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ABSTRACT

Developing Asia experienced a sharp surge in foreign currency reserves prior to the 2008-9 crisis. The global crisis has been associated with an unprecedented rise of swap agreements between central banks of larger economies and their counterparts in smaller economies. We explore whether such swap lines can reduce the need for reserve accumulation. The evidence suggests that there is only a limited scope for swaps to substitute for reserves. The selectivity of the swap lines indicates that only countries with significant trade and financial linkages can expect access to such ad hoc arrangements, on a case by case basis. Moral hazard concerns suggest that the applicability of these arrangements will remain limited. However, deepening swap agreements and regional reserve pooling arrangements may weaken the precautionary motive for reserve accumulation.

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1 Introduction

By any measure, developing Asia (henceforth Asia) has experienced an unprecedented build-up of FX reserves since the Asian financial crisis of 1997-8. Asia's reserves have surged from US$202 billion in 1990 to US$3,371 billion in 2008. The growth rate has accelerated since 2000, with reserves growing on average by more than 20% per year. China has definitely played a significant role in the build-up, accounting for more than 50% of the 1990-2008 growth, but the build-up is a region-wide phenomenon. The pattern is similar even if we account for the region's rapid economic growth – the region's reserves-to-GDP ratio tripled from 13.1% in 1990 to 40.2% in 2008. The explosive growth of Asia's reserves is part of a broader trend of reserve build-up in developing countries in general. The share of global reserves accounted for by developing countries has risen from 28% to 65% between 1990 and 2008. In Asia's case, the reserve build-up has been largely driven by a sharp reversal of the current account position since the crisis. While the region as a whole ran a small current account deficit prior to the crisis, it has run a sizable and persistent current account surplus since the crisis. In some countries such as PRC and Korea, an important additional source of reserve growth has been net capital inflows. As of December 2009, no fewer than six Asian developing countries were among the world’s ten largest holders of FX reserves – China, India, Taipei, Korea, Singapore, and Hong Kong SAR. In addition, Malaysia, Thailand, Indonesia, the Philippines, Viet Nam and Kazakhstan also have large and growing amounts of FX reserves.

Broadly speaking, there are two main explanations for the extraordinary growth of Asia's FX reserves in the post-crisis period: (i) precautionary self-insurance against financial crisis and (ii) mercantilist export promotion. The Asian crisis had a devastating economic and social impact on Asia. Although 5 countries – Indonesia, Korea, Malaysia, Philippines and Thailand – bore the brunt of the impact, the psychological impact of the crisis extended to the entire region. While there is a great deal of controversy about the causes of the crisis, what directly precipitated the crisis was a shortage of international liquidity. Therefore, one plausible interpretation of Asia's reserve hoarding is that it is an attempt to build up an ample war chest of international liquidity to protect oneself against a repeat of the Asian crisis. This type of demand for reserves is known as the precautionary or self-insurance demand for reserves. The other main benefit of reserves is that buying foreign currencies to hold down domestic currencies can improve external competitiveness and thus promote exports. This type of demand for reserves is known as the

mercantilist demand for reserves. Aizenman and Lee (2007) provide comprehensive discussions of both precautionary and mercantilist demand for reserves. A study of the two motives in Asia by Aizenman and Lee (2007) finds that both motives are at play in the region's reserve build-up. There is yet a third motive for holding reserves, which is related to the first two but somewhat different – exchange rate stability, outlined by Calvo and Reinhart (2002). Exchange rate stability is often a key macroeconomic policy objective and in that case, rapid reserve growth may be the result of systematic foreign market interventions aimed at stabilizing the exchange rate.

The different motives behind Asia's reserve accumulation are not mutually exclusive from a theoretical point of view and hence very difficult to distinguish empirically. Indeed efforts to empirically distinguish between the precautionary and mercantilist motives may ultimately be unproductive. It is precisely because a more competitive exchange rate allows a country to improve its current account position that the country is able to build up the reserves it needs for precautionary purposes. From the perspective of the global reserve currency system, regardless of the relative importance of the different motives, the massive purchase of US dollar-denominated reserve assets – i.e. US government and government sponsored enterprise (GSE) securities – by Asian countries has the effect of bolstering the status of the dollar as the world's dominant reserve currency. The dollar standard or Bretton Woods II view of global imbalances [see Dooley, Folkerts-Landau and Garber (2009)] is closely tied to the mercantilist demand for reserves. According to this view, much of Asia has in effect reverted to the tightly managed dollar-based exchange rate regimes, after a brief experimentation with more flexibility during the Asian crisis period. The term Bretton Woods II draws an analogy between the exchange rate behavior of Asian countries since the Asian crisis and the Bretton Woods system of pegged but adjustable exchange rates that was in place between 1945 and the early 1970s.

The desirability of the fast accumulation of FX reserves in Asia remains debatable [see Cheung and Xingwang (2009)]. As noted above, holding reserves entails a number of potential benefits – precautionary self-insurance, export promotion and exchange rate stability. At the same time, countries also incur substantial costs when they accumulate large amounts of reserves. These include inflationary pressures due to expansion of monetary base, fiscal costs which arise if the interest rate on sterilization bonds exceeds the interest rate earned on reserve assets, and potentially higher interest rates required to induce the public to hold ever-larger amounts of sterilization bonds. The presence of both costs and benefits implies an optimal reserve level,

above which more reserves subtract from rather than add to national welfare. According to most conventional measures of reserve adequacy, the region now has reserves far in excess of all plausible estimates of what it needs. According to one such measure, the Greenspan-Guidotti rule, a country has adequate reserves if its reserves exceed its short-term debt. The underlying notion here is that a country which has reserves exceeding all external debt falling within one year should be able to service its most urgent external obligations even during a financial crisis. At the end of 2008, all of Asia's top 10 reserve holders passed the Greenspan-Guidotti rule, some by a wide margin. Most other reserve adequacy measures also all point to an abundance of reserves. [1]

The growing consensus that the region now has substantial amounts of surplus reserves has led to calls for managing such reserves more actively. In the period immediately preceding the global financial crisis, parking surplus reserves in safe and liquid but low-yielding US government securities was increasingly seen as a waste of valuable national resources. The creation of sovereign wealth funds (SWFs) such as China Investment Corporation (CIC) and Korea Investment Corporation (KIC) represent a policy response to growing popular pressure for using surplus reserves for active profit-seeking investment rather than passive liquidity management.[2] In addition to the opportunity costs of foregoing more productive and profitable investment opportunities, the global financial crisis has exposed the risks of investing in industrialized countries. More specifically, the crisis, which originated in industrialized countries, tarnished their long-standing reputation for safe and efficient financial markets as well as sound financial regulation and macroeconomic policies. The upshot for Asia's reserve management is that holding massive amounts of reserves in the form of US government securities is not without risks, especially in light of the deterioration of public finances due to the current fiscal stimulus. A sustained depreciation of the US dollar and consequent valuation losses is another large potential cost confronting Asia's biggest reserve holders in the post-crisis period.

We have just seen that holding large amounts of reserves entails significant costs and risks for

[1] Park and Estrada (2009) provide a comprehensive analysis of the issue of whether Asia's reserves have reached excessive levels. Obstfeld, Shambaugh and Taylor (forthcoming) find empirical support a broader self-insurance view, where reserves provide a buffer against both deleveraging initiated by foreign parties and sudden demand of domestic residents for external assets, i.e., "sudden capital flight." The high positive co-movement of international reserves and M2 is consistent with the view that the greatest capital-flight risks are posed by the most liquid assets, i.e., by the liquid liabilities of the banking system captured by M2.

[2] Park (2007) provides a comprehensive analysis of the emergence of Asian SWFs.

Asian countries. One way to reduce such costs is to use reserves more productively via sovereign funds and more generally, by active reserve management. Although the global financial crisis has inflicted heavy losses on Asian sovereign funds and temporarily dampened their risk appetite, they provide an important channel for more productive use of reserves in the medium- and long-term. There are already signs that the funds are returning to the financial markets, and there are indications that China may inject up to US$250 billion of fresh capital into CIC. Furthermore, if we view reserves as insurance against unexpected shortage of international liquidity and financial crisis, pooling risks is more efficient than individual risk bearing. That is, collective insurance is always less costly than self insurance. The seemingly irrational behavior of reserve hoarding can partly be explained by the region's loss of confidence in the IMF during the Asian crisis. In principle, the IMF pools the risks of all countries and thus offers the most efficient collective insurance. In practice, a region wide perception that the IMF has mishandled the Asian crisis, compounded by a broader region wide perception that the IMF does not serve the interests of Asian countries, has eroded the region's confidence in IMF. Regardless of the validity of the perceptions, the perceptions themselves have contributed to a marked preference of self-insurance over collective insurance.

The central objective of this paper is to explore one alternative mechanism for reducing the need for precautionary reserves, namely swap agreements or swap lines between central banks of large economic powers and their counterparts in smaller economies. The global financial crisis has witnessed a proliferation of such agreements. Perhaps the most well-known example is the US$30 billion swap lines between the US Fed and the central banks of Brazil, Korea, Mexico and Singapore opened in October 2008 during the peak of the crisis. In principle, swaps can either substitute for or complement reserves. To the extent that swaps provide the international liquidity needed during emergencies, central banks can cut back on their reserve holdings. On the other hand, only countries with large reserves may be able to secure swap agreements and this may encourage countries to accumulate more reserves. In addition, large reserves and swap lines can jointly restore the confidence of financial markets in a country's liquidity and solvency. The broader issue of interest is whether swap lines can have a perceptible deterrent effect on the speed and scale of Asia's reserve accumulation. An important integral part of Asia's swap agreements is the Chiang Mai Initiative (CMI) which encompasses a network of bilateral agreements between ASEAN + 3 (China, Japan and Korea).

The unprecedented provision of $120 billion in swap lines to 4 the emerging markets by the US Fed in October 2008 provided welcome relief and an important signal to the financial markets. Yet the exposure of US banks was the single most important criterion for extending swap-lines to the four countries [see Aizenman and Pasricha (forthcoming)]. These ad hoc facilities would not suffice in protecting exposed countries from an Asian crisis-type crisis in the absence of self insurance. Furthermore, the selectivity of the swap lines suggests that only countries with solid past record of governance and significant trade and financial linkages can expect access to such ad hoc arrangements, on a case by case basis. Moral hazard concerns suggest that the applicability of these arrangements will remain limited. Mitigating moral hazard should be the prime responsibility of the international financial institutions, in particular the IMF. Due to the "cherry picking" nature of the swap lines between central banks, access to IMF lines of credit would remain a valuable option for many developing countries, but it is an option that countries may choose to avoid by means of alternative insurance arrangements.

Specifically, regions characterized by deepening trade and financial integration may consider cooperative regional arrangements, including regional swap-lines and international reserves pooling agreements. Asia is a good example of a region that stands to gain substantially from collective regional insurance. Intra-Asian trade has grown rapidly in recent years and this trend is likely to gather speed in light of the general weakness of the industrialized countries and hence their diminished appetite for imports. The prospective rebalancing of Asian countries toward domestic demand should also strengthen intra-regional trade, especially in final goods. The resulting shift of intra-Asian trade from parts and components to final goods will make trade among Asian economies less dependent upon final demand from outside the region. While intra-Asian financial integration lags far behind intra-Asian trade integration, we can expect financial linkages to grow as the regional economies become financially more developed. A further impetus for intra-regional financial integration may come from heightened reluctance to invest in industrialized countries in the wake of the global crisis. Other characteristics of Asian countries which work in the favor of swap arrangements and regional reserve pooling include high reserve-GDP ratios, high saving rates and lingering mistrust of the IMF.

2 Swap Lines and International Reserves

Swap lines may act to stabilize market concerns about the risk of losing control due to

deleveraging pressures, thereby preventing downward pressure on international reserves and the exchange rate, substituting the need to hoard reserves. This possibly was the case of Korea, where the introduction of the Fed swap line prevented a replay of the crisis dynamics of 1997 [see Park (2009)]. In these circumstances, access to swap lines would mitigate the need for Korea to hoard reserves to replace the 60 billion dollars of reserves it used during the first phase of the crisis. Yet, uncertainty regarding the duration of these swap lines, and lingering concerns that in the absence of these swap lines the initial level of reserves was insufficient to prevent crisis dynamics may induce Korea to further accumulate reserves in the future. Therefore, intuitively, perceptions about the duration of swap lines play a key role in determining the future path of reserves. To the degree that regional arrangements like the Chiang Mai Initiative offer pooling schemes of indefinite duration, they may mitigate the urge to hoard reserves. Greater use of regional swap lines may also reduce excessive hoarding precipitated by the wish to signal that country's reserves are above the average of its neighbours [the "keeping with the Joneses" motive, see Cheung and Qian (2009)].

A related issue is the currency composition of swap lines. There is no reason why swap lines have to be denominated solely in US dollars. Just as countries typically hold reserves in different currencies, they could agree to help each other by providing a basket of currencies rather than a single currency. The denomination of swap lines in non-dollar currencies will speed up the diversification of reserves away from dollars into other currencies. For example, euro-denominated swap lines will raise the demand for euro reserves since swap lines are ultimately a mutual promise to provide liquidity support in case of emergencies and that promise will not be credible in the absence of reserves. For Asian countries, a more realistic scenario is the denomination of swap lines in the currency of a dominant regional economy such as China or even a real or notional Asian currency. Such development would further speed up the shift away from dollar reserves and the emergence of an Asia-specific hard currency much like the Europe-specific euro. In fact, China's central bank has already entered into yuan-denominated swap agreements with its counterparts in Korea, Hong Kong, Malaysia, Belarus, Indonesia and Argentina.[3] A number of other central banks have also expressed a willingness to enter into swap

[3] More specifically, the central banks of China and South Korea signed a 180 billion yuan currency swap framework agreement on December 12, 2008. The People's Bank of China entered into a 200 billion yuan swap with the Hong Kong Monetary Authority on January 20, 2009; an 80 billion yuan agreement with Malaysia's central bank on February 8; a 20 billion yuan deal with the National Bank of Belarus on March

agreements with China. The growing popularity of yuan swaps reflects the rapid emergence of China as a globally significant trading power. Despite China's financial underdevelopment and the yuan's restricted convertibility, growing trade with China gives the yuan some intrinsic value.

There is also an intriguing possibility that broadening and deepening of the Chiang Mai Initiative could result in a more permanent and institutionalized form of regional precautionary insurance against financial crisis. The Chiang Mai Initiative (CMI) was announced by the finance ministers of ASEAN+3 – ASEAN countries, China, Japan and Korea – in May 2000. In the wake of the Asian financial crisis of 1997-1998, the CMI was designed to address short-term liquidity problems and to supplement existing international financial arrangements in the event of a crisis. The initiative consisted of an expanded ASEAN Swap Arrangement (ASA) involving all ASEAN members, a network of bilateral swap agreements (BSAs) and repurchase facilities among ASEAN+3. By December 2008, the size of the BSA had increased to $84 billion **[**Table 1].

[Table 1]

The leaders of ASEAN+3 decided to push for the multilateralization of the CMI in October 2008. Multilateralization means that funds available under the CMI would be managed as a self-managed reserve pooling arrangement, governed by a single contract, reducing waste and inefficiency. At this time, the countries also agreed that ASEAN's share of contribution in the total reserve pool would be 20% while the combined share of PRC, Korea, and Japan would be 80%. In February 2009, the ASEAN+3 finance ministers agreed to expand the pool of foreign-currency reserves from $80 billion to $120 billion. The most substantive progress toward multilateralization took place in May 2009, when the finance ministers agreed upon the governing mechanisms and implementation plan for the CMI multilateralization (CMIM). The politically trick issue of relative contributions among the big three powers was resolved, with Japan and PRC each contributing 32% and Korea contributing 16%. Other details such as voting rights, decision making rules, and operational issues such as activation of short-term liquidity in case of a sovereign financial emergency were also agreed upon.[4]

Especially significant was the agreement to establish an independent regional surveillance unit

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11, a 100 billion yuan swap with the central bank of Indonesia on March 24, and an 80 billion yuan swap with the central bank of Argentina. The swaps will allow the parties to avoid using dollars in trade between them and China.

[4] For the full text of the agreement, please visit http://www.asean.org/22536.htm.

which would monitor the region's economies and support CMIM decision-making. While the formal unit is being set up, the ASEAN Secretariat (ASEC) and ADB are working out an interim surveillance arrangement based on existing surveillance process. The ASEAN+3 independent regional surveillance unit is intended to supplement rather than replace the IMF. It is primarily a mechanism for objective economic monitoring. Under the CMIM, a country can draw up to 20% of its quota without being subject to IMF conditionality, although the duration is restricted to a maximum of 6 months. Should a country avail itself of its full quota, 80% of the total amount disbursed would be tied to an IMF program. Once the regional surveillance unit becomes fully operational, the amount that member countries can withdraw without IMF conditionality could be increased. The collective CMIM agreement on the process of managing a regional pool of international reserves marks a major milestone in institutionalizing Asian regionalism.

3 The implications of the global financial crisis on the dollar standard's sustainability, and alternative options

The global financial crisis, which originated in market failures in the housing and financial markets of the US, brings into question the desirability and feasibility of pegging Asian currencies to the dollar as the keystone for the regional stability and future growth. The alleged gains from pegging to the dollar are debatable, and there is scarcity of studies that tested it carefully against alternative hypotheses. The instability of the dollar against the euro and other key currencies implies that pegging to the dollar would increase the domestic currency volatility against the euro, pound and other currencies. This effect may be sub-optimal for countries that trade heavily with the euro bloc and experience an increase in such trade over time. One way to deal with this issue is to evaluate what would have been the optimal weight of achieving real exchange stability against a basket of currencies that reflect the actual trading patterns of the region.

Recent studies dealing with the Trilemma [Aizenman, Chinn and Ito (forthcoming)] are consistent with the notion that emerging market countries have moved towards the Trilemma middle ground, associated with greater exchange rate flexibility and limited but growing financial integration, buffered by sizable reserve holdings.[5] This has enabled them to retain a degree of monetary autonomy, even as financial integration continued – e,g, Indian and China

[5] Both trends are more pronounced for the emerging markets than for the non-emerging developing countries.

before the crisis, a time that both countries grew rapidly while maintaining controlled financial openness and limited exchange rate flexibility. During that time, the Chinese yuan appreciated significantly, without obvious downside effects. The onset of the crisis led to the renewed pegging of the yuan to the dollar, but is not self-evident that returning to a rigid peg to the dollar is desirable and sustainable in the post-crisis period. Applying data predating the crisis, Aizenman et al. (forthcoming) failed to find evidence that countries which pegged their currency to the dollar preformed on average better than those that allowed controlled flexibility. During crises, many developing countries found that allowing the real exchange rate and monetary policy to initially take the brunt of the required adjustment to a crisis facilitated the adjustment process. We will look at the recent history of the region to assess the potential gains from prolonging the dollar standard.

3.1 **Korea's Financial Turmoil in the Second Half of 2008: The Use of Both Reserves and Swaps**

During the second half of 2008, Korea used both FX reserves and swap lines to cope with turbulence in its FX and financial markets. The primary transmission channel which spread the global financial crisis to Asia was the collapse of trade and exports. By and large, Asian financial systems were relatively immune from the turbulence which afflicted their counterparts in the US and EU. However, in the case of Korea, the global crisis also had adverse effects on both the real economy and financial system. During the course of 2008, Korea suffered an unusually high degree of financial instability relative to other countries in the region. The instability reached its peak during October when the Korean won teetered on the verge of collapse [Figure 1] and the stock market plunged by one third. [Figure 2] There was even speculation of a repeat of the Asian crisis which had wrought havoc on the Korean economy. The financial stress was puzzling in light of Korea's relatively strong macroeconomic fundamentals – e.g. GDP growth, current account balance and fiscal balance – and microeconomic fundamentals – e.g. balance sheets of financial institutions and corporations. Equally puzzling was the fact that Korea's fundamentals were at least as strong as and certainly not visibly worse than those of comparable countries such as NIEs or the ASEAN-4, which were spared such financial turbulence. Furthermore, Korea was the world's sixth largest holder of FX reserves when it entered the crisis, and its reserve level comfortably passed conventional tests of reserve adequacy.

[Figure 1]

[Figure 2]

The most likely answer to the puzzle lies in Korea's exceptionally high degree of capital degree liberalization. For example, there are almost no restrictions on foreign residents' purchase and sale of domestic equities or domestic financial institutions' foreign borrowing. Growing financial integration kicked off by liberalization since the Asian financial crisis led to rapid increase in the share of foreign investments in Korean's stock market capitalization, from less than 5% in 1992 to more than 35% by 2005. In addition, the share of equity investment in total foreign investment is third highest among 30 OECD economies, at 39.0%. [Figure 3] The large exposure of Korean banks to short-term foreign loans arose from their taking counterparty positions to the purchases of forward exchange contracts by shipbuilders keen to hedge themselves against exchange rate risk. The rollover rate on those loans fell sharply as a result of the global credit crunch and the resulting repayment pressures precipitated the freefall of the won in October. Hedge funds and other foreign residents withdrew from Korean equities in droves to reinforce their balance sheets back home as the global financial crisis intensified. Total net sales of equities by foreign residents exceeded 43 trillion won during 2008. Those sales were the main drivers of the year-long plunge of the equity market and also contributed to the won debacle in October. The Korean experience should serve as a cautionary tale for other developing Asian countries about the substantial risks of capital account liberalization. Countries which are more open toward cross-border capital flows will suffer disproportionately when foreign residents withdraw their funds from the local financial markets.

[Figure 3]

The Korean government took a number of decisive policy actions to contain the financial turmoil. The Bank of Korea (BOK) spent around US$60 billion trying to defend the won but without much success. [Figure 4] There were some reservations about how BOK handled its FX market intervention, especially in terms of communicating its intentions clearly the financial markets, but the upshot is that even sustained and massive intervention failed to restore stability. The centre-piece of a bailout package the government finally unveiled in response to the mounting market pressure was a $100 billion, three-year government guarantee for banks' debt raised abroad before July 2009. This sum is more than sufficient to cover Korean banks' foreign debt maturing by June 2009, estimated by the Korean Ministry of Strategy and Finance to be about $80 billion. Yet, despite the large stockpile of FX reserves used to finance the bailout

package, market pressures did not subside. The limited effectiveness of high reserves-to-GDP ratio in containing market pressures reflects Korea's vulnerability to balance sheet effects due to its heavy short term borrowing in foreign currencies as well as its vulnerability to massive deleveraging by foreign portfolio investors during the global crisis [see Aizenman (2009)].

[Figure 4]

Korea regained a measure of stability in its financial markets only after the Bank of Korea entered into a $30 billion swap agreement with the US Federal Reserve. The BOK-Fed swap agreement came into effect on 30 October 2008 and was part of a network of $30 billion agreements that the Fed simultaneously signed with the central banks of 4 emerging markets – Brazil, Korea, Mexico and Singapore. The initial swap arrangement was in effect until April 2009 but has been twice extended since then, up to February 2010. The facilities were designed to support the provision of US dollar liquidity to fundamentally sound and well-managed emerging markets which faced the risk of shortage of US dollar funding due to unfavorable global liquidity conditions. Korea made the swap deal as part of efforts to secure secondary support measures, not because of any shortage of reserves. Further bolstering market confidence were two additional swap agreements reached with China and Japan in mid-December 2008, which expanded Korea's existing swap lines with the two countries to US$30 billion each. A simplified overall picture of the Korean experience is as follows: a country with an ample pool of reserves tries to defend its currency with massive but ineffective FX market intervention, and is ultimately rescued by swap agreements.

4 Empirical Analysis of Swap Lines

In this section, we report and discuss the results of our empirical analysis of swap lines. Our analysis is based on cross-country data. The swap lines since December 2007 to date involve 24 countries as shown in Table 2. Collectively, the economic size of the swap providers and recipients is equal to 85 percent of world GDP. In term of the initial swap amounts, the US Federal Reserve has been the largest provider, extending 14 swap lines, 755 billion USD in total. The People Bank of China has provided swap lines to 6 countries (650 billion Yuan) and the European Central Bank commits 4 swap lines (31.5 billion Euros).

[Table 2]

While the swap lines provided by the Federal Reserve to the ECB, the Bank of Japan, and the

Bank of England are by far the largest, many believe that the swap commitments among these central banks could be even larger. However, the claim that some of the swap lines are infinite or unlimited is probably overstating the evidence. The swap lines involved the OECD countries are more elastic at the margin, but they are most likely not infinite. To illustrate, the global swap size is constrained by a multiple the global GDP, but practicality suggests that they are elastic at the range that OECD countries will use them. Better institutional quality means lower moral hazard which should imply more elastic access to larger swap lines, which seems to be the case for the swap lines between the OECD countries.[6]

Figure 5 plots the extent and the use of swap lines in the last two years. The earliest columns measure the size of the swap lines. The remaining columns correspond to the actual use of the swap lines (subject to data availability). The figure reveals that the usage of the Federal Reserve's dollar swaps has been limited. Since the announcements of dollar swap liquidity,[7] the amounts outstanding have declined across the swap receivers. Canada, Brazil, Singapore, and New Zealand have never used the dollar swaps, and the total dollar swap liquidity extended had dropped to 57 billion USD as of September 30, 2009. These swap lines were originally authorized through February 1, 2010, but has recently been re-scheduled to October 30, 2009.

[Figure 5]

We first look at the percentage changes (%) of key variables from December 2007 to October 2009 between receivers and non-receivers of swap lines. Table 3 reports for 86 developing countries (of which 8 are swap receivers)[8] the changes in foreign exchange reserves, nominal depreciation, short-term external debts and export credits (standard errors in brackets). The data

6 Swap lines resemble unsecured sovereign debt, and may be constrained by similar considerations. Hence, factors that explain better access to the sovereign borrowing may also explain easier access to larger swap lines. These factors include low volatility, higher trade openness, credibility associated with history of low incidence of default and good growth prospects, quality of institutions, etc. All these factors play a role in explaining the differential patterns of access and the use of swap lines.

[7] December 12, 2007 for the ECB and the Swiss National Bank, and 29 October 2008 for the other central banks, except the Bank of England and the Bank of Japan, where the dollar swaps are implicitly always in place. The figure provides the amount of outstanding swap lines (billion USD) between the U.S. Federal Reserve and foreign central banks as reported in the Federal Reserve System Monthly Report on Credit and Liquidity Programs and the Balance Sheet.

[8] The eight countries are Argentina, Brazil, Hong Kong, Hungary, Indonesia, Korea, Mexico, and Poland.

are taken from the Economist Intelligent Unit (EIU) database. Since the end of 2007, in percentage term, the swap receivers on average accumulated larger foreign reserves, experienced more nominal depreciation, de-leveraged bigger amount of short-term debts and witnessed more decline in export credits. The evidence of short-term debts and export credits seem to suggest that the swap receivers are more exposed to the (lagged) effects of a general deterioration of conditions in global short-term funding markets.

[Table 3]

Obstfeld, Shambaugh and Taylor (2009) find that currencies of countries holding more reserves relative to M2 have tended to appreciate in the crisis, whereas those with smaller foreign reserves have depreciated. They also argue that the dollar swaps to the emerging markets have been largely symbolic since Brazil, Korea, and Singapore already had foreign reserves more than predicted.[9] Our evidence in Table 3 suggests that, as a group, the EM swap recipients have experienced significantly larger nominal currency depreciation and reduction of short-term debt stocks. Given that most of the EM's short-term external debts are foreign currency denominated, the swap liquidity might have been in place to backstopping these emerging markets, substituting for a large hoarding of foreign exchange reserves in a short period of time.

There is also a noticeable decline in export credits of developing countries, probably reflecting the effects of adverse global short-term credit market conditions on the real side of global economy, namely international trade in goods and services. The finance literature consistently shows the importance of trade credits as a financing vehicle between the buyers and sellers, as well as the source of external finance along with bank loans.[10] For all the emerging markets, export credits account for 10 percent of the short-term external debts.[11]

We explore further the relationship between swap agreements and international trade for all possible countries. Table 4 reports a seemingly unrelated regression of swap amount (dependent

[9] They predict the foreign reserves/GDP ratio as a function of financial openness, the exchange rate regime, monetary depth (M2/GDP ratio), a dummy for the advanced countries, and the ability to issue debt in one's own currency. From their estimation, Mexico and Hungary, however, had fewer foreign reserves than predicted and their swap lines may have had a more substantive impact beyond mere signaling.

[10] See for example, Love, Preve and Sama-Allende (2007). In the context of international transactions, Jinjarak (2007) provides some evidence that lagged trade credits forecast import, but not vice versa.

[11] This ratio dropped from 26 percent in 1997, presumably due to the Asian financial crisis.

variable) on the size of bilateral trade between the country of swap providers (the Federal Reserve, the European Central Bank, and the People Bank of China) and swap recipients (22 countries in Table 2) and non recipients (191 countries). The size of bilateral trade is the total sum from 2004 to 2008. The swap amount is in the currency of providers. The estimating equation is given by

$$SWAP_{USA\to i} = a_{USA}\frac{EXPORTS_{USA\to i}}{\sum_{i}^{213} EXPORTS_{USA\to i}} + b_{USA}\frac{IMPORTS_{USA\leftarrow i}}{\sum_{i}^{213} IMPORTS_{USA\leftarrow i}} + \varepsilon_{USA,i}$$

$$SWAP_{EUR\to i} = a_{EUR}\frac{EXPORTS_{EUR\to i}}{\sum_{i}^{213} EXPORTS_{EUR\to i}} + b_{EUR}\frac{IMPORTS_{EUR\leftarrow i}}{\sum_{i}^{213} IMPORTS_{EUR\leftarrow i}} + \varepsilon_{EUR,i}$$

$$SWAP_{CHN\to i} = a_{CHN}\frac{EXPORTS_{CHN\to i}}{\sum_{i}^{213} EXPORTS_{CHN\to i}} + b_{CHN}\frac{IMPORTS_{CHN\leftarrow i}}{\sum_{i}^{213} IMPORTS_{CHN\leftarrow i}} + \varepsilon_{CHN,i}$$

In using the above specification, we focus on the role of swap lines extended during the latest financial crisis. The key variable for swap liquidity provision is a trade link as measured by the trade shares of swap recipients in the provider's total trade.

[Table 4]

The estimation results show that the importance of swap recipients as an export destination is associated with a larger amount of swap liquidity extended from the US Federal Reserve and the People Bank of China. In the case of the dollar swap lines, the results seem to be driven by the presence of Japan and the euro area, which account for 7 and 20 percent of the US exports, respectively. For the swap liquidity extended by the People Bank of China, the association between the swap size and export share is quite systematic: Hong Kong, Korea, Indonesia, Malaysia, and Argentina account for 12, 4, .9, 1.1 and .2 percent of the China's total exports, respectively.

It is useful to check whether the marginal increase in bilateral trade (i.e. % increase in bilateral trade in the previous 5 years, as a measure of swap provider's propensity to trade) is associated with the presence of swap agreements and their size. We address this issue first by using OLS estimation and separating trade shares below and above 1%. The estimation results continue to show that larger export destinations tend to receive larger swap lines from the US and China. Next, we replace the bilateral trade shares with the marginal increases in bilateral trade.

Specifically, we check whether an increase in China's exports to Argentina relative to an increase in China's total exports from 2004 to 2008 increase the size of swap lines extended from China. The results suggest that the marginal increase of bilateral trade over the past five years is associated with the swap liquidity extensions by both the US and China.

During the financial turmoil of 2008, the frequent concern voiced towards the emerging markets has been on the possibility that their size of foreign exchange reserves might have been too low relative to GDP and outstanding short-term external debts. Indeed, history has never been short on providing the evidence of concurrent external liquidity and currency runs. Figure 6 plots the nominal depreciation (%) from July 2008 to June 2009 against [ST Debts - FX Reserves]/ FX Reserves (%) as of July 2008 for 23 emerging markets.[12] The figure also provides a linear prediction (quarterly data) specification (III) of Table 5.

[Figure 6]

[Table 5]

The estimation results in Table 5 show that, as expected, larger nominal depreciation is associated with larger [ST Debts – FX Reserves]/FX Reserves and lower FX Reserves/GDP ratios. Both coefficient estimates are, however, statistically weak. If we run the regression with only one of these two variables, each variable has become highly significant. As of July 2008, the correlation between [ST Debts – FX Reserves]/FX Reserves and FX Reserves/GDP is -.43, which is rather high. Emerging markets with larger external financing gap tended to hold smaller amount of foreign reserves at the onset of the 2008 crisis.

The swap recipients in Figure 6 seem to be indistinguishable from the non-recipients in terms of their nominal depreciation and short-term financing gap. Focusing on the recipient group, however, shows some difference between the recipients of China's swaps (Argentina, Indonesia, and Malaysia) and the other swap recipients. In relation to the prediction line, the recipients of China's swap have experienced smaller actual nominal depreciation than predicted. On the other hand the recipients of the US's swaps (Brazil, Korea, and Mexico) and the ECB's swaps (Hungary and Poland) have had larger actual depreciation than the predicted ones. One interpretation of this evidence is that the China's swap liquidity has been complementary to international reserves as an effective insurance against the instability of its recipient's currency,

[12] We narrow to these 23 countries as they make up the widely-followed S&P and MSCI emerging-market bond and equity indices.

while the swaps from the Federal Reserve and the ECB have play a substitute role to the foreign reserves accumulation of the emerging markets. [13]

A limitation of our analysis is that, at this stage, we are unable to control for the factors accounting for foreign currency pressure – for example, deleveraging pressures and drop in net exports, as well as country-specific balance sheet exposures. Ideally, one needs to control for these variables in order to understand the marginal contribution of swap lines.[14] Figure 5 and our estimation results are consistent with the possibility that the introduction of swap lines is more important than the actual use of these lines. This would be the case if countries value to flexibility granted by the swap line, providing the option value of using it if the crisis would deepen. Yet, the actual use of a swap line may be associated with a stigma, implying that countries would prefer to delay to use of swap line as a last resort (or at least as a secondary resort). Hence, somewhat paradoxically, countries that are eager to have access to swap lines in a crisis may prefer to refrain from using it.

[13] An alternative interpretation is that Argentina, Indonesia, and Malaysia are less integrated with the global financial system Brazil, Korea, and Mexico; thereby the first group faced smaller effective deleveraging pressure. This suggests that controlling financial integration, balance sheet exposure, and deleveraging would provide more satisfactory explanation of the cross country variation in exchange rate deprecation and international reserves loses during the 2008-9 crisis.

[14] To illustrate this point, deeper depletion of international reserves by Korea relative to Brazil may reflect deeper drop of net exports and greater deleveraging and exposure to short term foreign currency debt facing Korea than Brazil, inducing Korea to adjust both by depletion of 60 Billion US $ of its IR, as well as sizable depreciation, at times when Brazil's adjustment was mostly via the depreciation of the Real.

5 Concluding Observations

One key stylized fact of global FX reserve management during the global financial crisis has been the proliferation of swap agreements between large central banks such as the US Fed, PBOC and ECB on one hand and the central banks of emerging markets on the other hand. The most well-known of such agreements is the US$30 billion agreements between the US Fed and the central banks of four systematically important emerging markets with strong fundamentals – Brazil, Korea, Mexico and Singapore – which came into effect in October 2008. An important issue which arises in connection with the swap deals is the extent to which they can mitigate the precautionary or self-insurance motive underlying the unprecedented reserve accumulation in developing countries immediately prior to the global crisis. At a broader level, swap lines can substitute for reserves since the two serve the same basic purpose – they are both international liquidity which can be called upon in case of unexpected shortages of international liquidity. Upon closer inspection, there are clear limits to substitutability between swaps and reserves. Above all, the credibility of reserves in the eyes of financial markets is ultimately determined by the credibility of the central bank holding the reserves while the credibility of swap lines is determined by the credibility of the central bank providing the liquidity support. Of course, one may question the credibility of the US Fed in light of the fact that the global crisis originated in the US. However, the somewhat paradoxical appreciation of the dollar at the slightest sign of global financial distress – e.g. Dubai crisis – attests to the enduring safe-haven status of the dollar.

Before we can meaningfully assess the prospective impact of swap agreements on reserve accumulation, it is necessary to look at the nature of those agreements as well as their determinants. This has motivated the empirical analysis of this paper. Overall, the evidence indicates that by and large swap lines are extended only to fundamentally sound and well-managed emerging markets. Crucially, sound fundamentals include healthy levels of FX reserves. The highly selective nature of swap recipients means that a majority of developing countries will not have access to swap facilities. For those countries, swap lines cannot possibly be a substitute for reserve accumulation for the simple reason that the central banks of large countries are unwilling to provide them with swap lines. Of course, there are other substitutes for individual reserve accumulation such as regional reserve pooling arrangement or access to IMF credit lines. More fundamentally, our evidence shows that large central banks tend to extend swap facilities only to those countries with which they have strong financial and trade linkages. In other words,

while swaps can contribute to the global public good of global financial stability, in fact large central banks provide liquidity support only when it is in the self-interest of their respective countries to do so. For example, as noted earlier, exposure of US banks was the single most important explanation for why the US entered into swap deals with Brazil, Korea, Mexico and Singapore.

In the context of swap lines motivated by the self-interest of providing countries, a particularly interesting result from our empirical analysis is the strong influence of trade, in particular exports, in the determination of recipient countries. That is, large central banks tend to enter into swap agreements with their counterparts in countries which are important export markets. Although this pattern holds for large central banks in general, what is striking is that it helps to explain the recent rise of the PBOC as a major provider of swap facilities. For all its spectacular growth, China's financial system is still under-developed and lags far behind the country's real economy. The depth, breadth, liquidity and sophistication of its financial markets fall far below that of financial center countries, which explains why China invests so much of its savings in US financial markets. Furthermore, the credibility of the PBOC is not noticeably greater than that of central banks in other emerging markets even though it sits atop the world's largest stockpile of reserves. Nevertheless, the emergence of China as a globally significant trading power gives the yuan some intrinsic value despite the country's financial under-development. In particular, the yuan can be used as to pay for imports from China, which is large and growing in many countries given the sustained rapid growth of China's exports. The inclusion of countries such as Argentina and Belarus, not known for strong fundamentals nor sound management, among PBOC's swap recipient countries points to the overarching dominance of export markets as the key criterion. Be that as it may, the growth of yuan-dominated swap lines may be a precursor to the eventual emergence of the yuan as a new reserve currency.

The Korean experience is highly significant because it is a real-world case of a country simultaneously using both FX reserves and swap deals to deal with financial instability during the global financial crisis. One possible interpretation of the Korean saga is that more is always better when it comes to reserves since even an ample stockpile of reserves failed to prevent sharp currency depreciation. However, such a misinterpretation would be misguided and inappropriate since it is doubtful whether more reserves would have made any difference. When market confidence is shattered, FX market intervention to stabilize exchange rate becomes ineffective,

even if the economy has sound fundamentals. That is, reserves fail to perform their precautionary or self-insurance function when tail-end risks are realized. In fact, in the case of Korea, declining reserves themselves intensified market fears and concerns, forming a vicious cycle in which adverse market sentiment drive down reserves via FX market intervention and the decline in reserves, in turn, further dampens market sentiment. The timing of market movements suggests that BOK's three swap agreements, in particular the agreement with the US Fed, played a pivotal role in calming down the growing market hysteria over a possible dollar shortage. Quite clearly, the swap agreement would have been much less effective in the absence of strong fundamentals, including healthy reserve levels. A plausible interpretation of the Korean experience seems to be that swap lines which have important signaling effects, such as the BOK-Fed deal, can restore the precautionary or self-insurance function of reserves. This function can temporarily freeze up during severe shocks but the Korean experience shows that swap deals can revive the function by restoring market confidence.

One big puzzle in Asia's FX reserve management in the global crisis period is the virtual invisibility of the Chiang Mai Initiative (CMI). It was precisely the type of financial turbulence visited upon Korea in the second half of 2008, precipitated by market jitters about prospective shortage of dollar liquidity, that the architects of CMI had in mind. However, Korea turned to the US Fed for primary support when push came to shove and the country teetered toward a full-fledged financial crisis. Even CMI partners PBOC and Bank of Japan played only a secondary role and outside the CMI framework at that. What is needed for member countries to make greater use of the CMI in the future is more concrete and specific governance structure and implementation details. Encouragingly, as noted earlier, substantive progress has been made toward the multilateralization of the CMI (CMIM) since October 2008. In fact, the global financial crisis has served as a catalyst for CMIM. The resolution of politically sensitive issues such as the relative share of contributions among member countries, as well as the establishment of clear conditions for withdrawal of reserves and an independent regional surveillance unit, is expected to significantly boost the attractiveness of CMI as a source of funds during a crisis. Despite the progress of CMIM, a range of issues relating to the governance, operations and technical details of the CMI still remain unresolved. These include, for example, precisely how withdrawal requests will be evaluated and precisely how funds will be disbursed.

In addition to deepening regional reserve pooling arrangements – i.e. the CMI – another policy

option for mitigating the need for precautionary reserves is to lengthen the duration of swap agreements. The Korean experience shows that swap agreements can help restore market confidence at a time of severe crisis. There is an intriguing possibility that swaps can help maintain market confidence even during normal non-crisis periods. The evidence of our analysis suggests that swap lines are motivated primarily by the self-interest of provider countries, but in fact they deliver substantial benefits for both provider and recipient countries. For provider countries, swaps help to safeguard the economic interests they have in countries to which they extend swap lines. The interests may take different forms – e.g. the exposure of US banks or a significant export market – but they can be substantial. For recipient countries, swaps help to restore financial stability during episodes of extreme financial distress when even large stockpiles of FX reserves fail to reassure markets. It is entirely possible that swaps are mutually beneficial not only during crises but also during normal non-crisis periods. Formalizing and institutionalizing swap lines so that they are transformed from temporary anti-crisis measures to more long-term mechanisms for liquidity support may dampen the need for precautionary reserve hoarding.

At a broader level, the desirability of the unprecedented scale and speed of Asia's reserve accumulation in the pre-crisis period is debatable. According to the dollar standard or Bretton Woods II view of global imbalances, Asia seeks to achieve rapid economic growth by adopting macroeconomic and exchange rate policies that keep exchange rates very competitive on a sustained basis. A centerpiece of such policies is systematic intervention in the FX market to purchase US dollars and de facto pegging to the US dollar. The rapid build-up of reserves may be a visible consequence of those policies. According to this interpretation, the global financial crisis has shattered the myth that the dollar standard was sustainable for a long period of time since it benefited both Asia - rapid growth driven by rapid growth of exports – and the US – which obtained cheap external financing due to massive Asian purchases of low-yielding US government bonds. Arguably, some observers interpret the global crisis as a painful wake-up call that Asian over-production counterbalanced by US over-consumption is ultimately an unsustainable game which harms all countries.

Finally, since financial instability in emerging markets is usually the result of volatile capital flows and the fundamental purpose of precautionary reserves is to limit financial instability, some emerging markets may opt to dampen the precautionary accumulation of FX reserves by

controlling volatile capital flows. According to this argument, controlled financial integration which retains some restrictions on capital flows may limit financial instability, which, in turn, will limit the need for precautionary FX reserves. One possible solution to sudden stops and deleveraging may be a Pigovian tax scheme, where inflows of portfolio flows and external borrowing above a threshold may be taxed at an increasing rate, reflecting the resultant higher exposure of the central bank to a possible future bailout of the banking system.[15] Such a tax scheme, implemented *before* the inflow of foreign funds takes place, may curtail exposure to the growing hazard facing the recipient country due to possible de leveraging. It may induce the foreign investor to internalize the externality associated with possible costs of deleveraging, and reduce the cost of self insurance by funding some of the self insurance.

[15] The design of the FDIC deposit insurance scheme in the US may be viewed as generating outcomes similar to such a Pigovian tax scheme. The FDIC charges insurance premiums on bank deposits at a rate that ideally should reflect the riskiness of banks' investments. The insurance premium is akin to a tax on banks' borrowing, inducing the bank to internalize the impact of its balance sheet on the possibility of future bailouts. As with any insurance scheme, care should be taken to deal with the possibility of moral hazard.

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Table 1

Swap arrangements under the Chiang Mai Initiative (as of December 2008)

To / From	China	Japan	Korea	Indonesia	Malaysia	Philippines	Singapore	Thailand	**Total**
China		3.0	4.0	4.0	1.5	2.0		2.0	16.5
Japan	3.0		13.0	6.0	1.0	6.0	3.0	6.0	38.0
Korea	4.0	8.0		2.0	1.5	2.0		1.0	18.5
Indonesia			2.0						2.0
Malaysia			1.5						1.5
Philippines		0.5	2.0						2.5
Singapore		1.0							1.0
Thailand		3.0	1.0					..	4.0
Cambodia									0.0
Lao PDR									0.0
Myanmar									0.0
Vietnam									0.0
Sub-total	**7.0**	**15.5**	**23.5**	**12.0**	**4.0**	**10.0**	**3.0**	**9.0**	**84.0**
ASEAN Swap Agreement (among the 10 ASEAN countries)									**2.0**
TOTAL									**86.0**

Source: Elaborations based on Japan's Ministry of Finance website.
Available from:http://www.mof.go.jp/english/index.htm. Accessed: February 2009.

Figure 1
Korean won per US dollar, January 2008 – January 2010

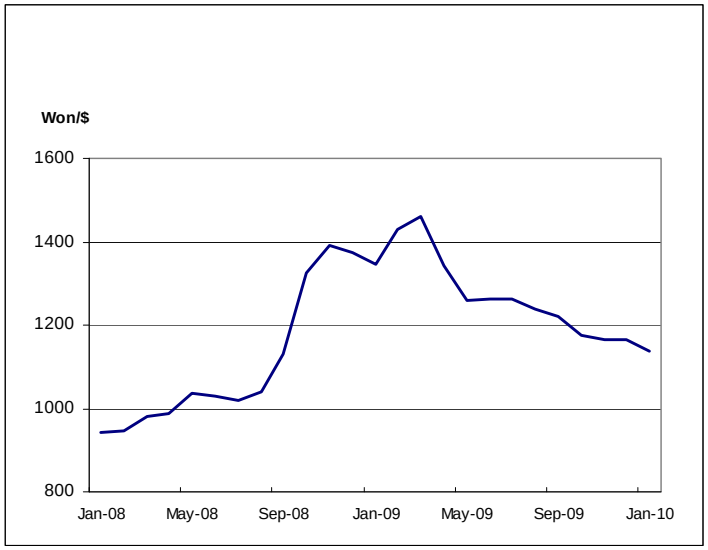

Figure 2
KOSPI monthly average,, January 2008 – January 2010

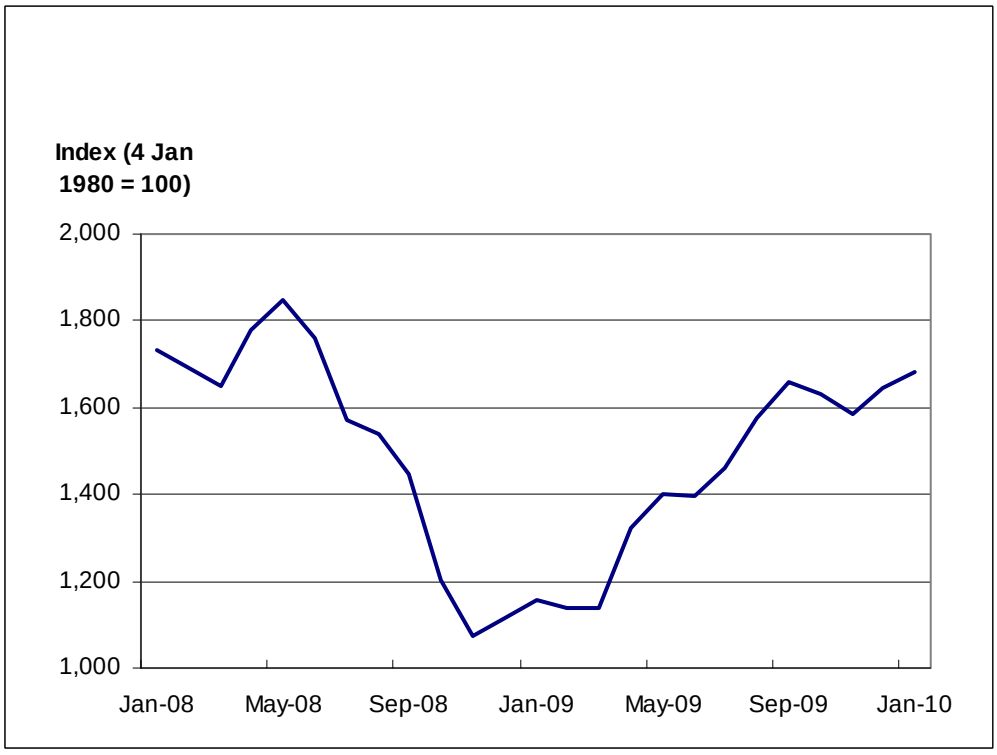

Figure 3
Equity investment as share of total foreign investment, selected OECD countries

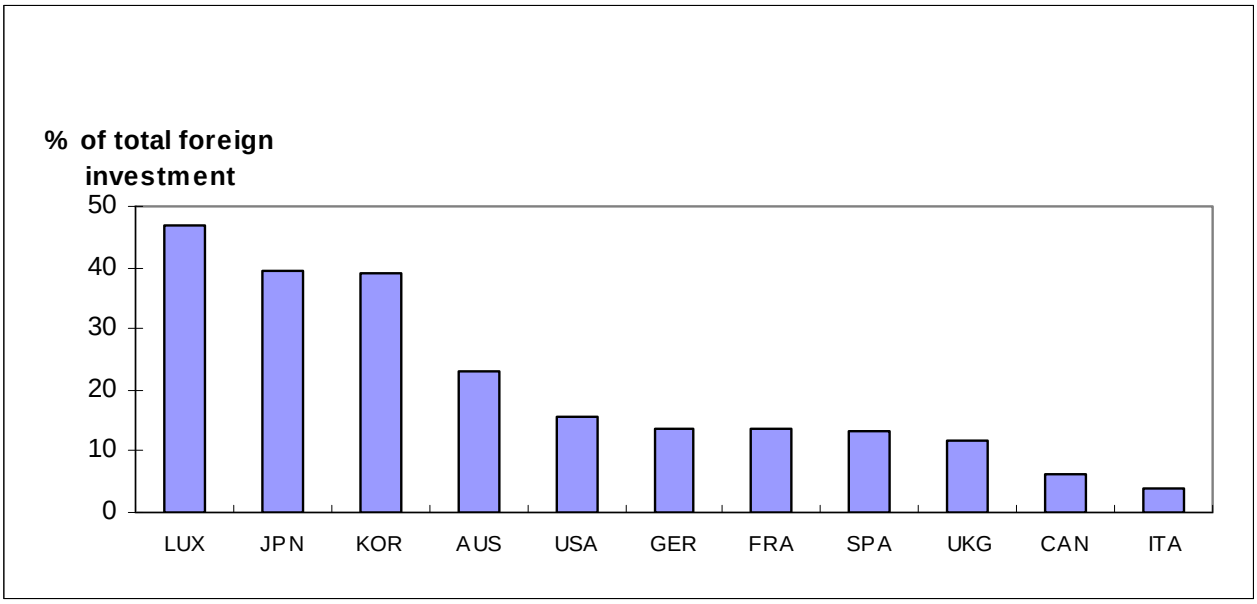

Figure 4
Korea's FX reserves, January 2008 – January 2010

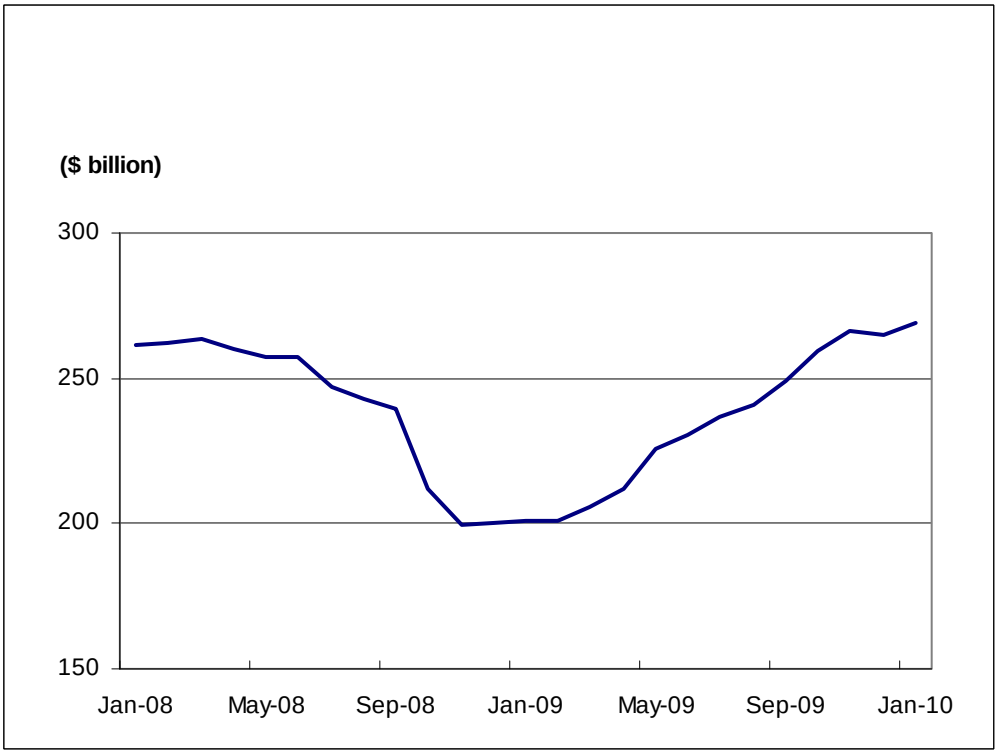

Table 2
This table provides the initial swap lines provided by the U.S. Federal Reserve (billion USD), the European Central Bank (billion Euro), and the People Bank of China (billion Yuan).

Country	FED_USD	ECB_EURO	PBC_CNY
Argentina			70
Australia	30		
Brazil	30		
Belarus			20
Canada	30		
Denmark	15	15	
ECB	240		
Hong Kong			200
Hungary		5	
Iceland		1.5	
Indonesia			100
Japan	120		
Korea	30		180
Mexico	30		
Malaysia			80
Norway	15		
New Zealand	15		
Poland		10	
Sweden	30		
Singapore	30		
Switzerland	60		
United Kingdom	80		

Figure 5
This figure provides the amount of outstanding swap lines (billion USD) between the U.S. Federal Reserve and foreign central banks as reported in the Federal Reserve System Monthly Report on Credit and Liquidity Programs and the Balance Sheet. The authorized dates of these dollar swap liquidity are December 12, 2007 for the ECB and the Swiss National Bank, and 29 October 2008 for the other central banks (except the Bank of England and the Bank of Japan, where the dollar swaps are implicitly always in place). The earliest columns measure the size of the swap lines.

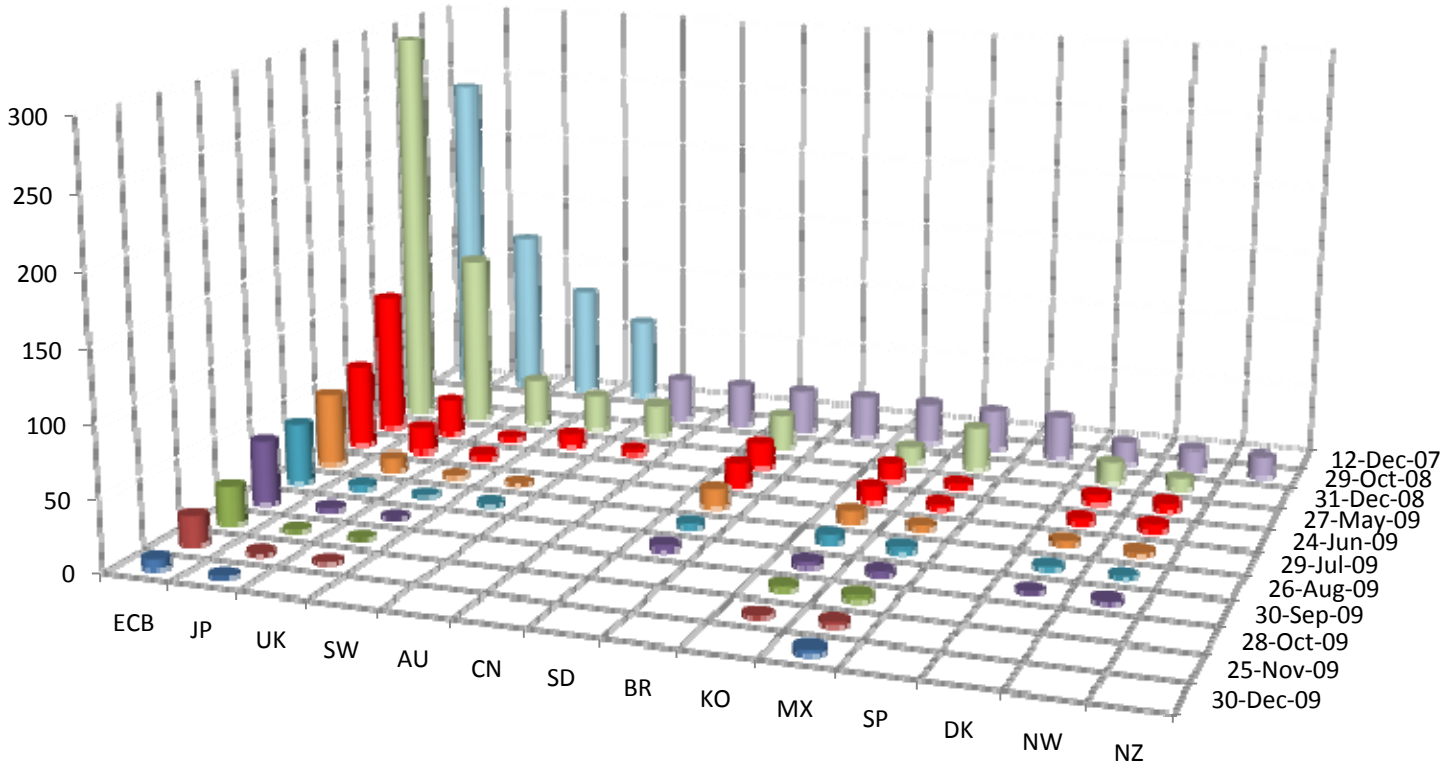

Table 3
This table compares percentage changes (%) of key variables from December 2007 to October 2009 between receivers and non-receivers of swap lines. Standard errors are in brackets. The sample includes 86 developing countries (of which 8 are swap receivers: Argentina, Brazil, Hong Kong, Hungary, Indonesia, Korea, Mexico, and Poland). The data are derived from the Economist Intelligent Unit (EIU).

	Swap Line(s)?		
	No	Yes	Diff.
% Change: Dec. 07 - Oct. 09			
Δforeign Reserves	5.620	14.846	-9.226
	[3.875]	[8.550]	[9.387]
Nominal Depreciation	8.685	18.463	-9.778
	[2.044]	[4.083]	[4.566]
ΔShort-Term Debts	-7.768	-26.130	18.363
	[3.966]	[6.269]	[7.418]
ΔExport Credits	-2.711	-14.132	11.421
	[2.173]	[7.688]	[7.989]

Table 4

This table reports a seemingly unrelated regression of swap amount (dependent variable) on the size of bilateral trade between the country of swap providers (the Federal Reserve, the European Central Bank, and the People Bank of China) and the receivers (22 countries in Table 2) and non receivers (191 countries). The size of bilateral trade is the total sum from 2004 to 2008. The swap amount is in the currency of providers. Standard errors are in parentheses. The estimating equation is given by

$$SWAP_{USA\to i} = a_{USA}\frac{EXPORTS_{USA\to i}}{\sum_{i}^{213} EXPORTS_{USA\to i}} + b_{USA}\frac{IMPORTS_{USA\leftarrow i}}{\sum_{i}^{213} IMPORTS_{USA\leftarrow i}} + \varepsilon_{USA,i}$$

$$SWAP_{EUR\to i} = a_{EUR}\frac{EXPORTS_{EUR\to i}}{\sum_{i}^{213} EXPORTS_{EUR\to i}} + b_{EUR}\frac{IMPORTS_{EUR\leftarrow i}}{\sum_{i}^{213} IMPORTS_{EUR\leftarrow i}} + \varepsilon_{EUR,i}$$

$$SWAP_{CHN\to i} = a_{CHN}\frac{EXPORTS_{CHN\to i}}{\sum_{i}^{213} EXPORTS_{CHN\to i}} + b_{CHN}\frac{IMPORTS_{CHN\leftarrow i}}{\sum_{i}^{213} IMPORTS_{CHN\leftarrow i}} + \varepsilon_{CHN,i}$$

	Trade Share (% of Total), SUR Estimation		
Bilateral Trade Shares	USA	EUR	CHN
Exports	**1.927** **(0.839)**	0.052 (0.122)	**2.922** **(1.037)**
Imports	**-1.422** **(0.752)**	-0.056 (0.128)	**-2.067** **(0.781)**
R-squared	0.041	0.001	0.038
Countries	213	213	213
Swap lines	11	4	6

Table 5

This table tests whether $\frac{\text{ST Debts-Foreign Reserves}}{\text{Foreign Reserves}}$ as of July 2008 is associated with the depreciation during June 2008 to June 2009. The sample includes 23 emerging markets (with quarterly data and included in MSCI). Standard errors are in parentheses.

	(I)	(II)	(III)
(SE-IR)/IR	.21 (.09)**		.16 (.10)
IR/GDP		-.37 (.19)*	-.24 (.20)
R-Squared	.19	.15	.24
Countries	23	23	23

Figure 6

This figure plots the nominal depreciation (%) from July 2008 to June 2009 against the $\frac{\text{ST Debts-Foreign Reserves}}{\text{Foreign Reserves}}$ (%) as of July 2008. The 23 countries below make up the S&P and MSCI emerging bond and equity indices. The linear prediction (using quarterly data) is given by specification (III) in Table 5.