Assessing the Emerging Global Financial Architecture: Measuring the Trilemma's Configurations over Time

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Abstract: We develop a methodology that intuitively characterizes the choices countries have made with respect to the trilemma during the post Bretton-Woods period. The paper first outlines the new metrics for measuring the degree of exchange rate flexibility, monetary independence, and capital account openness while taking into account the recent development of substantial international reserve accumulation. The evolution of our "trilemma indexes" illustrates that, after the early 1990s, industrialized countries accelerated financial openness, but reduced the extent of monetary independence while sharply increasing exchange rate stability, all reflecting the introduction of the euro. In contrast, emerging market countries pursued exchange rate stability as their key priority up to the late 1980s while non-emerging market developing countries has pursued it throughout the period since 1970. As a stark difference from the latter group of countries, emerging market countries have converged towards intermediate levels of all three indexes, characterizing managed flexibility while retaining some degree of monetary autonomy and accelerating financial openness. This recent trend appears to be sustained by using sizable international reserves as a buffer. We also confirm that the weighted sum of the three indexes adds up to a constant, validating the notion that a rise in one trilemma variable should be traded-off with a drop of the weighted sum of the other two. The second part of the paper deals with normative aspects of the trilemma, relating the policy choices to macroeconomic outcomes such as the volatility of output growth and inflation, and medium term inflation rates. Some key findings for developing countries include: (i) greater monetary independence can dampen output volatility while greater exchange rate stability implies greater output volatility, which can be mitigated by reserve accumulation; (ii) greater monetary autonomy is associated with a higher level of inflation while greater exchange rate stability and greater financial openness could lower the inflation level; (iii) a policy pursuit of stable exchange rate while financial development is at the medium level can increase output volatility, (iv) greater financial openness with a high level of financial development can reduce output volatility, though greater financial openness with a low level of financial development can be volatility-increasing; (v) net inflow of portfolio investment and bank lending can increase output volatility and higher levels of short-term debt or total debt services can increase both the level and the volatility of inflation.

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1. Introduction

A fundamental contribution of the Mundell-Fleming framework is the impossible trinity, or the trilemma, which states that a country simultaneously may choose any two, but not all, of the following three goals: monetary independence, exchange rate stability and financial integration. The trilemma is illustrated in Figure 1; each of the three sides – representing monetary independence, exchange rate stability, and financial integration – depicts a potentially desirable goal, yet it is not possible to be simultaneously on all three sides of the triangle. The top vertex – labeled "closed capital markets" – is, for example, associated with monetary policy autonomy and a fixed exchange rate regime, but not financial integration, the preferred choice of most developing countries in the mid to late 1980s.[1]

Over the last 20 years, most developing countries have opted for increasing financial integration. The trilemma implies that a country choosing this path must either forego exchange rate stability if it wishes to preserve a degree of monetary independence, or forego monetary independence if it wishes to preserve exchange rate stability.

The purpose of this paper is to outline a methodology that will allow us to easily and characterize in an intuitive manner the choices countries have made with respect to the trilemma during the post Bretton-Woods period. The first part of our study deals with positive aspects of the trilemma, outlining new ways of tracing the evolving financial configurations. The second part deals with normative aspects of the trilemma, relating the policy decisions chosen to macroeconomic outcomes, such as the volatility of output growth and inflation, and medium term inflation rates.

We begin by observing that over the last two decades, a growing number of developing countries, especially emerging market ones, have opted for hybrid exchange rate regimes – e.g., managed float buffered by increasing accumulation of international reserves [IR henceforth]. Despite the proliferation of greater exchange rate flexibility, IR/GDP ratios increased dramatically, especially in the wake of the East Asian crises. Practically, all the increase in IR/GDP holding has taken place in emerging market countries [see Figure 2]. The magnitude of the changes during recent years is staggering: global reserves increased from about USD 1 trillion to more than USD 5 trillion between 1990 and 2006.

The dramatic accumulation of international reserves has been uneven: while the IR/GDP ratio of industrial countries was relatively stable at approximately 4%, the IR/GDP ratio of developing countries increased from about 5% to about 27%. Today, about three quarters of the global international reserves are held by developing countries. Most of the accumulation has been in Asia, where reserves 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 IR/GDP

[1] See Obstfeld, Shambaugh, and Taylor (2005) for further discussion and references dealing with the trilemma.

ratio from about 1% in 1980, to about 41% in 2006 (and approaching 50% by 2008). Empirical studies suggest several structural changes in the patterns of reserves hoarding (Cheung and Ito, 2007; Obstfeld, et al. 2008). A drastic change occurred in the 1990s in terms of reserve management among developing countries. The IR/GDP ratios shifted upwards; the ratios increased dramatically immediately after the East Asian crisis of 1997-98, but subsided by 2000. Another structural change took place in the early 2000s, mostly driven by an unprecedented increase in the accumulation of international reserves by China.

The globalization of financial markets is evident in the growing financial integration of all groups of countries. While the original framing of the trilemma was silent regarding the role of reserves, recent trends suggest that reserve accumulation may be closely related to changing patterns of the trilemma for developing countries. The earlier literature focused on the role of international reserves as a buffer stock critical to the management of an adjustable-peg or managed-floating exchange-rate regime.[2] While useful, the buffer stock model has limited capacity to account for the recent development in international reserves hoarding – the greater flexibility of the exchange rates exhibited in recent decades should help reduce reserve accumulation, in contrast to the trends reported above.

The recent literature has focused on the adverse side effects of deeper financial integration of developing countries – the increased exposure to volatile short-term inflows of capital (dubbed "hot money"), subject to frequent sudden stops and reversals (see Calvo, 1998). The empirical evidence suggests that international reserves can reduce both the probability of a sudden stop and the depth of the resulting output collapse when the sudden stop occurs.[3] Aizenman and Lee (2007) link the large increase in reserves holding to the deepening financial integration of developing countries and find evidence that international reserves hoarding serves as a means of self-insurance against exposure to sudden stops. In extensive empirical analysis of the shifting determinants of international reserve holdings for more than 100 economies over the 1975-2004 period, Cheung and Ito (2007) find that while trade openness is the only factor that is significant in most of the specifications and samples under consideration, its explanatory power has been declining over time. In contrast, the explanatory power of financial variables has been increasing over time.

The increasing importance of financial integration as a determinant for international reserves hoarding suggests a link between the changing configurations of the trilemma and the level of international reserves. Indeed, Obstfeld, et al. (2008) find that the size of domestic financial liabilities that could potentially be converted into foreign currency (M2), financial

[2] Accordingly, optimal reserves balance the macroeconomic adjustment costs incurred in the absence of reserves with the opportunity cost of holding reserves (Frenkel and Jovanovic, 1981).
[3] See Ben-Bassat and Gottlieb (1992), Rodrik and Velasco (1999), and Aizenman and Marion (2004) for papers viewing international reserves as output and consumption stabilizers.

openness, the ability to access foreign currency through debt markets, and exchange rate policy are all significant predictors of international reserve stocks.

We begin by constructing an easy and intuitive way to summarize these trends in the form of a "Diamond chart." Applying the methodology outlined in the next section, we construct for each country a vector of trilemma and IR configurations that measures each country's monetary independence, exchange rate stability, international reserves, and financial integration. These measures are normalized between zero and one. Each country's configuration at a given instant is summarized by a "generalized diamond," whose four vertices measure the three trilemma dimensions and IR holding (as a ratio to GDP).

Figures 3 and 4 provide a concise summary of the recent history of trilemma configurations for different income groups and regional groups.[4] Figure 3 reveals that, over time, both industrialized countries and emerging market countries have moved towards deeper financial integration and losing monetary independence, a stark contrast from non-emerging market developing countries. Furthermore, emerging market countries have pursued greater financial integration while non-emerging market developing countries barely have. As of the 2000s, emerging market countries distinctly differ from other groups with its balanced combination of the three macroeconomic policy goals as well as substantial amount of IR holding.

In Figure 4, we can see that Latin American economies have liberalized their financial markets rapidly since the 1990s after some retrenchment during the 1980s. Emerging markets in Latin America reduced the extent of monetary independence in recent years and maintained a lower level of exchange rate stability. Emerging Asian economies have achieved comparable levels of exchange rate stability and financial openness while consistently reducing monetary independence. This group of economies differ from the other ones the most with their relatively balanced achievement of the three macroeconomic policy goals and their high levels of international reserves holding.

Figure 5 presents the development of trilemma indexes for 50 countries (32 of which are developing countries) during the 1970-2006 period for which we can construct a balanced data set. Focusing on developing countries, we can observe an interesting trend. Comparing Figure 3b and 3c reveals the distinctly different trilemma patterns between emerging (EMG) and non-emerging (non-EMG) market countries.[5] EMGs moved towards relatively more flexible exchange rate than Non-EMGs, buffering it by holding much higher IR/GDP, as well as towards

[4] In each diamond chart, the origin is normalized so as to represent zero monetary independence, pure float, zero international reserves and financial autarky.

[5] Table 1 shows that the differences of the Trilemma indexes for monetary independence, exchange rate stability, and financial openness as well as international reserves holding (as a ratio to GDP) between EMGs and non-EMG developing countries are statistically significant.

higher financial integration and lower monetary independence. The figure shows that EMGs have experienced convergence to some middle ground among all three indexes. In contrast, non-EMGs, 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 – though one could expect that the present crisis would induce these countries to move toward higher exchange rate flexibility. Currently, non-EMGs exhibit a greater degree of exchange rate stability and monetary independence, but a lower degree of financial integration compared to EMGs.

Despite the cross-country and over-time variations in the trilemma configures, one key message of the trilemma is instrument scarcity – 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). Yet, to our knowledge, the validity of this tradeoff among the three trilemma variables has not been tested properly. A possible concern is that the trilemma framework does not impose an exact functional restriction on the association between the three trilemma policy variables.

We conduct a regression analysis to test the validity of the simplest functional specification for the trilemma: whether the three trilemma policy goals are linearly related. For this purpose, we also examine and validate that the weighted sum of the three trilemma policy variables adds up to a constant (see Figure 7). This result confirms the notion that a rise in one trilemma variable should be traded-off with a drop of a linear weighted sum of the other two. The regression results also provide another diagnostic tool, allowing a simple description of the changing ranking among the three trilemma policy goals over time.

In the second half of the paper, we investigate the normative questions pertaining to the trilemma. More specifically, we examine how the policy choices among the three trilemma policies affect output growth volatility, inflation rates, and the volatility of inflation, with focus on developing economies. Given that EMGs collectively have outperformed non-EMGs in terms of average economic growth rates, it can be the middle ground configuration of the trilemma policies that have contributed to the recent rapid and better development and high economic growth among the emerging markets. Yet, without controlling for the macroeconomic environment, one cannot be definitive about the causality since the middle-ground convergence may also be the outcome of successful take offs and prolonged growth. Our paper attempts to verify these issues through regression analyses, looking more systematically at the association between trilemma choices and economic performance. Upon investigating the link between the trilemma policy configurations and macroeconomic performance of the countries of our focus,

we also pay close attention to three other factors, namely, international reserves (IR) holding, financial development, and external finance.

As has been intensively investigated in the literature, for the last decade since the Asian crisis of 1997-98, developing countries, especially those in East Asia and the Middle East, are rapidly increasing the amount of international reserves hoarding. China, the world's largest holder of international reserves, currently holds about $2 trillion of reserves, accounting for 30% of the world's total. As of the end of 2008, the top 10 biggest holders are all developing countries except for Japan, and the nine developing countries, including China, Russia, Taiwan, and Korea hold over 55% of international reserves available in the world. Against this backdrop, it has been argued that one of the main reasons for the rapid IR accumulation is countries' desire to stabilize exchange rate movement. Hypothetically, one could argue that countries hold massive international reserves to have balanced combinations of exchange rate stability, monetary policy autonomy, and financial openness. Thus, evidently, one cannot discuss the issue of the trilemma without incorporating the effect of IR holding, which we will do in this paper.

Secondly, the ongoing crisis has made it clear that financial development can be a double-edged sword. While it can enable more efficient allocation of capital, it also embraces the possibility of amplifying shocks to the economy. As a country may incorporate financial development into its decision-making process for the trilemma configurations, as China has been alleged to pursue closed financial markets with exchange rate stability as precautionary measures to protect its underdeveloped financial system, the degree of financial development could affect the macroeconomic performance of the economy.[6] Some also argue that countries with newly liberalized financial system tend to experience financial fragility (Demirguc-Kent and Detragiache, 1998). Thus, trilemma policy configurations need to be investigated while incorporating the level of financial development.

Thirdly, as globalization proceeds with an unprecedented speed, and more countries are abolishing capital controls, policy makers in countries, especially developing ones, cannot ignore the effect of capital flows from other countries. As Lane and Milesi-Ferretti (2006) show, the type, volume, and direction of capital flows has been changing over time, thus policy makers have to aim at moving targets in their policy decision making. Especially, considering that the present crisis has shown that the speed and the volume of tsunami of capital flows can be enormous, we must be abreast of the cost and benefit of trilemma configurations in tandem with those of external financing such as FDI flows, portfolio flows, and banking lending across countries.

[6] See Prasad (2008) for the argument that China's policy of exchange rate stability and closed financial markets is impairing the country's macroeconomic management.

In the remaining of the paper, Section 2 outlines the methodology for the construction of our "trilemma indexes." This section also presents summary statistics of the indexes and examines whether the indexes entail any structural breaks corresponding to major global economic events. Furthermore, in this section, we test the validity of a linear specification of the trilemma indexes to examine whether the notion of the trilemma can be considered to be a trade-off and binding. Section 3 conducts more formal analysis on how the policy choices affect output growth volatility, inflation rates, and the volatility of inflation, with focus on developing economies. In Section 4, we extend our empirical investigation and examine the impact of other important economic variables related to the current crisis such as financial development and various forms of external financing. In Section 5, we make casual observations to see whether our empirical findings are consistent with the occurrence of the ongoing severe crises in some countries. We present our concluding remarks in Section 6.

2. Measures of the Trilemma Dimensions

The empirical analysis of the tradeoffs being made requires measures of the policies. Unfortunately, there is a paucity of good measures; in this paper we attempt to remedy this deficiency by creating several indices.

2.1 Construction of the Trilemma Measures

Monetary Independence (MI)

The extent of monetary independence is measured as the reciprocal of the annual correlation of the monthly interest rates between the home country and the base country. Money market rates are used.[7]

The index for the extent of monetary independence is defined as:

$$MI = 1 - \frac{corr(i_i, i_j) - (-1)}{1 - (-1)}$$

where *i* refers to home countries and *j* to the base country. By construction, the maximum and minimum values are 1 and 0, respectively. Higher values of the index mean more monetary policy independence.[8,9]

[7] The data are extracted from the IMF's *International Financial Statistics* (60B..ZF...). For the countries whose money market rates are unavailable or extremely limited, the money market data are supplemented by those from the Bloomberg terminal and also by the discount rates (60...ZF...) and the deposit rates (60L..ZF...) series from *IFS*.
[8] The index is smoothed out by applying the three-year moving averages encompassing the preceding, concurrent, and following years ($t-1$, t, $t+1$) of observations.

Here, the base country is defined as the country that a home country's monetary policy is most closely linked with as in Shambaugh (2004). The base countries are Australia, Belgium, France, Germany, India, Malaysia, South Africa, the U.K., and the U.S. For the countries and years for which Shambaugh's data are available, the base countries from his work are used, and for the others, the base countries are assigned based on IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)* and *CIA Factbook.*

Exchange Rate Stability (ERS)

To measure exchange rate stability, annual standard deviations of the monthly exchange rate between the home country and the base country are calculated and included in the following formula to normalize the index between zero and one:

$$ERS = \frac{0.01}{0.01 + stdev(\Delta(\log(exch\_rate))}$$

Merely applying this formula can easily create a downward bias in the index, that is, it would exaggerate the "flexibility" of the exchange rate especially when the rate usually follows a narrow band, but is de- or revalued infrequently.[10] To avoid such downward bias, we also apply a threshold to the exchange rate movement as has been done in the literature. That is, if the rate of monthly change in the exchange rate stayed within +/-0.33 percent bands, we consider the exchange rate is "fixed" and assign the value of one for the ERS index. Furthermore, single year pegs are dropped because they are quite possibly not intentional ones.[11] Higher values of this

[9] We note one important caveat about this index. For some countries and some years, especially early in the sample, the interest rate used for the calculation of the MI index is often constant throughout a year, making the annual correlation of the interest rates between the home and base countries (corr(ii, ij) in the formula) undefined. Since we treat the undefined corr the same as zero, it makes the MI index value 0.5. One might think that the policy interest rate being constant (regardless of the base country's interest rate) is a sign of monetary independence. However, it could reflect the possibility that the home country uses other tools to implement monetary policy, rather than manipulating the interest rates (e.g., manipulation of required reserve ratios and providing window guidance; or financial repression). To complicate matters, some countries have used reserves manipulation and financial repression to gain monetary independence while others have used both while strictly following the base country's monetary policy. The bottom line is that it is impossible to fully account for these issues in the calculation of MI. Therefore, assigning an MI value of 0.5 for such a case appears to be a reasonable compromise. However, we also undertake robustness checks on the index.

[10] In such a case, the average of the monthly change in the exchange rate would be so small that even small changes could make the standard deviation big and thereby the ERS value small.

[11] The choice of the +/-0.33 percent bands is based on the +/-2% band based on the annual rate, that is often used in the literature. Also, to prevent breaks in the peg status due to one-time realignments, any exchange rate that had a percentage change of zero in eleven out of twelve months is considered fixed. When there are two re/devaluations in three months, then they are considered to be one re/devaluation event, and if the remaining 10 months experience no exchange rate movement, then that year is considered to be the year of fixed exchange rate. This way of defining the threshold for the exchange rate is in line with the one adopted by Shambaugh (2004).

index indicate more stable movement of the exchange rate against the currency of the base country.

Financial Openness/Integration (KAOPEN)

Without question, it is extremely difficult to measure the extent of capital account controls.[12] Although many measures exist to describe the extent and intensity of capital account controls, it is generally agreed that such measures fail to capture fully the complexity of real-world capital controls. Nonetheless, for the measure of financial openness, we use the index of capital account openness, or *KAOPEN*, by Chinn and Ito (2006, 2008). *KAOPEN* is based on information regarding restrictions in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (*AREAER*). Specifically, *KAOPEN* is the first standardized principal component of the variables that indicate the presence of multiple exchange rates, restrictions on current account transactions, on capital account transactions, and the requirement of the surrender of export proceeds.[13] Since *KAOPEN* is based upon reported restrictions, it is necessarily a *de jure* index of capital account openness (in contrast to *de facto* measures such as those in Lane and Milesi-Ferretti (2006)). The choice of a *de jure* measure of capital account openness is driven by the motivation to look into policy intentions of the countries; *de facto* measures are more susceptible to other macroeconomic effects than solely policy decisions with respect to capital controls.[14]

The Chinn-Ito index is normalized between zero and one. Higher values of this index indicate that a country is more open to cross-border capital transactions. The index is originally available for 181 countries for the period of 1970 through 2006.[15] The data set we examine does not include the United States. The Appendix presents data availability in more details.

2.2 Tracking the Indexes

Variations across Country Groupings

Comparing theses indexes provides some interesting insights into how the international financial architecture has evolved over time. For this purpose, the "diamond charts" are most useful. In each diamond chart, the origin is normalized so as to represent zero monetary

[12] See Chinn and Ito (2008), Edison and Warnock (2001), Edwards (2001), Edison et al. (2002), and Kose et al. (2006) for discussions and comparisons of various measures on capital restrictions.
[13] This index is described in greater detail in Chinn and Ito (2008).
[14] *De jure* measures of financial openness also face their own limitations. As Edwards (1999) discusses, it is often the case that the private sector circumvents capital account restrictions, nullifying the expected effect of regulatory capital controls. Also, IMF-based variables are too aggregated to capture the subtleties of actual capital controls, that is, the direction of capital flows (i.e., inflows or outflows) as well as the type of financial transactions targeted.
[15] The original dataset covers 181 countries, but data availability is uneven among the three indexes. *MI* is available for 172 countries; *ERS* for 182; and *KAOPEN* for 178. Both *MI* and *ERS* start in 1960 whereas *KAOPEN* in 1970. For the data availability of the trilemma indexes, refer to Appendix.

independence, pure float, zero international reserves and financial autarky. Figure 3 summarizes the trends for industrialized countries, those excluding the 12 euro countries, emerging market countries, and non-emerging market developing countries.[16]

That figure reveals that, over time, while both industrialized countries and emerging market countries have moved towards deeper financial integration and losing monetary independence, non-emerging market developing countries have only inched toward financial integration and have not changed the level of monetary independence. Emerging market countries, after giving up some exchange rate stability during the 1980s, have not changed their stance on the exchange rate stability whereas non-emerging market developing countries seem to be remaining at or slightly oscillating around a relatively high level of exchange rate stability. The pursuit of greater financial integration is much more pronounced among industrialized countries than developing countries while emerging market countries have been increasingly becoming more financial open. Interestingly, emerging market countries stand out from other groups by achieving a relatively balanced combination of the three macroeconomic goals by the 2000s, i.e., middle-range levels of exchange rate stability and financial integration while not losing as much of monetary independently as industrialized countries. The recent policy combination has been matched by a substantial increase in IR/GDP at a level that is not observed in any other groups.

To confirm the different development paths of the trilemma indexes for the groups of EMGs and non-EMG developing countries for the last four decades, we conduct mean-equality tests on the three trilemma indexes and the IR holding ratios between EMGs and non-EMG developing countries. We report the test results in Table 1 and statistically confirm that the development path of the trilemma configurations has been different between these two groups of developing countries.

Figure 4 compares developing countries across different geographical groups. Developing countries in both Asia and Latin America (LATAM) have moved toward exchange rate flexibility, but LATAM countries have rapidly increased financial openness while Asian counterparts haven not. Asian emerging market economies have moved further toward financial openness on a level comparable with LATAM emerging market countries, yet one key difference between the two groups is that the former holds much more international reserves than the latter. More importantly, Asian emerging market countries have achieved a balanced combination of the three policy goals while the other groups have not, which can easily make one suspect it is the high volume of IR holding that may have allowed this group of countries to achieve such a trilemma configuration. We will revisit this issue later on. Lastly, Sub-Saharan African countries

[16] The emerging market countries are defined as the countries classified as either emerging or frontier during the period of 1980-1997 by the International Financial Corporation plus Hong Kong and Singapore.

appear to have pursued the policy combination of exchange rate stability and monetary independence while lagging considerably in financial liberalization behind the other regions.

Patterns in a Balanced Panel

Figure 5 again presents the development of trilemma indexes for different subsamples while focusing on the time dimension of the development, but also restricts the entire sample to include only the countries for which all three indexes are available for the entire time period. By balancing the dataset, the number of countries included in the sample reduces to 50 countries out of which 32 countries are developing countries including 18 emerging market countries. Each panel presents the full sample (i.e., cross-country) average of the trilemma index of concern and also its one-standard deviation band. There is a striking differences between industrialized and developing countries as well as between emerging market and non-emerging market countries.

The top-left panel shows that, between the late 1970s and the late 1980s, the levels of monetary independence are closer to each other between industrialized countries and developing ones. However, since the early 1990s, these two groups have been diverging from each other. While developing countries have been hovering around the medium levels of monetary independence and slightly deviating from the cross-country average, industrialized countries have steadily become much less monetary independent and moved farther away from the cross-country average, reflecting the efforts made by the euro member countries.[17] In the case of the exchange rate stability index, after the breakup of the Bretton Woods system, industrialized countries significantly reduced the extent of exchange rate stability until the early 1980s. After the 1980s, these countries gradually, but steadily increased the extent of exchange rate stability to the present – though they experienced some intermittent in the early 1990s due to the EMS crisis.[18] Developing countries, on the other hand, maintained relatively high levels of exchange rate stability until the 1980s. Although these countries seem to have adopted some exchange rate flexibility in the early 1980s, they have since maintained constant levels of exchange rate stability through the early 2000s, which seems to reflect the "fear of floating." In the last few years, these countries even gradually increased the level of exchange rate stability. Not surprisingly, industrialized countries have achieved higher levels of financial openness throughout the period. The acceleration of financial openness in the mid-1990s remained significantly high compared to the cross-country average of both the full sample and LDC subsample. On the other hand, developing countries also accelerated financial openness in the

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

[18] The ERS index for the non-euro industrialized countries, persistently hovers around the value of .40 throughout the time period after rapidly dropping in the early 1970s.

early 1990s after some retrenchment during the 1980s. Overall, LDC countries have been in parallel with the global trend of financial liberalization throughout the sample period, but the difference from the industrialized countries has been moderately rising in the last decade.

Broadly speaking, the difference between emerging market countries and non-emerging market developing countries is smaller than that between IDC and LDC subsamples (shown in the bottom row of Figure 5). However, the divergence between the two groups seems to be becoming wider gradually since the mid-1990s. While non-EMG countries have retained relatively constant levels of monetary independence, EMG countries have become less monetary independent. As for exchange rate stability, EMG countries are persistently more flexible than non-emerging ones since 1980 and the difference is wider since the early 1990s. EMG countries have also become more financially open compared with non-EMG countries since the mid-1990s.

Figure 6 shows the development paths of these indexes altogether, making the differences between IDCs and LDCs and those between EMGs and non-EMGs appear more clearly. For the industrialized 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. The extent of monetary independence has experienced a declining trend, especially after the early 1990s.[19]

When we look at the group of developing countries, we can see that not only do these countries differ from industrialized ones, but also they differ between emerging and non-emerging market developing countries. Up to the mid-1980s, exchange rate stability was the most pervasive policy among the three, though it has been on a declining trend since the early 1970s, followed by monetary independence that has been relatively constant during the period. Between the mid-1980s and 2000, monetary independence and exchange rate stability became the most pursued policies while the level of financial openness kept rising rapidly. During the 1990s, the level of monetary independence went up on average while more countries adopted floating exchange rates and liberalized financial markets. Most interestingly, since 2000, all three indexes have been converged to the middle ground, which we have already observed as the balanced achievement of the three policy goals in Figure 4. This result suggests that developing countries may have been trying to cling to moderate levels of both monetary independence and financial openness while maintaining higher levels of exchange rate stability – leaning against the trilemma in other words – which may explain the reason why some of these economies hold sizable international reserves, potentially to buffer the trade-off arising from the trilemma. Willett (2003) has called this compulsion by countries with a mediocre level of exchange rate

[19] If the euro countries are removed from the sample (not reported), financial openness evolves similarly to the IDC group that includes the euro countries, but exchange rate stability hovers around the line for monetary independence, though at a bit higher levels, after the early 1990s. The difference between exchange rate stability and monetary independence has been slightly diverging after the end of the 1990s.

fixity to hoard reserves the "unstable middle" hypothesis (as opposed to the "disappearing middle" view).

None of these observations are applicable to non-emerging developing market countries. For this group of countries, exchange rate stability has been the most pervasive policy throughout the period, though there is some variation, followed by monetary independence. There is no discernable trend in financial openness for this subsample.

2.3 Identifying Structural Breaks

To shed more light on the evolution of the index values, we investigate whether major international economic events have been associated with structural breaks in the index series. We conjecture that major events – such as the breakdown of the Bretton Woods system in 1973, the Mexican debt crisis of 1982 (indicating the beginning of 1980's debt crises of developing countries), and the Asian Crisis of 1997-98 (the onset of sudden stop crises affecting high-performing Asian economies (HPAEs), Russia and other emerging countries) – may have affected economies in such significant ways that they opted to alter their policy choices.

We identify the years of 1973, 1982, 1997-98, and 2001 as candidate structural breaks, and test the equality of the group mean of the indexes over the candidate break points for each of the subsample groups.[20] The results are reported in Table 2 (a). The first and second columns of the top panel indicate that after the breakdown of the Bretton Woods system, the mean of the exchange rate stability index for the industrialized country group fell statistically significantly from 0.69 to 0.43, while the mean of financial openness slightly increase from 0.44 to 0.47. Non-emerging market developing countries, however, did not significantly decrease the level of fixity of their exchange rates over the same time period while they became less monetarily independent and more financially open. Although the same changes in monetary independence and financial openness are also observed among emerging market economies, they did move toward more flexible exchange rates.

Even after the Mexican debt crisis, industrialized countries slightly, but significantly increased the level of exchange rate stability and significantly increased the level of financial openness, while holding constant the level of monetary independence. In contrast, the debt crisis led *all* developing countries to pursue further exchange rate flexibility, most likely reflecting the fact that crisis countries could not sustain fixed exchange rate arrangements. However, these countries also simultaneously pursued more monetary independence. Interestingly, non-emerging

[20] The data for the candidate structural break years are not included in the group means either for pre- or post-structural break years. For the Asian crisis, we assume the years of 1997 and 1998 are the break years and therefore remove observations for these two years.

developing market countries tightened capital controls as a result of the debt crisis while emerging market countries did not follow the suit.

The Asian crisis also appears to be a significant event in the evolution of the trilemma indexes. The level of industrialized countries' monetary independence dropped significantly while their exchange rates became much more stable and their efforts of capital account liberalization continued, all reflecting the European countries' movement toward economic and monetary union. Non-emerging market developing countries on the other hand increased the level of all three indexes. Emerging market countries also started liberalizing financial markets but much more significantly, though they lost monetary independence and slightly gained exchange rate stability.

Several other major events are candidates for inducing structural breaks identified. For example, anecdotal accounts date globalization at the beginning of the 1990s, when many developing countries began to liberalize financial markets. Also, China's entry to the World Trade Organization in 2001 was, in retrospect, the beginning of the country's rise as *the* world's manufacturer. Because the effect of these events may have often been conflated with that of the Asian crisis we also test whether the years of 1990 and 2001 can be structural breaks.

The results are reported in Table 2 (b); the first two columns show the results of the mean equality test for the trilemma indexes with the year of 1990 as the candidate structural break whereas the last two columns report those with the year of 2001 as the structural break. The top panel shows that for industrialized countries, 1990 can be a structural break for all three indexes. However, when we compare the statistical magnitude of the change in the index for monetary independence across different candidate structural breaks (i.e., compare the t-statistics for monetary independence in column 4 of Table 2 (a), in column 2 of Table 2 (b), and in column 4 of Table 2 (b)), the mean equality test is most strongly rejected for the no structural break of 1997-98 hypothesis. We obtain the same result for exchange rate stability, though for financial openness, the structural break of 1990 rejects the null hypothesis the most significantly.[21] For the group of non-emerging market developing countries, the structural break of 1990 is the most significant for monetary independence and financial openness while it is the year of 2001 for exchange rate stability. For emerging market countries, however, the most significant structural break is found to have occurred in 2001 for monetary independence and exchange rate stability, and in 1997-98 for financial openness.

[21] The finding that both monetary independence and exchange rate stability entail structural breaks around the Asian crisis can be driven merely by the countries that adopted the euro in 1999. We repeat the same exercise using the industrial countries sample without the euro countries, and find that the structural breaks for monetary independence and financial opens remain the same as in the full IDC sample (1997-98 and 1990, respectively), but that the exchange rate stability series is found to have a structural break in 2001. Also, the change in the exchange rate stability series is negative (i.e., further exchange rate flexibility) in both 1990 and 2001.

Lastly, we compare the t-statistics across different structural breaks for each of the indexes and subsamples. Given that the balanced dataset is used in this exercise, the largest t-statistics should indicate the most significant structural break for the series. For example, industrial countries' monetary independence and exchange rate stability series have the largest t-statistics when the structural break of 1997-98 is tested.[22] For financial openness, however, the year of 1990 is identified with the largest structural break. The results for other variables and subsamples are shown in Table 2 (c). For non-emerging LDC and EMG countries, the debt crisis is found to be the most significant structural break for exchange rate stability. The year of 1990 is the most significant structural break for monetary independence and financial openness for non-emerging developing market countries, whereas the year of 2001 and the Asian crisis of 1997-98 are, respectively, for emerging market countries.

2.4 The Linear Relationships between the Trilemma Indexes

While the preceding analyses are quite informative on the evolution of international macroeconomic policy orientation, we have not shown whether these three macroeconomic policy goals are "binding" in the context of the impossible trinity. That is, it is important for us to confirm that countries have faced the trade-offs based on the trilemma. A challenge facing a full test of the trilemma tradeoff is that the trilemma framework does not impose any obvious functional form on the nature of the tradeoffs between the three trilemma variables. To illustrate this concern, we note that the instrument scarcity associated with the trilemma implies that increasing one trilemma variable, say higher financial integration, should induce lower exchange rate stability, or lower monetary independence, or a combination of these two policy adjustments.[23] Yet, the nature of the trade-off is not specified. Hence, we test the validity of a simplest possible trilemma specification – a linear tradeoff. Specifically, we test that the weighted sum of the three trilemma policy variables adds up to a constant. This reduces to examining the goodness of fit of this linear regression:

$$1 = a_j MI_{i,t} + b_j ERS_{i,t} + c_j KAOPEN_{i,t} + \varepsilon_t \qquad \text{where } j \text{ can be either IDC, ERM, or LDC.} \qquad (1)$$

Because we have shown that different subsample groups of countries have experienced different development paths, we allow the coefficients on all the variables to vary across different groups

[22] When the sample is restricted to non-euro IDCs, the most significant structural break for exchange rate stability is found to be 1973, the year when the Bretton Woods system collapsed, while those for monetary independence and financial openness are unchanged.

[23] More generally, increasing of one Trilemma variable should induce a drop of the second Trilemma variable, or a drop in the third Trilemma variable, or a combination of the two.

of countries – industrialized countries, the countries that have been in the European Exchange Rate Mechanism (ERM), and developing countries – allowing for interactions between the explanatory variables and the dummies for these subsamples.[24] The regression is run for the full sample period as well as the subsample periods identified in the preceding subsection. The results are reported in Table 3.

The rationale behind this exercise is that policy makers of an economy must choose a weighted average of the three policies in order to achieve a best combination of the two. Hence, if we can find the goodness of fit for the above regression model is high, it would suggest a linear specification is rich enough to explain the trade off among the three policy dimensions. In other words, the lower the goodness of fit, the weaker the support for the existence of the trade-off, suggesting either that the theory of the trilemma is wrong, or that the relationship is non-linear.

Secondly, the estimated coefficients in the above regression model should give us some approximate estimates of the weights countries put on the three policy goals. However, the estimated coefficients alone will not provide sufficient information about "how much of" the policy choice countries have actually implemented. Hence, looking into the predictions using the estimated coefficients and the actual values for the variables (such as $\hat{a}MI$, $\hat{b}ERS$, and $\hat{c}KAOPEN$) will be more informative.

Thirdly, by comparing the predicted values based on the above regression, i.e., $\hat{a}MI + \hat{b}ERS + \hat{c}KAOPEN$ **,** over a time horizon, we can obtain some inferences regarding how "binding" the trilemma is. If the trilemma is found to be linear, the predicted values should hover around the value of 1, and the prediction errors should indicate how much of the three policy choices have been "not fully used" or to what extent the trilemma is "not binding."

Table 3 presents the regression results. The results from the regression with the full sample data are reported in the first column, and the others for different subsample periods are in the following columns. First of all, the adjusted R-squared for the full sample model as well as for the subsample periods is found to be above 94%, which indicates that the three policy goals are linearly related to each other, that is, countries face the trade-off among the three policy options. Across different time periods, the estimated coefficients vary, suggesting that countries alter over time the weights on the three policy goals.

Figure 7 illustrates the goodness of fit from a different angle. In the top panels, the solid lines show the means of the predicted values (i.e., $\hat{a}MI + \hat{b}ERS + \hat{c}KAOPEN$) based on the full sample model in the first column of Table 3 for the groups of industrial countries (left) and

[24] The dummy for ERM countries is assigned for the countries and years that corresponds to participation in the ERM (i.e., Belgium, Denmark, Germany, France, Ireland, and Italy from 1979 on, Spain from 1989, U.K. only for 1990-91, Portugal from 1992, Austria from 1995, Finland from 1996, and Greece from 1999).

developing countries (right).[25] To incorporate the time variation of the predictions, the subsample mean of the prediction values as well as their 95% confidence intervals (that are shown as the shaded areas) are calculated using five-year rolling windows.[26] The panels also display the rolling means of the predictions using the coefficients and actual values of only two of the three trilemma terms – $\hat{a}MI + \hat{b}ERS$ (brown line with diamond nodes), $\hat{a}MI + \hat{c}KAOPEN$ (green line with circles), $\hat{b}ERS + \hat{c}KAOPEN$ (orange line with "x").

From these panels of figures, we can first see that the predicted values based on the model hover around the value of one closely for both subsamples. For the group of industrial countries, the prediction average is statistically below the value of one in the late 1970s through the beginning of the 1990s. However, since then, one cannot reject the null hypothesis that the mean of the prediction values is one, indicating that the trilemma is "binding" for industrialized countries. For developing countries, the model is under-predicting from the end of the 1970s through the mid-1990s. However, unlike the IDC group, the mean of the predictions has become statistically smaller than one since 2000. At the very least, for both subsamples, the mean of the predictions never rises above the value of one in statistical sense, implying that, despite some years when the trilemma is not binding, the three macroeconomic policies are linearly related with each other.[27]

The top panels also show that, among industrialized countries, the policy combination of increasing exchange rate stability and more financial openness rapidly became prevalent after the beginning of the mid-1990s. Among developing countries, the policy combinations of monetary independence and exchange rate stability has been quite dominant throughout the sample period while the policy combination of exchange rate stability and financial openness has been the least prevalent over, most probably reflecting the bitter experiences of currency crises.

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[25] For this exercise, predictions also incorporate the interactions with the dummy variables shown in Table 3.

[26] Both the mean and the standard errors of the predicted values are calculated using the rolling five-year windows. The formula for the mean and the standard errors can be shown as $\bar{x}_{t|t-4} = \sum_{t}^{t-4}\sum_{i=1}^{n}\hat{x}_{i_t} \Big/ n\times 5$ and $SE(\hat{x}) = \sqrt{\sum_{t}^{t-4}\sum_{i=1}^{n}\left(\hat{x}_{i_t} - \bar{x}_{t|t-4}\right)^2 \Big/ n\times 5 - 1} \Big/ \sqrt{n\times 5}$, respectively, where n refers to the number of countries in a subsample (i.e., IDC and LDC), $\hat{x}_{it}$ to the prediction values, and $\bar{x}_{t|t-4}$ to the mean of $\hat{x}_{it}$ in the rolling five-year window. Because of the use of rolling five-year windows, the lines in the figures only start in 1974.

[27] One may question the uniqueness of this regression exercise by pointing at the left-hand side variable being an identity scalar. As a robustness check, we ran a regression of $MI_{i,t}$ on $ERS_{i,t}$ and $KAOPEN_{i,t}$, recovered the estimated coefficients for a_j, b_j, and c_j.in equation (1), and recreated panels of figures comparable to those in Figure 7. These alternative figures appeared to be very much comparable to Figure 7 and therefore confirmed our conclusions about the linearity of the trilemma indexes as well as the development of the subsample mean of prediction values based on equation (1).

In the lower panels, we can observe the contributions of each policy orientation (i.e., $\hat{a}MI$, $\hat{b}ERS$, and $\hat{c}KAOPEN$) for the IDC and LDC groups.[28] While less developed countries maintained high, though fluctuating, levels of monetary independence, both exchange rate stability and financial integration remained at much lower levels throughout the period with the former moderately declining and the latter slightly increasing. In the last decade or so, while monetary independence is on a declining trend, the gap between the predictions based on exchange rate stability and financial openness has been somewhat shrinking. This may indicate that more countries tend to try to achieve certain levels of exchange rate stability and financial openness together while maintaining high levels of monetary independence. This kind of effort can be done only when the countries accumulate high levels of international reserves that allow them to intervene in foreign exchange markets, consistent with the fact that many developing countries increased international reserves in the aftermath of the Asian crisis of 1997-98. However, as the concept of the trilemma predicts, this sort of environment must involve a rise in the costs of sterilized intervention especially when the actual volume of cross-border transactions of financial assets increase and when there is no reversal in the three policies.[29] This seems to explain the drop in the level of monetary independence after 2000 for this group of countries.[30]

The experience of the industrialized countries casts a stark contrast. Although monetary independence was also IDC's top priority until the 1990s, it yielded to financial integration in the late 1990s and to exchange rate stability in the early 2000s. The trend of financial liberalization and exchange rate stability correspond to declines in the level of monetary independence, which persistently kept falling and became the lowest priority in the 2000s. Such changes in the relative weights of the three policy goals do not require the countries to accumulate international reserves as was the case with developing countries.[31]

3. Regression Analyses

Although the above characterization of the trilemma indexes allows us to observe the development of policy orientation among countries, it fails to identify countries' motivations for policy changes. Hence, we examine econometrically how various choices regarding the three

[28] They are again the means based on five-year rolling windows.
[29] Refer to Aizenman and Glick (2008) and Glick and Hutchison (2008) for more analysis on the limit of sterilized intervention.
[30] When this exercise is repeated for both the emerging market country (EMG) group and the non-emerging market developing country group (Non-EMG LDC), the results remain about the same, only except for that the financial liberalization is more evident for the EMG group; the drop in the level of monetary independence is larger; and the gap between the predictions based on exchange rate stability and financial openness has been shrinking further.
[31] We also repeat the exercise using the regression models (whose results shown in Table 3) for each of the subsample period (excluding the break years). The results (not reported) are qualitatively the same as in Figure 7.

policies affect final policy goals, namely, output growth stability, low inflation, and inflation stability.

The basic model we estimate is given by:

$$y_{it} = \alpha_0 + \alpha_1 TLM_{it} + \alpha_2 TR_{it} + \alpha_3 (TLM_{it} \times TR_{it}) + X_{it}\mathrm{B} + Z_t\Gamma + D_i\Phi + \varepsilon_{it} \qquad (2)$$

y_{it} is the measure for macro policy performance for country i in year t. More specifically, y_{it} is either output volatility measured as the five-year standard deviations of the growth rate of per capita real output (using Penn World Table 6.2); inflation volatility as the five-year standard deviations of the monthly rate of inflation; or the five-year average of the monthly rate of inflation. TLM_{it} is a vector of any two of the three trilemma indexes, namely, *MI*, *ERS*, and *KAOPEN*.[32] TR_{it} is the level of international reserves (excluding gold) as a ratio to GDP, and (TLM_{it} x TR_{it}) is an interaction term between the trilemma indexes and the level of international reserves. We are particularly interested in the effect of the interaction terms because we suspect that international reserves may complement or substitute for other policy stances.

X_{it} is a vector of macroeconomic control variables that include the variables most used in the literature, namely, relative income (to the U.S. based on PWT per capita real income); its quadratic term; trade openness (=(*EX*+*IM*)/*GDP*); the TOT shock as defined as the five-year standard deviation of trade openness times TOT growth; fiscal procyclicality (as the correlations between HP-detrended government spending series and HP-detrended real GDP series); M2 growth volatility (as five-year standard deviations of M2 growth); private credit creation as a ratio to GDP as a measure of financial development; the inflation rate; and inflation volatility. Z_t is a vector of global shocks that includes change in U.S. real interest rate; world output gap; and relative oil price shocks (measured as the log of the ratio of oil price index to the world's CPI). D_i is a set of characteristic dummies that includes a dummy for oil exporting countries and regional dummies. Explanatory variables that persistently appear to be statistically insignificant are dropped from the estimation. ε_{it} is an *i.i.d.* error term.

The data set is organized into five-year panels of 1972-1976, 1977-81, 1982-1986, 1987-91, 1992-96, 1997-2001, 2002-06. All time-varying variables are included as five-year averages. The full sample is divided into the groups of industrialized countries (IDC) and developing countries (LDC) which also includes a subgroup of commodity exporters (COMMOD-LDC), i.e., developing countries that are either exporters of fuel or those of non-fuel primary products as defined by the World Bank, and a subgroup of emerging market countries (EMG). We report the results only for the last three groups, i.e., only subsamples related to developing countries.

[32] In Table 3, we have shown that these three measures of the trilemma are linearly related. Therefore, it is most reasonable to include two of the indexes concurrently, not just individually nor all three collectively.

Since inflation volatility turned out to be a significant explanatory variable for the regressions for output volatility and the level of inflation, and also the inflation level for the regressions for inflation volatility, we need to implement an estimation method that handles outliers properly. Hence, we decide to use the robust regression method which downweights outliers.[33] Also, we remove the observations if their values of inflation volatility are greater than a value of 30 or the rate of inflation (as an explanatory variable) is greater than 100%. Furthermore, for comparison purposes, the same set of explanatory variables is used for the three subsamples except for the regional dummies.

3.1 Estimation of the Basic Model

3.1.1 Output Volatility

The regression results for the estimation on output volatility are shown in Tables 4-1 through 4-3 for the three subsamples of developing countries, i.e., developing countries, developing commodity exporters, and emerging market countries. Different specifications are tested using different combinations of the trilemma indexes as well as their interaction terms. The results are presented in columns 1 through 6 in each table.[34] The variables that consistently appear to be statistically insignificant are dropped from the estimations.

The model explains well the output volatility for the developing countries subsample (Table 4-1). Across different model specifications, the following is true for the group of developing countries: The higher the level of income is (relative to the U.S.), the more reduced output volatility is, though the effect is nonlinear. The bigger change occurs on U.S. real interest rate, the higher output volatility of developing countries may become, indicating that the U.S. real interest rate may represent the debt payment burden on these countries. The higher TOT shock there is, the higher output volatility countries experience, consistent with Rodrik (1998) and Easterly, Islam and Stiglitz (2001) who argue that volatility in world goods through trade openness can raise output volatility.[35] Countries with procyclical fiscal policy tend to experience more output volatility while oil exporters also experience more output volatility.[36]

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[33] The robust regression procedure conducts iterative weighted least squares regressions while downweighting observations that have larger residuals until the coefficients converge.

[34] The dummies for "East Asia and Pacific" and "Sub-Saharan Africa" are included in the model for developing countries, but not reported to conserve space.

[35] The effect of trade openness is found to have insignificant effects for all subgroups of countries and is therefore dropped from the estimations. This finding reflects the debate in the literature, in which both positive (i.e., volatility enhancing) and negative (i.e., volatility reducing) effects of trade openness has been evidenced. The volatility enhancing effect in the sense of Easterly et al. (2001) and Rodrik (1998) is captured by the term for (TOT*Trade Openness) volatility. For the volatility reducing effect of trade openness, refer to Calvo et al. (2004), Cavallo (2005, 2007), and Cavallo and Frankel (2004). The impact of trade openness on output volatility also depends on the type of trade, i.e., whether it is inter-industry trade (Krugman, 1993) or intra-industry trade (Razin and Rose,1994).

[36] Countries in East Asia and Pacific as well as in Sub Sahara Africa tend to experience more output volatility (results not reported).

Countries with more developed financial markets tend to experience lower output volatility, a result consistent with the theoretical predictions by Aghion, et al. (1999) and Caballero and Krishnamurthy (2001) as well as past empirical findings such as Blankenau, et al. (2001) and Kose et al. (2003). This result indicates that economies armed with more developed financial markets are able to mitigate output volatility, perhaps by allocating capital more efficiently, lowering the cost of capital, and/or ameliorating information asymmetries (King and Levine, 1993, Rajan and Zingales, 1998, Wurgler, 2000). We will revisit this issue later on.

Among the trilemma indexes, only the monetary independence variable is found to have a significant effect on output volatility; the greater monetary independence one embraces, the less output volatility the country tends to experience. This finding is no surprise, considering that stabilization measures should reduce output volatility, especially more so under higher degree of monetary independence.[37] Mishkin and Schmidt-Hebbel (2007) find that countries that adopt inflation targeting – one form of increasing monetary independence – are found to reduce output volatility, and that the effect is bigger among emerging market countries.[38] This volatility reducing effect of monetary independence may explain the tendency that developing countries, especially, non-emerging market ones, try not to reduce the extent of monetary independence over years.

Like other developing countries, less developed commodity exporting countries are also susceptible to changes in U.S. real interest rates and TOT shocks, but other variables do not exhibit the same effects (Table 4-2). Again, countries with greater monetary independence tend to experience lower output volatility. Interestingly, more exchange rate stability per se does not have any significant impact on output volatility, but if it is coupled with higher levels of international reserves holding, then countries can reduce output volatility, which may help explain the recent buildup of international reserves by developing, especially oil exporting, countries. Additionally, more financially open commodity exporters seem able to reduce output volatility, though, interestingly, the coefficient on the interaction term between *KAOPEN* and international reserve holding is significantly *positive* in one of the models. This result indicates that countries with higher levels of reserves holding than 27% of GDP can experience *more* output volatility. This result is somewhat counterintuitive.

[37] This finding can be surprising to some if the concept of monetary independence is taken synonymously to central bank independence because many authors, most typically Alesina and Summers (1993), have found more independent central banks would have no or little at most impact on output variability. However, in this literature, the extent of central bank independence is usually measured by the legal definition of the central bankers and/or the turnover ratios of bank governors, which can bring about different inferences compared to our measure of monetary independence.

[38] The link is not always predicted to be negative theoretically. When monetary authorities react to negative supply shocks, that can amplify the shocks and exacerbate output volatility. Cechetti and Ehrmann (1999) find the positive association between adoption of inflation targeting and output volatility.

While emerging market countries share many of the same traits in macroeconomic variables as those in the LDC sample, the results on the trilemma indexes are a little different. Countries with more stable exchange rate tend to experience higher output volatility, which conversely implies that countries with more flexible exchange rates will experience lower levels of output volatility, as was found in Edwards and Levy-Yeyati (2005) and Haruka (2007). However, the interaction term is found to have a statistically negative effect, suggesting that countries holding high levels of international reserves are able to reduce output volatility. The threshold level of international reserves holding is 21-24% of GDP. Singapore, a country with a middle level of exchange rate stability (0.50 in the 2002-06 period) and a very high level of international reserves holding (100% as a ratio of GDP), is able to reduce the output volatility by 2.65-3.2 percentage points.[39] China, whose exchange rate stability index is as high as 0.97 and whose ratio of reserves holding to GDP is 40% in 2006, is able to reduce volatility by 1.1-1.5 percentage points. The estimation results on the trilemma variables are summarized in Table 7.[40]

Figure 8 graphically shows the marginal interactive effects between ERS and IR based on the estimates from Column 2 of Table 4-3. For presentation purposes, in the figure, the EMG group of countries is divided into (a) the Asian group, (b) the Latin American group, and (c) the other EMG countries. In all the panels of figures, the contours are drawn to present different levels of the effect of ERS on output volatility conditional on the level of IR. Also, the solid horizontal line refers to the threshold of IR at 21% of GDP, above which higher levels of ERS will have a negative impact on output volatility.[41] For example, the solid line of contour above the threshold shows the combinations of ERS and IR that leads to a one percentage point reduction in the output volatility. In the figure, we can see that the further toward the northeast corner in the panel, i.e., the higher level of ERS *and* IR a country pursues, the more negative impact it can have on output volatility. Below the threshold, however, it is true that the further toward the southeast corner, i.e., the higher level of ERS *and* the lower level of IR a country pursues, the more *positive* impact it can have on output volatility. In each of the panels, the scatter diagrams of ERS and IR are superimposed. The black circles indicate ERS and IR for the period of 2002-06 and the red "x's" for the 1992-96 period.

[39] See Moreno and Spiegel (1997) for earlier study of trilemma configurations in Singapore.
[40] Following Acemoglu (2003), we also suspect institutional development plays a role in reducing output volatility. To measure the level of institutional development, we use the variable *LEGAL*, which is the first principal component of law and order (*LAO*), anti-corruption measures (*CORRUPT*), and bureaucracy quality (*BQ*). However, it turns out that the *LEGAL* variable is statistically insignificant and sometimes with the wrong sign (not reported). Given small variations in the time series of the variable, this result is not surprising.
[41] We also note that the estimated coefficient on IR (level) is significantly positive in Columns (2) and (6) of Table 4-3, which indicates that, while a higher level of IR holding can lessen the positive effect of ERS, a higher level of IR holding itself is volatility-enhancing. This is not captured in Figure 8 since we focused on the effect of ERS and how it changes depending on the level of IR.

Using these diagrams, we can make several interesting observations. First, between the 1992-96 and 2002-06 periods, a period which encompasses the last wave of global crises, i.e., the Asian crisis of 1997-98, the Russian crisis of 1998, and the Argentina crisis of 2001-02, many countries, especially those in East Asia and Eastern Europe, increased their IR holding above the threshold. Secondly, the movement is not necessarily toward the northeast direction. Rather, it is around the threshold level where the effect of ERS is neutral (i.e., zero percentage point impact), unless they move much higher toward output volatility-reducing territory (such as China and Bulgaria). Thirdly, while we observe a moderately positive association between ERS and IR, none of these observations are applicable to Latin American countries. Lastly, there are not many countries that have achieved combinations of ERS and IR to reduce output volatility significantly. Countries such as Botswana, China, Hong Kong, Malaysia, Jordan, and Singapore are more of exceptions. However, at the very least, these estimation results should explain why many countries, especially those with the intention of pursuing greater exchange rate stability, are motivated to hold a massive amount of international reserves.

3.1.2 Inflation Volatility

We repeat the exercise for inflation volatility. The results for subsamples of developing countries are reported in Tables 5-1 through 5-3 and summarized in Table 7.

Across different subsamples, countries with higher relative income tend to experience lower inflation volatility, and naturally, those with higher levels of inflation are expected to experience higher inflation volatility. The TOT shock is found to increase inflation volatility. Furthermore, for commodity exporters, oil price increases would lead to higher inflation volatility.

The performance of the trilemma indexes appears to be the weakest for this group of estimations overall. Monetary independence is found to be an inflation volatility decreasing factor for commodity exporters. However, given that it is also an output volatility decreasing factor for this group of countries, this finding is somewhat counterintuitive.

Emerging market countries, on the other hand, tend to experience higher inflation volatility if they are more open to capital account transactions. This significantly positive effect of financial openness may be capturing financial turbulence that can arise as a result of financial liberalization policy. In fact, when we include the interaction term between the crisis dummy and the financial openness variable, the statistical significance of the financial openness variable declines while the interaction term enters the estimation marginally significantly.[42]

[42] The currency crisis dummy variable is derived from the conventional exchange rate market pressure (EMP) index pioneered by Eichengreen *et al.* (1996). The EMP index is defined as a weighted average of monthly changes in the nominal exchange rate, the international reserve loss in percentage, and the nominal interest rate. The weights are inversely related to the pooled variance of changes in each component over the sample countries, and adjustment is

3.1.3. Medium-run Level of Inflation

Tables 6-1 through 6-3 show the results for the regressions on the level of inflation. These three tables report that countries with higher inflation volatility, M2 growth volatility, and oil price shocks tend to experience higher output volatility. Also, when the world economy is experiencing a boom, developing countries tend to experience higher inflation, which presumably reflects strong demand for goods produced and exported by developing countries.

Countries with more monetary autonomy tend to experience higher inflation. From the perspective that greater monetary independence should be synonymous with a more independent central bank, most typically exemplified by the literature of time-inconsistency in monetary policy, a country with greater monetary independence should be able to lower inflation.[43] One possible explanation would be that countries with higher levels of monetary independence attempt to monetize their debt and cause higher inflation. Such countries may be better off if they are not monetarily independent and just import monetary policy from other countries through fixed exchange rate arrangements.

As a matter of fact, in all three subsamples, higher exchange rate stability is found to lead countries to experience lower inflation, a result consistent with the literature (such as Ghosh et al., 1997). This finding and the previously found positive association between exchange rate stability and output volatility are in line with the theoretical prediction that establishing stable exchange rates is a trade-off issue for policy makers; it will help the country to achieve lower inflation by showing a higher level of credibility and commitment, but at the same time, the efforts of maintaining stable exchange rates will rid the policy makers of an important adjustment mechanism through fluctuating exchange rates – which would explain the negative coefficient on monetary independence in the output volatility regressions.

Furthermore, for the LDC group, the interaction term between ERS and international reserves holding is found to have a positive impact on the rate of inflation. Models 2 and 6 in Table 6-1 show that if the ratio of reserves holding to GDP is greater than 53% or 65%, respectively, the efforts of pursuing exchange rate stability can help *increase* the level of inflation. Although these levels of reserves holding are very high, this means that countries with excess levels of reserves holding will eventually face the limit in the efforts of fully sterilizing

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made for the countries that experienced hyperinflation following Kaminsky and Reinhart (1999). For countries without data to compute the EMP index, the currency crisis classifications in Glick and Hutchison (2001) and Kaminsky and Reinhart (1999) are used.

[43] In other words, more independent central bankers should be able to remove the inflation bias (Kydland and Prescott, 1977 and Barro and Gordon, 1983).

foreign exchange intervention to maintain exchange rate stability, thereby experiencing higher inflation.[44]

Lastly, models (3) through (6) in all subsamples show that the more financially open a developing country is, the lower inflation it will experience. Interestingly, the more open to trade a country is, the more likely it is to experience lower inflation, though this effect is weakly significant only for the LDC group.

As globalization became actively debated, the negative association between "openness" and inflation was more frequently remarked upon.[45] Romer (1993), extending the Barro-Gordon (1983) model, theorized and empirically verified that the more open to trade a country becomes, the less motivated its monetary authorities are to inflate, suggesting a negative link between trade openness and inflation. Razin and Binyamini (2007) predicted that both trade and financial liberalization will flatten the Phillips curve, so that policy makers will become less responsive to output gaps and more aggressive in fighting inflation.[46] Here, across different subsamples of developing countries, we present evidence consistent with the negative openness-inflation relationship.

3.2. How Does a Policy Orientation Affect Macroeconomic Performance?

Composite Indexes for Policy Orientation

As we have already seen, decisions on which two of the three policy goals – monetary independence, exchange rate stability, and financial integration – to retain, or which one to give up, characterizes the international financial regime a country decides to implement. For example, currency unions such as the Euro countries and the Gulf Cooperation Council (GCC) or countries with currency boards like Argentina before 2001 require member countries to abandon monetary independence, but retain exchange rate stability and financial openness. The Bretton Woods system kept countries financially closed, but let them exercise an independent monetary policy and to stabilize their currency values. Thus, measures constructed by two of the above three indexes can allow one to summarize the policy orientations of countries. In other words, measures composed of two of the three indexes should be able to show how close countries are to the "vertex" of the trilemma triangle.

For this purpose, we construct composite indexes based on two of the above three measures. The principal component of *MI* and *ERS* measures how close countries (*MI_ERS*) are

[44] Aizenman and Glick (2008) and Glick and Hutchison (2008) show that China, whose ratio of reserves holding to GDP is estimated to be 50%, has started facing more inflationary pressure in 2007 as a result of intensive market interventions to sustain exchange rate stability (though the onset of global crisis has reversed these trends).
[45] Rogoff (2003) argues that globalization contributes to dwindling mark-ups, and thereby, disinflation.
[46] Loungani et al. (2001) provides empirical evidence that countries with greater restrictions on capital mobility face steeper Phillips curves.

toward the vertex of "closed economy" whereas that of *ERS* and *KAOPEN* (*ERS_KAO*) refers to the vertex of currency union or currency board, and that of *MI* and *KAOPEN* (*MI_KAO*) to "floating exchange rate." Again, all three indexes are normalized between zero and one. Higher values indicate a country is closer toward the vertex of the trilemma triangle.

Estimation with Composite Indexes

Columns 7 though 12 in Tables 4-1 through 6-3 show the estimation results for different models each of which include one composite index and its interaction with reserves holding. Tables 4-1 and 4-2 show that countries with higher MI_KAO, i.e., countries with more flexible exchange rates, tend to experience lower output volatility, which is in line with the oft-argued automatic stabilizing role of flexible exchange rates. For developing countries, the more financially closed an economy is (the higher its MI_ERS is), output volatility tends to be lower. Given that monetary independence is found to have a volatility reducing effect in the estimations with individual trilemma indexes, it is monetary independence that leads to lower output volatility whether financially closed economies with more stable exchange rates or financially open but with more flexible exchange rates. Emerging market economies (Table 4-3), on the other hand, seem to follow different dynamics. Economies with higher MI_ERS, i.e., more closed financial markets, are able to reduce output volatility only when they hold ample reserves.

In Tables 5-1 through 5-3, we see that developing countries or emerging market economies with higher exchange rate stability and more financial openness (ERS and KAO), or those with weaker monetary independence, tend to experience higher inflation volatility. Commodity exporters that pursue greater monetary independence and financial openness (MI and KAO) tend to experience less inflation volatility (Table 5-2).

The level of inflation can be lowered if a developing or commodity-exporting country pursues greater monetary independence and more stable exchange rates (Columns 7 and 8 in Tables 6-1 and 6-2). Or, if developing countries, whether commodity-exporting or emerging market ones, pursue a policy combination of greater exchange rate stability and more financial openness, these economies should be able to lower the level of inflation. This finding can be disappointing news for monetary authorities because it implies that, to implement disinflationary policy, policy makers should yield monetary policy making to another country and invite more policy discipline by opening financial markets.

4. Further Analyses of the Trilemma Configurations on Macro-Performance

While the above analysis sheds important light on how the trilemma configurations affect macroeconomic performance of the economies, other important questions, especially those which have emerged out of the ongoing financial crisis, are not directly addressed. In this section,

we further investigate the following two more issues. First, we take a closer look at the effect of financial development on output volatility. Secondly, we examine the impacts of external financing on output volatility, inflation volatility, and the medium-term level of inflation.

4.1 Interactions Between the Trilemma Configurations and Financial Development

The ongoing global financial crisis has illustrated that financial development can be a double-edged sword. While further financial development may enhance output growth and stability by ameliorating information asymmetry, enabling more efficient capital allocation, and allowing for further risk sharing, it can also expose economies to high-risk, high-return financial instruments, thereby involving the possibility of amplifying real shocks and/or falling into the boom-burst cycles. Naturally, the effect of financial development deserves further investigation, which we are about to conduct.

In Tables 4-1 through 4-3, we have seen that more financial development can lead to less output volatility, but its effect is significant only for the LDC subsample. One may also wonder how trilemma configurations can interact with the level of financial development. There is no question that monetary policy with high levels of authorities' independence, which is found to be volatility-reducing, should work better with more developed financial markets. Exchange rate stability, which can lead to higher output volatility, may be less disturbing if financial markets handle capital allocation more efficiently. Financial liberalization can easily be expected to work hand in hand with financial development to reduce economic volatility.

With these assumptions, we test to see if there is any interaction between the trilemma indexes and financial development which we measure using private credit creation as a ratio to GDP (*PCGDP*). The results turn out to be simply futile; when the previous output volatility regressions from Tables 4-1 through 4-3 are repeated, including interaction terms between the trilemma indexes and *PCGDP*, none of the interaction terms turn out to be significant (not reported). These results are not surprising or discouraging, because, as we already mentioned, we suspect that the effect of financial development can be ambiguous.

The weakness of using interaction terms is that we must assume that the effect of *PCGDP* on the link between the trilemma indexes and output volatility is monotonic; a higher level of *PCGDP* must either enhance, have no impact on, or lessen the link. Given the insignificance of the interaction terms from the initial investigation, we suspect the nonlinearity of *PCGDP*. As such, we decide to use the dummies for different level groups of *PCGDP*.[47] That is, *PCGDP_HI* is assigned a value of one for a country if the country's *PCGDP* is above the 75th percentile in the distribution of five-year averages of *PCGDP* within a five-year window, and

[47] This investigation is motivated by Hnatkovska and Loayza (2005), who examines the nonlinear effect of structural variables, including financial development, on the output volatility-growth link.

zero, otherwise. *PCGDP_LO* takes a value of one if the country's *PCGDP* is below the 25th percentile, and zero, otherwise. *PCGDP_MD* takes a value of one if the country's *PCGDP* lies between the 25th and 75th percentiles in a five-year period. We interact these level category dummies with the trilemma indexes and include the interaction terms in the output volatility regressions, hoping to capture the nonlinear effect of financial development on the link between the trilemma configurations and output volatility.

Table 8 reports the estimation results only for the *PCGDP* variable and the interaction terms for the developing countries subsample (Columns 1-3) and the emerging market countries subsample (Columns 4-6) in order to conserve space. At the bottom of the tables, we also report the Wald test statistics for the tests on the differences in the estimated coefficients of the interaction terms between the trilemma indexes and different *PCGDP* groups.

In Columns 1-3, we can see that this analysis does not yield any significant results for the group of developing countries. Exchange rate stability may contribute to higher output volatility if the country is equipped with medium (or higher) levels of financial development while the low level of financial development may contribute to reducing output volatility, though none of the estimated coefficients are significant.

Among EMGs (Columns 4-6), we see more interesting results. The estimated coefficient on the term "ERS x Medium *PCGDP*" is significant in Columns 4 and 5. In Column 5, the coefficient on "ERS x High *PCGDP*" is also significant, and both "ERS x Medium *PCGDP*" and "ERS x High *PCGDP*" are greater than "ERS x Low *PCGDP*" in the estimates' magnitude although they are not statistically significantly different. At least, we can surmise that for countries with underdeveloped financial markets, higher levels of exchange rate stability do not lead to higher output volatility. Those with medium levels of financial development do seem to experience higher output volatility when they pursue a more stable exchange rate, suggesting that countries with newly developed financial markets can be volatile when they pursue greater exchange rate stability. Furthermore, in both Columns 4 and 5, the estimated coefficients on the interaction term between ERS and IR are found to be significantly negative. Using the estimates, we can estimate that to cancel or lessen the volatility-enhancing effect of ERS, EMGs with medium (or higher) levels of financial development need to hold at least 22-25% of GDP of international reserves. However, this rule is not applicable to those with underdeveloped financial markets.

Financial development and financial openness seem to have interesting interactive effects on output volatility as well. While those EMGs with medium or higher levels of financial development tend to experience less output volatility when they decide to pursue more stable exchange rates, those with underdeveloped financial markets are expected to experience greater output volatility if they pursue greater financial openness. When the coefficient of "*KAOPEN* x

Medium *PCGDP*" and "*KAOPEN* x High *PCGDP*" are compared to that of "*KAOPEN* x Low *PCGDP*," the difference is found to be statistically significant. These results indicate that emerging market economies need to be equipped with highly developed financial markets if they want to reap the benefit of financial liberalization on their output volatility.

These findings suggest that a policy management leaning more toward exchange rate stability is most likely to exacerbate output volatility when the economy is equipped with medium levels of financial development. Having a higher level of financial openness and financial development can yield a synergistic impact to dampen output volatility, presumably by facilitating allocation of capital, ameliorating information asymmetry, and thereby reducing the cost of capital.[48] The worst and more significant case is that a country with underdeveloped financial markets can exacerbate output volatility caused by financial liberalization.

4.2 The Effects of External Financing

Financial liberalization has increased its pace over the last two decades. This, however, does not mean that countries suddenly became more financially linked with others. In the 1980s, developing countries received external financing in the form of sovereign debt, but the debt crisis experience spurred many of these countries to shy away from sovereign debt. After the 1990s, the role of FDI became more important and more recent waves of financial liberalization have contributed to a rise in portfolio flows across borders as well. As Lane and Milesi-Ferretti (2006) note, the type, volume, and direction of capital flows have changed over time.

4.2.1 Incorporation of External Financing

Against this backdrop, we extend our investigation by incorporating the effect of external financing. More specifically, we include the variables that capture net FDI inflows, net portfolio inflows, net 'other' inflows (which mostly include bank lending in IFS), short-term debt, and total debt service. For net capital flows, we use the IFS data and define them as external liabilities (= capital inflows with a positive sign) minus assets (= capital inflows with a negative sign) for each type of flows – negative values mean that a country experiences a net outflow capital of the type of concern. Short-term debt is included as the ratio of total external debt and total debt service as is that of Gross National Income (GNI). Both variables are retrieved from WDI. Because the debt-related variables are limited, we only deal with one subsample that is composed of developing countries for which the debt-related variables are available. Also, to

[48] See Bekaert et al., (2000, 2001), Henry (2000), Stultz (1999) among others for the link between financial liberalization and the cost of capital. Chinn and Ito (2006) show that financial openness can exogenously lead to more financial development.

isolate the effect of external financing from currency crises, we include a dummy for currency crises.

The results are reported in Table 9 for all three dependent variables, output volatility in columns 1 through 3, inflation volatility in columns 4 through 6, and inflation level in columns 7 through 9. We present the estimated coefficients only for the variables of interest.[49] Table 9 shows that the more 'other' capital inflows, i.e., banking lending or more net portfolio inflows, a country receives, the more likely it is to experience higher output volatility, reflecting the fact that countries that experience macroeconomic turmoil often experience an increase in inflows of banking lending or "hot money" such as portfolio investment. FDI inflows appear to contribute to lowering inflation volatility, which is somewhat counterintuitive. One possible explanation is that countries tend to stabilize inflation movement to attract FDI, and this may also explain the negative, but less significant, coefficients on the net FDI inflow variables in the inflation level regressions. Other types of capital flows do not seem to matter for either inflation volatility or inflation levels.

Both short-term debt and total debt service are positive and significant contributors to both inflation volatility and inflation level, supporting our previous argument that countries do tend to monetize their debt especially when their monetary authorities embrace more independence – the estimated coefficient on monetary independence continues to be significantly positive in the inflation level regressions.

Among the trilemma indexes, greater monetary independence continues to be a negative contributor to output volatility though it is also a positive contributor to the level of inflation. More financial openness is now a negative contributor to output volatility for this sample of countries while its negative impact on the level of inflation remains. Higher exchange rate stability continues to dampen the level of inflation, but holding too much of international reserves (more than 45% of GDP) can cancel the negative effect and contribute to higher inflation.

4.2.2 External Financing and Policy Orientation

Given that the combination of two out of three policy stances is what matters to the macro outcomes, when we estimate the effect of external financing, it is important to condition on what kind of policy combination is being pursued by the recipient countries.[50] The best way for us to do that is to examine the interactive effect between the type of external financing and that of the policy combination. For that purpose, we create dummy variables for the types of

[49] Overall, other macroeconomic variables retain the characteristics found in the previous regressions, though they tend to be less statistically significant.

[50] See IMF (2007) for an examination of the relationship between how countries manage capital inflows and subsequent macroeconomic outcomes.

policy orientation using the composite trilemma indexes we have been using. That is, if the composite index MI_ERS turns out to be the highest compared to the other two, MI_KAO and ERS_KAO, then a value of one is assigned for D_MI_ERS and zero for the other two, D_MI_KAO and D_ERS_KAO. In the results shown in Table 10, the external financing variables are interacted with the dummy for one particular type of policy combination. For example, in columns 1 and 2 of Table 10 we use in the estimation of output volatility the dummy for the policy orientation of greater monetary independence and exchange rate stability (MI_ERS; or "financially closed" policy option) and interact it with the external financing variables. Columns 3 and 4 use the dummy for the policy orientation of greater monetary independence and further financial opening ("more flexible exchange rate" policy), and columns 5 and 6 use that of greater exchange rate stability and further financial opening ("currency union" or currency board). The following six columns report the results for the estimation of inflation volatility and the next six for the level of inflation.

For output volatility, we find different types of external financing can have different impacts on output volatility depending on the policy regime in place. Net FDI inflows, for example, tend to dampen output volatility in general, but it can enhance the volatility in a regime that has pursued greater monetary independence and more stable exchange rates (i.e., less financial openness). Net portfolio inflows seem to have a positive impact on output volatility, but its volatility increasing impact is especially higher for the countries with the ERS-KAO ("currency union") regimes, in line with what has been found in the crisis literature. Countries with more flexible exchange rates (or monetary independence and financial openness), on the other hand, may be able to dampen the volatility-increasing effect, though its effect for this policy orientation is not found to be statistically significant. Positive net inflows of bank lending can be volatility increasing, but that effect can be dampened, though only marginally significantly, if the country adopts the policy combination of exchange rate stability and financial openness.

The greater the debt service is, the more likely a country is to experience higher levels of output volatility, especially when the country pursues a combination of greater exchange rate stability and financial openness. This result appears to be consistent with the "original sin" argument; countries that are indebted in a foreign currency and that try to maintain both exchange rate stability and capital account openness often experience sudden capital flow reversal and consequently higher output volatility.

In the inflation volatility regressions, it seems that net inflow of FDI contributes to lower inflation volatility across different policy regimes in general. However, the volatility-reducing effect is even higher for countries with flexible exchange rates. The table also shows that, for countries with flexible exchange systems, portfolio inflows can lower inflation volatility. These

results imply that if a country is considering to allow more influx of FDI or portfolio flows while wanting to lower inflation volatility, it would be best to adopt a flexible exchange rate system or keep the overall level of financial openness at low levels. Lastly, total debt services can make countries with monetary independence and financial openness experience higher inflation volatility while financially closed regimes would experience a slight drop in inflation volatility. This may be because rapid currency depreciation could enlarge the size of total debt which could encourage countries to monetize away the debt.

Different types of policy combinations seem to matter only for 'other' (i.e., bank lending) inflows in the estimation for the level of inflation; a net recipient of bank lending flows tends to experience lower inflation if it adopts a policy combination of monetary independence and financial openness, but it could experience higher inflation if it adopts a financially closed system. One merit of a country with currency union-like regime is that it can dampen the inflation pressure of total debt services. A country with closed financial markets on the other hand may experience higher output volatility as a result of higher levels of debt services.

5. Implications for the Current Crisis

5.1 International Reserve Holdings: Is the Trilemma Still Binding?

It has been argued that one of the main causes of the financial crisis of 2008-09 is the ample liquidity provided by the global imbalances; current account surplus countries hoard international reserves in an attempt to stabilize their exchange rates, export liquidity to the global markets, and finance profligacy in the advanced countries, especially the United States.[51] In Figure 8, we have seen that some, but not many, countries pursue higher levels of ERS and IR concurrently. Figure 9 updates Figure 8 by using the updated Trilemma indexes and IR data for 2007 and compare with the data from the 2002-06 period. In the panels of figures, we can observe that countries' positions do not change much. The only noticeable change would be that countries continue to increase their IR holding, but they are not necessarily moving toward the northeast corner. Why do these countries continue to increase their IR holding?

One possible conjecture is that countries holding a massive amount of foreign reserves might allow the relaxation of the trilemma, i.e., achieve all three goals at the same time. Figure 10 displays a scatter diagram for EMG countries' ERS and MI_KAO (composite index of MI and KAOPEN), which the concept of the trilemma predicts should be negatively correlated. There are two groups of country-years shown in the diagram; one is a group of country-years with the IR holding greater than 21% of GDP, the threshold above which ERS can have output volatility-reducing effect as shown in Figures 8 and 9, and the other is those with the IR holding less than 21% of GDP. If the above speculation is right, the (green) triangles – country-years

[51] See Roubini (2008) as one example.

with >21% IR – in the diagram should be scattered above the circles – country-years with <21% IR.

Theoretically, these two variables should be negatively correlated – the higher level of ERS a country pursues, the lower level of MI-KAO, which is a proxy to the weighted average of MI and KAO it has to choose as we formally confirmed in Section 2.4. In the figure, however, the fitted lines for both groups are barely negatively sloped – the estimated coefficients for both are statistically insignificantly negative. We test whether the slopes and intercepts of these two fitted lines are statistically different. If the conjecture that higher levels of IR holding could relax the trilemma, a country should be able to pursue higher levels of MI-KAO with the same level of ERS, which would either make the slope flatter or raise the intercept, i.e., the conditional mean of MI-KAO. Simple coefficient equality tests reveal that the slopes of the two fitted lines are not statistically different from each other, but that the intercept for the fitted line for the country-years with >21% IR is significantly higher than that for the <21% IR group. This is in line with the conjecture that higher levels of IR holding can allow a country to pursue a higher weighted average of MI and KAOPEN, i.e., relax the trilemma.

Given the findings from the output volatility regressions in Table 4, for the EMG countries, having greater monetary independence could lead a country to reduce output volatility. If a country holds a higher level of IR than 21% of its GDP, it may be able to relax the trilemma, so that it may decide to pursue greater monetary independence and financial openness while maintaining exchange rate stability. One easy candidate that fits this category is China. Figure 11 shows the trilemma configurations and IR holding for emerging market countries in East Asia and China. We can observe that while it does not give up its exchange rate stability and monetary independence, China's IR holding has been increasing and financial openness has inched up. Although we have not tested formally, we find evidence consistent with the view that countries' efforts to "relax the trilemma" can involve an increase in IR holding, which may have contributed to the global expansion of liquidity prior to the financial crisis of 2008-09. We leave testing this argument as one of our future research agendas.

5.2 Is the Current Crisis Consistent with Our Models?

As the IMF has revised the GDP estimates downward for many developing countries several times since the fall of 2008, it has become clear that the ongoing crisis is not just an American problem or the one in the industrial world, but a major challenge for the global economy. In other words, the concept of "de-coupling" is no longer applicable.

Given that we can identify the countries that are experiencing more severe economic situations than others as the time of this writing, we examine whether the current crisis situations are consistent with what we have found from our previous findings. That is, we use the data from

2007 for the variables upon which we have focused in this paper and see whether the conditions of these variables as of the eve of the crisis present any signals for the ongoing crisis. For this purpose, Table 11 presents the variables of our focus for a group of emerging market countries. Namely, the table reports *PCGDP*, IR (both as% of GDP), the three trilemma indexes, and the external finance variables. *dX* refers to the change of the variable *X* compared to the 2002-06 period.[52] In the table, we also report swap lines provided by the U.S. Federal Reserve and rescue loans provided by the IMF (as of March 2009). The swap lines and rescue loans are reported to identify which countries are experiencing more severe situations than others although countries without these arrangements can be also experiencing dire situations.

Before making observations of these countries, it is noteworthy to point out that the size of the swap lines or the IMF rescue loans is not so big for most of the countries. For Brazil, Mexico, and Korea, it is about 2-3% of GDP and 7% for Pakistan. It is only for Singapore and Hungary that the size of the additionally available IR is relatively substantial, around 18% of GDP. Based on what we found in Figures 8 and 9, we can see that, except for Singapore and Hungary, the effect of these swap lines or IMF rescue loans can be quite minimal at most to reduce output volatility. Obstfeld et al. (2009) also mention the smallness of the additional IR provided for developing countries, especially compared to industrialized countries, and argue that these additional reserves would merely have signaling effects, unlike industrial countries' that can have real effects to relax liquidity constraints.[53] Our results are consistent with their observation.

Let us now make observations about the conditions pertaining to trilemma configurations and both internal and external financing of the concerned countries. Among the countries with the swap or rescue loan arrangements, Hungary, Korea, and Pakistan experienced a relatively rapid increase in net inflows of bank lending ('Other'). In Table 9, we see that countries with positive net inflow of 'other' investment tend to experience higher output volatility. Among the three countries, Hungary appears to have pursued the combination of MI and KAOPEN whereas Pakistan did that of MI and ERS. Both combinations, MI-KAO or MI-ERS, are found to lead bank lending flows to have a bigger impact on output volatility (Table 10). The Pakistani economy is also subject to higher output volatility because its financial development level is not high although it pursues greater exchange rate stability. Interestingly, several other East European countries, such as Lithuania, Poland, and Slovak Republic, and Russia also experienced large increases in net inflow of bank lending, which suggest that these economies

[52] *PCGDP* is as of 2006 (or 2005 if the figure for 2006 is unavailable) because it is unavailable for 2007.
[53] They also argue that the fact that a more substantial amount of rescue reserves can be readily available for industrialized countries should be the reason why industrialized countries do not (have to) hold a massive amount of IR.

can be subject to higher output volatility.[54] In Table 9, we also found that the higher level of net inflow of portfolio investment it receives, the greater output volatility a country would have to face. The impact can be greater especially when the country pursues a policy combination of ERS and KAO. Both Brazil and Argentina experienced a rapid increase in net inflow of portfolio investment although neither of them pursued the policy combination of ERS and KAO. The table also shows that Venezuela may be exposed to higher output volatility; it pursued fixed exchange rate though its IR fell significantly while portfolio inflow increased. Thus, our casual observations confirm that the inferences we obtained from our estimations seem to be consistent with the economic conditions that led to severe crisis situations.

6. Concluding Remarks

Our paper outlined a methodology to trace the changing patterns of the trilemma configurations. Taking a longer-run view, it reveals striking differences between the choices of industrialized and developing countries during 1970-2006. The recent trend suggests that among emerging market countries, the three dimensions of the trilemma configurations: monetary independence, exchange rate stability, and financial openness, are converging towards a "middle ground" with managed exchange rate flexibility, which they attempted to buffer by holding sizable international reserves, while maintaining medium levels of monetary independence and financial integration. Industrialized countries, on the other hand, have been experiencing divergence of the three dimensions of the trilemma and moved toward the configuration of high exchange rate stability and financial openness and low monetary independence as most distinctively exemplified by the euro countries' experience.

This configuration of the three macroeconomic policies is an outcome of the evolution of different system arrangements. Over years, external shocks have affected the policy arrangement across countries. In this regard, we have shown that major crises in the last four decades, namely, the collapse of the Bretton Woods system, the debt crisis of 1982, and the Asian crisis of 1997-98, caused structural breaks in the trilemma configurations. For both industrialized and developing countries, the major events in the last decade, such as the emergence of rapid globalization and the rise of China, have also impacted the policy arrangements significantly. With these results, we can safely expect that the present turbulence in the global financial markets could challenge the stability of the current trilemma configuration.

We also tested whether the three macroeconomic policy goals are "binding" in the context of the impossible trinity. That is, we attempted to provide evidence that countries have faced the trade-offs based on the trilemma. Because there is no specific functional form of the

[54] Latvia, though not categorized as an EMG country in the dataset, also experienced an influx of bank lending in this year and is experiencing a severe economic crisis in 2008-09.

trade-offs or the linkage of these three policy goals, we tested a simplest linear specification for the three trilemma indexes and examined whether the weighted sum of the three trilemma policy variables adds up to a constant. Our results confirmed that countries do face the binding trilemma. That is, a change in one of the trilemma variables would induce a change with the opposite sign in the weighted average of the other two.

While external forces could impact countries' decisions on the trilemma configurations, policy makers decide on the specifics of the combination of the three policies depending on the goals they would like to achieve. Hence, we also tested how each one of the three policy choices as well as the combination of the two could affect the economic outcomes policy makers pay close attention to, such as output volatility, inflation volatility, and medium-term inflation rates, with a particular focus on developing countries.

We found countries with higher levels of monetary independence tend to experience lower output volatility. When we restrict our sample to emerging market economies, we also found that countries with higher levels of exchange rate fixity tend to experience higher output volatility. However, this effect can be mitigated by holding international reserves if the level of international reserves is higher than 19-22% of GDP. This result motivates the reason why so many emerging market countries want to hold massive amounts of international reserves.

We also found that countries with more monetary autonomy tend to experience higher inflation, which may reflect countries' motives to monetize their debt. Countries with higher exchange rate stability tend to experience lower inflation as has been found in the literature. Furthermore, financial openness helps a country to experience lower inflation, possibly indicating that globalization gives more discipline than monetary autonomy to a country's macroeconomic management.

We also extended our estimation model to investigate the following two questions relevant to the current crisis: 1) Can financial development affect the link between trilemma policy configurations and output volatility?; and 2) How can external financing affect macroeconomic performances interactively with the trilemma configurations?

Regarding the effect of financial development on the link between the trilemma configurations and output volatility, we found a nonlinear effect among emerging market economies that medium-levels of financial development can raise the volatility-enhancing impact of exchange rate stability. Highly developed financial markets can help financial liberalization policy to reduce output volatility while underdeveloped financial markets could exacerbate output volatility, signifying the synergistic effects between financial development and financial opening.

In the estimations with the variables for external financing, we find the following: net recipients of cross-border bank lending or portfolio flows – or the "hot money" – tend to

experience higher output volatility, a result consistent with the literature. We also took a closer look at the effect of policy orientations on the effect of external financing and found that the effect of different types of external financing can depend upon the policy regime adopted by a country. First, net FDI inflows tend to dampen output volatility in general, but it can increase the volatility in a "financially closed" regime, i.e., one with greater monetary independence and more stable exchange rates. Net portfolio inflows can be volatility-increasing, and its effect is greater for the countries with currency union or alike regimes. This type of regimes, however, can dampen the volatility-enhancing effect of bank lending. Among the variables related to sovereignty debt, the greater the debt service is, the more likely a country could experience higher levels of output volatility, especially when combined with greater exchange rate stability and financial openness, a result consistent with the "original sin" literature.

Our results also help answer why many countries have been hoarding massive amount of IR, which has been claimed to be one of the causes of the current global financial crisis. A motive for countries to hold massive IR is its desire to relax the trilemma; voluminous IR holding allows countries to pursue *both* a higher level of exchange rate stability *and* a higher weighted average of the other two trilemma policies through active foreign exchange interventions. Given our finding that holding a higher level of IR than 21-24% of GDP can dampen or even reverse the volatility-increasing effect of exchange rate stability, this finding is plausible.

Lastly, our empirical findings are consistent with the conditions of the countries that are currently experiencing macroeconomic turmoil; countries in turmoil do seem to be the ones with the trilemma variables and those related to both internal and external financing at the levels that lead to higher output volatility. In other words, our model could predict higher output volatility for countries experiencing or at the brink of financial crises. This bolsters the validity of our empirical analyses.

References

Acemoglu, D., S. Johnson, J. Robinson, and Y. Thaicharoen. 2003. "Institutional Causes, Macroeconomic Symptoms: Volatility, Crises, and Growth," *Journal of Monetary Economics*, Vol. 50, No. 1, pp. 49–123.

Aghion, P., A. Banerjee, and T. Piketty, 1999, "Dualism and Macroeconomic Volatility," *Quarterly Journal of Economics*, Vol. 114, pp. 1359–97.

Aizenman, J. and R. Glick. 2008. "Sterilization, Monetary Policy, and Global Financial Integration," mimeo, University of California, Santa Cruz. Forthcoming in *Review of International Economics*.

Aizenman, J. and Marion, N. 2004. "International reserves holdings with sovereign risk and costly tax collection." *Economic Journal* 114, pp. 569–91.

Aizenman, J. and Lee, J. 2007. "International reserves: precautionary versus mercantilist views, theory and evidence," *Open Economies Review*, 2007, 18 (2), pp. 191-214.

Alesina, A. and Summers, L., 1993. "Central Bank Independence and Macroeconomic Performance. *Journal of Money, Credit and Banking* 25, pp. 151–162

Barro, R. and Gordon, D. 1983. "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy*, 91: 589-610.

Bekaert, G., C. Harvey, and C. Lundblad. 2001. "Does Financial Liberalization Spur Growth?" *NBER Working Paper #8245*.

Bekaert, G., C. Harvey, and C. Lundblad. 2000. "Emerging Equity Market and Economic Development," *NBER Working Paper* No. 7763 (April).

Ben-Bassat A. and Gottlieb, D. 1992. "Optimal international reserves and sovereign risk." *Journal of International Economics* 33, pp. 345–62.

Blankenau,W.,M.A. Kose, and K. Yi, 2001, "Can World Real Interest Rates Explain Business Cycles in a Small Open Economy?" *Journal of Economic Dynamics and Control*, Vol. 25, pp. 867–89.

Caballero, R.J., and A. Krishnamurthy, 2001, "International and Domestic Collateral Constraints in a Model of Emerging Market Crises," *Journal of Monetary Economics*, Vol. 48, pp. 513–48.

Calvo, G. 1998. "Capital Flows and Capital-market Crises: The Simple Economics of Sudden Stops." *Journal of Applied Economics* 1: 35–54.

Calvo, G.A., A. Izquierdo and L.F. Mejía. 2004. "On the Empirics of Sudden Stops: The Relevance of Balance-Sheet Effects." Research Department Working Paper 509. Washington, DC, United States: Inter-American Development Bank.

Cavallo, E.A. 2007. "Output Volatility and Openness to Trade: A Reassessment" Inter-American Development Bank Working Paper #604 (April).

Cavallo, E.A. 2005. "Trade, Gravity and Sudden Stops: On How Commercial Trade Openness Can Increase the Stability of Capital Flows." Cambridge, United States: Harvard University. Mimeographed document.

Cavallo, E.A., and J.A. Frankel. 2004. "Does Openness to Trade Make Countries More Vulnerable to Sudden Stops, or Less?" NBER Working Paper 10957. Cambridge, United States: National Bureau of Economic Research.

Cecchetti, S.G. and M. Ehrmann. 1999. "Does Inflation Targeting Increase Output Volatility? An International Comparison Of Policymakers' Preferences And Outcomes" NBER Working Paper #7426. Cambridge, MA : National Bureau of Economic Research (December).

Cheung, Y-W and H. Ito. 2007. "Cross-sectional analysis on the determinants of international reserves accumulation," mimeo, University of California, Santa Cruz.

Chinn, M. D. and H. Ito. 2008 "A New Measure of Financial Openness." *Journal of Comparative Policy Analysis*, Volume 10, Issue 3 (September), p. 309 - 322.

Chinn, M. D. and H. Ito, 2006. "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics***,** Volume 81, Issue 1, Pages 163-192 (October).

Demirguc-Kent, A. and E. Detragiache. 1998. "Financial liberalization and financial fragility," Policy Research Working Paper Series 1917, Washington, D.C.: The World Bank.

Easterly, W., R. Islam and J. Stiglitz. 2001. "Shaken and Stirred: Explaining Growth Volatility." In: B. Plesokovic and N. Stern, editors. *Annual World Bank Conference on Development Economics*. Washington, DC, United States: World Bank.

Edison, Hali J., M. W. Klein, L. Ricci, and T. Sløk, 2002. "Capital Account Liberalization and Economic Performance: A Review of the Literature," IMF Working Paper (May).

Edison, Hali J. and F. E. Warnock, 2001. "A simple measure of the intensity of capital controls," *International Finance Discussion Paper* #708 (Washington, D.C.: Board of Governors of the Federal Reserve System, September).

Edwards, S., 2001. "Capital Mobility and Economic Performance: Are Emerging Economies Different?" *NBER Working Paper* No. 8076.

Edwards, S., 1999. "How effective are capital controls?" *Journal of Economic Perspectives* 13, 65–84.

Edwards, S. & Levy-Yeyati, E. 2005. "Flexible exchange rates as shock absorbers," *European Economic Review*, Elsevier, vol. 49(8), pages 2079-2105, November.

Eichengreen, B., Rose, A. K., and Wyplosz, C. 1996. "Contagious Currency Crises," NBER Working Paper 5681.

Frenkel, J. and Jovanovic, B. 1981. "Optimal international reserves: a stochastic framework. *Economic Journal* 91, 507–14.

Glick, R. and Hutchison, M. 2008. "Are Capital Controls Effective? Duration of Capital Controls and the Survival of Pegged Exchange Rate Regimes with Special Reference to the People's Republic of China," mimeo, University of California, Santa Cruz.

Glick, R. and Hutchison, M. 2001. "Banking and Currency Crises: How Common Are Twins?" 35-69, In R. Glick, R. Moreno, and M. Spiegel, eds. *Financial Crises in Emerging Markets.* Cambridge, UK: Cambridge University Press.

Ghosh, A., A. Gulde and J. Ostry. 1997. *"Does the Nominal Exchange Rate Regime Matter?"*. NBER Working Paper No 5874.

Haruka, D. S. 2007. "Output Volatility and Large Output Drops in Emerging Market and Developing Countries," IMF Working Paper WP/07/114 (May). Washington, D.C.: International Monetary Fund.

Henry, P. B. 2006. "Capital Account Liberalization: Theory, Evidence, and Speculation," NBER Working Paper No. 12698.

Hnatkovska, V. and N. Loayza. 2005. "Volatility and Growth" in J. Aizenman and B. Pinto eds. *Managing Economic Volatility and Crises: A Practitioner's Guide* (Cambridge: Cambridge University Press, October).

IMF. 2007. "Managing Large Capital Inflows," *World Economic Outlook*. Washington, D.C.: International Monetary Fund, October.

Kaminsky, G. and Reinhart, C. 1999. "The Twin Crises: The Causes of Banking and Currency Balance-of-Payments Problems," *American Economic Review* 89, 473-500.

King, R. G. and Levine, R., 1993. Finance and Growth: Schumpeter Might Be Right, *Quarterly Journal of Economics*, 108: 717 – 738.

Kose, M. A., E. Prasad, K. Rogoff, and S. J. Wei, 2006, "Financial Globalization: A Reappraisal," IMF Working Paper, WP/06/189.

Kose, M.A., E. Prasad and M. Terrones. 2003. "Financial Integration and Macroeconomic Volatility." IMF Working Paper WP/03/50. Washington, DC, United States: International Monetary Fund.

Krugman, P., 1993. "Lessons of Massachusetts for EMU," in *The Transition to Economic and Monetary Union in Europe*, ed. by F. Giavazzi and F. Torres (Cambridge: Cambridge University Press), pp. 241–61.

Kydland, F. and Prescott, E. 1977. "Rules Rather Than Discretion: The Inconsistency of Optimal Plans," *Journal of Political Economy*, 85: 473-490.

Lane, P. R. and Milesi-Ferretti, G. M. 2006. "The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970-2004," IMF Working Paper 06/69.

Loungani, P., A. Razin, C. W. Yuen. 2001. "Capital Mobility and the Output–Inflation Tradeoff," *Journal of Development Economics* Vol. 64. 255–274.

Mishkin, F. S. and K. Schmidt-Hebbel. 2007. "Does Inflation Targeting Make a Difference?" NBER Working Paper #12876. Cambridge, MA : National Bureau of Economic Research (January).

Moreno R. and M. M. Spiegel. 1997. "Are Asian economies exempt from the "impossible trinity?": evidence from Singapore," Federal Reserve Bank of San Francisco, Pacific Basin Working Paper Series, 97-01.

Obstfeld, M., J.C. Shambaugh, & A.M. Taylor. 2009. "Financial Instability, Reserves, and Central Bank Swap Lines in the Panic of 2008," NBER Working Papers 14826, Cambridge, MA : National Bureau of Economic Research (March).

Obstfeld, M., J. C. Shambaugh, and A. M. Taylor. 2008. "Financial Stability, The Trilemma, and International Reserves." NBER Working Paper 14217 (August).

Obstfeld, M., J. C. Shambaugh, and A. M. Taylor, 2005. “The Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility." *Review of Economics and Statistics* 87 (August): 423-38.

Prasad, E. S., 2008. “Monetary Policy Independence, the Currency Regime, and the Capital Account in China. In Goldstein, M. and N. R. Lardy, Eds. *Debating China’s Exchange Rate Policy*, Washington, D.C.: Peterson Institute for International Economics.

Rajan, R.G., and Zingales, L., 1998. Financial Dependence and Growth, *American Economic Review*, 88: 559 – 586.

Razin, A. and Binyamini, A., 2007. “Flattening the Short-Run Trade-Off Between Inflation and Domestic Activity: The Analytics of the Effects of Globalization.” Kiel Working Paper No. 1363 (June). Kiel: Kiel Institute for World Economics.

Razin, A., and Rose, A. K. 1994. “Business Cycle Volatility and Openness: An Exploratory Cross-Sectional Analysis.” In L. Leiderman and A. Razin (Ed.), *Capital Mobility: the Impact on Consumption, Investment, and Growth*. Cambridge: Cambridge University Press.

Rodrik, D. 1998. “Why Do More Open Economies Have Bigger Governments?” *Journal of Political Economy* 106(5): 997-1032.

Rodrik, D., and A. Velasco. 1999. "Short-Term Capital Flows." NBER Working Paper No. 7364. Cambridge, MA : National Bureau of Economic Research.

Rogoff, K. 2003. Globalization and global disinflation. *Federal Reserve Bank of Kansas City Economic Review*, 4th quarter issue, 45-78.

Romer, D. 1993. “Openness and Inflation: Theory and Evidence.” *Quarterly Journal of Economics* 108, 869–903.

Roubini, Nouriel. 2008. “Will the Bretton Woods (BW2) Regime Collapse Like the Original Bretton Woods Regime Did? The Coming End Game of BW2. mimeo. RGE Monitor (July 6).

Shambaugh, Jay C. 2004. “The Effects of Fixed Exchange Rates on Monetary Policy.” *Quarterly Journal of Economics* 119 (February): 301-52.

Stultz, R. 1999. “Globalization, Corporate Finance and the Cost of Capital,” *Journal of Applied Corporate Finance*, v12(3), 8-25.

Willett, T. 2003. “Fear of Floating Need Not Imply Fixed Exchange Rates,” *Open Economies Review* 14, 77 – 91.

Wurgler, J., 2000. Financial Markets and the Allocation of Capital, *Journal of Financial Economics*, 58, 187 – 214.

Appendix: Data Availability of the Trilemma measures

	Country code (cn)	Country Name	Base Country	Monetary Independence (MI) (172)		Exchange rate stability (ERS) (181)		KA Openness (KAOPEN) (178)	
1	512	Afghanistan (C)	U.S.	-	-	1961	2005	1970	2004
2	914	Albania (C)	U.S.	1992	2006	1993	2006	1996	2006
3	612	Algeria (C)	France	1974	2006	1961	2006	1970	2006
4	614	Angola (C)	U.S.	1995	2006	1961	2006	1993	2006
5	311	Antigua and Barbuda	U.S.	1981	2006	1961	2006	1985	2006
6	213	Argentina (E) (C)	U.S.	1977	2006	1961	2006	1970	2006
7	911	Armenia	U.S.	1995	2006	1993	2006	1996	2006
8	314	Aruba	U.S.	1986	2006	1987	2006	1992	2006
9	193	Australia	U.S.	1969	2006	1961	2006	1970	2006
10	122	Austria	Germany	1960	2006	1961	2006	1970	2006
11	912	Azerbaijan	U.S.	1993	2006	1993	2006	2000	2006
12	313	Bahamas, The	U.S.	1970	2006	1961	2006	1977	2006
13	419	Bahrain (C)	U.S.	1975	2006	1967	2006	1976	2006
14	513	Bangladesh (E)	U.S.	1972	2006	1972	2006	1976	2006
15	316	Barbados	1960-74 U.K.; 1975-U.S.	1967	2006	1961	2006	1974	2006
16	913	Belarus	U.S.	1993	2006	1993	2006	1996	2006
17	124	Belgium	Germany	1960	2006	1961	2006	1970	2006
18	339	Belize	U.S.	1979	2006	1961	2006	1985	2006
19	638	Benin	France	1964	2006	1961	2006	1970	2006
20	514	Bhutan	Rupee	1982	2006	1961	2006	1985	2006
21	218	Bolivia (C)	U.S.	1960	2006	1961	2006	1970	2006
22	616	Botswana (E) (C)	South Africa	1976	2006	1961	2006	1972	2006
23	223	Brazil (E)	U.S.	1964	2006	1965	2006	1970	2006
24	918	Bulgaria (E)	Germany	1991	2006	1961	2006	1996	2006
25	748	Burkina Faso	France	1964	2006	1961	2006	1970	2006
26	618	Burundi (C)	1960-70 Belgium; 1971-U.S.	1977	2006	1961	2006	1970	2006
27	662	Cote d'Ivoire (E) (C)	France	1964	2006	1961	2006	1970	2006
28	522	Cambodia	U.S.	1994	2006	1961	2006	1973	2006
29	622	Cameroon	France	1968	2006	1961	2006	1970	2006
30	156	Canada	U.S.	1960	2006	1961	2006	1970	2006
31	624	Cape Verde	Germany	1985	2006	1961	2006	1982	2006
32	626	Central African Rep.	France	1968	2006	1961	2006	1970	2006
33	628	Chad (C)	France	1968	2006	1961	2006	1970	2006
34	228	Chile (E) (C)	U.S.	1977	2006	1961	2006	1970	2006
35	924	China (E)	U.S.	1980	2006	1961	2006	1970	2006
36	233	Colombia (E)	U.S.	1964	2006	1961	2006	1970	2006
37	632	Comoros	France	1983	2006	1961	2006	1981	2006
38	636	Congo, Dem. Rep. (C)	U.S.	1982	2003	1961	2006	1970	2000
39	634	Congo, Rep. (C)	France	1968	2006	1961	2006	1970	2006
40	238	Costa Rica	U.S.	1964	2006	1961	2006	1970	2006
41	960	Croatia	Germany	1992	2006	1993	2006	1998	2006
42	423	Cyprus	Germany	1969	2006	1961	2006	1970	2006
43	935	Czech Republic (E)	Germany	1993	2006	1994	2006	1998	2006
44	128	Denmark	Germany	1960	2006	1961	2006	1970	2006
45	611	Djibouti	U.S.	1996	2006	1961	2006	1982	2006
46	321	Dominica	U.S.	1981	2006	1961	2006	1982	2006
47	243	Dominican Republic	U.S.	1995	2006	1961	2006	1970	2006
48	248	Ecuador (E)	U.S.	1970	2006	1961	2006	1970	2006
49	469	Egypt, Arab Rep. (E)	U.S.	1964	2006	1961	2006	1970	2006
50	253	El Salvador	U.S.	1983	2005	1961	2006	1970	2006
51	642	Equatorial Guinea (C)	France	1985	2006	1961	2006	1973	2006
52	643	Eritrea	U.S.	-	-	1961	2006	1998	2006
53	939	Estonia	Germany	1993	2006	1993	2006	1998	2006
54	644	Ethiopia (C)	U.S.	1985	2006	1961	2006	1970	2006
55	819	Fiji	U.S.	1974	2006	1961	2006	1975	2006
56	172	Finland	Germany	1960	2006	1961	2006	1970	2006
57	132	France	Germany	1964	2006	1961	2006	1970	2006
58	646	Gabon (C)	France	1968	2006	1961	2006	1970	2006
59	648	Gambia, The	U.K.	1977	2006	1961	2006	1971	2006
60	915	Georgia	U.S.	1995	2006	1996	2006	1998	2006
61	134	Germany	U.S.	1960	2006	1961	2006	1970	2006
62	652	Ghana (E) (C)	U.S.	1964	2006	1961	2006	1970	2006
63	174	Greece	1960-80 U.S.; 1981-Germany	1960	2006	1961	2006	1970	2006
64	328	Grenada	U.S.	1981	2006	1961	2006	1979	2006

	Country Code (cn)	Country Name	Base Country	Monetary Independence (MI)		Exchange rate stability (ERS)		KA Openness (KAOPEN)	
65	258	Guatemala (C)	U.S.	1960	2006	1961	2006	1970	2006
66	656	Guinea (C)	1960-73 France; 1974-U.S.	1986	2006	1961	2005	1970	2006
67	654	Guinea-Bissau (C)	U.S.	1975	2006	1961	2006	1981	2006
68	336	Guyana (C)	1960-75 U.K.; 1976-U.S.	1966	2006	1961	2006	1970	2006
69	263	Haiti	U.S.	1994	2006	1961	2006	1970	2006
70	268	Honduras (C)	U.S.	1979	2006	1961	2006	1970	2006
71	532	Hong Kong, China (E)	U.S.	1982	2006	1961	2006	1970	2006
72	944	Hungary (E)	1960-91 U.S.; 1992-Germany	1971	2006	1969	2006	1998	2006
73	176	Iceland (C)	1960-90 U.S.; 1991-Germany	1964	2006	1961	2006	1970	2006
74	534	India (E)	1960-79 U.K.; 1980-U.S.	1964	2006	1961	2006	1970	2006
75	536	Indonesia (E)	U.S.	1983	2006	1968	2006	1970	2006
76	429	Iran, Islamic Rep. (C)	U.S.	1960	2006	1961	2006	1970	2006
77	433	Iraq (C)	U.S.	-	-	1961	2006	1970	2006
78	178	Ireland	1960-78 U.K.; 1979-Germany	1964	2006	1961	2006	1970	2006
79	436	Israel (E)	U.S.	1982	2006	1961	2006	1970	2006
80	136	Italy	Germany	1964	2006	1961	2006	1970	2006
81	343	Jamaica (E)	U.S.	1961	2006	1961	2006	1970	2006
82	158	Japan	U.S.	1960	2006	1961	2006	1970	2006
83	439	Jordan (E)	U.S.	1966	2006	1961	2006	1970	2006
84	916	Kazakhstan	U.S.	1994	2006	1994	2006	1998	2006
85	664	Kenya (E)	U.S.	1967	2006	1961	2006	1970	2006
86	826	Kiribati	Australia	-	-	1961	2006	1990	2005
87	542	Korea, Rep. (E)	U.S.	1964	2006	1961	2006	1970	2006
88	443	Kuwait	U.S.	1975	2006	1961	2006	1970	2006
89	917	Kyrgyz Republic	U.S.	1993	2006	1994	2006	1998	2006
90	544	Lao PDR	U.S.	1979	2006	1961	2006	1970	2006
91	941	Latvia	Germany	1993	2006	1993	2006	1998	2006
92	446	Lebanon	U.S.	1964	2006	1961	2006	1970	2006
93	666	Lesotho	South Africa	1980	2006	1961	2006	1972	2006
94	668	Liberia (C)	U.S.	1981	2006	1961	2006	1970	2006
95	672	Libya (C)	U.S.	1963	2006	1961	2006	1970	2006
96	946	Lithuania (E)	Germany	1994	2006	1993	2006	1998	2006
97	137	Luxembourg	1960-78 Belgium; 1979- Germany	1985	2006	1961	2006		-
98	674	Madagascar (C)	France	1970	2006	1961	2006	1970	2006
99	676	Malawi (C)	U.S.	1963	2006	1961	2006	1970	2006
100	548	Malaysia (E)	U.S.	1966	2006	1961	2006	1970	2006
101	556	Maldives	U.S.	1978	2006	1961	2006	1982	2006
102	678	Mali (C)	France	1964	2006	1961	2006	1970	2006
103	181	Malta	France	1969	2006	1961	2006	1972	2006
104	682	Mauritania (C)	1960-73 France; 1974-U.S.	1964	2006	1961	2005	1970	1964
105	684	Mauritius (E)	U.K.	1967	2006	1961	2006	1972	1967
106	273	Mexico (E)	U.S.	1976	2006	1961	2006	1970	1976
107	868	Micronesia, Fed. Sts.	U.S.	1996	2006	1961	2006	1996	1996
108	921	Moldova	U.S.	1995	2006	1992	2006	1998	1995
109	948	Mongolia (C)	U.S.	1993	2006	1991	2006	1998	1993
110	686	Morocco (E)	France	1969	2006	1961	2006	1970	1969
111	688	Mozambique	U.S.	1994	2006	1961	2006	1988	1994
112	518	Myanmar (C)	U.S.	1975	2006	1961	2006	1970	1975
113	728	Namibia (C)	South Africa	1991	2006	1962	2006	1994	1991
114	558	Nepal	1960-82 U.S.; 1983-India	1974	2006	1961	2006	1970	1974
115	138	Netherlands	Germany	1960	2006	1961	2006	1970	1960
116	353	Netherlands Antilles	U.S.	1980	2006	1961	2006	1970	1980
117	196	New Zealand (C)	Australia	1969	2006	1961	2006	1970	1969
118	278	Nicaragua (C)	U.S.	1990	2006	1961	2006	1970	1990
119	692	Niger (C)	France	1964	2006	1961	2006	1970	1964
120	694	Nigeria (E) (C)	U.S.	1964	2005	1961	2006	1970	1964
121	142	Norway	Germany	1964	2006	1961	2006	1970	1964
122	449	Oman (C)	U.S.	1980	2006	1961	2006	1977	1980
123	564	Pakistan (E)	U.S.	1964	2006	1961	2006	1970	1964
124	283	Panama	U.S.	1986	2006	1961	2006	1970	1986
125	853	Papua New Guinea (C)	1960-85 Australia; 1986-U.S.	1974	2006	1961	2006	1979	1974
126	288	Paraguay (C)	U.S.	1990	2006	1961	2006	1970	1990
127	293	Peru (E) (C)	U.S.	1960	2006	1961	2006	1970	1960
128	566	Philippines (E)	U.S.	1964	2006	1961	2006	1970	1964
129	964	Poland (E)	Germany	1991	2006	1961	2006	1990	1991
130	182	Portugal	Germany	1960	2006	1961	2006	1970	1960
131	453	Qatar (C)	U.S.	1980	2006	1967	2006	1976	1980
132	968	Romania	U.S.	1994	2006	1961	2006	1976	1994

	Country Code (cn)	Country Name	Base Country	Monetary Independence (MI)		Exchange rate stability (ERS)		KA Openness (KAOPEN)	
133	922	Russian Federation (E)	U.S.	1995	2006	1993	2006	1998	2006
134	714	Rwanda (C)	1960-73 Belgium; 1974-U.S.	1966	2006	1961	2006	1970	2006
135	716	Sao Tome & Principe (C)	U.S.	1989	2006	1961	2006	1981	2006
136	862	Samoa	Australia	1983	2006	1961	2006	1975	2006
137	135	San Marino	Germany	-	-	1961	2006	1996	2006
138	456	Saudi Arabia (C)	U.S.	1997	2006	1961	2006	1970	2006
139	722	Senegal	France	1964	2006	1961	2006	1970	2006
140	718	Seychelles	U.S.	1979	2006	1961	2006	1981	2006
141	724	Sierra Leone	1960-77 U.K.; 1978-U.S.	1966	2006	1961	2006	1970	2006
142	576	Singapore (E)	Malaysia	1972	2006	1961	2006	1970	2006
143	936	Slovak Republic (E)	Germany	1993	2006	1994	2006	1998	2006
144	961	Slovenia (E)	Germany	1993	2006	1992	2006	1998	2006
145	813	Solomon Islands (C)	1960-85 Australia; 1986-U.S.	1981	2006	1961	2006	1982	2006
146	726	Somalia (C)	U.S.	-	-	1961	1989	1970	2006
147	199	South Africa (E)	U.S.	1960	2006	1961	2006	1970	2006
148	184	Spain	Germany	1964	2006	1961	2006	1970	2006
149	524	Sri Lanka (E)	1960-92 U.S.; 1993-India	1964	2006	1961	2006	1970	2006
150	361	St. Kitts and Nevis	U.S.	1981	2006	1961	2006	1988	2006
151	362	St. Lucia	U.S.	1981	2006	1961	2006	1983	2006
152	364	St. Vinc. & the Gren. (C)	U.S.	1981	2006	1961	2006	1983	2006
153	732	Sudan (C)	1960-71 U.K.; 1972-U.S.	1978	1984	1961	2006	1970	2005
154	366	Suriname (C)	U.S.	1991	2006	1961	2006	1970	2006
155	734	Swaziland (C)	South Africa	1974	2006	1961	2006	1973	2006
156	144	Sweden	Germany	1960	2006	1961	2006	1970	2006
157	146	Switzerland	Germany	1964	2006	1961	2006	1996	2006
158	463	Syrian Arab Republic	U.S.	2003	2006	1961	2006	1970	2006
159	528	Taiwan (E)	U.S.	1985	2006	1983	2006	-	-
160	923	Tajikistan	U.S.	1997	2006	1993	2006	1998	2006
161	738	Tanzania (C)	U.S.	1973	2006	1961	2006	1970	2006
162	578	Thailand (E)	U.S.	1977	2006	1961	2006	1970	2006
163	742	Togo (C)	France	1964	2006	1961	2006	1970	2006
164	866	Tonga	Australia	1981	2006	1961	2006	1989	2006
165	369	Trinidad & Tobago (E) (C)	1960-75 U.K.; 1976-U.S.	1965	2006	1961	2006	1970	2006
166	744	Tunisia (E)	France	1964	2006	1961	2006	1970	2006
167	186	Turkey (E)	U.S.	1964	2006	1961	2006	1970	2006
168	925	Turkmenistan (C)	U.S.	-	-	1994	2001	1998	2006
169	746	Uganda (C)	U.S.	1980	2006	1961	2006	1970	2006
170	926	Ukraine	U.S.	1992	2006	1993	2006	1998	2006
171	466	United Arab Emirates (C)	U.S.	-	-	1967	2006	1976	2006
172	112	United Kingdom	Germany	1960	2006	1961	2006	1970	2006
173	298	Uruguay	U.S.	1976	2006	1965	2006	1970	2006
174	846	Vanuatu	U.S.	1981	2006	1961	2006	1985	2000
175	299	Venezuela, RB (E) (C)	1960-89 France; 1990-U.S.	1964	2006	1961	2006	1970	2006
176	582	Vietnam (C)	U.S.	1996	2006	1961	2006	1970	2006
177	474	Yemen, Rep.	U.S.	1996	2006	1991	2006	1995	2006
178	754	Zambia (C)	U.S.	1965	2006	1961	2006	1970	2006
179	698	Zimbabwe (E) (C)	U.S.	1965	2005	1961	2005	1984	2006

Notes: The base countries are primarily based on Shambaugh (QJE) and complemented by information from IMF's *Annual Report on Exchange Arrangement and Exchange Restrictions* and *CIA Factbook*

Table 1: Mean-Equality Tests of the Trilemma Indexes between Emerging Market Countries (EMG) and Non-Emerging Market Developing Countries (Non-EMG LDC)

		1971 – 1980	1981 – 1990	1991 – 2000	2001-2006
Monetary Independence (MI)	Non-EMG LDC	.4495	.4510	.4748	.4427
	EMG	.4784	.4772	.4941	.3847
	Difference	.02883	.0262	.0193	-.0579
	t-statistics	2.86***	2.71***	2.07**	4.31***
Exchange Rate Stability (ERS)	Non-EMG LDC	.7941	.7228	.6508	.7266
	EMG	.6703	.4983	.4901	.5364
	Difference	-.1238	-.2245	-.1607	-.1902
	t-statistics	6.70***	11.04***	8.47***	8.68***
Financial Openness (KAOPEN)	Non-EMG LDC	.3511	.3138	.3785	.4177
	EMG	.2803	.2522	.4014	.5498
	Difference	-.0708	- .0616	.0230	.1320
	t-statistics	3.42***	3.08***	$1.19^{12\%}$	5.09***
International Reserves Holding (% of GDP; IR)	Non-EMG LDC	.1013	.1093	.1331	.1772
	EMG	.1109	.1104	.1697	.2322
	Difference	.0095	.0011	.0366	.0550
	t-statistics	1.31*	0.12	4.25***	4.67***

Table 2 (a): Tests for Structural Breaks in the Trilemma Indexes

			1970-72	1974-81	1983-96	1999-2006
Industrial Countries (18)	Monetary Independence	Mean	0.376	0.407	0.389	0.139
		Change		+0.031	-0.018	-0.250
		t-stats (p-value)		1.31 (0.11)	0.85 (0.20)	11.91 (0.00)***
	Exchange Rate Stability	Mean	0.688	0.429	0.476	0.702
		Change		-0.259	+0.047	+0.226
		t-stats (p-value)		6.64 (0.00)***	2.41 (0.01)**	12.45 (0.00)***
	Financial Openness	Mean	0.439	0.469	0.688	0.955
		Change		+0.030	+0.219	+0.266
		t-stats (p-value)		1.62 (0.07)*	4.34 (0.00)***	5.27 (0.00)***
			1970-72	**1974-81**	**1983-96**	**1999-2006**
Non-Emerging Developing Countries (32)	Monetary Independence	Mean	0.500	0.399	0.457	0.534
		Change		-0.101	+0.058	+0.077
		t-stats (p-value)		1.68 (0.06)*	1.84 (0.04)**	3.55 (0.00)***
	Exchange Rate Stability	Mean	0.786	0.780	0.635	0.742
		Change		-0.006	-0.145	+0.107
		t-stats (p-value)		0.10 (0.46)	5.26 (0.00)***	3.76 (0.00)***
	Financial Openness	Mean	0.267	0.365	0.326	0.391
		Change		+0.098	-0.040	+0.065
		t-stats (p-value)		5.73 (0.01)***	2.25 (0.02)**	3.93 (0.00)***
			1970-72	**1974-81**	**1983-96**	**1999-2006**
Emerging Market Countries (18)	Monetary Independence	Mean	0.526	0.474	0.508	0.407
		Change		-0.052	+0.034	-0.100
		t-stats (p-value)		2.16 (0.03)**	1.42 (0.09)*	3.81 (0.00)***
	Exchange Rate Stability	Mean	0.818	0.715	0.517	0.579
		Change		-0.103	-0.198	+0.63
		t-stats (p-value)		3.38 (0.00)***	9.55 (0.00)***	2.71 (0.01)***
	Financial Openness	Mean	0.210	0.229	0.240	0.474
		Change		+0.020	+0.010	+0.234
		t-stats (p-value)		5.03 (0.00)***	0.40 (0.35)	8.88 (0.00)***

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2(b): Tests for Structural Breaks in the Trilemma Indexes

			1983-89	1991-2006	1983-2000	2002-2006
Industrial Countries (18)	Monetary Independence	Mean	0.396	0.246	0.355	0.126
		Change		-0.150		-0.229
		t-stats (p-value)		3.17 (0.00)***		5.82 (0.00)***
	Exchange Rate Stability	Mean	0.476	0.599	0.511	0.715
		Change		+0.124		+0.204
		t-stat (p-value)		2.64 (0.01)***		5.33 (0.00)***
	Financial Openness	Mean	0.578	0.905	0.748	0.949
		Change		+0.327		+0.201
		t-stats (p-value)		9.22 (0.00)***		2.62 (0.01)**
			1983-89	**1991-2006**	**1983-2000**	**2002-2006**
Non-Emerging Developing Countries (32)	Monetary Independence	Mean	0.421	0.522	0.483	0.517
		Change		+0.100		+0.034
		t-stats (p-value)		4.80 (0.00)***		1.05 (0.15)
	Exchange Rate Stability	Mean	0.633	0.699	0.643	0.778
		Change		+0.066		+0.135
		t-stats (p-value)		2.01 (0.03)**		4.73 (0.00)***
	Financial Openness	Mean	0.296	0.376	0.336	0.400
		Change		+0.080		+0.064
		t-stats (p-value)		5.94 (0.00)***		3.20 (0.00)***
			1983-89	**1991-2006**	**1983-2000**	**2002-2006**
Emerging Market Countries (18)	Monetary Independence	Mean	0.471	0.469	0.508	0.385
		Change		-0.002		-0.123
		t-stats (p-value)		0.08 (0.47)		4.52 (0.00)***
	Exchange Rate Stability	Mean	0.537	0.532	0.515	0.608
		Change		-0.005		+0.093
		t-stats (p-value)		0.19 (0.43)		3.95 (0.00)***
	Financial Openness	Mean	0.188	0.403	0.282	0.482
		Change		+0.215		+0.200
		t-stats (p-value)		6.27 (0.00)***		4.23 (0.00)***

Note: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2(c): Summary of the Structural Breaks Tests

		Structural Breaks
Industrial Countries (IDC)	Monetary Independence	1997-98
	Exchange Rate Stability	1997-98 (1973 for non-Euro Countries)
	Financial Openness	1990
Non-Emerging Developing Countries (NOEMG)	Monetary Independence	1990
	Exchange Rate Stability	1982
	Financial Openness	1990
Emerging Market Countries (EMG)	Monetary Independence	2001
	Exchange Rate Stability	1982
	Financial Openness	1997-98

Table 3: Regression for the Linear Relationship between the Trilemma Indexes: $1 = a_j MI_{i,t} + b_j ERS_{i,t} + c_j KAOPEN_{i,t} + \varepsilon_t$

	(1) FULL	(2) 1970-72	(3) 1974-81	(4) 1983-96	(5) 1999-2006	(6) 1983-89	(7) 1991-2006	(8) 1983-2000	(9) 2002-2006
Monetary Independence	1.084	0.946	1.339	0.99	0.336	1.065	0.558	0.931	0.522
	[0.039]***	[0.127]***	[0.069]***	[0.057]***	[0.109]***	[0.066]***	[0.077]***	[0.057]***	[0.101]***
Exch. Rate Stability	0.611	0.665	0.597	0.647	0.223	0.613	0.633	0.66	0.448
	[0.032]***	[0.076]***	[0.090]***	[0.051]***	[0.181]	[0.061]***	[0.100]***	[0.050]***	[0.249]*
KA Openness	0.437	0.369	0.29	0.448	0.869	0.439	0.632	0.468	0.733
	[0.021]***	[0.050]***	[0.063]***	[0.031]***	[0.072]***	[0.045]***	[0.042]***	[0.029]***	[0.091]***
ERM x MI	-0.166	–	0.375	-0.287	0.159	-0.43	-0.059	-0.104	-0.022
	[0.072]**	–	[0.299]	[0.111]***	[0.119]	[0.286]	[0.103]	[0.086]	[0.126]
ERM x ERS	-0.026	–	0.254	0.073	-0.115	0.218	-0.398	-0.105	-0.338
	[0.055]	–	[0.165]	[0.073]	[0.183]	[0.104]**	[0.108]***	[0.067]	[0.251]
ERM x KAOPEN	-0.005	–	-0.273	-0.009	0.039	0.09	0.137	-0.012	0.177
	[0.052]	–	[0.128]**	[0.054]	[0.075]	[0.122]	[0.059]**	[0.054]	[0.097]*
LDC x MI	0.148	0.389	-0.175	0.299	0.78	0.214	0.675	0.365	0.567
	[0.045]***	[0.164]**	[0.097]*	[0.065]***	[0.119]***	[0.078]***	[0.083]***	[0.064]***	[0.120]***
LDC x ERS	-0.193	-0.371	-0.118	-0.21	0.211	-0.134	-0.244	-0.24	0.001
	[0.035]***	[0.094]***	[0.097]	[0.055]***	[0.184]	[0.067]**	[0.103]**	[0.054]***	[0.252]
LDC x KAOPEN	-0.158	-0.136	-0.043	-0.176	-0.536	-0.009	-0.362	-0.257	-0.378
	[0.030]***	[0.079]*	[0.081]	[0.051]***	[0.080]***	[0.069]	[0.052]***	[0.045]***	[0.100]***
Observations	1850	150	400	700	400	350	800	900	250
Adjusted R-squared	0.95	0.98	0.94	0.96	0.95	0.96	0.96	0.95	0.95

Robust standard errors in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

NOTES: ERM is a dummy for the countries and years that correspond to participation in ERM (i.e., Belgium, Denmark, Germany, France, Ireland, and Italy from 1979, Spain from 1989, U.K. only for 1990-91, Portugal from 1992, Austria from 1995, Finland from 1996, and Greece from 1999)

Table 4-1: Output Volatility: Less Developed Countries (LDC), 1972 – 2006, Panels of 5-year Windows

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.032	-0.039	-0.034	-0.022	-0.031	-0.045	Relative Income	-0.029	-0.036	-0.035	-0.037	-0.026	-0.047
	[0.020]	[0.020]*	[0.020]*	[0.020]	[0.020]	[0.021]**		[0.020]	[0.020]*	[0.020]*	[0.020]*	[0.020]	[0.021]**
Relative Income, sq.	0.05	0.062	0.059	0.034	0.057	0.085	Relative Income, sq.	0.046	0.057	0.063	0.07	0.047	0.089
	[0.024]**	[0.024]**	[0.024]**	[0.025]	[0.024]**	[0.026]***		[0.024]*	[0.024]**	[0.024]***	[0.024]***	[0.024]**	[0.025]***
Change in US real interest rate	0.173	0.171	0.166	0.166	0.168	0.17	Change in US real interest rate	0.174	0.173	0.164	0.164	0.171	0.172
	[0.045]***	[0.046]***	[0.046]***	[0.046]***	[0.046]***	[0.046]***		[0.045]***	[0.045]***	[0.046]***	[0.046]***	[0.046]***	[0.046]***
Volatility of TOT*OPN	0.037	0.037	0.036	0.036	0.035	0.035	Volatility of TOT*OPN	0.036	0.037	0.036	0.036	0.035	0.035
	[0.008]***	[0.008]***	[0.008]***	[0.008]***	[0.008]***	[0.008]***		[0.008]***	[0.008]***	[0.008]***	[0.008]***	[0.008]***	[0.008]***
Inflation volatility	0.001	0.001	0.001	0.001	0.001	0.001	Inflation volatility	0.001	0.001	0.001	0.001	0.001	0.001
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]		[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Fiscal Procyclicality	0.003	0.003	0.003	0.003	0.003	0.003	Fiscal Procyclicality	0.003	0.003	0.003	0.003	0.003	0.003
	[0.002]	[0.002]	[0.002]*	[0.002]*	[0.002]*	[0.002]*		[0.002]	[0.002]	[0.002]*	[0.002]*	[0.002]*	[0.002]*
Oil Exporters	0.011	0.012	0.011	0.011	0.011	0.011	Oil Exporters	0.011	0.012	0.011	0.011	0.01	0.011
	[0.004]***	[0.004]***	[0.004]***	[0.004]***	[0.004]***	[0.004]***		[0.004]***	[0.004]***	[0.004]***	[0.004]***	[0.004]***	[0.004]***
Private credit creation	-0.009	-0.009	-0.01	-0.009	-0.009	-0.009	Private credit creation	-0.009	-0.008	-0.01	-0.011	-0.009	-0.009
	[0.005]*	[0.006]	[0.005]*	[0.005]*	[0.005]*	[0.006]		[0.005]	[0.005]	[0.005]*	[0.005]*	[0.005]*	[0.006]
Total Reserve/GDP	0.018	0.049	0.019	0.021	0.018	0.045	Total Reserve/GDP	0.018	0.048	0.019	0.025	0.019	0.045
	[0.008]**	[0.041]	[0.008]**	[0.033]	[0.009]**	[0.025]*		[0.008]**	[0.034]	[0.008]**	[0.031]	[0.008]**	[0.024]*
Monetary Independ. (MI)	-0.02	-0.015	-0.019	-0.016			PC of MI & ERS	-0.018	-0.009				
	[0.008]**	[0.012]	[0.008]**	[0.012]				[0.008]**	[0.012]				
MI x reserves		-0.038		-0.017			MI_ERS x reserves		-0.068				
		[0.067]		[0.063]					[0.071]				
Exchange Rate Stability (ERS)	-0.005	-0.001			-0.003	0.002	PC of MI & KAO			-0.02	-0.018		
	[0.004]	[0.005]			[0.004]	[0.005]				[0.009]**	[0.012]		
ERS x reserves		-0.029				-0.034	MI_KAO x reserves				-0.012		
		[0.032]				[0.031]					[0.058]		
KA Openness			-0.005	-0.007	-0.004	-0.002	PC of ERS. & KAO					-0.006	0
			[0.004]	[0.005]	[0.004]	[0.005]						[0.005]	[0.007]
KAOPEN x reserves				0.015		-0.02	ERS_KAO x reserves						-0.054
				[0.025]		[0.025]							[0.041]
# of Obs.	412	412	412	412	412	412	# of Obs.	412	412	412	412	412	412
Adjusted R2	0.21	0.21	0.22	0.2	0.21	0.22	Adjusted R2	0.21	0.21	0.22	0.22	0.2	0.23

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for East Asia and Pacific and Sub-Saharan Africa are not reported.

Table 4-2: Output Volatility: Less Developed, Commodity Exporting Countries (LDC-CMD), 1972 – 2006, Panels of 5-year Windows

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.057	-0.055	-0.062	-0.071	-0.04	-0.044	Relative Income	-0.053	-0.054	-0.066	-0.073	-0.037	-0.037
	[0.040]	[0.039]	[0.040]	[0.039]*	[0.039]	[0.038]		[0.038]	[0.038]	[0.039]*	[0.038]*	[0.039]	[0.039]
Relative Income, sq.	0.133	0.133	0.138	0.145	0.121	0.126	Relative Income, sq.	0.13	0.132	0.141	0.147	0.118	0.119
	[0.046]***	[0.045]***	[0.046]***	[0.045]***	[0.045]***	[0.044]***		[0.045]***	[0.045]***	[0.046]***	[0.044]***	[0.045]***	[0.045]***
Change in US real interest rate	0.232	0.246	0.213	0.211	0.227	0.238	Change in US real interest rate	0.234	0.242	0.218	0.212	0.23	0.234
	[0.086]***	[0.085]***	[0.087]**	[0.085]**	[0.086]***	[0.084]***		[0.086]***	[0.086]***	[0.087]**	[0.084]**	[0.086]***	[0.086]***
Volatility of TOT*OPN	0.03	0.03	0.029	0.029	0.028	0.028	Volatility of TOT*OPN	0.03	0.03	0.03	0.029	0.028	0.028
	[0.012]**	[0.012]**	[0.012]**	[0.012]**	[0.012]**	[0.012]**		[0.012]**	[0.012]**	[0.012]**	[0.012]**	[0.012]**	[0.012]**
Inflation volatility	0.001	0.002	0.001	0.001	0.001	0.001	Inflation volatility	0.001	0.001	0.001	0.001	0.001	0.001
	[0.003]	[0.002]	[0.003]	[0.002]	[0.003]	[0.002]		[0.002]	[0.002]	[0.003]	[0.002]	[0.003]	[0.003]
Fiscal Procyclicality	0.002	0.002	0.003	0.004	0.003	0.003	Fiscal Procyclicality	0.002	0.002	0.003	0.004	0.002	0.002
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Oil Exporters	0.011	0.01	0.01	0.009	0.008	0.007	Oil Exporters	0.01	0.01	0.01	0.01	0.008	0.008
	[0.006]*	[0.006]*	[0.006]	[0.006]	[0.006]	[0.006]		[0.006]*	[0.006]*	[0.006]*	[0.006]	[0.006]	[0.006]
Private credit creation	0.003	0.005	-0.005	-0.006	0.002	0.004	Private credit creation	0.004	0.005	-0.005	-0.006	0.005	0.005
	[0.017]	[0.016]	[0.017]	[0.016]	[0.016]	[0.016]		[0.016]	[0.016]	[0.017]	[0.016]	[0.016]	[0.016]
Total Reserve/GDP	0.01	0.021	0.015	-0.105	0.011	0.031	Total Reserve/GDP	0.009	0.053	0.015	-0.124	0.009	0.024
	[0.015]	[0.072]	[0.015]	[0.073]	[0.015]	[0.050]		[0.014]	[0.058]	[0.015]	[0.067]*	[0.014]	[0.049]
Monetary Independ. (MI)	-0.021	-0.031	-0.021	-0.043			PC of MI & ERS	-0.024	-0.011				
	[0.017]	[0.024]	[0.017]	[0.024]*				[0.016]	[0.023]				
MI x reserves		0.092		0.15			MI_ERS x reserves		-0.095				
		[0.131]		[0.133]					[0.124]				
Exchange Rate Stability (ERS)	-0.009	0.004			-0.005	0.007	PC of MI & KAO			-0.034	-0.078		
	[0.007]	[0.010]			[0.007]	[0.010]				[0.019]*	[0.027]***		
ERS x reserves		-0.105				-0.091	MI_KAO x reserves				0.295		
		[0.061]*				[0.063][15%]					[0.139]**		
KA Openness			-0.015	-0.035	-0.012	-0.023	PC of ERS. & KAO					-0.016	-0.012
			[0.009]*	[0.013]***	[0.009]	[0.013]*						[0.010]	[0.016]
KAOPEN x reserves				0.129		0.068	ERS_KAO x reserves						-0.033
				[0.062]**		[0.064]							[0.101]
# of Obs.	180	180	180	180	180	180	# of Obs.	180	180	180	180	180	180
Adjusted R2	0.22	0.24	0.22	0.24	0.22	0.24	Adjusted R2	0.22	0.22	0.22	0.25	0.22	0.22

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for East Asia and Pacific and Sub-Saharan Africa are not reported.

Table 4-3: Output Volatility: Emerging Market Countries (EMG), 1972 – 2006, Panels of 5-year Windows

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.032	-0.04	-0.033	-0.026	-0.031	-0.039	Relative Income	-0.036	-0.038	-0.031	-0.032	-0.033	-0.044
	[0.024]	[0.024]*	[0.024]	[0.025]	[0.024]	[0.026]		[0.023]	[0.022]*	[0.023]	[0.024]	[0.023]	[0.025]*
Relative Income, sq.	0.046	0.056	0.048	0.038	0.045	0.056	Relative Income, sq.	0.049	0.052	0.047	0.049	0.046	0.064
	[0.030]	[0.030]*	[0.029]*	[0.032]	[0.029]	[0.034]		[0.028]*	[0.027]*	[0.028]*	[0.030]	[0.028]	[0.033]*
Change in US real interest rate	0.204	0.212	0.2	0.198	0.196	0.2	Change in US real interest rate	0.207	0.212	0.194	0.196	0.2	0.21
	[0.055]***	[0.054]***	[0.055]***	[0.054]***	[0.054]***	[0.054]***		[0.052]***	[0.051]***	[0.053]***	[0.053]***	[0.052]***	[0.053]***
Volatility of TOT*OPN	0.006	0.003	0.011	0.013	0.006	0.001	Volatility of TOT*OPN	0.015	0.014	0.013	0.013	0.014	0.013
	[0.013]	[0.013]	[0.013]	[0.013]	[0.013]	[0.013]		[0.013]	[0.012]	[0.013]	[0.013]	[0.013]	[0.013]
Inflation volatility	0.057	0.06	0.049	0.043	0.054	0.059	Inflation volatility	0.039	0.04	0.043	0.043	0.04	0.042
	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***		[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***
Fiscal Procyclicality	0.005	0.005	0.004	0.005	0.005	0.005	Fiscal Procyclicality	0.004	0.004	0.004	0.004	0.004	0.004
	[0.002]**	[0.002]**	[0.002]*	[0.002]**	[0.002]**	[0.002]**		[0.002]*	[0.002]**	[0.002]**	[0.002]**	[0.002]**	[0.002]**
Oil Exporters	0.011	0.013	0.012	0.012	0.01	0.012	Oil Exporters	0.013	0.014	0.011	0.011	0.012	0.011
	[0.005]**	[0.005]***	[0.005]**	[0.005]***	[0.005]**	[0.005]**		[0.005]***	[0.004]***	[0.005]**	[0.005]**	[0.004]**	[0.005]**
Private credit creation	-0.007	-0.004	-0.008	-0.008	-0.007	-0.003	Private credit creation	-0.006	-0.004	-0.008	-0.008	-0.006	-0.005
	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]	[0.006]		[0.005]	[0.005]	[0.006]	[0.006]	[0.005]	[0.006]
Total Reserve/GDP	0.026	0.105	0.028	0.041	0.028	0.059	Total Reserve/GDP	0.027	0.089	0.029	0.04	0.027	0.053
	[0.008]***	[0.038]***	[0.008]***	[0.035]	[0.008]***	[0.024]**		[0.008]***	[0.030]***	[0.008]***	[0.033]	[0.008]***	[0.023]**
Monetary Independ. (MI)	-0.017	-0.005	-0.02	-0.013			PC of MI & ERS	-0.012	0.01				
	[0.010]*	[0.014]	[0.010]**	[0.013]				[0.010]	[0.013]				
MI x reserves		-0.081		-0.043			MI_ERS x reserves		-0.139				
		[0.063]		[0.061]					[0.065]**				
Exchange Rate Stability (ERS)	0.004	0.017			0.005	0.017	PC of MI & KAO			-0.017	-0.014		
	[0.005]	[0.007]**			[0.005]	[0.007]**				[0.010][11%]	[0.013]		
ERS x reserves		-0.081				-0.072	MI_KAO x reserves				-0.018		
		[0.033]**				[0.032]**					[0.060]		
KA Openness			-0.004	-0.005	-0.001	-0.003	PC of ERS. & KAO					-0.001	0.006
			[0.005]	[0.006]	[0.004]	[0.006]						[0.006]	[0.009]
KAOPEN x reserves				0.011		0.008	ERS_KAO x reserves						-0.047
				[0.026]		[0.026]							[0.042]
# of Obs.	208	208	208	208	208	208	# of Obs.	208	208	208	208	208	208
Adjusted R2	0.47	0.5	0.44	0.41	0.46	0.5	Adjusted R2	0.39	0.42	0.41	0.41	0.4	0.41

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for East Asia and Pacific and Sub-Saharan Africa are not reported.

Table 5-1: Inflation Volatility: Less Developed Countries (LDC), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.078	-0.078	-0.087	-0.078	-0.08	-0.071	Relative Income	-0.08	-0.084	-0.084	-0.081	-0.08	-0.075
	[0.026]***	[0.026]***	[0.027]***	[0.028]***	[0.026]***	[0.027]***		[0.026]***	[0.026]***	[0.026]***	[0.027]***	[0.026]***	[0.027]***
Relative Income, sq.	0.074	0.075	0.082	0.062	0.072	0.054	Relative Income, sq.	0.08	0.086	0.083	0.079	0.072	0.061
	[0.032]**	[0.033]**	[0.033]**	[0.036]*	[0.033]**	[0.036]		[0.033]**	[0.033]**	[0.033]**	[0.034]**	[0.033]**	[0.036]*
Volatility of TOT*OPN	0.017	0.016	0.02	0.021	0.017	0.017	Volatility of TOT*OPN	0.017	0.017	0.017	0.017	0.017	0.017
	[0.010]*	[0.010]*	[0.010]**	[0.010]**	[0.010]*	[0.010]*		[0.010]*	[0.010]*	[0.010]*	[0.010]*	[0.010]*	[0.010]*
Inflation Rate	0.215	0.213	0.221	0.222	0.223	0.221	Inflation Rate	0.207	0.21	0.212	0.211	0.223	0.224
	[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.010]***		[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.010]***
Relative oil price shocks	0.005	0.005	0.006	0.006	0.005	0.005	Relative oil price shocks	0.006	0.006	0.006	0.006	0.005	0.005
	[0.003]	[0.003]	[0.003]**	[0.003]*	[0.003]*	[0.003]		[0.003]**	[0.003]**	[0.003]**	[0.003]**	[0.003]*	[0.003]*
Total Reserve/GDP	-0.008	0.033	-0.012	-0.01	-0.01	-0.022	Total Reserve/GDP	-0.01	0.016	-0.011	-0.02	-0.009	-0.026
	[0.012]	[0.057]	[0.012]	[0.050]	[0.012]	[0.035]		[0.012]	[0.049]	[0.012]	[0.045]	[0.012]	[0.034]
Monetary Independ. (MI)	-0.01	-0.001	-0.011	-0.006			PC of MI & ERS	0	0.008				
	[0.012]	[0.017]	[0.012]	[0.017]				[0.012]	[0.018]				
MI x reserves		-0.058		-0.04			MI_ERS x reserves		-0.059				
		[0.094]		[0.093]					[0.104]				
Exchange Rate Stability (ERS)	0.007	0.011			0.007	0.01	PC of MI & KAO			0.006	0.003		
	[0.005]	[0.008]			[0.005]	[0.008]				[0.013]	[0.018]		
ERS x reserves		-0.027				-0.011	MI_KAO x reserves				0.019		
		[0.045]				[0.043]					[0.083]		
KA Openness			0.008	0.004	0.009	0.004	PC of ERS. & KAO					0.016	0.012
			[0.006]	[0.008]	[0.006]	[0.008]						[0.008]**	[0.011]
KAOPEN x reserves				0.03		0.032	ERS_KAO x reserves						0.031
				[0.036]		[0.035]							[0.057]
# of Obs.	429	429	429	429	429	429	# of Obs.	429	429	429	429	429	429
Adjusted R2	0.59	0.59	0.59	0.59	0.59	0.59	Adjusted R2	0.58	0.58	0.58	0.58	0.6	0.59

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for Middle East and North Africa and Sub-Saharan Africa are not reported.

Table 5-2: Inflation Volatility: Less Developed, Commodity Exporting Countries (LDC-CMD), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.184	-0.18	-0.162	-0.16	-0.147	-0.143	Relative Income	-0.169	-0.167	-0.151	-0.151	-0.152	-0.152
	[0.066]***	[0.065]***	[0.066]**	[0.066]**	[0.069]**	[0.068]**		[0.066]**	[0.065]**	[0.065]**	[0.064]**	[0.068]**	[0.069]**
Relative Income, sq.	0.234	0.232	0.218	0.217	0.198	0.198	Relative Income, sq.	0.223	0.222	0.208	0.208	0.205	0.204
	[0.087]***	[0.086]***	[0.087]**	[0.087]**	[0.091]**	[0.088]**		[0.088]**	[0.087]**	[0.087]**	[0.086]**	[0.089]**	[0.090]**
Volatility of TOT*OPN	0.06	0.059	0.054	0.055	0.047	0.047	Volatility of TOT*OPN	0.055	0.055	0.051	0.051	0.048	0.048
	[0.022]***	[0.022]***	[0.022]**	[0.022]**	[0.023]**	[0.022]**		[0.022]**	[0.022]**	[0.022]**	[0.022]**	[0.022]**	[0.023]**
Inflation Rate	0.323	0.315	0.319	0.315	0.303	0.288	Inflation Rate	0.294	0.295	0.319	0.313	0.287	0.29
	[0.033]***	[0.032]***	[0.031]***	[0.032]***	[0.035]***	[0.034]***		[0.032]***	[0.031]***	[0.031]***	[0.031]***	[0.034]***	[0.035]***
Relative oil price shocks	0.021	0.023	0.018	0.019	0.024	0.025	Relative oil price shocks	0.026	0.027	0.019	0.018	0.027	0.026
	[0.009]**	[0.009]**	[0.009]**	[0.009]**	[0.010]**	[0.009]***		[0.009]***	[0.009]***	[0.009]**	[0.009]**	[0.009]***	[0.009]***
Total Reserve/GDP	-0.036	0.081	-0.032	-0.033	-0.039	-0.011	Total Reserve/GDP	-0.046	0.075	-0.033	-0.093	-0.044	-0.029
	[0.032]	[0.160]	[0.032]	[0.163]	[0.034]	[0.116]		[0.033]	[0.132]	[0.032]	[0.153]	[0.033]	[0.115]
Monetary Independ. (MI)	-0.076	-0.054	-0.082	-0.069			PC of MI & ERS	-0.061	-0.022				
	[0.036]**	[0.053]	[0.035]**	[0.052]				[0.037]	[0.053]				
MI x reserves		-0.113		-0.084			MI_ERS x reserves		-0.262				
		[0.291]		[0.299]					[0.278]				
Exchange Rate Stability (ERS)	-0.004	0.012			-0.003	0.01	PC of MI & KAO			-0.094	-0.11		
	[0.017]	[0.023]			[0.017]	[0.023]				[0.038]**	[0.057]*		
ERS x reserves		-0.122				-0.118	MI_KAO x reserves				0.124		
		[0.134]				[0.146]					[0.314]		
KA Openness			-0.026	-0.041	-0.023	-0.034	PC of ERS. & KAO					-0.028	-0.023
			[0.019]	[0.028]	[0.019]	[0.029]						[0.026]	[0.040]
KAOPEN x reserves				0.095		0.079	ERS_KAO x reserves						-0.033
				[0.137]		[0.145]							[0.235]
# of Obs.	182	182	182	182	182	182	# of Obs.	182	182	182	182	182	182
Adjusted R2	0.48	0.47	0.48	0.48	0.45	0.44	Adjusted R2	0.45	0.45	0.48	0.48	0.44	0.44

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5-3: Inflation Volatility: Emerging Market Countries (EMG), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.078	-0.075	-0.087	-0.085	-0.083	-0.082	Relative Income	-0.08	-0.081	-0.085	-0.088	-0.079	-0.079
	[0.031]**	[0.031]**	[0.031]***	[0.034]**	[0.031]***	[0.034]**		[0.029]***	[0.030]***	[0.031]***	[0.032]***	[0.030]***	[0.033]**
Relative Income, sq.	0.082	0.08	0.087	0.084	0.082	0.08	Relative Income, sq.	0.085	0.087	0.087	0.094	0.078	0.079
	[0.039]**	[0.040]**	[0.039]**	[0.046]*	[0.039]**	[0.048]*		[0.037]**	[0.038]**	[0.038]**	[0.042]**	[0.038]**	[0.045]*
Volatility of TOT*OPN	0.102	0.1	0.105	0.105	0.099	0.098	Volatility of TOT*OPN	0.106	0.104	0.099	0.099	0.096	0.096
	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***	[0.017]***		[0.016]***	[0.016]***	[0.016]***	[0.016]***	[0.016]***	[0.016]***
Inflation Rate	0.177	0.177	0.184	0.185	0.184	0.186	Inflation Rate	0.167	0.17	0.178	0.176	0.18	0.181
	[0.011]***	[0.011]***	[0.011]***	[0.011]***	[0.011]***	[0.011]***		[0.010]***	[0.010]***	[0.011]***	[0.011]***	[0.011]***	[0.011]***
Relative oil price shocks	0.003	0.003	0.004	0.004	0.003	0.003	Relative oil price shocks	0.003	0.003	0.004	0.004	0.003	0.003
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]		[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Total Reserve/GDP	-0.005	0.034	-0.009	0.008	-0.009	-0.004	Total Reserve/GDP	-0.004	0.015	-0.005	0.012	-0.008	-0.007
	[0.011]	[0.053]	[0.012]	[0.051]	[0.012]	[0.034]		[0.011]	[0.043]	[0.011]	[0.047]	[0.011]	[0.033]
Monetary Independ. (MI)	-0.009	0.002	-0.006	0.001			PC of MI & ERS	-0.003	0.004				
	[0.014]	[0.019]	[0.014]	[0.019]				[0.013]	[0.019]				
MI x reserves		-0.058		-0.039			MI_ERS x reserves		-0.042				
		[0.087]		[0.087]					[0.092]				
Exchange Rate Stability (ERS)	0.006	0.01			0.005	0.009	PC of MI & KAO			0.013	0.018		
	[0.007]	[0.010]			[0.007]	[0.010]				[0.015]	[0.020]		
ERS x reserves		-0.024				-0.016	MI_KAO x reserves				-0.032		
		[0.045]				[0.044]					[0.086]		
KA Openness			0.011	0.011	0.011	0.01	PC of ERS. & KAO					0.017	0.017
			[0.007]*	[0.009]	[0.006]*	[0.009]						[0.009]*	[0.012]
KAOPEN x reserves				0.002		0.006	ERS_KAO x reserves						-0.002
				[0.038]		[0.037]							[0.059]
# of Obs.	215	215	215	215	215	215	# of Obs.	215	215	215	215	215	215
Adjusted R2	0.68	0.68	0.69	0.69	0.69	0.68	Adjusted R2	0.68	0.68	0.68	0.68	0.69	0.69

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for Middle East and North Africa and Sub-Saharan Africa are not reported.

Table 6-1: Inflation: Less Developed Countries (LDC), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.028	-0.015	0.013	0.036	-0.028	0.005	Relative Income	-0.022	-0.019	0.004	0.012	-0.022	0.016
	[0.052]	[0.052]	[0.053]	[0.055]	[0.050]	[0.052]		[0.054]	[0.054]	[0.055]	[0.055]	[0.050]	[0.051]
Relative Income, sq.	0.059	0.045	0.014	-0.022	0.074	0.027	Relative Income, sq.	0.052	0.049	0.018	0.005	0.068	0.013
	[0.062]	[0.063]	[0.065]	[0.068]	[0.060]	[0.064]		[0.065]	[0.065]	[0.066]	[0.068]	[0.060]	[0.064]
World Output Gap	0.876	0.91	0.71	0.714	0.897	0.921	World Output Gap	0.901	0.898	0.8	0.771	0.861	0.871
	[0.310]***	[0.310]***	[0.321]**	[0.321]**	[0.300]***	[0.298]***		[0.323]***	[0.323]***	[0.328]**	[0.330]**	[0.300]***	[0.296]***
Trade openness	-0.013	-0.014	-0.015	-0.018	-0.008	-0.012	Trade openness	-0.02	-0.02	-0.021	-0.023	-0.007	-0.012
	[0.008]*	[0.008]*	[0.008]*	[0.008]**	[0.007]	[0.008]		[0.008]**	[0.008]**	[0.008]***	[0.008]***	[0.007]	[0.008]
Volatility of TOT*OPN	0.032	0.031	0.027	0.025	0.022	0.02	Volatility of TOT*OPN	0.042	0.041	0.041	0.041	0.019	0.018
	[0.021]	[0.021]	[0.022]	[0.022]	[0.020]	[0.020]		[0.022]*	[0.022]*	[0.022]*	[0.022]*	[0.020]	[0.020]
Inflation volatility	0.311	0.31	0.295	0.293	0.304	0.303	Inflation volatility	0.3	0.3	0.297	0.297	0.3	0.299
	[0.013]***	[0.013]***	[0.013]***	[0.013]***	[0.012]***	[0.012]***		[0.013]***	[0.013]***	[0.014]***	[0.014]***	[0.012]***	[0.012]***
Private Credit Creation	-0.016	-0.022	-0.011	-0.014	-0.017	-0.025	Private Credit Creation	-0.015	-0.017	-0.012	-0.013	-0.016	-0.024
	[0.013]	[0.013]	[0.014]	[0.014]	[0.013]	[0.013]*		[0.014]	[0.014]	[0.014]	[0.014]	[0.013]	[0.013]*
M2 Growth Volatility	0.137	0.146	0.116	0.116	0.144	0.149	M2 Growth Volatility	0.127	0.13	0.111	0.112	0.142	0.147
	[0.036]***	[0.036]***	[0.038]***	[0.037]***	[0.035]***	[0.035]***		[0.038]***	[0.038]***	[0.038]***	[0.039]***	[0.035]***	[0.035]***
Fiscal Procyclicality	-0.001	-0.001	0.003	0.003	-0.003	-0.002	Fiscal Procyclicality	0.002	0.002	0.004	0.004	-0.003	-0.002
	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]		[0.005]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Oil Shock	0.044	0.044	0.038	0.037	0.04	0.04	Oil Shock	0.039	0.039	0.038	0.038	0.038	0.038
	[0.005]***	[0.006]***	[0.006]***	[0.006]***	[0.005]***	[0.005]***		[0.006]***	[0.006]***	[0.006]***	[0.006]***	[0.005]***	[0.005]***
Total Reserve/GDP	-0.021	-0.122	0.014	-0.002	-0.01	-0.136	Total Reserve/GDP	-0.001	-0.114	0.011	-0.058	-0.002	-0.128
	[0.024]	[0.104]	[0.025]	[0.089]	[0.024]	[0.061]**		[0.025]	[0.090]	[0.026]	[0.083]	[0.023]	[0.059]**
Monetary Independ. (MI)	0.037	0.033	0.063	0.067			PC of MI & ERS	-0.092	-0.125				
	[0.022]*	[0.030]	[0.022]***	[0.031]**				[0.022]***	[0.033]***				
MI x reserves		0.029		-0.067			MI_ERS x reserves		0.248				
		[0.169]		[0.166]					[0.189]				
Exchange Rate Stability (ERS)	-0.074	-0.096			-0.08	-0.099	PC of MI & KAO			-0.009	-0.031		
	[0.010]***	[0.014]***			[0.009]***	[0.013]***				[0.025]	[0.034]		
ERS x reserves		0.161				0.152	MI_KAO x reserves				0.138		
		[0.082]*				[0.075]**					[0.159]		
KA Openness			-0.037	-0.051	-0.048	-0.059	PC of ERS. & KAO					-0.131	-0.16
			[0.011]***	[0.015]***	[0.010]***	[0.013]***						[0.014]***	[0.018]***
KAOPEN x reserves				0.095		0.086	ERS_KAO x reserves						0.238
				[0.068]		[0.064]							[0.104]**
# of Obs.	403	403	403	403	403	403	# of Obs.	403	403	403	403	403	403
Adjusted R2	0.72	0.72	0.68	0.68	0.73	0.74	Adjusted R2	0.68	0.68	0.66	0.66	0.73	0.74

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for Latin American and the Caribbean and Eastern Europe are not reported.

Table 6-2: Inflation: Less Developed, Commodity Exporting Countries (LDC-CMD), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.015	-0.003	-0.044	-0.04	-0.012	-0.004	Relative Income	-0.088	-0.078	-0.082	-0.078	-0.013	-0.012
	[0.083]	[0.084]	[0.086]	[0.088]	[0.079]	[0.079]		[0.087]	[0.088]	[0.088]	[0.089]	[0.078]	[0.077]
Relative Income, sq.	0.019	0.007	0.037	0.032	0.038	0.029	Relative Income, sq.	0.092	0.082	0.067	0.063	0.042	0.038
	[0.100]	[0.101]	[0.104]	[0.106]	[0.094]	[0.095]		[0.106]	[0.106]	[0.107]	[0.107]	[0.094]	[0.093]
World Output Gap	1.355	1.35	1.08	1.1	1.39	1.372	World Output Gap	1.079	1.01	0.955	1.025	1.35	1.315
	[0.521]**	[0.530]**	[0.540]**	[0.560]*	[0.499]***	[0.503]***		[0.555]*	[0.558]*	[0.557]*	[0.566]*	[0.496]***	[0.491]***
Trade openness	0.006	0	-0.018	-0.018	0.001	-0.002	Trade openness	-0.019	-0.022	-0.021	-0.022	-0.004	-0.003
	[0.017]	[0.017]	[0.017]	[0.018]	[0.016]	[0.016]		[0.017]	[0.017]	[0.017]	[0.018]	[0.015]	[0.015]
Volatility of TOT*OPN	-0.013	-0.017	-0.001	-0.004	-0.025	-0.027	Volatility of TOT*OPN	0.005	0.001	0.016	0.013	-0.028	-0.026
	[0.029]	[0.029]	[0.030]	[0.031]	[0.028]	[0.028]		[0.030]	[0.031]	[0.031]	[0.031]	[0.027]	[0.027]
Inflation volatility	0.297	0.296	0.285	0.284	0.289	0.289	Inflation volatility	0.29	0.291	0.288	0.287	0.286	0.286
	[0.016]***	[0.017]***	[0.017]***	[0.018]***	[0.016]***	[0.016]***		[0.018]***	[0.018]***	[0.018]***	[0.018]***	[0.016]***	[0.015]***
Private Credit Creation	-0.043	-0.046	-0.037	-0.038	-0.058	-0.061	Private Credit Creation	-0.052	-0.056	-0.038	-0.036	-0.06	-0.062
	[0.038]	[0.038]	[0.039]	[0.040]	[0.036]	[0.036]*		[0.040]	[0.040]	[0.041]	[0.041]	[0.036]*	[0.035]*
M2 Growth Volatility	0.209	0.226	0.177	0.191	0.226	0.234	M2 Growth Volatility	0.21	0.217	0.171	0.18	0.231	0.227
	[0.059]***	[0.060]***	[0.061]***	[0.064]***	[0.056]***	[0.057]***		[0.062]***	[0.063]***	[0.063]***	[0.064]***	[0.056]***	[0.055]***
Fiscal Procyclicality	-0.006	-0.005	0.001	0.001	-0.009	-0.007	Fiscal Procyclicality	-0.003	-0.004	0.003	0.003	-0.009	-0.007
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]		[0.008]	[0.008]	[0.008]	[0.008]	[0.007]	[0.008]
Oil Shock	0.05	0.048	0.043	0.043	0.045	0.044	Oil Shock	0.041	0.039	0.043	0.044	0.042	0.042
	[0.009]***	[0.010]***	[0.010]***	[0.010]***	[0.009]***	[0.009]***		[0.010]***	[0.010]***	[0.010]***	[0.010]***	[0.009]***	[0.009]***
Total Reserve/GDP	-0.046	-0.137	0.027	0.1	-0.031	-0.159	Total Reserve/GDP	-0.005	-0.191	0.023	0.114	-0.016	-0.168
	[0.034]	[0.167]	[0.035]	[0.184]	[0.033]	[0.112]		[0.036]	[0.144]	[0.036]	[0.175]	[0.031]	[0.106]
Monetary Independ. (MI)	0.048	0.044	0.07	0.099			PC of MI & ERS	-0.141	-0.198				
	[0.039]	[0.057]	[0.040]*	[0.060]*				[0.041]***	[0.056]***				
MI x reserves		-0.009		-0.19			MI_ERS x reserves		0.408				
		[0.306]		[0.332]					[0.305]				
Exchange Rate Stability (ERS)	-0.104	-0.126			-0.108	-0.13	PC of MI & KAO			-0.002	0.028		
	[0.017]***	[0.023]***			[0.016]***	[0.022]***				[0.048]	[0.069]		
ERS x reserves		0.184				0.193	MI_KAO x reserves				-0.188		
		[0.146]				[0.146]					[0.359]		
KA Openness			-0.049	-0.054	-0.061	-0.071	PC of ERS. & KAO					-0.178	-0.217
			[0.022]**	[0.032]*	[0.019]***	[0.029]**						[0.024]***	[0.035]***
KAOPEN x reserves				0.026		0.067	ERS_KAO x reserves						0.317
				[0.154]		[0.141]							[0.217]
# of Obs.	173	173	173	173	173	173	# of Obs.	173	173	173	173	173	173
Adjusted R2	0.72	0.72	0.68	0.67	0.74	0.74	Adjusted R2	0.67	0.67	0.66	0.65	0.74	0.75

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The dummy for Latin America is not reported.

Table 6-3: Inflation: Emerging Market Countries (EMG), 1972 – 2006, Panels of 5-year Windows, Robust Regression

	(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)	(9)	(10)	(11)	(12)
Relative Income	-0.079	-0.062	-0.019	-0.039	-0.073	-0.071	Relative Income	-0.021	-0.016	0.002	-0.002	-0.075	-0.066
	[0.090]	[0.092]	[0.085]	[0.090]	[0.088]	[0.095]		[0.088]	[0.088]	[0.087]	[0.090]	[0.086]	[0.093]
Relative Income, sq.	0.122	0.101	0.075	0.107	0.134	0.138	Relative Income, sq.	0.063	0.055	0.048	0.057	0.132	0.118
	[0.110]	[0.112]	[0.104]	[0.115]	[0.108]	[0.122]		[0.108]	[0.108]	[0.107]	[0.112]	[0.106]	[0.119]
World Output Gap	0.994	1.016	0.781	0.812	0.888	0.939	World Output Gap	0.978	0.974	0.928	0.937	0.93	0.926
	[0.440]**	[0.444]**	[0.422]*	[0.425]*	[0.433]**	[0.431]**		[0.439]**	[0.439]**	[0.431]**	[0.435]**	[0.423]**	[0.425]**
Trade openness	-0.012	-0.011	-0.004	-0.002	-0.004	-0.001	Trade openness	-0.01	-0.009	-0.006	-0.006	-0.005	-0.006
	[0.011]	[0.011]	[0.011]	[0.012]	[0.011]	[0.012]		[0.011]	[0.011]	[0.011]	[0.012]	[0.011]	[0.011]
Volatility of TOT*OPN	0.068	0.07	0.052	0.051	0.066	0.067	Volatility of TOT*OPN	0.062	0.064	0.056	0.055	0.068	0.069
	[0.040]*	[0.041]*	[0.039]	[0.039]	[0.040]*	[0.039]*		[0.040]	[0.040]	[0.040]	[0.040]	[0.039]*	[0.039]*
Inflation volatility	0.443	0.444	0.443	0.446	0.423	0.432	Inflation volatility	0.458	0.457	0.455	0.455	0.432	0.431
	[0.023]***	[0.023]***	[0.023]***	[0.023]***	[0.023]***	[0.023]***		[0.023]***	[0.023]***	[0.023]***	[0.023]***	[0.022]***	[0.023]***
Private Credit Creation	-0.026	-0.031	-0.039	-0.039	-0.031	-0.037	Private Credit Creation	-0.038	-0.04	-0.044	-0.045	-0.03	-0.031
	[0.018]	[0.019]	[0.018]**	[0.018]**	[0.018]*	[0.018]**		[0.018]**	[0.018]**	[0.018]**	[0.018]**	[0.018]*	[0.018]*
M2 Growth Volatility	0.128	0.136	0.155	0.145	0.178	0.169	M2 Growth Volatility	0.123	0.128	0.142	0.15	0.151	0.155
	[0.051]**	[0.052]***	[0.050]***	[0.050]***	[0.051]***	[0.050]***		[0.051]**	[0.051]**	[0.051]***	[0.051]***	[0.050]***	[0.050]***
Fiscal Procyclicality	-0.01	-0.01	-0.008	-0.008	-0.013	-0.012	Fiscal Procyclicality	-0.008	-0.008	-0.008	-0.008	-0.012	-0.012
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]*	[0.007]*		[0.007]	[0.007]	[0.007]	[0.007]	[0.007]*	[0.007]*
Oil Shock	0.027	0.026	0.015	0.015	0.02	0.02	Oil Shock	0.021	0.02	0.016	0.016	0.022	0.021
	[0.008]***	[0.008]***	[0.008]*	[0.008]*	[0.008]**	[0.008]**		[0.008]***	[0.008]**	[0.008]*	[0.008]*	[0.008]***	[0.008]***
Total Reserve/GDP	-0.023	-0.138	-0.018	0.01	-0.02	-0.048	Total Reserve/GDP	-0.026	-0.126	-0.026	-0.005	-0.018	-0.037
	[0.030]	[0.121]	[0.029]	[0.108]	[0.030]	[0.076]		[0.030]	[0.101]	[0.030]	[0.106]	[0.030]	[0.075]
Monetary Independ. (MI)	0.034	0.012	0.02	0.019			PC of MI & ERS	-0.026	-0.063				
	[0.031]	[0.043]	[0.031]	[0.042]				[0.032]	[0.044]				
MI x reserves		0.115		0.002			MI_ERS x reserves		0.219				
		[0.197]		[0.188]					[0.210]				
Exchange Rate Stability (ERS)	-0.04	-0.059			-0.042	-0.059	PC of MI & KAO			-0.067	-0.061		
	[0.016]**	[0.023]***			[0.016]***	[0.021]***				[0.034]*	[0.044]		
ERS x reserves		0.118				0.112	MI_KAO x reserves				-0.043		
		[0.102]				[0.097]					[0.202]		
KA Openness			-0.048	-0.038	-0.052	-0.042	PC of ERS. & KAO					-0.092	-0.098
			[0.014]***	[0.019]**	[0.014]***	[0.018]**						[0.020]***	[0.028]***
KAOPEN x reserves				-0.057		-0.058	ERS_KAO x reserves						0.037
				[0.086]		[0.086]							[0.139]
# of Obs.	203	203	203	203	203	203	# of Obs.	203	203	203	203	203	203
Adjusted R2	0.78	0.78	0.8	0.8	0.79	0.8	Adjusted R2	0.78	0.78	0.79	0.79	0.8	0.79

Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The estimated coefficients of the dummies for Latin American and the Caribbean and Eastern Europe are not reported.

Table 7: Summary of the Effects of the Trilemma Configurations

(A) Output Volatility

	Monetary Independ. (MI)	Exchange Rate Stab. (ERS)	Financial Openness (KAO)	MI and ERS	MI and KAO	ERS and KAO
Less Developing Countries (LDC)	Decreases			Decreases	Decreases	
Commodity Exporters (LDC-CMD)	Decreases	Decreases if coupled w. higher IR	Decreases, but can be increased if IR > 27%		Decreases, but can be increased if IR > 26%	
Emerging Market Countries (EMG)	Decreases	Increases, but can be reduced if IR > 21-24%		Decreases if coupled w. higher IR		

(B) Inflation Volatility

	Monetary Independ. (MI)	Exchange Rate Stab. (ERS)	Financial Openness (KAO)	MI and ERS	MI and KAO	ERS and KAO
Less Developing Countries (LDC)						Increases
Commodity Exporters (LDC-CMD)	Decreases				Decreases	
Emerging Market Countries (EMG)			Increases			Increases

(C) Level of Inflation

	Monetary Independ. (MI)	Exchange Rate Stab. (ERS)	Financial Openness (KAO)	MI and ERS	MI and KAO	ERS and KAO
Less Developing Countries (LDC)	Increases	Decreases, but can be increased if IR >53-65%	Decreases	Decreases		Decreases, but can be increased if IR > 67%
Commodity Exporters (LDC-CMD)	Increases	Decreases	Decreases	Decreases		Decreases
Emerging Market Countries (EMG)		Decreases	Decreases		Decreases	Decreases

Table 8: Output Volatility: the Trilemma Indexes Interacted w/ different levels of *PCGDP*

	Developing Countries (LDC)			Emerging Market Countries (EMG)		
	(1)	(2)	(3)	(4)	(5)	(6)
Private credit creation (% of GDP)	-0.012 [0.008]	-0.013 [0.007]*	-0.011 [0.008]	0.001 [0.008]	0.001 [0.007]	-0.005 [0.008]
MI x Int'l reserves	-0.042 [0.068]		-0.023 [0.065]	-0.092 [0.068]		-0.068 [0.065]
MI x High *PCGDP*	-0.014 [0.017]		-0.009 [0.016]	-0.006 [0.020]		-0.01 [0.017]
MI x Medium *PCGDP*	-0.016 [0.012]		-0.019 [0.012]	-0.007 [0.014]		-0.016 [0.014]
MI x Low *PCGDP*	-0.005 [0.015]		-0.018 [0.013]	0.009 [0.023]		-0.022 [0.018]
ERS x Int'l reserves	-0.036 [0.033]	-0.042 [0.031]		-0.082 [0.037]**	-0.067 [0.032]**	
ERS x High *PCGDP*	0.002 [0.010]	0.012 [0.009]		0.013 [0.012]	0.017 [0.009]*	
ERS x Medium *PCGDP*	0.003 [0.006]	0.003 [0.005]		0.018 [0.007]**	0.017 [0.007]**	
ERS x Low *PCGDP*	-0.011 [0.007]	-0.005 [0.006]		0.019 [0.016]	0.005 [0.010]	
KAOPEN x Int'l reserves		-0.014 [0.027]	-0.001 [0.027]		0.026 [0.027]	0.032 [0.027]
KAOPEN x High *PCGDP*		-0.012 [0.010]	-0.015 [0.009]		-0.012 [0.010]	-0.018 [0.010]*
KAOPEN x Medium *PCGDP*		0 [0.006]	0 [0.006]		-0.005 [0.006]	-0.008 [0.006]
KAOPEN x Low *PCGDP*		-0.004 [0.009]	-0.01 [0.010]		0.037 [0.016]**	0.039 [0.018]**
Adjusted R2	0.23	0.24	0.23	0.49	0.48	0.44
Significance of the estimated coefficients of the interaction terms b/w the trilemma indexes and different PCGDP groups is tested using a Wald test.						
MI: High vs. Med.	0.04		0.85	0.00		0.26
MI: Med. vs. Low	1.25		0.03	0.60		0.24
MI: High vs. Low	0.32		0.42	0.42		0.51
ERS: High vs. Med.	0.02	1.30		0.17	0.00	
ERS: Med. vs. Low	4.39**	2.60*		0.01	1.57	
ERS: High vs. Low	1.82	3.70**		0.11	1.05	
KAO: High vs. Med.		1.81	2.74*		0.45	1.27
KAO: Med. vs. Low		0.19	0.81		6.61***	6.83***
KAO: High vs. Low		0.52	0.17		7.35***	8.84***

Table 9: The Impact of External Financing: Less Developed Countries

Dependent Variable:	**Output Volatility**			**Inflation Volatility**			**Level of Inflation**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total Reserve/GDP	0.057	-0.022	0.039	0.039	0.038	-0.038	-0.074	0.162	-0.096
	[0.058]	[0.055]	[0.036]	[0.086]	[0.083]	[0.055]	[0.145]	[0.145]	[0.089]
Currency Crisis	0.018	0.016	0.014	0.052	0.053	0.053	0.131	0.144	0.118
	[0.011]	[0.011]	[0.011]	[0.016]***	[0.017]***	[0.017]***	[0.028]***	[0.028]***	[0.027]***
Net FDI inflows/GDP	-0.022	0.009	0.003	-0.24	-0.287	-0.286	-0.388	-0.299	-0.293
	[0.074]	[0.075]	[0.075]	[0.065]***	[0.067]***	[0.067]***	[0.208]*	[0.219]	[0.204]
Net portfolio inflows/GDP	0.124	0.136	0.15	0.172	0.258	0.237	-0.078	-0.098	-0.119
	[0.087]	[0.087][12%]	[0.087]*	[0.179]	[0.188]	[0.187]	[0.306]	[0.326]	[0.306]
Net 'other' inflows/GDP	0.045	0.051	0.056	-0.015	-0.035	-0.03	-0.017	0.06	0.032
	[0.030]	[0.030]*	[0.030]*	[0.042]	[0.043]	[0.043]	[0.071]	[0.074]	[0.070]
Short-term Debt	-0.003	0.005	0.006	0.042	0.041	0.038	0.054	0.094	0.085
(as % of total external debt)	[0.017]	[0.017]	[0.017]	[0.023]*	[0.024]*	[0.024][11%]	[0.043]	[0.045]**	[0.042]**
Total debt service	0.047	0.058*	0.048	0.12	0.106	0.109	0.203	0.281	0.209
(as % of GNI)	[0.036]	[0.035]	[0.036]	[0.052]**	[0.053]**	[0.053]**	[0.099]**	[0.100]***	[0.096]**
Monetary Independence (MI)	-0.021	-0.029		-0.009	-0.01		0.03	0.078	
	[0.015]	[0.015]**		[0.022]	[0.023]		[0.038]	[0.039]**	
MI x reserves	-0.003	0.063		-0.11	-0.1		-0.02	-0.223	
	[0.095]	[0.095]		[0.140]	[0.144]		[0.237]	[0.249]	
Exchange Rate Stability (ERS)	0.001		0.003	0.002		0.002	-0.084		-0.09
	[0.007]		[0.007]	[0.011]		[0.011]	[0.018]***		[0.017]***
ERS x reserves	-0.049		-0.044	0.03		0.039	0.189		0.202
	[0.048]		[0.047]	[0.071]		[0.070]	[0.121]		[0.115]*
KA Openness		-0.018	-0.014		0.006	0.004		-0.035	-0.052
		[0.008]**	[0.008]*		[0.013]	[0.012]		[0.022]	[0.020]***
KAOPEN x reserves		0.063	0.041		0.019	0.046		-0.01	0.051
		[0.045]	[0.044]		[0.071]	[0.068]		[0.124]	[0.112]
Observations	313	313	313	321	321	321	306	306	306
Adjusted R-squared	0.21	0.22	0.21	0.6	0.59	0.59	0.75	0.73	0.76

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: External Financing and Policy Orientation

Dependent variable	**Output Volatility**						**Inflation Volatility**					
(*Policy Orientation*)	**Mon. Indep. & ERS "Financially Closed"**		**Mon. Indep. & KAO "More Flexible Exch. R"**		**ERS & KAO "Currency Union"**		**Mon. Indep. & ERS "Financially Closed"**		**Mon. Indep. & KAO "More Flexible Exch. R"**		**ERS & KAO "Currency Union"**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Total Reserve/GDP	0.04	0.039	0.017	0.02	0.034	0.032	0	0	0.006	0.002	0.004	0.004
	[0.014]***	[0.014]***	[0.014]	[0.014]	[0.014]**	[0.014]**	[0.021]	[0.022]	[0.021]	[0.020]	[0.023]	[0.023]
Currency Crisis	0.015	0.015	0.014	0.014	0.017	0.019	0.053	0.052	0.042	0.043	0.048	0.046
	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]	[0.011]*	[0.017]***	[0.017]***	[0.018]**	[0.017]**	[0.018]***	[0.018]**
(*Policy Orientation*)	0.002	0.004	-0.001	0.002	0.002	-0.009	-0.011	-0.005	0.016	0.004	0.006	0.014
	[0.004]	[0.007]	[0.005]	[0.008]	[0.005]	[0.008]	[0.007]*	[0.011]	[0.008]**	[0.012]	[0.007]	[0.012]
(*Policy Orientation*)	-0.034	-0.034	0.032	0.028	-0.011	-0.003	0.004	-0.005	-0.015	-0.011	-0.008	-0.007
x Reserves	[0.024]	[0.023]	[0.024]	[0.024]	[0.023]	[0.023]	[0.035]	[0.036]	[0.038]	[0.037]	[0.035]	[0.036]
Net FDI inflows/GDP	-0.089	-0.196	0.015	0.023	-0.038	-0.035	-0.251	-0.302	-0.179	-0.164	-0.394	-0.41
	[0.086]	[0.086]**	[0.080]	[0.081]	[0.112]	[0.112]	[0.070]***	[0.072]***	[0.071]**	[0.069]**	[0.180]**	[0.182]**
Net FDI inflow	0.174	0.332	-0.223	-0.181	0.022	0	-0.034	-0.111	-0.508	-0.664	0.206	0.189
x (*Policy Orientation*)	[0.176]	[0.175]*	[0.188]	[0.191]	[0.151]	[0.152]	[0.245]	[0.261]	[0.289]*	[0.283]**	[0.200]	[0.202]
Net portfolio inflows/GDP	0.181	-0.121	0.191	0.199	0.06	0.061	0.149	0.183	0.278	0.237	-0.102	-0.137
	[0.133]	[0.131]	[0.090]**	[0.091]**	[0.105]	[0.104]	[0.196]	[0.204]	[0.225]	[0.217]	[0.369]	[0.375]
Net Portfolio inflow	-0.066	0.234	-0.348	-0.277	0.298	0.332	0.042	0.14	-0.679	-0.948	0.363	0.451
x (*Policy Orientation*)	[0.176]	[0.174]	[0.273]	[0.284]	[0.187][11%]	[0.190]*	[0.924]	[0.958]	[0.463]	[0.464]**	[0.435]	[0.446]
Net 'other' inflows/GDP	0.059	0.066	0.028	0.03	0.079	0.08	0.005	0.026	-0.064	-0.052	-0.03	-0.033
	[0.044]	[0.044]	[0.032]	[0.033]	[0.034]**	[0.033]**	[0.066]	[0.069]	[0.048]	[0.047]	[0.052]	[0.052]
Net 'Other' inflow	0.009	0.004	0.097	0.084	-0.106	-0.094	-0.073	-0.095	0.166	0.174	-0.053	-0.03
x (*Policy Orientation*)	[0.056]	[0.056]	[0.069]	[0.070]	[0.068][12%]	[0.070]	[0.085]	[0.089]	[0.112]	[0.109]	[0.106]	[0.110]
Short-term Debt (as % of	-0.003	0.005	0	-0.004	0.002	0.001	0.034	0.017	0.04	0.044	0.047	0.061
total external debt)	[0.018]	[0.021]	[0.017]	[0.019]	[0.018]	[0.020]	[0.025]	[0.031]	[0.025]	[0.028]	[0.025]*	[0.029]**
Short-term Debt		-0.026		0.020		-0.002		0.049		-0.015		-0.051
x (*Policy Orientation*)		[0.030]		[0.032]		[0.032]		[0.047]		[0.046]		[0.049]
Total debt service	0.054	0.072	0.069	0.097	0.055	0.008	0.088	0.149	0.149	0.081	0.111	0.114
(as % of GNI)	[0.036]	[0.044]	[0.035]*	[0.041]**	[0.035]	[0.042]	[0.053]*	[0.068]**	[0.055]***	[0.060]	[0.055]**	[0.069]*
Total debt service		-0.038		-0.102		0.172		-0.187		0.271		-0.002
x (*Policy Orientation*)		[0.067]		[0.080]		[0.074]**		[0.106]*		[0.117]**		[0.115]
Observations	313	313	313	313	313	313	319	319	319	319	319	319
Adjusted R-squared	0.2	0.23	0.21	0.21	0.2	0.21	0.56	0.55	0.55	0.55	0.54	0.54

Robust p values in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10 (con't): External Financing and Policy Orientation

Dependent variable	**Level of Inflation**					
Policy Orientation	**Mon. Indep. & ERS "Financially Closed"**		**Mon. Indep. & KAO "More Flexible Exch. R"**		**ERS & KAO "Currency Union"**	
	(13)	(14)	(15)	(16)	(17)	(18)
Total Reserve/GDP	0.03	0.025	0.051	0.052	0.034	0.044
	[0.039]	[0.039]	[0.037]	[0.037]	[0.037]	[0.037]
Currency Crisis	0.167	0.162	0.138	0.137	0.142	0.134
	[0.029]***	[0.029]***	[0.029]***	[0.029]***	[0.028]***	[0.028]***
(*Policy Orientation*)	0.014	-0.011	0.037	0.029	-0.045	-0.013
	[0.012]	[0.018]	[0.014]***	[0.022]	[0.011]***	[0.019]
(*Policy Orientation*)	0.029	0.04	-0.069	-0.067	0.037	0.022
x Reserves	[0.061]	[0.062]	[0.063]	[0.064]	[0.057]	[0.058]
Net FDI inflows/GDP	-0.186	-0.146	-0.393	-0.39	-0.404	-0.366
	[0.240]	[0.242]	[0.229]*	[0.230]*	[0.302]	[0.304]
Net FDI inflow	-0.31	-0.435	0.205	0.203	0.212	0.19
x (*Policy Orientation*)	[0.464]	[0.469]	[0.505]	[0.512]	[0.379]	[0.382]
Net portfolio inflows/GDP	-0.266	-0.246	0.032	0.037	0.236	0.173
	[0.349]	[0.351]	[0.342]	[0.345]	[0.500]	[0.503]
Net Portfolio inflow	1.331	1.289	-0.268	-0.326	-0.363	-0.268
x (*Policy Orientation*)	[0.860][12%]	[0.860]	[0.806]	[0.828]	[0.633]	[0.645]
Net 'other' inflows/GDP	-0.129	-0.151	0.091	0.09	-0.009	-0.017
	[0.115]	[0.117]	[0.081]	[0.081]	[0.080]	[0.081]
Net 'Other' inflow	0.249	0.251	-0.479	-0.46	0.131	0.11
x (*Policy Orientation*)	[0.148]*	[0.150]*	[0.187]**	[0.191]**	[0.169]	[0.176]
Short-term Debt (as % of	0.099	0.086	0.038	0.03	0.082	0.111
total external debt)	[0.047]**	[0.058]	[0.044]	[0.049]	[0.044]*	[0.050]**
Short-term Debt		0.073		0.021		-0.073
x (*Policy Orientation*)		[0.080]		[0.081]		[0.079]
Total debt service	0.217	0.102	0.216	0.199	0.277	0.406
(as % of GNI)	[0.100]**	[0.124]	[0.098]**	[0.110]*	[0.096]***	[0.117]***
Total debt service		0.284		0.088		-0.326
x (*Policy Orientation*)		[0.180][11%]		[0.208]		[0.188]*
Observations	306	306	306	306	306	306
Adjusted R-squared	0.72	0.72	0.73	0.72	0.75	0.74

Robust p values in brackets * significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Trilemma Configurations and External Financing of Major EMG Countries as of 2007

	Financial Develop.	Trilemma Indexes								External Finances						Swap /IMF ($ bill.)**
	PCGDP*	IR	dIR	MI	dMI	ERS	dERS	KA-OPEN	dKAO	FDI	dFDI	Port.	dPort	Other	dOther	
Argentina	11.4%	17.2%	4.5%	0.74	0.49	0.61	0.29	0.24	-0.08	1.9%	0.1%	2.7%	5.3%	-3.0%	3.6%	
Brazil	32.9%	13.6%	6.0%	0.12	-0.36	0.24	0.05	0.64	0.06	2.1%	0.8%	3.7%	3.5%	1.0%	2.1%	30 (FR)
Chile	74.5%	10.3%	-7.4%	0.96	0.74	0.35	0.06	1.00	0.07	6.5%	2.5%	-9.6%	-5.7%	-2.9%	-2.8%	
China	135.5%	46.6%	15.7%	0.50	-0.02	0.75	-0.22	0.15	0.00	3.7%	0.9%	0.6%	0.9%	-2.1%	-2.5%	
Colombia	24.5%	10.2%	-1.5%	0.83	0.24	0.17	-0.16	0.39	0.10	4.7%	1.9%	0.5%	1.4%	0.8%	0.6%	
Czech Rep.	37.3%	19.7%	-6.6%	0.16	-0.34	0.38	0.00	0.81	-0.15	4.7%	-1.1%	-1.5%	-0.5%	-0.3%	-2.7%	
Egypt	52.6%	23.6%	3.6%	0.50	0.18	0.64	-0.11	1.00	0.06	8.5%	5.0%	-2.8%	-3.3%	-3.4%	2.7%	
Hong Kong	138.7%	73.9%	2.8%	0.10	-0.11	0.79	-0.21	1.00	0.00	-3.3%	-2.7%	-1.3%	18.8%	-7.7%	-12.8%	
Hungary	51.4%	17.4%	1.0%	0.86	0.24	0.38	0.01	0.81	-0.07	3.2%	-0.1%	-1.7%	-6.3%	4.8%	3.4%	25 (IMF)
India	40.2%	24.3%	7.1%	0.37	0.21	0.35	-0.14	0.15	0.00							
Indonesia	22.7%	12.7%	-1.1%	0.32	-0.02	0.34	0.04	0.69	0.00	0.5%	0.0%	1.3%	0.0%	-1.1%	0.9%	
Israel	87.5%	17.4%	-4.4%	0.55	0.20	0.28	-0.11	1.00	0.02	1.6%	1.3%	0.2%	2.3%	-3.0%	-0.1%	
Korea	112.5%	27.0%	1.0%	0.93	0.56	0.40	0.06	0.39	0.00	-1.4%	-1.5%	-2.5%	-3.0%	4.3%	3.0%	30(FR)***
Lithuania	37.2%	19.4%	2.4%	0.11	-0.12	0.71	0.18	1.00	0.00	3.7%	0.5%	-0.6%	-0.7%	13.3%	7.4%	
Malaysia	110.2%	54.0%	6.8%	0.50	0.06	0.44	-0.46	0.39	0.00	-1.4%	-2.5%	3.0%	1.8%	-7.5%	-1.9%	
Mexico	19.5%	8.5%	-0.5%	0.90	0.48	0.42	0.09	0.69	0.10	2.1%	-0.2%	1.7%	1.1%	-1.4%	-0.8%	30 (FR)
Pakistan	26.5%	9.8%	-1.5%	0.51	0.24	0.76	-0.06	0.15	0.00	3.6%	2.0%	1.5%	0.8%	1.9%	2.9%	10 (IMF)
Peru	17.3%	25.1%	7.6%	0.93	0.76	0.50	-0.05	1.00	0.00	4.9%	1.9%	3.1%	2.4%	0.5%	2.4%	
Philippines	29.0%	21.0%	1.6%	0.10	-0.18	0.37	-0.12	0.45	0.00	-0.4%	-1.6%	3.1%	1.5%	-0.5%	2.0%	
Poland	28.6%	14.9%	0.4%	0.13	-0.20	0.37	0.08	0.45	0.00	4.3%	1.5%	-1.2%	-3.0%	6.9%	7.4%	
Russia	26.2%	36.1%	14.8%	0.80	0.35	0.48	-0.07	0.39	0.00	0.7%	0.5%	0.5%	0.5%	6.2%	6.1%	
Singapore	96.1%	101.2%	0.9%	0.52	-0.03	0.51	0.00	1.00	0.00	7.3%	-1.8%	-10.3%	-0.5%	-8.4%	4.5%	30 (FR)
Slovak	35.9%	24.0%	-9.0%	0.73	0.28	0.39	-0.03	0.76	0.25	4.0%	-3.5%	-1.0%	-1.7%	6.3%	3.8%	
S. Africa	103.6%	10.5%	3.2%	0.97	0.43	0.29	0.12	0.15	0.00	1.0%	0.7%	4.2%	1.7%	2.8%	3.0%	
Thailand	86.9%	34.8%	4.4%	0.19	0.09	0.52	0.11	0.15	-0.24	3.0%	-0.5%	-2.8%	-3.9%	-1.4%	1.6%	
Turkey	28.8%	11.1%	-3.2%	0.02	-0.47	0.31	0.12	0.15	0.00	3.1%	1.7%	0.1%	-1.2%	4.2%	2.0%	
Venezuela	13.4%	10.6%	-8.5%	0.94	0.64	1.00	0.19	0.31	-0.06	-0.7%	-0.9%	1.8%	3.8%	-11.1%	-3.3%	

Notes: *dX* refers to a change of the variable *X* compared to the 2002-06 period.
* PCGDP is as of 2006 or 2005 if the figure for 2006 is unavailable.
** "Swap/IMF" refer to the amount of swap lines provided by the U.S. Federal Reserve on Oct. 29, 2008 as well as the loans provided by IMF as of Mach 2009. The information on Fed's swap lines is based on Obstfeld et al. (2009)
*** In December 2008, China and Japan also agreed to provide Korea with the swap lines of $28 billion and $20 billion, respectively.

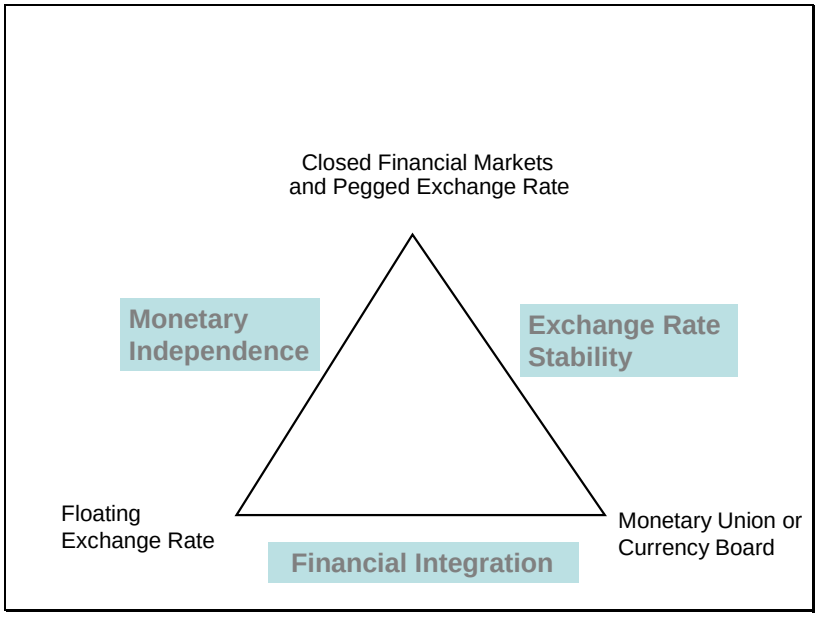


Figure 1: The Trilemma Framework

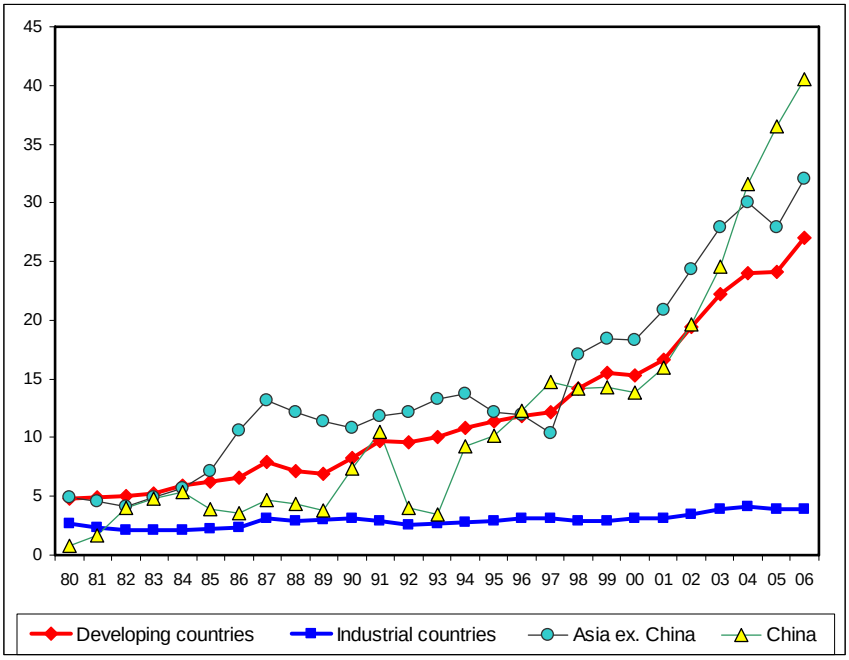


Figure 2: International Reserves/GDP, 1980-2006

Figure 3: The Trilemma and International Reserves Configurations over Time

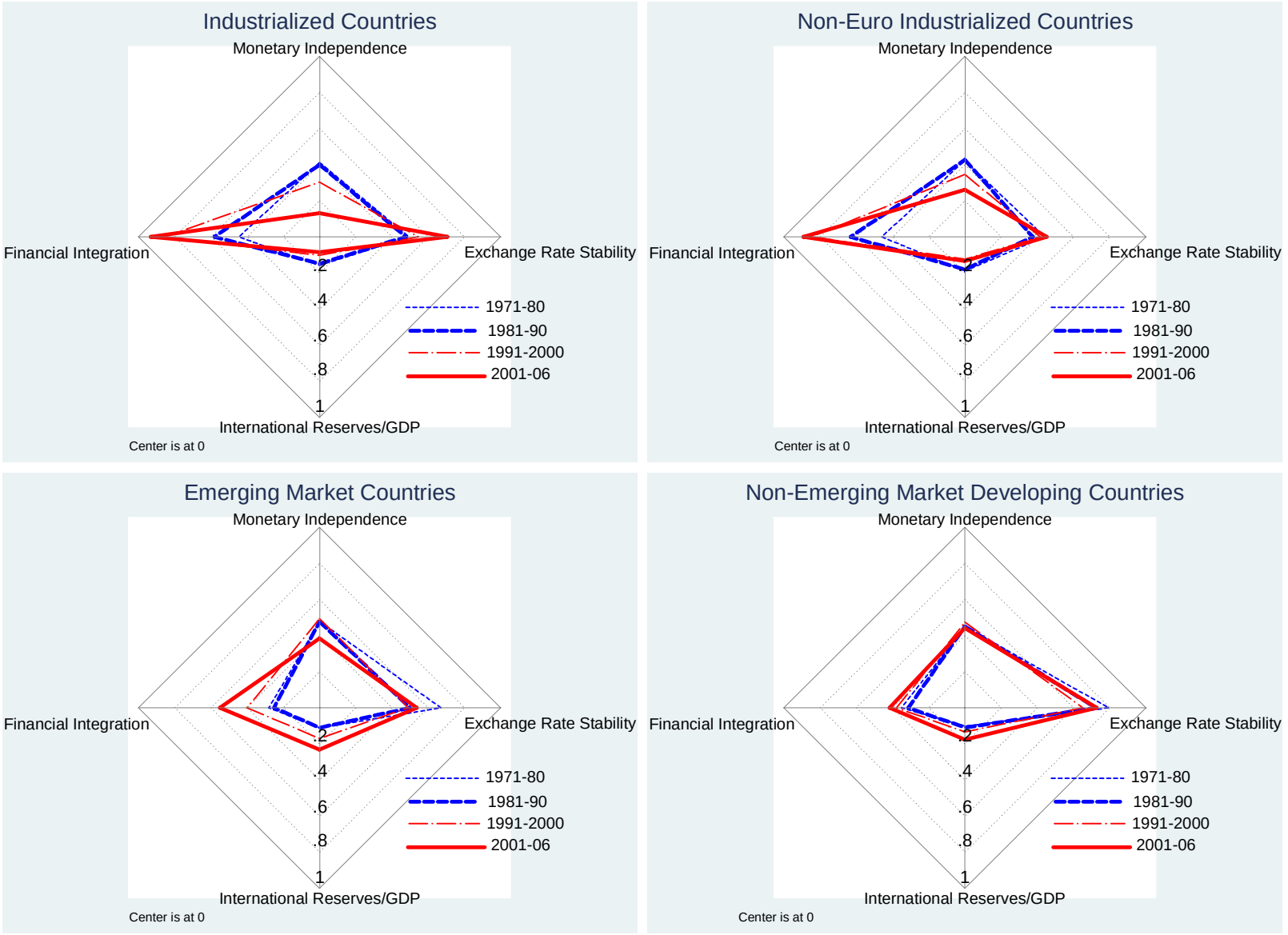
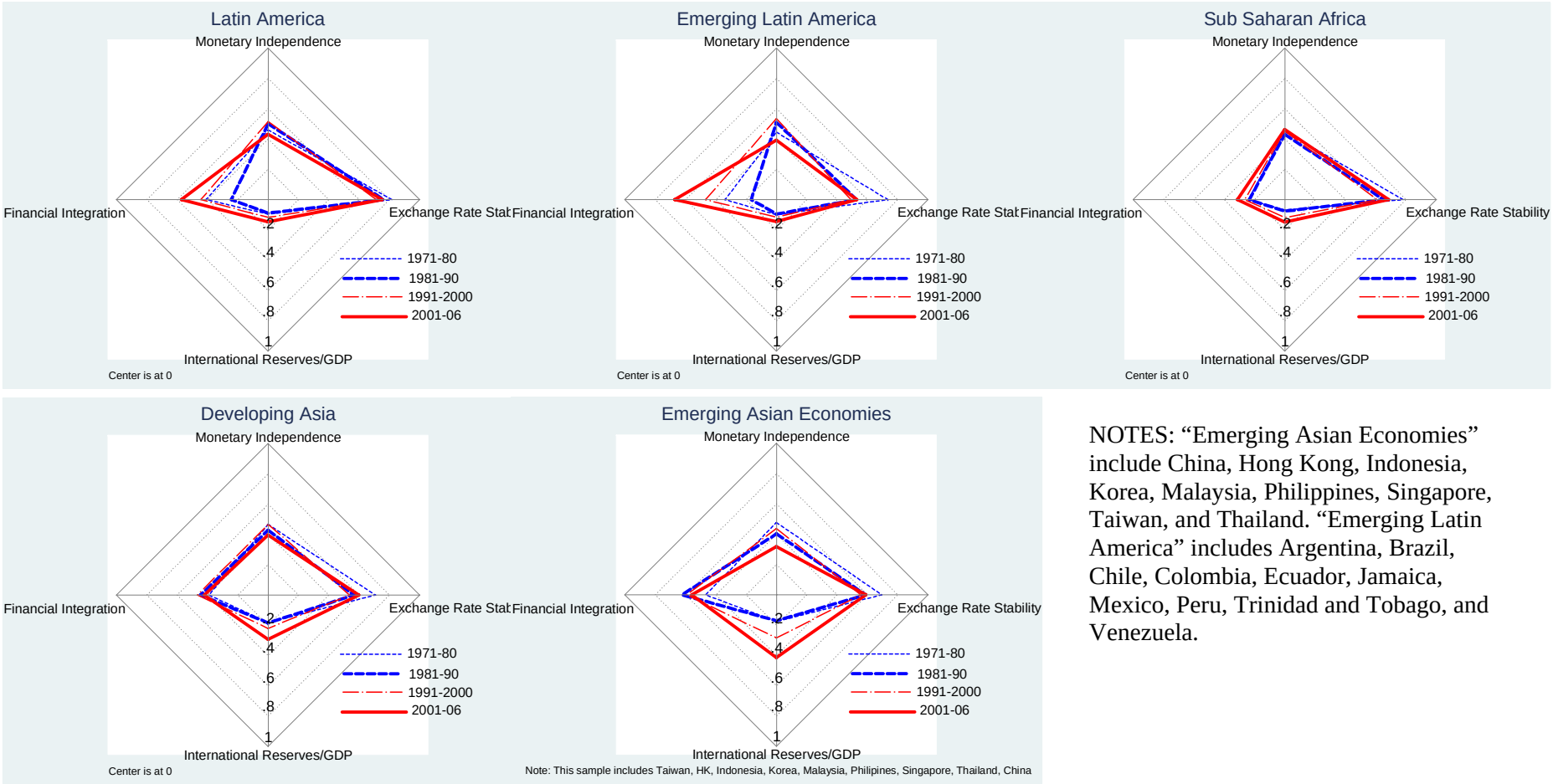


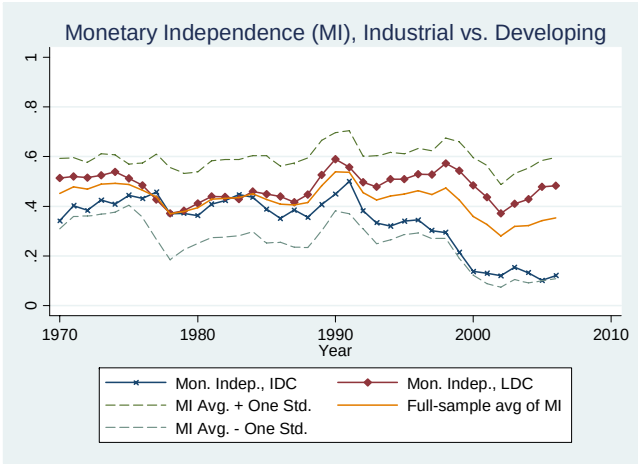
Figure 4: The Trilemma and International Reserves Configurations over Time: Regional Patterns for Developing Countries

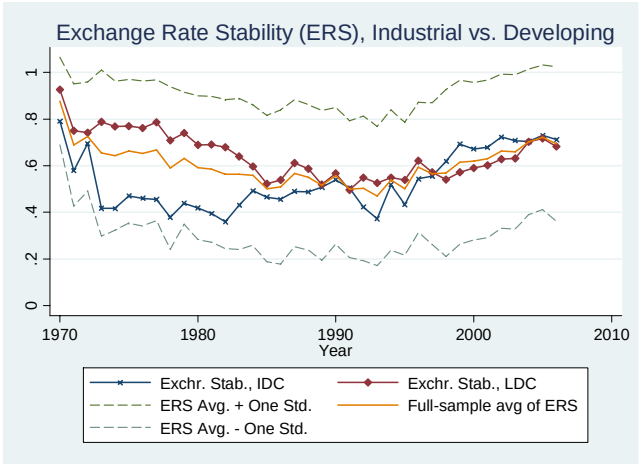


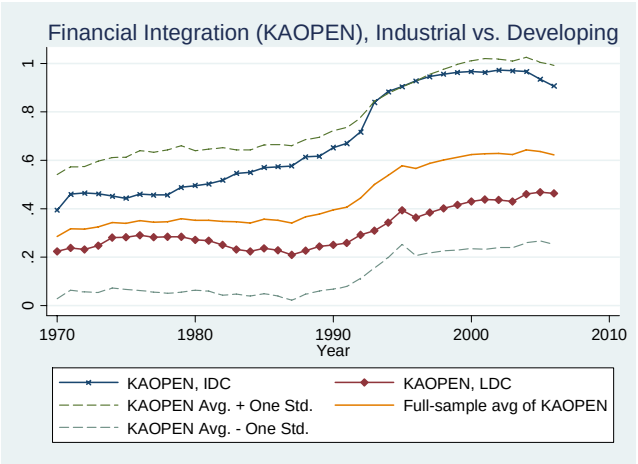
NOTES: "Emerging Asian Economies" include China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand. "Emerging Latin America" includes Argentina, Brazil, Chile, Colombia, Ecuador, Jamaica, Mexico, Peru, Trinidad and Tobago, and Venezuela.

Figure 5: Development of Individual Trilemma Indexes

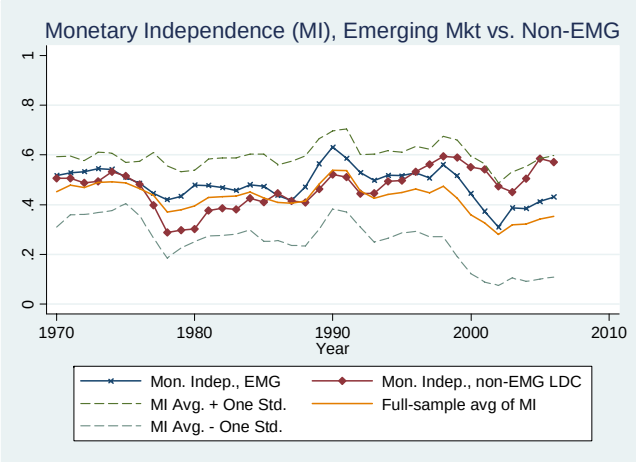
(a) Industrialized countries vs. Developing countries

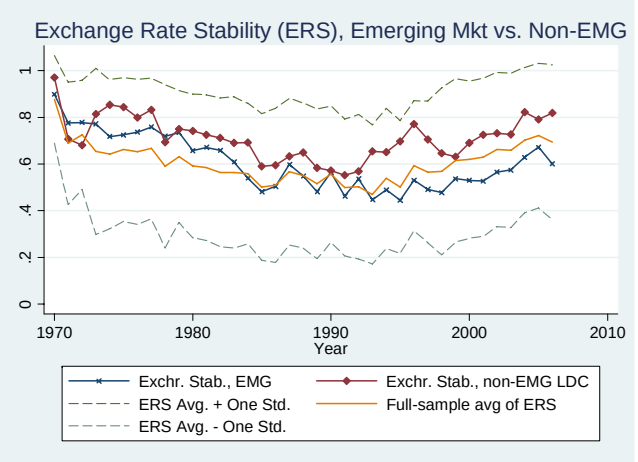






(b) Emerging market countries vs. Non-emerging market, developing countries





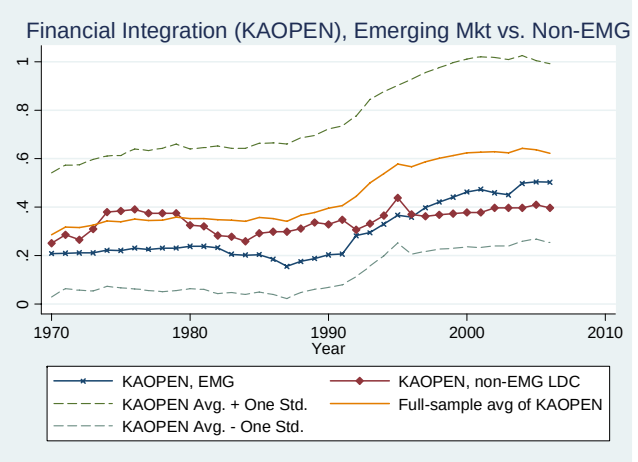
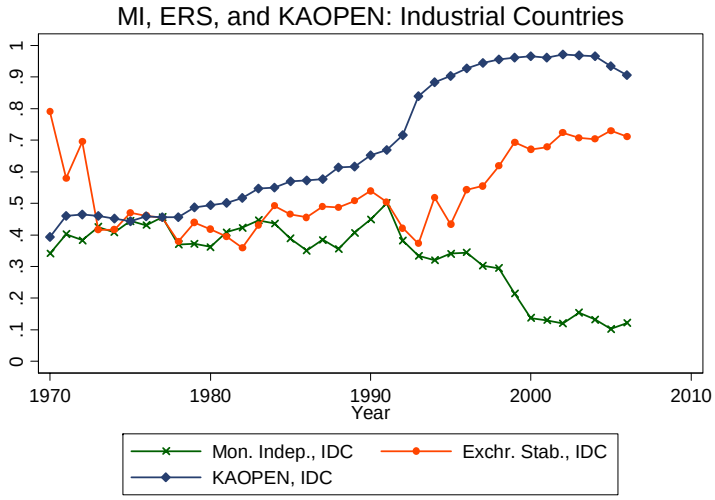
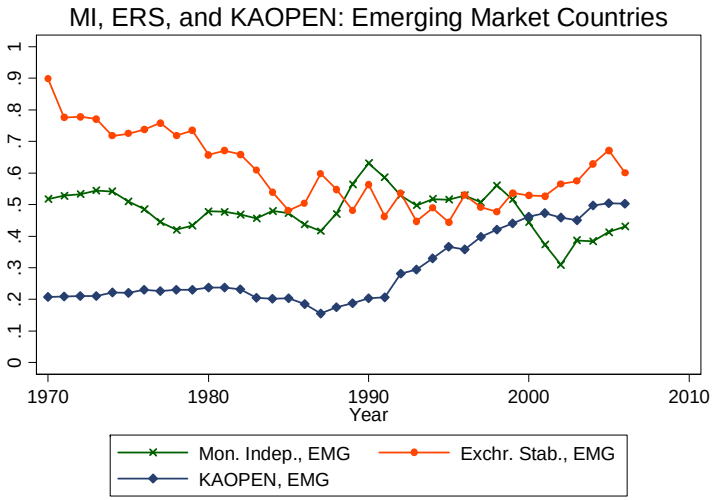


Figure 6: The Evolution of Trilemma Indexes

(a) Industrialized Countries



(b) Emerging Market Countries



(c) Non-Emerging Market Developing Countries

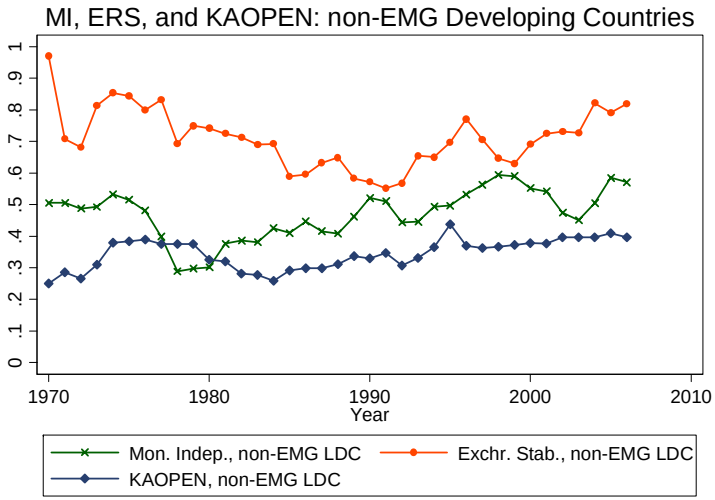
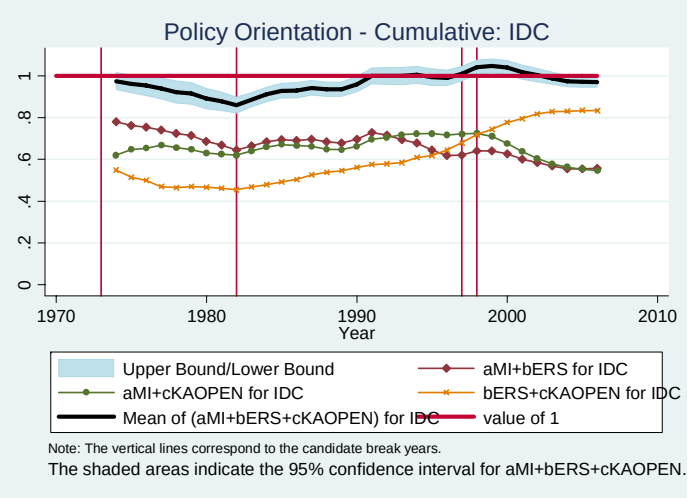


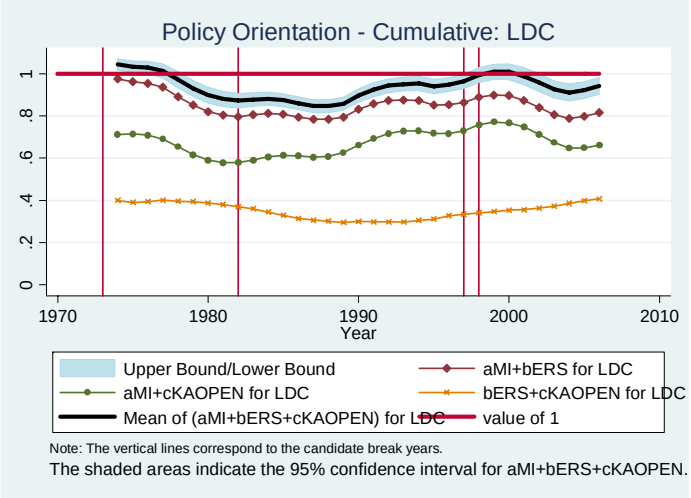
Figure 7: Policy Orientation of IDCs and LDCs

(a) Cumulative Effects: $(\hat{a}MI + \hat{b}ERS)$, $(\hat{a}MI + \hat{c}KAOPEN)$, $(\hat{b}ERS + \hat{c}KAOPEN)$, and $(\hat{a}MI + \hat{b}ERS + \hat{c}KAOPEN)$

Industrial Countries

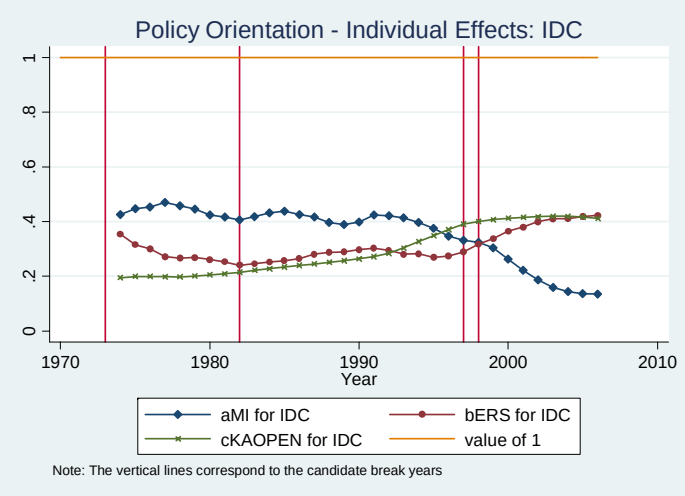


Developing Countries



(b) Individual Effects $\hat{a}MI, \hat{b}ERS$, and $\hat{c}KAOPEN$

Industrial Countries



Developing Countries

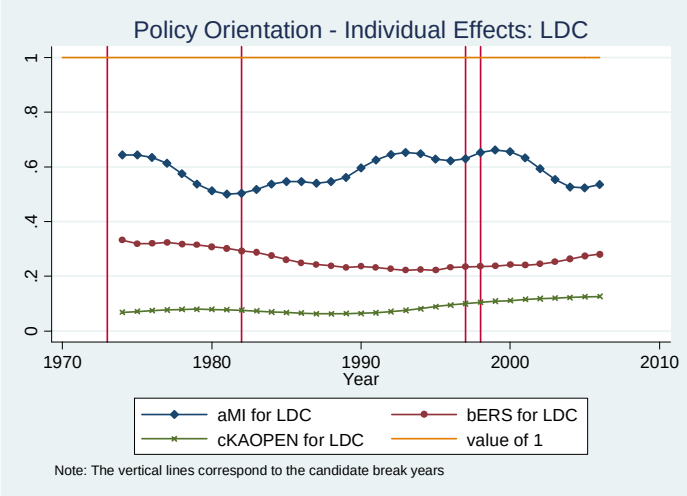
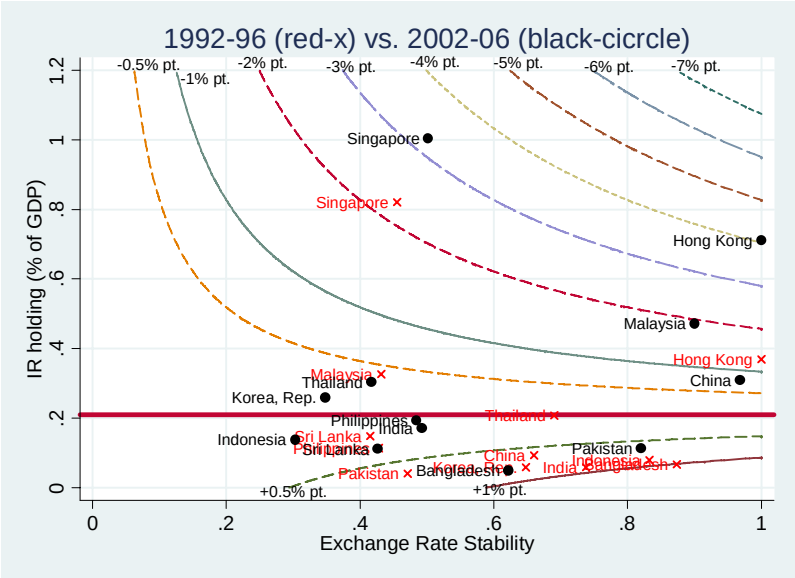
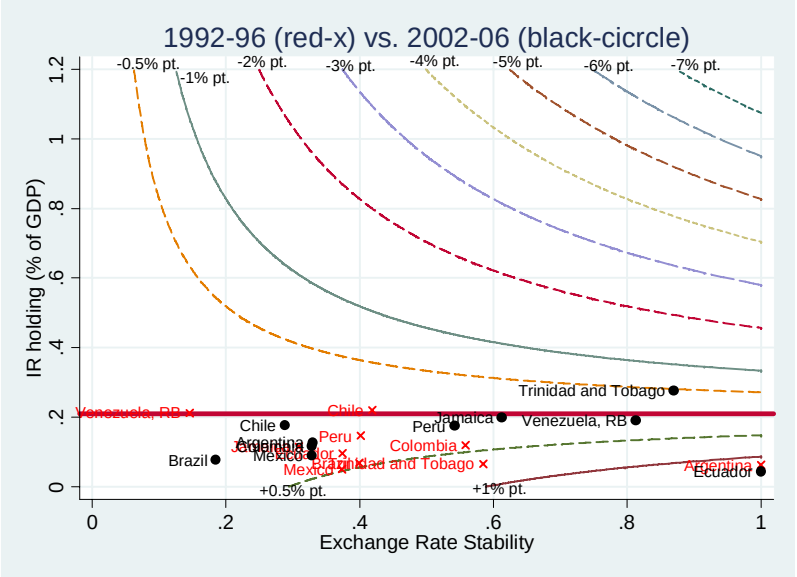


Figure 8: Non-linear Effect of Exchange Rate Stability – 1992-96 vs. 2002-06

(a) Asian EMG



(b) Latin American EMG



(c) EMG excluding Asia and Latin America

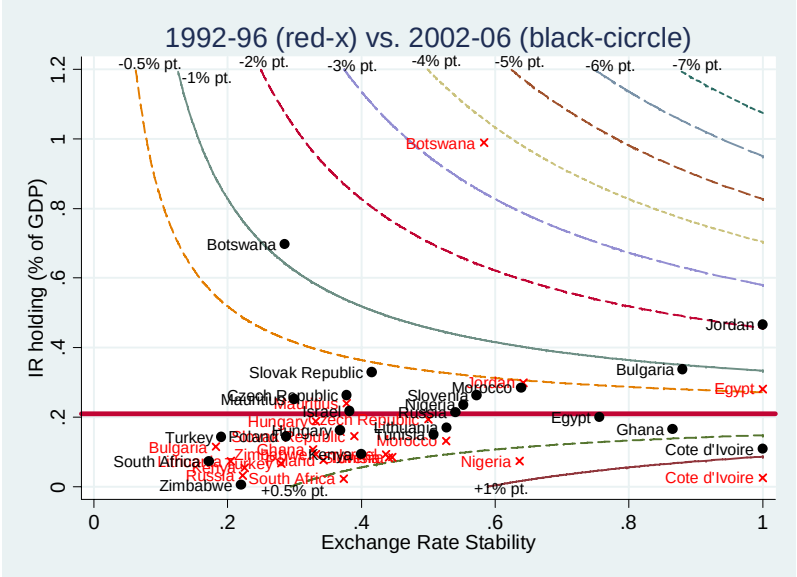
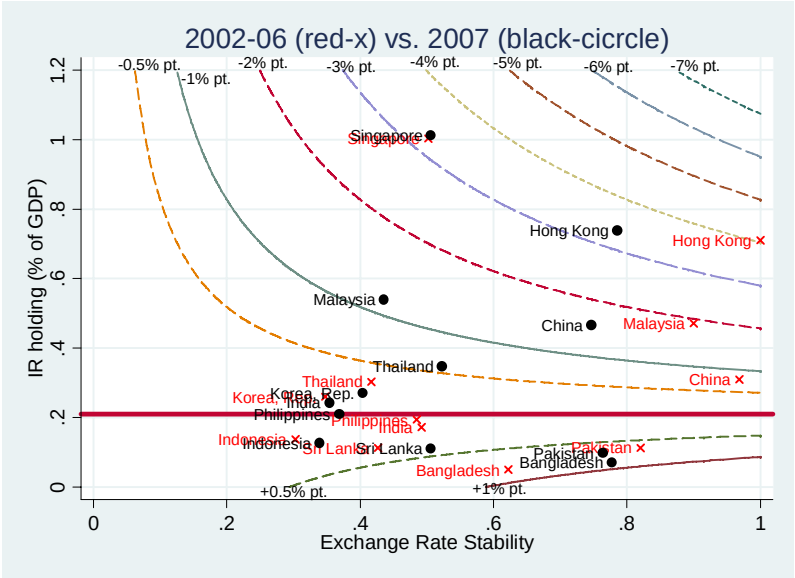
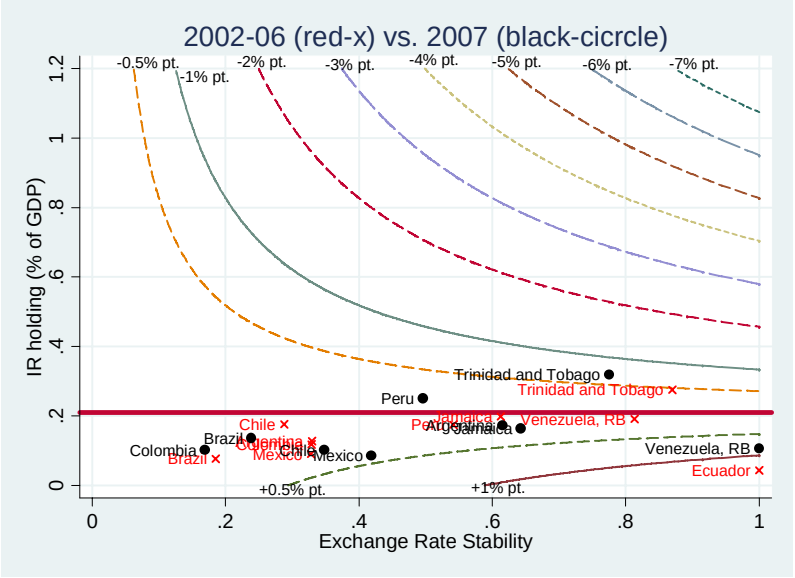


Figure 9: Non-linear Effect of Exchange Rate Stability – 2002-06 vs. 2007-08

(a) Asian EMG



(b) Latin American EMG



(c) EMG excluding Asia and Latin America

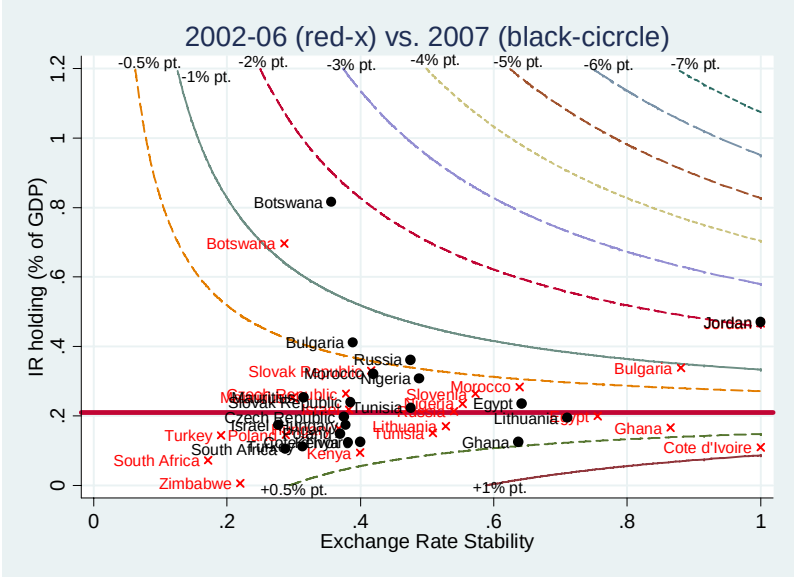


Figure 10: MI-KAO vs. Exchange Rate Stability

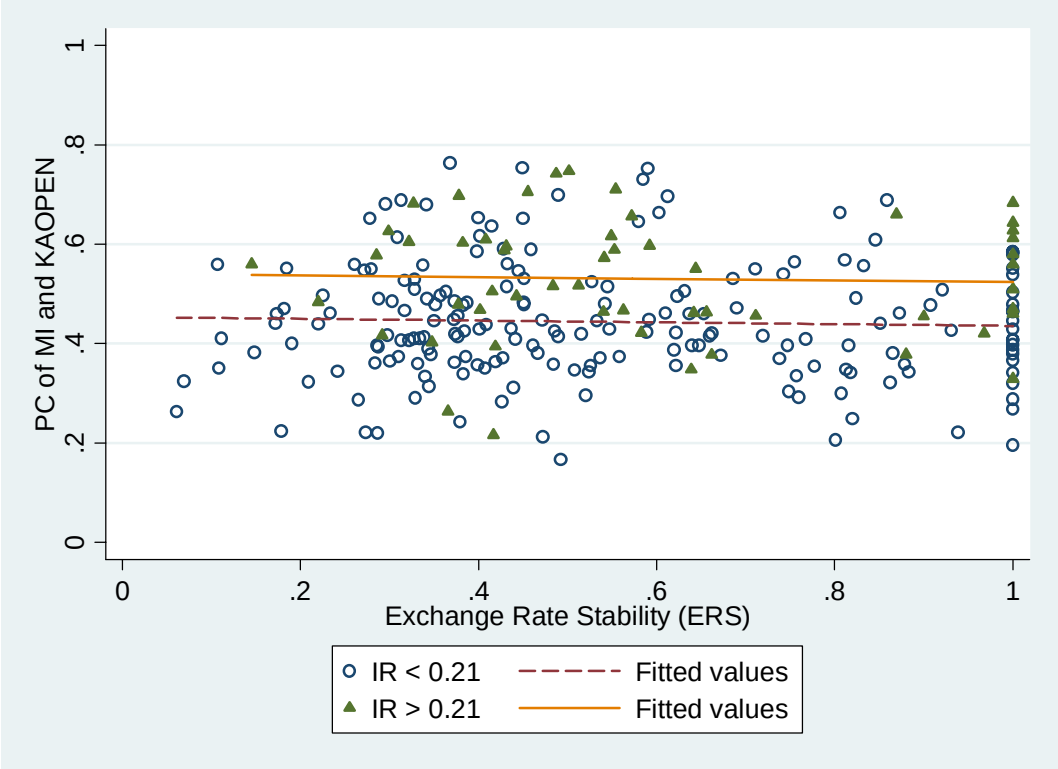
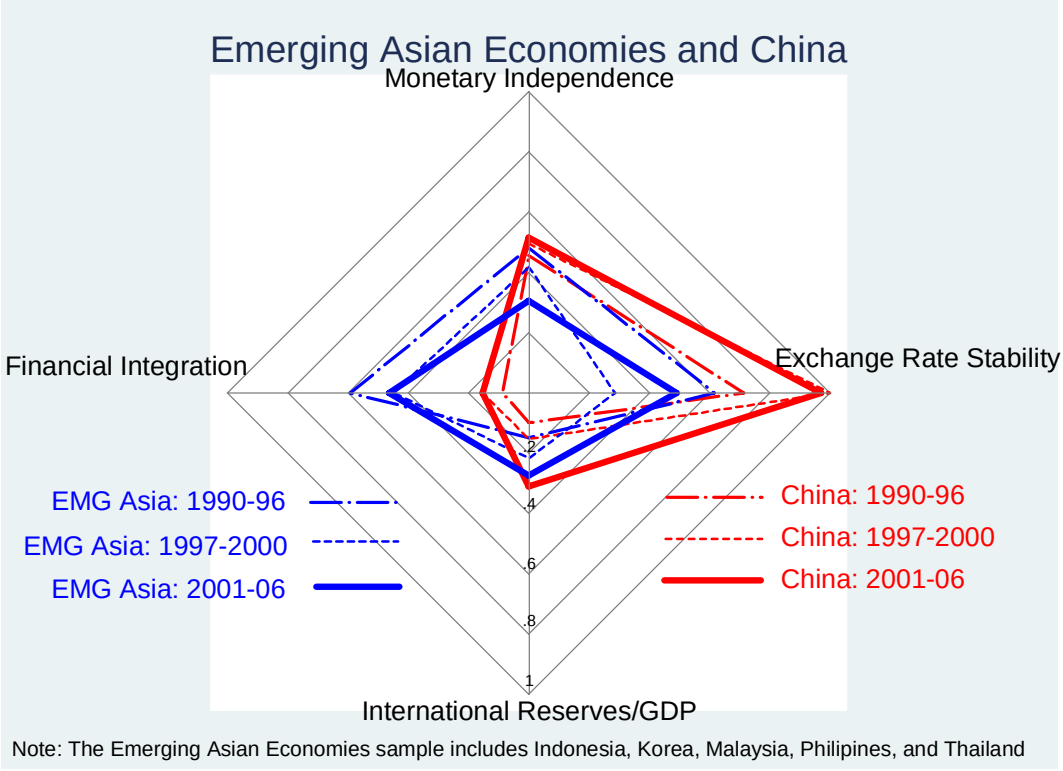


Figure 11: Trilemma Indexes and IR Holding for Asian EMG and China



Note: The Emerging Asian Economies sample includes Indonesia, Korea, Malaysia, Philipines, and Thailand