: available instruments might hedge the annual fiscal revenues of a commodity-exporting country against oil or copper price risk, but not against a sudden stop. Caballero therefore proposed new instruments centered on contingent bonds targeted explicitly at exogenous shocks not under the control of emerging markets. On the reserve build up, he noted: "...these economies are self-insuring through costly accumulation of large international reserves and stabilization funds. Most individuals would be 'underinsured' if they had to leave a million dollars aside for a potential automobile collision and the liabilities that would follow, rather than buying insurance against such event; countries are no different. Underinsurance is what greatly amplifies these countries' recessions."

Without taking a position on whether the reserve accumulation by emerging markets was excessive or not, it is important to point out that emerging markets did much more than simply build up reserves after the 1997-2001 crises. These crises did not simply change the West's perception of emerging markets (of East Asia in particular, where fiscal probity and the dominance of the private sector might have fueled complacency) but more importantly changed the perceptions of emerging markets about themselves. Table 2 provides more detail regarding the response of emerging markets to the crises of the 1980s and 1997-2001 by linking specific

policy measures to the three generations of crisis models that were developed to capture the growing coverage and sophistication of the underlying crisis elements.²¹

Table 2: Evolving Crisis Response of Emerging Markets

Goal	Policies	Comments
1. Restore sustainable debt dynamics <i>(First generation)</i>	<ul style="list-style-type: none"> • Raise primary fiscal surpluses for prolonged period • Improve expenditure composition and tax regime • Strengthen fiscal institutions. 	Might have to cut even good public investments in order to raise primary surpluses (similar to external debt overhang of 1980s)
2. Lower contingent liabilities associated with private sector <i>(Third generation)</i>	<ul style="list-style-type: none"> • Shift to flexible exchange rates • Monitor private external borrowing and currency mismatches • Strengthen financial institutions. 	Flexible exchange rates will reduce incentive for currency mismatches but direct controls may also be needed by central bank on volume of private external debt and loan-to-deposit ratios of commercial banks
3. Insure against shifting market sentiment and possible sudden stops <i>(Second generation)</i>	<ul style="list-style-type: none"> • Build up foreign exchange reserves • Restrict currency mismatches on government and private balance sheets. 	“Ideal” level of reserves will depend upon short-term external debt, flexibility of exchange rates and extent of currency mismatches

Source: Chapter 7, Pinto (forthcoming).

The table adds two elements to the policy trilemma: the accumulation of IR, which has been discussed above; and government’s intertemporal budget constraint. IR accumulation has proceeded in tandem with measures to bolster the public finances: according to the arguments laid out in Pinto (forthcoming) reforms which lowered public indebtedness while curbing contingent liabilities from private sector balance sheets have been pivotal in establishing credibility and lowering vulnerability. The two together have buffered the move to the trilemma middle ground and facilitated financial stability.

²¹ The first generation crisis model honed in on the inconsistency of fiscal deficits financed by credit creation and a fixed exchange rate; the second generation on confidence crises, international liquidity and multiple equilibria; while the third brought in balance sheet exposures. Key contributions were made by Krugman (1979, 1999), Flood and Garber (1984), Obstfeld (1994), Chang and Velasco (2000) and Burnside, Eichenbaum and Rebelo (2001). For summaries, see Frankel and Wei (2005) and Pinto (forthcoming).

In other words, the response of emerging markets evolved into a “public finance approach” to financial integration and managing macroeconomic risk. The public finance approach has three elements: first, putting the fiscal house in order so as to create space for addressing tail risks;²² second, recognizing from experience that good management of the public finances is not enough—costly externalities and bailout costs associated with the private (especially, financial) sector need to be factored in; and third, strengthening financial sector regulation and supervision are essential.

The efficacy of self-insurance underpinned by the public finance approach to financial integration is demonstrated by the performance of developing countries during the Great Recession. The resilience they displayed during the 2008-09 crisis has been the ultimate litmus test, notwithstanding the skepticism about self-insurance expressed in Caballero (2003).²³ The reason of course is that EMs went considerably beyond simply building up IR. They benefited by adopting controlled exchange rate flexibility and the active management of external balance sheet exposure by using reserves to cover short-term debt and in some cases taking steps to minimize currency mismatches on private sector balance sheets. During the 2008-09 crisis, about half of the emerging markets managed the crisis without significant IR depletion (including Chile, China, Columbia, Egypt, Israel, Thailand, South Africa). Their reserves reduced their sovereign risk premia, deterring financial attacks. The other half of the emerging markets depleted between one-tenth and one-third of their IR at the peak of the global crisis.²⁴ Most of them bounced back to respectable growth paths without the need for massive external help. Those emerging market and developing countries that relied on external help (such as Korea and Mexico, which used swap lines extended by the US Federal Reserve Board or IMF stabilization packages) were characterized by large balance sheet exposure, where lax financial regulations prior to the crisis increased their vulnerability.

²² A vivid example of this policy has been Chile, where a fraction of the revenues from copper exports were saved in years when the price of copper exceeded a moving average of past years. In years when the price of copper has been below the moving average of past years, the accumulated funds have been used to buffer the fiscal expenditure of the Chile: saving in good times, dissaving in bad times, and supporting counter cyclical fiscal policy stance of Chile. Commodity-driven swings of boom and bust have defined Latin America’s economic history for the past 100 years. “That is a cycle that needs to be ended,” Velasco said. “We have been out to show that a Latin American country can manage properly, and not mismanage, a commodity cycle. You save in times of abundance, and you invest in lean times.” [citation?]

²³ Remarkably, there was not a single systemic financial sector crisis in any emerging market, even though systemic banks in some countries (e.g. Latvia, Ukraine) came under threat.

²⁴ Emerging markets that lost at least 10% of reserves include Russia (36%), Poland (28%), Malaysia (27%), Korea (25%), India (21%), Peru (17%), Indonesia (16%), Turkey and Brazil (about 10%). See Aizenman and Sun (2009) for further discussion.

While the decoupling of EMs from the recession impacting the OECD has been elusive, emerging markets countries have become key contributors to the post-crisis global growth, led by the largest and most populous, China and India, and the other BRICS.²⁵ Overall, these countries adopted a heterodox approach to self-insurance, consisting of a move to the trilemma middle ground supported by reserve accumulation and underpinned by the public finance approach to financial integration, the essence of which is that the social gains from deeper financial integration should be balanced against the social costs of growing exposure to turbulence.

POLICY IMPLICATIONS OF THE PUBLIC FINANCE APPROACH

The global crisis of 2008-09, which originated in the financial sector of the US on the one hand and showcased the resilience of developing markets as a result of their adopting a public finance approach in response to their own crises on the other, both point to the urgency for policy makers to balance the interests of the financial and real sectors. In particular, low and uneven standards of prudential regulation could lead to devastating crises in the financial sector with negative spillovers into the real sector as illustrated by the 2008-09 crisis. The chances are that OECD countries overshot the optimal level of financial deregulation in the decade before the crisis with financial globalization going too far. We illustrate this possibility in a reduced form model of the GDP, decomposing the economy into financial and non-financial sectors. The financial sector provides competitive financial intermediation services, measured by FI , facilitating the production of a stochastic final output, Y , $Y = Y(FI)$; $Y' > 0$, and $Y'' < 0$. Financial services FI are measured in constant dollar (equivalently, in terms of the numeraire good). The choice of FI is done prior to the realization of the random shocks affecting the final output, Y .

In the absence of distortions, with risk neutral agents, the optimal financial intermediation is at the level that maximizes the expected profits, $E[Y - FI]$. Consequently, the optimal level of financial intermediation, denoted by FIO , is at the level where the expected marginal benefit of financial intermediation, $E[Y']$, equals the expected marginal cost, 1. The corresponding total GDP is $Y(FIO)$. It can be decomposed to give the non financial GDP; $GDP_{nf} = Y(FIO) - FIO$, while the GDP contribution of the financial sector is FIO . Figure 3, top panel characterizes the equilibrium at point A, where the expected cost of financial intermediation, $EMC[FI]$, equals the expected marginal benefit, $EMB[FI]$.²⁶

²⁵ See for example, Canuto and Giugale (2010).

²⁶ In terms of Figure 3, In the absence of distortions, $EMB[FI] = E[dY(FI)/dFI] = E[Y']$; $EMC[FI] = E[dFI/dFI] = 1$. Note that total expected GDP equals the trapezoid below the bold curve, $EMB[FI]$; between zero and FIO .

Financial distortions, like moral hazard associated with the “too big to fail” doctrine, shift the private valuation of the expected marginal benefit of FI up, and the expected marginal cost down; to $EMB[FI^*]$, $EMC[FI^*]$ respectively. The net effect is that, relative to the non distorted equilibrium, moral hazard induces excessive financial intermediation [shifting the equilibrium financial intermediation from point A to point B in Figure 3, lower panel, increasing the financial intermediation from FIO to FIO^*]. The welfare cost of the distortion induced by moral hazard is the dotted triangle at the bottom panel of Figure 3.

In a risk-neutral economy, policy z should be set to minimize the welfare costs of financial distortions. In such an economy, financial depth, FI/GDP , is not a goal by itself. Financial intermediation may be too lucrative if the expected social marginal benefit of financial depth falls short of the expected social cost.

We list three policy implications of the above framework:

- Too much financial intermediation may be bad for the economy. Financial innovation that may deepen financial intermediation would be undesirable if the marginal social benefit of financial innovation (the net increase in $E[Y - FI]$) fall shorts of the marginal social cost of the financial innovation, thereby reducing welfare. In the US itself, the share of financial intermediation was about 5 percent of GDP in 1980. It reached about 8 percent prior to the crisis, with the bulk of the increase happening in the 2000s. Figure 4 shows that financial intermediation was well below 5 percent during most of the 20th century, with the exception of the decade prior to the Great Depression and Great Recessions. While correlation is not causation, the search for the gains in the performance of non financial sectors as a result of the massive increase in financial depth in the US and the global economy remains elusive.
- There is a potential rivalry between the interests of the financial sector and non financial economy. Regulation level z , $z =$ (leverage, reserve ratio, intermediation tax, etc.) should be set at a level such that the social marginal cost of FI equals the social marginal social benefit measured in relation to the nonfinancial sector.
- There is a built-in bias against financial regulation: Crises prevented by tighter financial regulation are unobservable and therefore not credited to the policy maker. Yet, the cost of financial regulation is transparent and debited to the policy maker. This asymmetry means that a higher regulatory effort, while preventing crises, tends to erode support over time for future regulation (Aizenman, 2010).

WHAT SHOULD DEVELOPING COUNTRIES DO POST GREAT RECESSION?

The massive resumption of inflows of capital to emerging markets in 2010 has strengthened the need for prudential regulations dealing with inflows of hot money. These inflows reflect both ‘yield chasing’ induced by the low interest rates and quantitative easing in the US and Europe, and the presumption that EMs are the new locomotive for global growth. What should emerging markets do in these circumstances?

With vulnerability endogenous to private agents’ actions and behavior, optimality calls for a mixture of partial insurance and preventive methods reducing the frequency and intensity of the calamity (analogous to requiring installation of fire alarms and external lights in a house, setting speed limits for drivers, making air-bags in cars mandatory, etc, as controls or conditions for insurance provision). This logic applies equally well to the emerging markets’ exposure to sudden stops and deleveraging shocks – developing countries must supplement hoarding international reserves with policies that would reduce their exposure to capital flight. Such policies could include proactive steps to place public finances on a sustainable trajectory by raising primary fiscal surpluses while simultaneously taking steps to limit contingent liabilities from private external debt and mismatches on private sector balance sheets—as indeed several important emerging markets did after 2001.

Today’s challenges (a more extreme form of past challenges) are exemplified by Korea: the Bank of Korea may hold IR as a buffer against instability associated with private banks’ external borrowing, the carry trade and other activities the social benefits of which to the non financial sector may fall short of the social cost associated with the growing exposure of the taxpayer to the need to bailout systemic financial players in bad times.²⁷ Regulations reducing external borrowing may trim the demand for IR, increasing the overall welfare of the economy. The public finance approach is reflected in Hyun Song Shin’s statement, advising South Korea’s government: “...it should tax the wholesale liabilities of the country’s banks. Whenever a South Korean bank wants to expand its loan book faster than its retail deposits, it relies on foreign

²⁷ See Aizenman (2011) for a case study of Korea’s under-regulated external exposure prior to the 2008-09 crisis, and a public finance view of optimal regulation external borrowing and hoarding of IR. See Ostry et al. (2011), Jeanne and Korinek (2011) and the references therein for further analysis of conditions conducive to the inclusion of capital controls in the policy toolkit of EMs. An interesting observation on IR and carry trade: “Countries with large stocks of international reserves and a high domestic interest rate may inadvertently be counter-parties to the carry trade. While carry-traders borrow in low interest currencies and invest in high interest currencies, most reserve building countries invest in low interest foreign currencies and borrow at the (relatively higher) domestic interest rate.” Dominguez et al. (2011). This observation is consistent with the view that the optimal accumulation of reserves should be addressed as part of a comprehensive prudential regulation that would recognize possible externalities associated with carry trade exposures.

borrowing to fill the gap. So a levy on these extra liabilities would serve to limit banks' borrowing abroad." [*The Economist*, November 11, 2010].

Taxing surges in external borrowing by domestic banks is a discretionary tool that could support prudential supervision (Aizenman (2011)). This policy tool is akin to an international version of the FDIC's policies in the US. A deposit in a bank covered by the FDIC allows the bank to expand its balance sheet, increasing the expected liabilities of the FDIC (i.e., the taxpayer) at a rate proportional to the riskiness of bank's portfolio. The insurance offered by the FDIC destroys any incentive for the saver to monitor the bank. This distortion could be dealt with by imposing a risk premium on the bank, at a rate reflecting its riskiness.

The main difference between FDIC's risk premium and external borrowing by banks in emerging markets is that the FDIC covers deposits in US dollar, and is indirectly backed by US ability to cover these liabilities by fiat money and/or domestic taxes. In contrast, external borrowing by EMs banks increases the balance sheet exposure of the country to foreign currency debt. By analogy, this exposure should be dealt by the accumulation of IR *and* by the proper risk premium, inducing banks to internalize the impact of external borrowing on the taxpayers' exposure to future bailouts. Ironically, economists who oppose an external borrowing tax, viewing it as an impediment to free mobility of capital, rarely support the abolition of deposit insurance!

In the meanwhile, concerns about the growing exposure of these countries to the risk associated with sudden reversal of hot money flows post 2008-09 is inducing emerging markets to adopt various regulations taxing external borrowing and hot money. These policies are not a substitute for the need to maintain fiscal and monetary discipline in EMs. Yet, short of moving to financial autarky, prudential regulations dealing with external borrowing may help in mitigating the downside risk of hot money. Table A1 provides a summary of these steps in 2010-11.

The effectiveness of prudential regulation dealing with capital flows is an important open research agenda. The well-documented experience of Chile with unremunerated reserve requirement suggests that this policy changed the composition of inflows towards longer maturities, without significantly affecting the overall volume [see Edwards (1999)]. Focusing on the recent experience of Brazil, Forbes, Fratzscher, Kostka and Straub (2011) report that the regulations induced capital outflows from Brazil, in line with the intention of the Brazilian authorities.²⁸ Experience suggests that the private sector reacts over time to the regulations and to

²⁸ They looked at the impact of the March 2008 1.5% tax on fixed income investment, and the October 2009 2 % tax on all foreign portfolio investments). Using fund level capita flows data (fixed income), they found that the regulations induced capital outflows from Brazil.

changing global and local circumstances. Therefore, proper prudential regulation and supervision should be a dynamically evolving framework. This is vividly reflected in the recent experience of Korea and other countries.²⁹ The interaction between the regulator and the private sector suggests that some regulations tend to lose their bite overtime. Hence, policy makers may adopt a mixture of temporary measures dealing with unanticipated transitory shocks, and more enduring policies [reserve requirements, taxes, etc.] at rates that evolve overtime, responding to changing risk exposure and to the size of capital flows.

CONCLUSIONS

A salient macroeconomic trend during the 1990s-2000s was the massive financial globalization of emerging markets. While the links between faster growth and the external financial integration of these countries has been tenuous at best, an unintended consequence has been their growing exposure to financial turbulence associated with sudden stops of inflows of capital, capital flights, and deleveraging crises. The significant output and social costs associated with financial crises, estimated on average at more than 10 percent of GDP, has highlighted the need for going beyond the three policy goals framed by the original trilemma. In response to the crises of 1997-2001, several emerging market countries added financial stability as an explicit goal, built up reserves and adopted a public finance approach to financial integration incorporating the control of private sector balance sheet vulnerabilities and the attendant contingent fiscal liabilities into their policy formulation.

The subsequent resilience emerging markets displayed during the global crisis of 2008-09 is an eye-opener, not just for developing countries but OECD countries as well. A key lesson is that financial regulation and integration should be defined in the context of a public finance approach, aiming at maximizing the contribution of financial intermediation to the expected performance of the economy. The goal should not be to maximize financial stability, but to choose policies balancing the expected cost of crises to the economy at the margin with the provision of efficient financial intermediation services to the non- financial sector of the economy.

²⁹ From July 25 2011 onward, financial institutions operating in Korea are no longer allowed to buy FX-denominated bonds issued onshore by Korean companies (“Kimchi bonds”) who swap proceeds into local currency. A Bank of Korea official explained the policy intent saying that “local firms should raise funds in won when they use the money here.” Kimchi bond issuance had risen considerably in the months before the policy change, because all-in borrowing costs are lower than for comparable won-denominated debt. [*Financial times*, “Seoul takes kimchi bonds off the menu,” July 19, 2011].

The 2008-09 crisis demonstrated the risk of low and uneven standards of prudential regulation. With the very real risk of the financial sector tail wagging the real sector dog, bubbles in the real estate market and the wider economy, frequently associated with easy leverage and inflows of hot money, are too costly to ignore. IT bubbles may be fine (even efficient) in a vibrant technology sector, where the financial damage following the burst of the bubble impacts a few sophisticated agents. Such a bubble subsidizes investment in new technology, and may provide a social benefit if there is underinvestment in IT in the absence of bubbles. In contrast, housing bubbles lead to economy-wide damage, costly debt deflation, and large stock of foreclosed houses that degrade the economy. The US is a prime example of a country where the real estate sector plays a pivotal role in accounting for the business cycle, inducing Leamer (2007) to conclude that in the US “Housing IS the Business Cycle”. This result may be US specific, reflecting the favorable tax treatment of housing, and the mortgage subsidies associated with the operations of Fannie Mae and Freddie Mac.³⁰ Yet, in most countries housing is the prime financial asset of the middle class, and turbulence in the real estate market directly affects the stability of the banking system.

Even if a bubble cannot be identified ex-ante, chances are that one can pin down the probability of a housing bubble. To illustrate this, in the 2000s, the probability of a housing bubble was close to zero in Germany (experiencing an overall constant valuation of real estate), yet positive and increasing in the US (see Shiller (2000)).³¹ Chances are that regulations lowering the Loan to Value Ceiling [LTVC] reduce the probability of a bubble [see policies in Hong Kong, Singapore, and China, where dynamic LTVC regulations are used in a counter-cyclical ways]. Recent suggestions [Co-VAR, VAR, stress tests] are useful, but simplicity and greater transparency of positions has its virtues: transparent LTVC regulations; derivatives restricted to traded exchanges, where positions of systemic players are monitored, would help.

While a decisive approach to financial sector regulation is clearly needed—even to the point of curbing the growth and size of the financial sector, the chances are that financial system agents will resist change to protect their rents and one-way bets with publicly-funded bailouts on

³⁰ U.S. Treasury Secretary Timothy F. Geithner acknowledged in November 2009 interview with the *Financial Crisis Inquiry Commission* that government-sponsored mortgage giants, Fannie Mae and Freddie Mac, were the biggest sources of moral hazard, leading investors to count on a bailout for risks gone wrong [Bloomberg, Feb 18, 2010].

³¹ Shiller’s 2000 book (and its 2005 extended edition) explains why we should worry about the formation of bubbles in general, and in the housing market in particular. Curiously, Shiller’s warning were ignored by policy makers, apparently being convinced by Greenspan’s (2002) position that monetary policy should not try to lean against asset-price bubbles, but rather should just clean up after they burst. This “cleaning up” turned out to be a validation of the large costs associated with debt deflation, and the ex-post inefficiency of the foreclosure system in the US.

the downside. The built-in bias against financial regulation noted earlier needs to be recognized and counteracted. Financial integration during the 1990s-2000s globalized arbitrage, while the national tax bases have been saddled with the resultant costly bailouts at times of trouble.

In contrast to some OECD countries, which had access to elastic swap lines that facilitated their adjustment, most emerging markets and developing countries were left to their own devices, deleveraging their exposure by drawing down reserves, or more painful adjustments. The resilience of emerging markets and developing countries during the 2008-09 crisis validated the logic of self-insurance as part of the overall design of macroeconomic policies. A desirable configuration of macro policies that allowed countries to reduce their exposure to the 2008-09 crisis included: (i) sound management of the public finances to place public debt on a sustainable trajectory; (ii) building up international reserves; (iii) prudential steps to reduce contingent liabilities from private sector balance sheets; and (iv) moving to the trilemma middle ground with its emphasis on controlled exchange rate flexibility.

None of these policies would probably have sufficed on its own to insulate emerging markets from global turbulence; but agile combinations of these policies provided policy makers with the needed tools to limit debilitating growth and confidence crises in EMs in the wake of the global crisis. Indeed, the limited capacity to move along the lines proposed by Caballero (2003) and the validation of the self gains from self-insurance is one of the lessons from the crisis. Self-insurance lays bare the limitations of the global system in dealing efficiently with the global imbalances, and stresses the need for coordinating financial regulation across national borders. By virtue of their limited internal safety nets and their relative poverty, emerging markets do not have the luxury to wait for the collective resolution of the challenges associated with global imbalances and the proliferation of under-regulated financial flows that the G20 is aiming at. Hence, self-insurance combined with the public finance approach to financial integration may be an optimal response of emerging markets in a second best global structure.

Further Reading

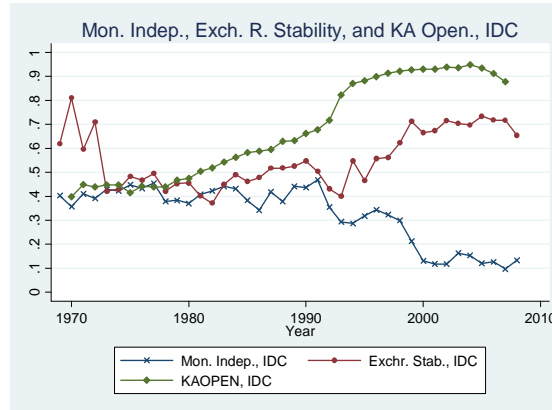
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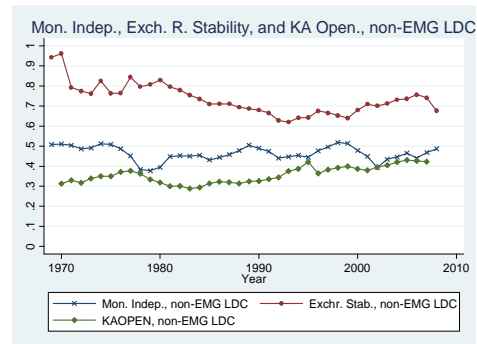
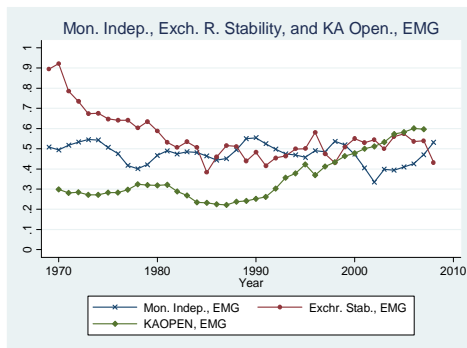
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Figure 1: The Evolution of Trilemma Indices, 1970-2009³²
 (a) Industrialized Countries



(b) Emerging market economies (c) Non-Emerging Market Developing Countries



Definitions: The index for the extent of monetary independence (MI); $MI =$

$1 - 0.5[\text{corr}(i_i, i_j) - (-1)]$, where i refers to home countries and j to the base country (the base country is defined as the country that a home country's monetary policy is most closely linked with, as defined in Shambaugh (2004)).³³ By construction, higher values of the index mean higher monetary policy independence. For the countries and years for which Shambaugh's data are available, the base countries from his work are used, and for the others, the base countries are assigned based on IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)* and *CIA Factbook*.

Exchange rate stability (ERS), ERS = Annual standard deviations of monthly exchange rate series between the home country and the base country are calculated and included in the following formula to normalize the index between zero and one: $ERS = 0.01/[0.01 + \text{stdev}(\Delta(\log(\text{exch_rate})))]$.

Financial openness (KAOPEN): KAOPEN = A *de jure* index of capital account openness constructed by Chinn and Ito (ref), normalized between zero and one. Higher values of this index indicate that a country is more open to cross-border capital transactions.

³² Source: Aizenman, Chinn and Ito (2011, forthcoming, JJIE)

³³ The base countries group identified by Shambaugh include Australia, Belgium, France, Germany, India, Malaysia, South Africa, the U.K., and the U.S., Shambaugh fitted the base country j to country i , reflecting country i 's policy choices.

Figure 2 Hoarding International Reserves /GDP patterns, 1977-2009
 The figure depicts total reserves minus gold to GDP ratio. Source: IFS – IMF

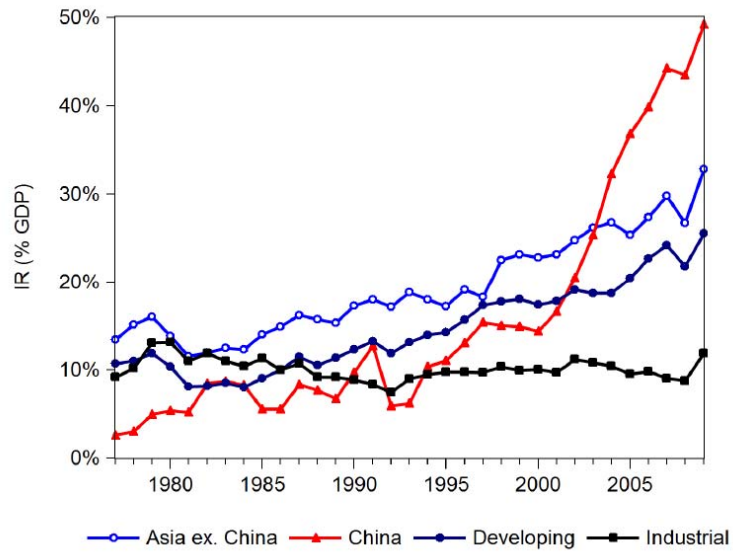
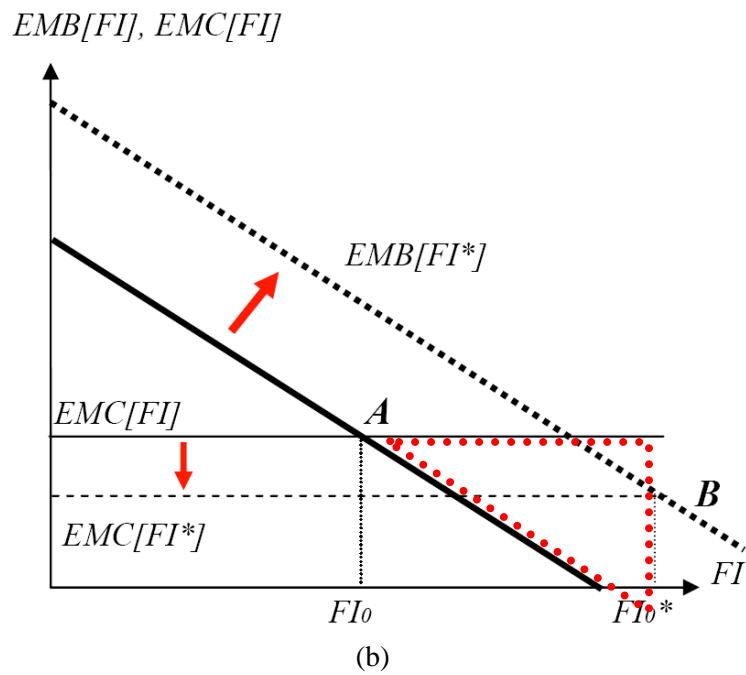
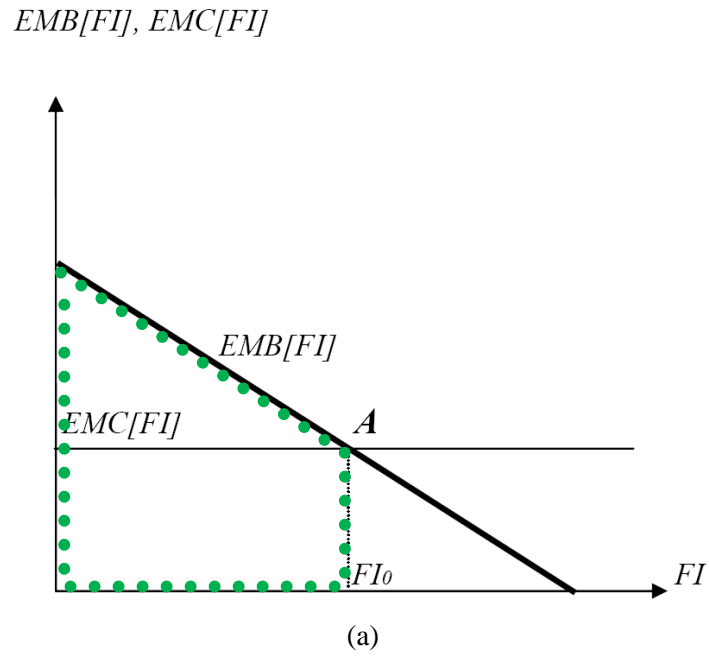


Figure 3: Optimal financial intermediation and moral hazard



Notes:
 The dotted trapezoid in panel (a) measures the expected GDP. The dotted triangle in panel (b) measures the welfare cost of the financial distortions leading to excessive financial intermediation.

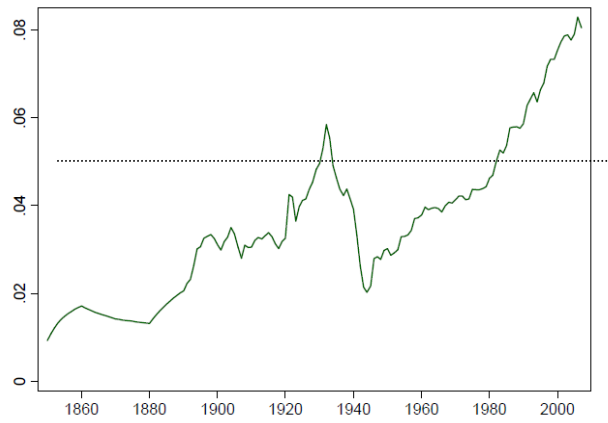


Figure 4
GDP Share of U.S. Financial Industry. Source: Philippon (2008)

Table A1: Recent Macro-prudential Measures and Capital Controls in Emerging Markets^{a/}

Country	Year	I/O	T/E	Type	Nature	Summary
Brazil	2010	I	T	CC	Tax on Inflows	IOF Tax on foreign inflows increased from 2% to 4%.
Brazil	2010	I	T	CC	Tax on Inflows	IOF Tax on foreign inflows increased from 4% to 6%.
Brazil	2010	I	T	CC	Tax on derivatives	Margins on derivative contracts by non-residents on BM&F Bovespa to be taxed at 6%, up from 0.38%.
Brazil	2010	I	T	CC		Brazilian financial institutions banned from renting, lending or swapping assets to foreigners seeking to invest in the futures market.
Brazil	2010	I	T	CC	Tax on Inflows	IOF tax reduced from 6% to 2% for overseas investments into private equity funds, or FIPs, and venture capital funds
Brazil	2011	I	T	CM	URR	Starting April 4, Brazilian banks will need to deposit in cash at the central bank 60 percent of their short positions in U.S. dollars above \$3 billion or their capital base, whichever is smaller. The reserves will not earn interest.
Chile	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	From December 1, in 3 successive moves, foreign investment limits for pension funds to rise from 80 percent from 60 percent of assets.
China	2010	I	E	CC	Foreign investors' access	Some overseas FIs allowed to invest their foreign yuan holdings in domestic interbank market bonds.
India	2010	I	T	CC	Interest Rate Caps on ECB	Interest rate cap on eligible external commercial borrowing re-instated.
Indonesia	2010		T	OM	Minimum holding periods on central bank bills	Minimum holding period introduced on central bank debt instruments, for both residents and non-residents.
Indonesia	2010	I	T	CM	Reserve Ratios	Foreign-currency deposit RR increased from 1% to 5% in March.
Indonesia	2010	I	T	CM	Reserve Ratios	Foreign-currency deposit RR increased from 5% to 8% in June
Indonesia	2010	I	T	CC	Reserve Ratios	30% RR on vostro accounts (rupiah-denominated transaction accounts held by non-residents), beginning end-Jan-11 with 3-month transition.
Indonesia	2010	I	T	CC	Ceilings on foreign investment/ external borrowings	Limit (30%) on daily balance of banks' short term external debt re-instated.
Korea	2010	I	E	CC	Withholding Tax	Removed withholding tax of 0-15% (depending on tax treaty) on interest, capital gains tax and transaction tax for non-residents.
Korea	2010		T	CC	Limits to FX exposure/ currency mismatches	Tightened limit on FX derivatives contracts of domestic banks and foreign bank branches with domestic residents (100% of value of exports from 125%)
Korea	2010	I	T	CC	Limits to FX exposure/ currency mismatches	New limits set on FX derivatives contracts of domestic banks (50% of previous month's capital) and branches of foreign banks (250%).
Korea	2010	I	T	CM	Exchange controls	Bank loans in foreign currency to be restricted to overseas uses only. Small and medium sized manufacturers exempted.
Korea	2010	I	T	CC/CM	Limits to FX exposure/ currency mismatches	Tighten existing regulations on foreign currency liquidity of domestic banks.
Korea	2010	I	T	CC	Tax on Inflows	14% withholding tax on interest income on bonds bought by foreign investors as well as a 20% capital gains tax re-imposed.
Korea	2010	I	T	CM	Tax on Inflows	Announced plans to legislate a macro-prudential stability levy on non-deposit foreign currency liabilities. The levy will fund provision of FX liquidity when necessary.

Country	Year	I/O	T/E	Type	Nature	Summary
Peru	2010	I	T	CC	Reserve Ratios	Reserve requirements on non-deposit foreign liabilities with maturity less than 2 years raised to 35% from 0%.
Peru	2010	I	T	CC	Tax on derivatives	30% income tax introduced for settlement of derivative contract with offshore banks (imposed on local financial institutions)
Peru	2010		T, E	CM	Limits to FX exposure/ currency mismatches	Changed limits on banks' net FX position to 75 percent for long position (from 100 percent) and 15 percent for short position (from 10 percent)
Peru	2010	I	T	CC	Reserve Ratios	Reserve requirements on non-deposit foreign liabilities with maturity less than 2 years raised to 40% from 35%.
Peru	2010	I	T	CC	Reserve Ratios	Marginal reserve requirements on local currency deposits held by foreigners increased to 35% (from 30%) .
Peru	2010			OM	Limits to FX exposure/ currency mismatches	Imposed private pension funds' limit on trading FX at 0.85% of assets under management (for daily transactions) and 1.95% (over 5-day period)
Peru	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Operating limit on pension funds' overseas investments increased to 28 percent from 26 percent.
Peru	2010	I	T	CC	Reserve Ratios	Reserve requirements on non-deposit foreign liabilities with maturity less than 2 years raised to 50% from 40%.
Peru	2010	I	T	CC	Reserve Ratios	Marginal reserve requirements on local currency deposits held by foreigners increased to 45% (from 35%) .
Peru	2010	I	T	CC	Reserve Ratios	Reserve requirements on non-deposit foreign liabilities with maturity less than 2 years raised to 65% from 50%.
Peru	2010	I	T	CC	Reserve Ratios	Marginal reserve requirements on local currency deposits held by foreigners increased to 50% (from 45%) .
Peru	2010	I	T	CC	Foreign investors' access	Fee on foreign purchases of central bank liquidity draining instruments increased to 400 bps.
Peru	2010	I	T	CC	Reserve Ratios	Marginal reserve requirements on local currency deposits held by foreigners increased to 65% (from 50%) .
Peru	2010	I	T	CC	Reserve Ratios	Marginal reserve requirements on local currency deposits held by foreigners increased to 120% (from 65%) .
Peru	2010	I	T	CC	Reserve Ratios	Reserve requirements on non-deposit foreign liabilities with maturity less than 2 years raised to 75% from 65%.
Peru	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Operating limit on pension funds' overseas investments increased to 30 percent from 28 percent.
Peru	2010	I	T	CM	Reserve Ratios	Increased marginal reserve requirements to 25% for domestic currency lending and to 55% for foreign currency lending by banks
Peru	2010	I	T	CC	Tax on Inflows	Imposed 30 percent capital gains tax on non-residents' investments in the stock market for transactions through Peruvian broker and at 5 percent for transactions through a non-resident broker.
Peru	2010	I	T	CC	Tax on Inflows	30% tax on foreign investor gains from PEN-denominated futures maturing within 60 days.
Peru	2011	I	T	CM	Reserve Ratios	Reduced reserve requirements on foreign currency liabilities to 60 percent
Peru	2011		T	CM	Limits to FX exposure/ currency mismatches	US Dollar forward holdings of companies limited to 40% of assets or 400mn, whichever is greater.
Philippines	2010	O	E	CC	Exchange controls	Allow prepayment of BSP-registered foreign/foreign currency loans of the private sector to be funded with FX from AABs/AAB-FX corps without prior BSP approval.
Philippines	2010	O	E	CC	Exchange controls	Banks allowed to process remittance requests by foreign investors without prior approval.
Philippines	2010	O	E	CC	Exchange controls	Increase in FX purchase limit for outward investment by residents.
Philippines	2010	O	E	CC	Disclosure Requirements	Registration requirements for outward investments by residents in excess of USD 60 million lifted and replaced by reporting requirements.
South Africa	2010		T	CC	Ceilings on foreign investment/ external borrowings	As of 1 March 2010 South African banks will be able to acquire direct and indirect foreign exposure up to 25% of their total liabilities (excluding equity), covering all foreign exposure but excluding FDI. The initial limit of 40% has been adjusted downwards in light of recent international developments

Country	Year	I/O	T/E	Type	Nature	Summary
South Africa	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Authorities (i) eliminated the 10 percent levy on the capital that South Africans could transfer upon emigration, (ii) raised the limit on individuals investment offshore to R4 million per year from R4 million in a lifetime, (iii) and raised the single discretionary allowance to R1 million from R750,000
South Africa	2010	O	E	CC	Exchange Controls	Increased limits to allow different types of institutions to take between 25 and 35 percent of assets abroad.
South Africa	2010		E	CC	Exchange Controls	Authorities allowed qualifying international headquarter companies to raise and deploy capital offshore without exchange control approval
Taiwan	2010	I	T	CM		The rate on reserve requirements for currency deposits will be increased to 0.193 percent from 0.178 percent, while the rate for Taiwan dollar time deposits was lifted to 0.934 percent from 0.855 percent
Taiwan	2010	I	T	CC	Foreign investors' access	Offshore funds restricted to investing no more than 30 percent of their portfolios into local government debt and money-market products.
Taiwan	2010	I	T	CC	Exchange controls	Trading in NDFs capped at one-fifth of a bank's total FX trading
Taiwan	2010	I	T	CC	URR	Monetary authority won't pay lenders interest from Jan. 1 on reserves held for deposits from foreigners. It currently pays interest on 55 percent of the reserves.
Thailand	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Raised limits on foreign asset accumulation by residents, including outward FDI
Thailand	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Removed limit on direct overseas investment, relaxed restrictions on lending by Thai firms to non-resident borrowers, and raised cap on offshore property purchase
Thailand	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Permitted Thai companies to invest abroad in the form of direct investment or lend to affiliated companies up to USD 50 million per year
Thailand	2010	O	E	CC	Ceilings on foreign investment/ external borrowings	Relaxed other regulations for Thai residents which include: raising outstanding balance limits on foreign currency deposit accounts deposited with funds exchanged from commercial banks; increasing amount limit for purchase of immovable properties abroad; relaxing regulations on repatriation by raising the threshold amount above which foreign currency proceeds are required to be brought into Thailand, as well as relaxing the related reporting requirement
Thailand	2010	I	T	CC	Tax on Inflows	Withholding tax of 15% to be imposed on interest income and capital gains receivable by non-resident corporate and individual investors on bonds issued by the government, state enterprises and the Bank of Thailand.
Turkey	2010	I	E	CC	Tax on Inflows	Reduction in withholding tax rate on bonds issued abroad by Turkish firms with a maturity of over 3 years.

^{a/}See Pasricha (2011) for further analysis and sources. The following abbreviations used: I/O – Inflow/outflow; T/E – Tightening/easing; Type – CC – capital control; CM – Currency based measure; OM – other measure; Source: IMF AREAER 2002 - 2009, Reinhart and Reinhart 2008, national sources and news articles.