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THE IMPOSSIBLE TRINITY — FROM THE POLICY TRILEMMA TO THE POLICY QUADRILEMMA

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The policy Trilemma (the ability to accomplish only two policy objectives out of financial integration, exchange rate stability and monetary autonomy) remains a valid macroeconomic framework. The financial globalization during 1990s–2000s reduced the weighted average of exchange rate stability and monetary autonomy. An unintended consequence of financial globalization is the growing exposure of developing countries to capital flights, and deleveraging crises. The significant costs associated with these crises added financial stability to the Trilemma policy goals, modifying the Trilemma framework into the policy Quadrilemma. Emerging markets frequently coupled their growing financial integration with sizable hoarding of reserves, as means of self-insuring their growing exposure to financial turbulences. The global financial crisis of 2008–2009 illustrated both the usefulness and the limitations of hoarding reserves as a self-insurance mechanism. While modifying the global financial architecture to deal with the challenges of the 21st century remains a work in progress, the extended Trilemma framework keeps providing useful insights about the trade-offs and challenges facing policy makers, investors, and central banks.

Keywords: The impossible trinity; policy trilemma; financial stability; international reserves.

JEL Classifications: F15, F36

1. The Trilemma and Mundell–Fleming's Framework

A fundamental contribution of the Mundell–Fleming framework is the impossible trinity, or the Trilemma. The Trilemma states that a country may simultaneously choose any two, but not all of the following three policy goals — monetary independence, exchange rate stability and financial integration. The "Trilemma triangle" is illustrated in Fig. 1. Each of the three sides of the triangle, representing monetary independence, exchange rate stability, and financial integration, depicts a potentially desirable policy goal. However it is not possible to be on all three sides

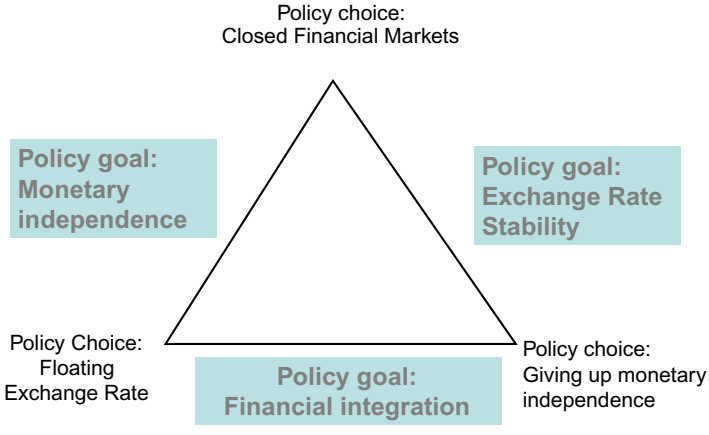


Figure 1. The Trilemma "textbook framework."

of the triangle simultaneously. The top vertex, labeled "closed financial markets," is associated with monetary policy autonomy and a fixed exchange rate regime. But it represents financial autarky — the preferred choice of most developing countries in the mid to late 1980s. The left vertex, labeled "floating exchange rate regime," is associated with monetary independence and financial integration — the preferred choice of the US during the last three decades. The right vertex, labeled "giving up monetary independence," is associated with exchange rate stability (a pegged exchange rate regime), and financial integration, but no monetary independence — the preferred choice of the countries forming the Euro block (a currency union) and of Argentina during the 1990s (choosing a currency-board exchange rate regime).

Among Mundell's seminal contributions in the 1960s was the derivation of the Trilemma in the context of an open economy extension of the IS-LM Neo-Keynesian model.[1] The model considers a small country choosing its exchange rate regime and its financial integration with the global financial market. Analysis is considerably simplified by focusing on polarized binary choices, i.e., credibly fixed exchange rate or pure float and prefect capital mobility or financial autarky. To illustrate the resultant tradeoff, consider first a fixed exchange rate system with perfect capital mobility. This policy configuration corresponds to the policy pair associated with the right side of the Trilemma triangle. In circumstances where domestic and foreign government bonds are prefect substitutes, credible fixed

[1] For overview of Mundell's works see *The Prize in Economics* 1999 — Press release.

exchange rate implies that the domestic interest rate equals the foreign interest rate, as follows from the uncovered interest rate parity condition. If the central bank increases the supply of money, the incipient downward pressure on the domestic interest rate triggers the sale of domestic bonds, in search for a higher yield of foreign bonds. As a result of these arbitrage forces, the central bank is faced with an excess demand for foreign currency aimed at purchasing foreign bonds (and a matching excess supply of domestic currency). Under the fixed exchange rate, the central bank must intervene in the currency market in order to satisfy the public's demand for foreign currency at the official exchange rate. As a result, the central bank sells foreign currency to the public. In the process the central bank buys back the excess supply of domestic currency that is triggered by its own attempt to increase the supply of money. The net effect is that the central bank loses control of the money supply, which passively adjusts to the money demand. Thus, the policy configuration of prefect capital mobility and fixed exchange rate implies giving up monetary policy. An open market operation only changes the composition of central bank's balance sheet between domestic and foreign assets, without affecting the monetary base and the domestic interest rate. This pair of policy choices implies that in a small open economy, determination of the domestic interest rate is relegated to the country to which it's exchange rate in pegged (corresponding to the right vertex of the Trilemma triangle).

A small open economy wishing to maintain financial integration can regain its monetary autonomy by giving up the fixed exchange rate. Under a flexible exchanger rate regime, expansion of the domestic money supply reduces the interest rate, resulting in capital outflows in search of the higher foreign yield. The incipient excess demand for foreign currency depreciates the exchange rate. Hence, in a flexible exchange rate regime with financial integration, monetary policy is potent. A higher supply of money reduces the interest rate, thereby increasing domestic investment, and weakens the domestic currency, which in turn expands the economy through increased net exports. This policy configuration corresponds to the policy pair associated with the left and the lower side of the Trilemma triangle, attainable under a flexible exchange rate regime. However, achieving monetary independence requires the small open economy to give up exchange rate stability, implying a shift from the right vertex of the Trilemma triangle to the left.

An alternative way for the small open economy to regain its monetary independence is to give up financial integration, and opt for exchange rate stability and monetary independence. Giving up financial integration prevents arbitrage between domestic and foreign bonds, thereby delinking the domestic interest rate from the foreign interest rate. Monetary policy operates in ways similar to the closed economy, where in the short run, the central bank controls the supply of money,

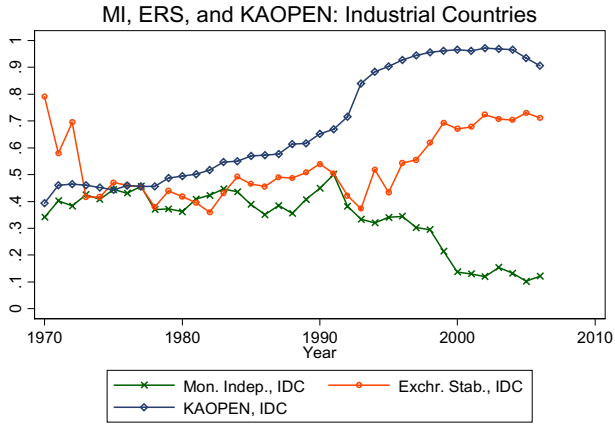
and monetary expansion reduces the domestic interest rate. This policy configuration corresponds to the policy pair associated with the left and the right side of the Trilemma triangle, attainable under closed financial markets and a pegged exchange rate, i.e., the top vertex. Monetary independence in this case gets traded off with financial integration.

The sharp predictions of the Trilemma and its crisp intuitive interpretation made it the Holy-Grail of the open economy neo-Keynesian paradigm. The *impossible trinity* has become self-evident for most academic economists. Today, this insight is also shared by practitioners and policy makers alike. A lingering challenge is that in practice, most countries rarely face the binary choices articulated by the Trilemma. Instead, countries chose the degree of financial integration and exchange rate flexibility. Even in rare cases of adoption of a strong version of a fixed exchange rate system (like the currency-board regime chosen by Argentina in the early 1990s), the credibility of the fixed exchange rate changes overtime, and the central bank rarely follows the strict version of currency-board. Similarly, countries choosing a flexible exchange rate regime, occasionally (some frequently) actively intervene in foreign currency markets, and end up implementing different versions of a managed float system. Furthermore, most countries operate in the gray range of partial financial integration, where regulations restrict flows of funds. Understanding these mixed regimes remains a challenge.

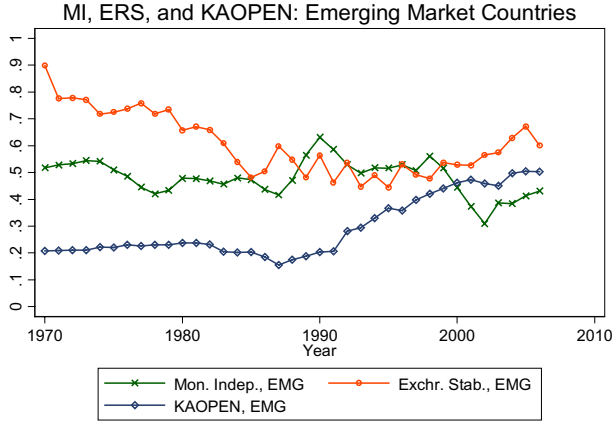
Testing the predictions of the Trilemma paradigm remains work in progress, as there is no unique way to define and measure the degree of exchange rate flexibility, monetary autonomy, and financial integration. Proper modeling of limited financial integration and limited substitutability of assets remains a challenge. Yet, even in this murky situation, the Trilemma remains a potent paradigm. A key message of the Trilemma is scarcity of policy instruments. Policy makers face a tradeoff, where increasing one Trilemma variable (such as higher financial integration) would induce a drop in the weighted average of the other two variables (lower exchange rate stability, or lower monetary independence, or a combination of the two). We continue with a review of the changing Trilemma configurations of countries during recent decades, then discuss the empirical literature dealing with the evolving Trilemma patters, and finally interpret challenges facing countries that have been navigating the Trilemma throughout the globalization process.

2. The Trilemma Choices of Countries — Trends and Tradeoffs

Figure 2 summarizes the changing patterns of Trilemma during the 1970–2006 period. It reports the Trilemma indices for 50 countries (32 of which are developing countries) during the 1970–2006 period, for which there is a balanced data



(a)



(b)

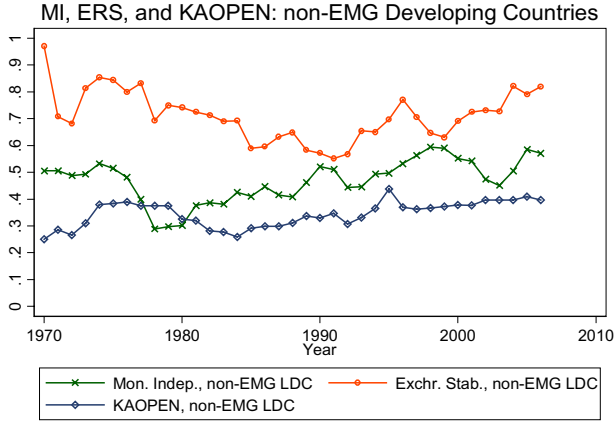
Figure 2. The evolution of Trilemma indices. (a) Industrial countries, (b) emerging market countries, (c) non-emerging market developing countries.

Definitions: The index for the extent of monetary independence (MI); $\text{MI} = 1 - 0.5[\text{corr}(i_i, i_j) - (-1)]$, where i refers to home countries and j to the base country. By construction, higher values of the index mean higher monetary policy independence.

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.

Source: Aizenman *et al.* (2010).



(c)

Fig. 2. (*Continued*)

set. Figure 2(a) vividly shows that after the breakup of the Bretton Woods system, industrial countries significantly reduced the extent of exchange rate stability until the early 1980s. Overall, for the industrial countries, financial openness accelerated after the beginning of the 1990s and exchange rate stability rose after the end of the 1990s, reflecting the introduction of the euro in 1999. In line with the Trilemma predictions, the extent of monetary independence experienced a declining trend, especially since the early 1990s.

Looking at the group of developing countries, we can see that not only do these countries differ from industrial ones, but there are also differences between emerging and non-emerging market (EM) developing countries. Comparing Figs. 2(b) and 2(c) reveals that EMs moved towards relatively more flexible exchange rate regimes, higher financial integration and lower monetary independence, than developing non-EMs. The figure shows that EMs have experienced convergence to some middle ground among all three indices. In contrast, non-EMs, on average, have not exhibited such convergence. For both groups, while the degree of exchange rate stability declined from the early 1970s to the early 1990s, it increased during the last fifteen years. By the end of this sample period, non-EMs exhibit a greater degree of exchange rate stability and monetary independence, but a lower degree of financial integration compared to EMs.

The original formulation of the Trilemma focused on polar Trilemma configuration at the vertex of the Trilemma triangle. However, Fig. 2 implies that most of the action has been happening in the middle ground, with countries shifting their configuration to adapt to new challenges and changing economic

and global structures. Looking at the time series of the Trilemma variables supports the conjecture that major events are associated with structural breaks. After the breakdown of the Bretton Woods system, the mean of the exchange rate stability index for the industrial country group fell statistically significantly, while the mean of financial openness fell only slightly. Non-emerging developing countries did not significantly decrease the level of fixity of their exchange rates over the same time period. However they became less monetarily independent and more financially open. The external debt crisis of 1980s led *all* developing countries to pursue higher exchange rate flexibility, most likely reflecting the fact that countries affected by the crisis could not sustain fixed exchange rate arrangements. Moreover, these countries also simultaneously pursued higher monetary independence, while tightening capital controls in the early 1980s, as a result of the debt crisis.

The level of industrial countries' monetary independence dropped significantly during the 1990s while their exchange rates became more stable and their efforts of capital account liberalization continued. These trends reflect the European countries' movement toward economic and monetary union. For financial openness, the year of 1990 is identified with a major structural break — the beginning of the wave of financial integration of developing countries. For non-emerging developing and EMs countries, the debt crisis is found to be a major structural break for exchange rate stability. The Asian crisis of 1997–1998 is also a major structural break for EM countries [see Aizenman *et al.* (2010)].

3. Testing the Trilemma

Testing properly the predictions of the Trilemma paradigm remains a challenge. While main stream economists by now view the Trilemma as truism, most countries are not at the vertices of the Trilemma. A possible concern is that the Trilemma framework does not impose an exact functional restriction on the association between the three Trilemma policy variables with respect to configurations outside the three Trilemma vertices. Furthermore, measuring the degree of financial integration, exchange rate flexibility and monetary independence in robust ways remain a challenge. Capital mobility has often been difficult to operationalize and to measure in practice. Does it refer to no-legal-impediments to capital flow? Does it assume perfect asset substitutability? What if the domestic financial sector is repressed? Is it possible to replace no-legal-impediments to capital flows with repressing the domestic financial system by means of varying required reserves on banks' deposit liabilities (a policy used frequently by China, India, and other EMs)? These issues are of key importance in evaluating the *de*

facto financial integration of a country, as greater domestic financial repression may mitigate and undermine greater *de jure* financial openness.[2]

One string of the literature sidesteps some of these difficulties by taking a historical perspective, evaluating the transmission of interest rate shocks in various regimes, and over time contrasting different regimes that were close to the three Trilemma vertices [see Obstfeld *et al.* (2004, 2005, 2008)]. Overall, the results are in line with the Trilemma prediction. During fixed-exchange rate episodes in the classical gold standard period, a pronounced and rapid transmission of interest-rate shocks is found. This is in line with the prediction that fixed exchange rate coupled with capital mobility, nullifies monetary independence (corresponding to the right vertex of the Trilemma triangle). In contrast, during the Bretton Woods era, fixed exchange rates did not provide much of a constraint on domestic interest rates, a by-product of widespread capital controls (corresponding to the top vertex of the Trilemma triangle). In the post-Bretton Woods era, the reversion to the more globalized pattern is manifested through an increased interest-rate transmission among fixed-rate countries. Non-peg countries, both before 1914 and in the post-Bretton Woods period, have enjoyed considerably higher monetary independence than countries with pegs.

Yet another research direction has tested the degree to which a linear version of the Trilemma trade-off among the three Trilemma variables is supported by the data. Focusing on the post-Bretton Woods era, the test examines and validates that the weighted sum of the three Trilemma policy variables adds up to a constant, where all the weights are positive. This result confirms the notion that a rise in one Trilemma variable is traded-off with a drop of a linear weighted sum of the other two [see Aizenman *et al.* (2013)]. This analysis supports the viability of the tradeoffs predicted by the Trilemma framework in interior configurations of the Trilemma variables (i.e., when the economy is not at one of the three vertices of Fig. 1).

Looking at the diverse experiences of developing and EMs during 1970–2006, the actual choice of the Trilemma configuration depends on the varying challenges and priorities facing an economy. Higher monetary independence has been associated with dampened output volatility, while greater exchange rate stability is associated with greater output volatility, which can be mitigated by international reserve accumulation. Greater monetary autonomy is associated with higher inflation, while greater exchange rate stability and greater financial openness are

[2] See Chinn and Dooley (1997), articulating that required reserves on banks' deposit liabilities have been utilized by both industrial and developing countries to discourage and sterilize international capital flows. They find that changes in reserve requirements can insulate a repressed financial market from international financial shocks. They conclude that traditional measures of capital mobility such as interest parity conditions or the scale of gross private capital flows are of limited or no value in assessing the openness of repressed financial systems.

linked to a lower inflation. Pursuit of exchange rate stability can increase output volatility when financial development is at an intermediate stage. Greater financial openness, when accompanied by a high level of financial development, reduces output volatility.

4. Beyond the Trilemma Triangle: International Reserves and the Impossible Trinity

Pertinent developments that modify the context of the Trilemma are the massive financial globalization of almost all countries of the world during 1990s–2000s. Concurrently, the economic take-off of EMs, including the most populous countries (China and India), gradually led to a structural-shift, so that by 2010 more than half of the global GDP (PPP adjusted) is produced by developing and EMs. An unintended consequence of financial globalization is the growing exposure of developing countries to financial turbulences 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 more than 10% of the GDP [see Hutchison and Noy (2006)], added financial stability to the three policy goals framed by the original Trilemma, changing thereby the policy Trilemma into the policy Quadrilemma.

Pursuing financial integration while maintaining financial stability of EMs may explain intriguing developments in the three decades since the 1980s — despite the proliferation of greater exchange rate flexibility, international reserves/GDP ratios increased substantially. Most of the increase in reserve holding has taken place in developing countries, especially in emerging East Asia. The dramatic increase of international reserve hoarding has been lopsided.

While the international reserves/GDP ratio of industrial countries was overall stable hovering around 4%, the reserves/GDP ratio of developing countries increased dramatically, from about 5% to about 27% (see Fig. 3). By 2007, about two-thirds of the global international reserves were held by developing countries. Most of this increase has been in Asia, where the reserves/GDP increased from about 5% in 1980 to about 37% in 2006 (32% in Asia excluding China). The most dramatic changes occurred in China, increasing its reserve/GDP from about 1% in 1980, to about 41% in 2006. Econometric evaluations suggest several structural changes in the patterns of reserves hoarded by developing countries [see Aizenman and Lee (2007); Cheung and Ito (2009)]. A notable change occurred in the 1990s, a decade when the international reserves/GDP ratios shifted upwards. The trend that intensified shortly after the East Asian crisis of 1997–1998, subsided by 2000. Another structural change took place in early 2000s, mostly driven by an unprecedented increase in the hoarding of international reserves in China. China's

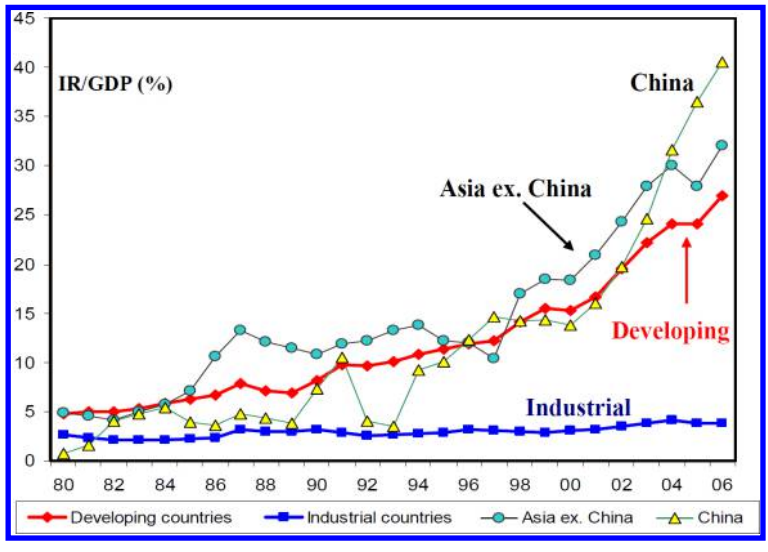


Figure 3. Hoarding international reserves/GDP patterns, 1980–2006.

reserve/GDP ratio almost tripled within six years, from about 14% during 1997–2000, to 41% in 2006 (see Fig. 3).

A probable interpretation for the unprecedented hoarding of international reserves reported in Fig. 3 deals with the unintended consequences of financial globalization. Figure 4 reports international reserves/GDP ratios (top panel) and capital account liberalization indices (bottom panel) for developing and industrial countries. While the international reserves/GDP ratios followed similar patterns in the 1980s, a remarkable take-off in reserve hoarding by developing countries occurs from early 1990s, coinciding with the takeoff of financial integration of developing countries. The hoarding of international reserves/GDP by developing countries accelerated dramatically in the aftermath of the East Asian crisis. The evidence is consistent with the conjecture that financial integration of developing countries led to drastic changes in the demand for international reserves. Prior to the financial integration, the demand for reserves provided self-insurance against volatile trade flows. However, financial integration of developing countries also added the need to self-insure against volatile financial flows. By the nature of financial markets, the exposure to rapidly increasing demands for foreign currency triggered by financial volatility, exceeds by a wide margin the one triggered by trade volatility. Consequently, the financial self-insurance motive associated with the growing exposure to sudden-stops and deleveraging crises accounts well for the international reserves takeoff in the 1990s [see Aizenman and Lee (2007)]. The East Asian crisis was a watershed event, as it impacted high saving countries with overall balanced fiscal accounts. These countries were viewed as been less exposed

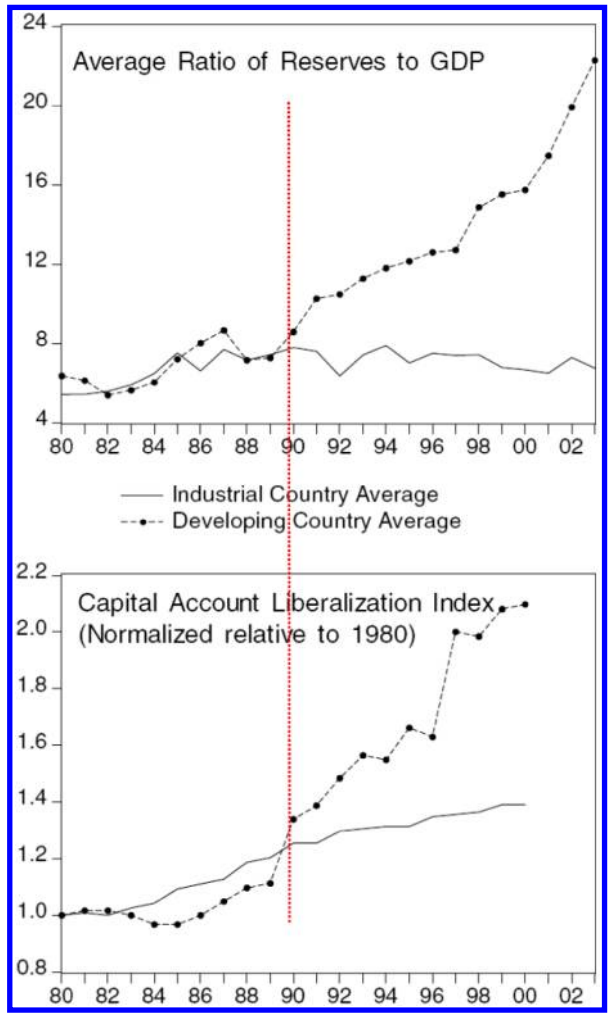


Figure 4. International reserves and financial integration patterns. International reserves/GDP ratios and capital account liberalization indices, for industrial and developing countries.

Source: http://www.springerlink.com/content/e65th31835267t7v/fulltext.pdf.

to sudden stop events as compared to other developing countries prior to the crisis. With a lag, the affected countries reacted by massive increases in their stock of reserves [see Aizenman and Marion (2003)].

The link between hoarding reserves and financial integration suggests a fourth dimension to the Trilemma. In the short-run, countries came to expect that hoarding and managing international reserves may increase their financial stability and capacity to run independent macroeconomic policies. This development seems

to be important for EMs that are only partially integrated with the global financial system, and where sterilization is heavily used to manage the potential inflationary effects of hoarding reserves (China and India being prime examples of these trends). In contrast, most of the industrial countries kept their international reserves/GDP ratios low. This could have reflected the easy access of industrial countries to bilateral swap lines in case of urgent needs for foreign currencies as well as their ability to borrow externally in their currencies.

Obstfeld *et al.* (2010) links the reserve hoarding trend to three key factors associated with the shifting positions 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). The desire to stabilize the exchange rate reflects a hybrid of factors — to boost trade, to mitigate destabilizing balance sheet shocks in the presence of dollarized liabilities, to provide a transparent nominal anchor used to stabilize inflationary expectations, etc. [see Calvo and Reinhart (2002); Klein and Shambaugh (2006)]. 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 the financial integration of the developing country with international financial markets.

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 1994–1995 crisis, the 1997–1998 East Asian crisis, and the Argentinean 2001–2002 financial collapse. The recent history of EMs implies that the macro challenges facing them are probably more complex than navigating the Trilemma triangle. Short of the easy access to institutional swap lines available to mature OECD countries, EMs self insure against financial instability associated with their growing financial integration with the global financial system. Recent studies validate the importance of "financial factors" as important determinants in addition to the traditional factors in accounting for increased international reserves/GDP ratios. Indeed, recent research has revealed that the role of financial factors has increased in tandem with growing financial integration.

More financially open, financially deep countries, with greater exchange rate stability tend to hold more reserves. Within the EM sample, the fixed exchange rate effect is weaker, but financial depth (potentially measured by M2/GDP) is highly significant and growing in importance over time. Trade openness is the other robust determinant of reserve demand, though its importance seems to have diminished overtime. The growing importance of financial factors helps in accounting for a greater share of the international reserves/GDP ratios. However, even with the inclusion of the new variables, China and Japan's international reserves/GDP ratios

seem to be outliers. These results are in line with a broader self-insurance view, where reserves provide a buffer, both against deleveraging initiated by foreign parties, as well as the sudden wish of domestic residents to acquire new external assets, i.e., "sudden capital flight" [see Calvo (2006)]. 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 as measured by M2.

The experience of EMs suggests that the Trilemma triangle, while useful, overlooks the possibility that with limited but growing financial integration, countries hoarding international reserves may loosen in the short-run some of the Trilemma constraints. This possibility may be illustrated by contrasting the Trilemma trends of Latin American and Asian EMs. Latin American EM economies liberalized their financial markets rapidly since the 1990s, after some retrenchment during the 1980s, while reducing the extent of monetary independence and maintaining a lower level of exchange rate stability in recent years. Emerging Asian economies on the other hand, stand out by achieving comparable levels of exchange rate stability and growing financial openness while consistently displaying greater monetary independence. These two groups of economies are most differentiated from each other by their high levels of international reserves holding. Without giving up its exchange rate stability and monetary independence, China has increased its international reserves holding while slowly increasing financial openness. This evidence is consistent with the view that countries' efforts to "relax the Trilemma" in the short-run can involve an increase in international reserves holding [see Aizenman *et al.* (2011); Aizenman and Ito (2012).

5. The Trilemma and the Future Financial Architecture

We conclude with remarks dealing with the relevance of the Trilemma five-decades after Mundell's seminal contributions. The Trilemma is among the few macroeconomic frameworks that have passed the test of time and remains as pertinent today as it was in the past. The main developments that modify the context of the Trilemma are the massive financial globalization of almost all countries of the world, and the fast deepening of domestic and international financial markets. Unlike the 1960s, today the private sector dominates financial intermediation. The sheer volume of potential arbitrage in the presence of misaligned exchange rate is huge relative to the resources of a typical central bank. These developments imply that the viability of the fixed exchange rate is limited, like the viability of a promising *Mirage* [Obstfeld and Rogoff (1995)]. During the 1990's there was significant discussion about the "disappearing middle" — the hypothesis that

everybody was going to hard pegs or fully flexible regimes. The more recent evidence suggests that, with the exception of the formation of the Euro and few currency-boards that survived beyond a decade (mostly in small open economies, like Hong Kong), there has been no obvious global trend that implies the disappearance of the middle ground. Frankel (1999) shows there are no clear cut reasons to expect any convergence towards the polar choices of pure float or pure fixed exchange rate regimes. Figure 2 suggests that, while developing countries keep exhibiting preferences towards exchange rate stability, the growing class of EMs seems to move towards greater exchange rate flexibility. Beyond these trends, one expects that countries will keep adjusting their policy choices in ways that reflect the changing economic circumstances, without any obvious permanent patterns. Similarly, the large increase in the depth of international trade implies that the viability of financial autarky is vanishing, as trade in goods offers channels leading to de-facto financial integration by means of trade mis-invoicing. These developments do not impact the relevance of the Trilemma, but imply that most of action is not in the vertices of the Trilemma, but in the middle ground of limited exchange rate flexibility, partial integration of financial markets, and viable though constrained monetary autonomy.

The enormous challenges associated with rapid financial globalization have been vividly illustrated by the global financial crisis of 2008–2009, when to the surprise of the global financial system, the epic center of the crisis was the US. This crisis happened against the background of a remarkable decline in macroeconomic volatility and cost of risk during the 1990s and early 2000s, a trend that has hence been referred to as "the great moderation." The "great moderation" induced observers to presume the beginning of the end of costly business cycles. Practitioners and markets got convinced about the durability of this moderation trend, and about the superior financial intermediation of the US. This reflected the spirit of late 1990s and early 2000s, when the presumption of key policy makers in the US was that private intermediation with minimal regulatory oversight provide superior results. The alleged superior intermediation of the US provided the intellectual explanation for the growing global imbalances of the 1990s–2000s, when expanding US current account deficits, ranging between 0.5% and 1% of the global GDP, were financed mostly by EMs and commodities exporters. During this period, emerging markets channeled a growing portion of financial inflows to hoarding international reserves. The 2008–2009 global crisis has been a watershed event, shifting the global patterns of Trilemma configurations towards new configurations. The massive tax payer based bailouts in the OECD countries, affecting financial institutions with large international exposure, put to fore the global moral hazard associated with the "put option" provided by the tax payers in rich countries. The challenges facing the OECD countries include redesigning the

global financial architecture in ways that will mitigate the moral hazard consequences of anticipated bailouts, and reducing the exposure to costly global financial storms.

Extending the policy Trilemma into the Quadrilemma by adding financial stability to the Macro policy goals is one of the consequences of the global liquidity crisis of 2008–2009. While our discussion has focused on the EMs, it applies also to the OECD. The logic of our discussion may be viewed as an open economy extension of the growing recognition that the current global financial crisis calls for changes in the global financial architecture. By force of history and by virtue of learning by doing, the pendulum is now shifting towards a more nuanced view. The emphasis is switching towards recognizing central banks and Treasuries' responsibility in implementing prudential regulations and policies aimed at reducing volatility and susceptibility of economies to crises.[3]

The crisis may also lead to changing patterns of financial integration pursued by EMs. In the absence of a major reform of global financial architecture, EMs remain exposed to sudden stops and deleveraging crises. As the crisis of 2008–2009 illustrated, hoarding international reserves remains a potent self-insurance mechanism. Yet, it is a costly option, which may not be sufficient unless it is coupled with assertive policies directed at managing and mitigating aggregate exposure to external debt. Alternatives to massive hoarding of international reserves include a deeper use of swap lines and international reserves pooling arrangements as well as channeling reserves into potentially higher yielding but riskier assets, such as those managed by Sovereign Wealth Funds. While potentially useful, these alternatives are not a panacea. Swap lines are typically of short duration, and are limited by potential moral hazard considerations. Diversification by means of Sovereign Wealth Funds exposes the economy to the risk that value of the fund may collapse precisely at the time when hard currency is needed to fund deleveraging, as has been the case during the 2008–2009 global liquidity-crisis.

In the second half of the 2000s, the fastest growing countries in Asia (China and India) applied regulations on inflows of capital. These policies implicitly subsidize the cost of hoarding international reserves. These regulations reduced the exposure

[3] A Bloomberg report exemplifies the 2008–2009 crisis *Zeitgeist*:
"Central bankers from Washington to Oslo are taking greater account of accelerating asset prices to avoid the policy mistakes that inflated two speculative bubbles in a decade and led to the worst financial crisis since the Great Depression. A month after warning that property prices are rising 'probably excessively,' Norges Bank Governor *Svein Gjedrem* is set to increase interest rates on October 28. Reserve Bank of Australia Governor *Glenn Stevens* cited costlier real estate as a reason for raising rates three weeks ago. . . .The question now is 'whether the interest rate should respond to asset prices and the financial situation more generally, and there is a strong argument that the answer is yes,' Bank of Israel Governor *Stanley Fischer* said Aug. 21."
Central Banks Hitting Assets Question Greenspan View, Bloomberg, Simon Kennedy, October 26, 2009. http://www.bloomberg.com/apps/news?pid=20601087&sid=aIYvRd5Zjf2Y.

of these countries to the deleveraging crisis of 2008–2009, and may reduce the costs of renewed inflows of hot money associated with the recovery from the crisis. Other EMs, more financially integrated with the global financial system before the crisis than China and India, anticipated that their large international reserves warchest would provide sufficient buffer against external deleveraging. Intriguingly, during the 2008–2009 crisis about half of the EMs seemed to be constrained more by the fear of using and losing international reserves than by the "fear of floating." These EMs used a share of their international reserves in the first few quarters of the crisis to finance deleveraging pressures, thereby mitigating currency depreciation. Yet, after losing not more than one-third of their initial stock of international reserves, countries became more averse to further drawing down their reserves. This cautious behavior may reflect the uncertainty regarding the duration and depth of the current global crisis. Some EMs may opt for greater exchange rate depreciation, possibly saving most of their international reserves for leaner years to self-insure against potential prolonged periods of financial turbulence and weakness in their terms of trade.

Consequently, the global financial crisis of 2008–2009 illustrated both the usefulness and the limitations of hoarding reserves as a self-insurance mechanism. The massive deleveraging initiated by OECD countries in 2008 may provide the impetus for some EMs to regulate inflows of short terms funds. Such regulations may include adjusting reserve ratios facing private banks to their external borrowing exposures, as well taxes on short terms inflows of capital. These policies may help fund the hoarding of international reserves by activities that expose the economy to higher risk of deleveraging and to the need to self-insure. Such an approach is akin to the insurance premium imposed by the (Federal Deposit Insurance Corporation) FDIC on the banking system in the US, yet in the international context such policy has repercussions on the financial integration of countries.

These developments illustrate the thorny problems facing countries as they navigate between the macroeconomic policy Trilemma and the goal of maintaining financial stability at times of deepening globalization. While modifying the global financial architecture to deal with the challenges of the 21st Century remains a work in progress, the extended Trilemma framework keeps providing useful insights regarding the trade-offs and challenges facing policy makers, investors, and central banks.

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