Surfing the Waves of Globalization:
Asia and Financial Globalization in the Context of the Trilemma

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Abstract:

Using the "trilemma indexes" developed by Aizenman et al. (2008) that measure the extent of achievement in each of the three policy goals in the trilemma, monetary independence, exchange rate stability, and financial openness, this paper examines how policy configurations affect macroeconomic performances with focus on the Asian economies. We find that the three policy choices do not matter for per capita economic growth. However, they do matter for output volatility and the medium-term level of inflation. Greater monetary independence is associated with lower output volatility while greater exchange rate stability implies greater output volatility, which can be mitigated if a country holds IR at a higher level than a threshold (around 20% of GDP). 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. We find that trilemma policy configurations and external finances affect output volatility mainly through the investment channel. While a higher degree of exchange rate stability could stabilize the real exchange rate movement, it could also make investment volatile, though the volatility-enhancing effect of exchange rate stability on investment can be cancelled by holding higher levels of international reserves (IR). Greater financial openness helps reduce real exchange rate volatility. These results indicate that policy makers in a more open economy would prefer pursuing greater exchange rate stability and greater financial openness while holding a massive amount of IR. Asian emerging market economies are found to be equipped with macroeconomic policy configurations that help the economies to dampen the volatilities in both investment and real exchange rate. These economies' sizeable amount of international reserves holding appears to help enhance the stabilizing effect of the trilemma policy choices, which explains the recent phenomenal buildup of international reserves in the region.

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1. Introduction

Originating from the financial crisis in the United States, the waves of the global crisis quickly hit hard so many countries, including those in Asia, in the summer of 2008, devastating economies on the global scale by the end of 2008. According to the IMF, all of the U.S., the Euro area, and Japan are expected to experience negative output growth in 2009 for the first time in the post-WWII era. Emerging and developing economies are expected to grow at a mere 1.7%, plunging from 8.3% in 2007 and 6.0 % in 2008. Asia is no exception; Newly Industrialized Asian economies are expected to shrink by 2.4% in 2009, and the two high-growth economies in Asia, China and India, are predicted to significantly slow down to 7.5% and 5.4%, respectively. Clearly, countries have experienced the worst global economic crisis since the Great Depression of the 1930s.

By the summer of 2009, however, there are some, but mosaic, signs of recovery among some countries. Even the United States, the epicenter of the crisis, started to show some signs of bottoming out by the fall of 2009. Although smaller economies seem to continue to be in a frail situation, bigger emerging economies in Asia started reporting economic data that suggest robust recovery; in the second quarter of 2009 Asian emerging economies' GDP grew at an average annualized rate of over 10% while America's fell by 1%. As of July 23, 2009, ADB Chief Economist Jong-Wha Lee commented "Emerging East Asia could see a V-shaped recovery, with growth dipping sharply in 2009 before regaining last year's pace in 2010."[1]

The V-shaped recovery in Asia, if that ever happens, is not unprecedented. In fact, that is how many economies in the region reacted to the Asian crisis of 1997-98. Despite a severe output contraction in 1998, Asian crisis economies did make a remarkable comeback with robust growth in exports and output as early as in 1999. Park and Lee (2002) attribute the quick comeback of the crisis-inflicted economies to their openness to and close link with the rest of the world. Asia's quick bounce this time is not only impressive but also surprising given that, unlike in the aftermath of the Asian crisis, the U.S. economy does not provide the "demand of last resort" (Aizenman and Jinjarak, 2008) that can fill the foregone demand in the world economy.

If the Asian economies could show robust and sustainable recovery while the advanced economies do not, that could involve two implications. First, robust recovery can be interpreted

[1] Asian Development Bank News Release on July 23, 2009, available at http://www.adb.org/Media/Articles/2009/12944-east-asian-economics-growths/.

as evidence for the Asian economies "decoupling" from the advanced economies. Second, Asian quick and robust recovery, while other developing economies do not follow the suit, could also mean that economies in the region, most of which are quite open to international trade in goods and financial assets, are better prepared to cope with economic crises in a highly globalized environment. In fact, Figure 1 shows that output volatility – measured by the standard deviations of per capita output growth rates – for Asian emerging market economies has been maintained at low levels comparable to those of the industrialized countries. This suggests that these economies may have adopted international economic policies that allow them to experience better macroeconomic performance. While we still have to wait a few more years to conduct meaningful analysis on the "decoupling" issue, we can investigate whether Asian economies are better-suited to cope with globalization by examining what has happened in the past. This will be the main focus of this paper.

To examine policy configurations in the context of international macroeconomics, this paper focuses on a very powerful hypothesis in international finance called the "impossible trinity," or just the "trilemma." The hypothesis 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. This concept, if valid, is supposed to constrain policy makers by forcing them to choose only two out of the three policy choices. In fact, among many different international monetary and financial arrangements that have been in place since the Gold Standard system, each set of arrangements imposed different choices on countries.

Given that Asian emerging market economies collectively have outperformed other developing economies in terms of output growth stability, it can be their international macroeconomic policy management, determined within the constraint of the trilemma, that have contributed to making these economies better-prepared for higher vulnerability possibly exacerbated by recent globalization.

As such, this paper will investigate how policy configurations based on the trilemma affect the macroeconomic performance of the economies, with focus on emerging markets in Asia. Given the complexity of the dynamics of policy choices and macroeconomic performances, it is most appropriate and effective to conduct panel data analysis to unravel the peculiarity, if there is, of international macroeconomic policies of these economies. More specifically, using the "trilemma indexes" developed by Aizenman et al. (2008) that measure the extent of

achievement in each of the three policy goals, this paper will examine how policy configurations based on the trilemma affect macroeconomic performances such as output growth, output volatility, inflation volatility, and the medium rate of inflation for developing countries.

Furthermore, this study focuses on output volatility and attempt to identify the channels by which the trilemma policy choices affect output volatility. As candidate channels, the volatilities of investment and the real exchange rate will be examined. This exercise should yield some inferences about how policy configurations can differ depending on the extent of openness of the economy.

In the remainder of the paper, Section 2 briefly reviews the theory of the trilemma and also assess the development of the three macroeconomic policies based on the trilemma by using the "trilemma indexes." Section 3 conducts more formal analysis on how the policy choices affect macroeconomic policy goals, namely, output growth, output volatility, inflation rates, and the volatility of inflation. We will examine the implications of the estimation results for Asian economies. In Section 4, we extend our empirical investigation to investigate the channels by which international macroeconomic policy configurations affect output volatility. Section 5 presents concluding remarks.

2. The "Impossible Trinity" or "Trilemma": Theory and Evidence

2.1 Brief Review of the Theory

Although it is debatable whether the worst is over for the current global crisis, it at least has put the current international financial architecture or individual countries' international macroeconomic policies into question as symbolized by the series of G20 meetings in Washington, D.C., London, and Pittsburgh. Some commentators emphasized parallelism to the series of meetings to determine the post-WWII international financial architecture held in 1944 in Bretton Woods, New Hampshire.

Whatever configuration of international financial architecture or international macroeconomic policies policy makers consider, conceptually, they cannot avoid confronting the "impossible trinity," or just the "trilemma": a hypothesis that states that a country simultaneously may choose any two, but not all, of the three goals of monetary independence, exchange rate stability and financial integration.

The trilemma is illustrated in Figure 2; 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.[2]

Since the Gold Standard system, different international financial systems have attempted to achieve different combinations of two out of the three policy goals. The Bretton Woods system sacrificed capital mobility for monetary autonomy and exchange rate stability. The Euro system is built upon the fixed exchange rate arrangement and free capital mobility, but abandoned monetary autonomy of the member countries. For many years until recently, developing countries had pursued monetary independence and exchange rate stability, but kept their financial markets closed for foreign investors.

The fact that countries have adopted different combinations of two out of the three policy choices and altered the combinations as a reaction to crises or major economic events must mean that each of the three policy options is a mixed bag of both merits and demerits for managing macroeconomic conditions.

Monetary independence allows the monetary authorities of an economy to have autonomy over its macroeconomic management. An economy with a high degree of monetary independence should be able to stabilize the economy through monetary policy without being subject to other economies' macroeconomic management. Hence, monetary independence can potentially lead to stable and sustainable economic growth. However, in a world with price and wage rigidities, policy makers can manipulate output movement (at least in the short-run), which means that policy makers with greater monetary autonomy could lead to increasing output and inflation volatility. Furthermore, it is also possible that monetary authorities abuse its autonomy to monetize fiscal debt, and therefore end up destabilizing the economy through high and volatile inflation.

Exchange rate stability could bring out price stability by providing an anchor, lessen risk premium by mitigating uncertainty, and thereby foster investment and international trade.[3] Also, at the time of an economic crisis, maintaining a pegged exchange rate could increase the

[2] See Obstfeld, Shambaugh, and Taylor (2005) for further discussion and references dealing with the trilemma.
[3] Aghion, et al. (2005) argue that, for an economy equipped with well-developed financial markets, reduction in uncertainty could enhance more efficient allocation of capital that could lead to higher productivities.

credibility of policy makers and thereby contribute to stabilizing output movement (Aizenman, et al., 2009). However, greater levels of exchange rate fixity could also rid policy makers of a policy choice of using exchange rate as a tool to absorb external shocks. Prasad (2008) argues that exchange rate rigidities would prevent policy makers from implementing appropriate policies consistent with macroeconomic reality, so that they would be prone to cause asset boom and bust through overheating the economy. Hence, the rigidity caused by exchange rate fixity could not only enhance output volatility, but also cause misallocation of resources and unbalanced, unsustainable growth.

Financial liberalization is probably the most contentious and hotly debated policy among the three. Theory predicts that more open financial markets could lead to economic growth through more efficient resource allocation, mitigating information asymmetry, enhancing/supplementing domestic savings, and helping transfer of technological or managerial know-how (i.e., growth in total factor productivity).[4] Also, economies with greater access to international capital markets should be able to stabilize themselves through risk sharing and portfolio diversification. However, as financial liberalization increased its pace over the last two decades, financial openness has got the blame for economic instability for these years as was the case in a series of crises in the late 1990s and the current crisis. Based on this view, financial openness could expose economies to volatile cross-border capital flows including sudden stop or reversal of capital flows, thereby making economies face boom-bust cycles (Kaminsky and Schmukler, 2002).[5]

Thus, theory tells us that each one of the three trilemma policy choices can be a double-edged sword, that should explain the wide and mixed variety of empirical findings on each of the three policy choices.[6] Furthermore, to make the matter more complicated, while there are three ways of pairing two out of the three policies (i.e., three vertexes in the triangle in Figure 2), the

[4] Henry (2006) argues that only when it fundamentally changes productivity growth through financial market development, could equity market liberalization policies have a long-term effect on investment and output growth. Otherwise, the effect of financial liberalization should be short-lived, which may explain the weak evidence on the link between financial liberalization and growth.

[5] For a summary on the cost and benefits of financial liberalization, refer to Henry (2006) and Prasad and Rajan (2008).

[6] Monetary independence is often discussed in the context of the impact of central bank independence or inflation targeting such as Alesina and Summers (1993) and Cechetti and Ehrmann (1999) among many others. On the impact of the exchange rate regime, refer to Ghosh et al. (1997), Levy-Yeyati and Sturzenegger (2003), and Eichengreen and Leblang (2003). The empirical literature on the effect of financial liberalization is surveyed by Edison et al. (2002), Henry (2006), Kawai and Takagi (2008), and Prasad et al. (2003).

effect of each policy choice can differ depending on what the other policy choice it is paired with. For example, exchange rate stability can be more destabilizing when it is paired with financial openness. But if it paired with greater monetary autonomy (i.e., closed financial markets), it can be stabilizing as well. Hence, the three types of policy combinations may as well be subject to empirical scrutiny, which needs to be done in comprehensive and systematic ways.

2.2 The "Trilemma Indexes"

Despite its pervasive recognition, there has been almost no empirical work that tests the concept of the trilemma systematically. Many of the studies in this literature often focus on one or two variables of the trilemma, but fail to provide comprehensive analysis on all of the three policy aspects of the trilemma.[7] This is partly because of the lack of appropriate metrics that measure the extent of achievement in the three policy goals.

Aizenman et al. (2008) overcame this deficiency by developing a set of the "trilemma indexes" that measure the degree of three policy choices countries make with respect to the trilemma. Using these indexes, we tested whether the indexes are linearly related to each other and confirmed that a change in one of the trilemma variables would induce a change with the opposite sign in the weighted average of the other two. This means, as theory predicts, countries do face the trade-off of the three policy choices.[8]

The "trilemma indexes" are created for more than 170 countries for the period of 1970 through 2007. The monetary independence index (MI) is based on the correlation of a country's interest rates with the base country's interest rate. The index for exchange rate stability (ERS) is an invert of the exchange rate volatility, i.e., standard deviations of the monthly rate of depreciation, for the exchange rate between the home and base countries. The degree of financial integration is measured with the Chinn-Ito (2006, 2008) capital controls index (KAOPEN). More details on the construction of the indexes can be found in the Appendix 1.

2.3 Development of the Trilemma Dimensions

[7] Of course, the notable exceptions include the papers by Obstfeld, Shambaugh, and Taylor (2005, 2008, and 2009) and shambaugh (2004).

[8] We also showed 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.

Comparing theses indexes provides interesting insights into how the international financial architecture has evolved over time. Figure 3 shows the trajectories of the trilemma indexes for different income country groups. For the industrialized countries, financial openness accelerated after the beginning of the 1990s while the extent of monetary independence has started a declining trend. After the end of the 1990s, exchange rate stability rose significantly. All these trends reflect the introduction of the euro in 1999.[9]

Developing countries on the other hand do not present such a distinct divergence of the indexes, and their experiences differ depending on whether they are emerging or non-emerging market ones.[10] For emerging market countries, exchange rate stability declined rapidly from the 1970's through the mid-1980's. After some retrenchment after the early 1980s (in the wake of the debt crisis), financial openness started rising from 1990 onward. For the other developing countries, exchange rate stability declined less rapidly, and financial openness trended upward more slowly. In both cases, though, monetary independence remained more or less trendless.

Interestingly, for the emerging market economies, our indexes suggest a convergence toward the middle ground, even as talk of the disappearing middle rose in volume. This pattern of results 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 interestingly coincides with the period when some of these economies started holding sizable international reserves, potentially to buffer the trade-off arising from the trilemma.[11]

None of these observations are applicable to non-emerging developing market countries (Figure 3(c)). For this group of countries, exchange rate stability has been the most aggressively pursued policy throughout the period. In contrast to the experience of the emerging market economies, financial liberalization is not proceeding rapidly for the non-emerging market developing economies.

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[9] 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.

[10] 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. For those in Asia, emerging market countries are "Emerging East Asia-14" defined by Asian Development Bank plus India.

[11] Willett (2003) has called this compulsion by countries with a mediocre level of exchange rate fixity to hoard reserves the "unstable middle" hypothesis (as opposed to the "disappearing middle" view).

To shed further light on the concept of the trilemma, adding one more dimension to the three trilemma dimensions is helpful. That is the role of international reserves (IR) holding. Since the Asian crisis of 1997-98, developing countries, especially those in East Asia and the Middle East, have been rapidly increasing the amount of international reserves holding. 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, with the sole exception of Japan. The nine developing countries, including China, Russia, Taiwan, and Korea, hold about 50% of world international reserves. 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. One perspective holds that countries accumulate massive international reserves in order to achieve some target combination of exchange rate stability, monetary policy autonomy, and financial openness.

For example, a country pursuing stable exchange rate and monetary autonomy may try to liberalize cross-border financial transactions while determined not to give up the current levels of exchange rate stability and monetary autonomy. This sort of policy combination, however, could make the monetary authorities motivated to hold a sizeable amount of IR so that they can stabilize the exchange rate movement while retaining monetary autonomy. Or, if an economy with open financial markets and fixed exchange rate faces a need to lax monetary policy independently, it may be able to do so – though temporarily – as long as it holds a massive amount of IR. Thus, evidently, one cannot discuss the issue of the trilemma without incorporating the a role for IR holding.

The "Diamond charts" in Figure 4 are useful to trace the changing patterns of the trilemma configurations while incorporating IR holding. Each country's configuration at a given instant is summarized by a 'generalized diamond,' whose four vertices measure monetary independence, exchange rate stability, IR/GDP, and financial integration with the origin normalized so as to represent zero monetary independence, pure float, zero international reserves and financial autarky. Figure 4 summarizes the trends for industrialized countries, emerging Asian economies, non-emerging market developing Asian countries, Non-Asian developing countries, and Latin American emerging market countries.

In Figure 4, we can observe again the divergence of the trilemma configurations for the industrial economies: move towards deeper financial integration, greater exchange rate stability,

and weaker monetary independence over years. But this group of countries have reduced the level of IR holding over years unlike the other country groups. Once we shift our attention to regional comparison of the trilemma configurations, Asia, especially those economies with emerging markets, looks distinct from other groups of countries.[12] The diamond chart for Asian emerging market economies shows that the middle-ground convergence we observed for the EMG group in Figure 3 is quite evident for this group of economies, and that it is not a recent phenomenon for these economies. Since as early as the 1980s, the three indexes have been clustered around the middle range, although exchange rate stability is the most pervasive policy choice and the degree of monetary independence has been gradually dropping. This characterization does not appear to be applicable to the other groups of developing economies, whether or not they are Asian. Latin American emerging market countries appear to have gone through a distinctively different path of development compared to the Asian counterparts. Most importantly, the group of Asian emerging market economies stands out from the others with their sizeable and rapidly increasing amount of IR holding, which may make one suspect potential implications of such IR holdings on trilemma policy choices and macroeconomic performances.

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

The estimation model is given by:

$$y_{it} = \alpha_0 + \alpha_1 TLM_{it} + \alpha_2 IR_{it} + \alpha_3 (TLM_{it} \times IR_{it}) + X_{it}\mathrm{B} + Z_t\Gamma + D_i\Phi + \varepsilon_{it} \quad (1)$$

y_{it} is the measure of macro policy performance for country i in year t, i.e., per capita output growth, output volatility, inflation volatility, and the medium-term level of inflation.[13] TLM_{it} is a

[12] Appendix 2 lists "Asian economies" included in the sample.

[13] Output growth is measured as the five-year average of the growth rate of per capita real output (using Penn World Table 6.2); output volatility is measured as the five-year standard deviations of the per capita output growth rate; inflation volatility as the five-year standard deviations of the monthly rate of inflation; and the medium-term level of inflation as the five-year average of the monthly rate of inflation.

vector of any two of the three trilemma indexes, namely, *MI*, *ERS*, and *KAOPEN*. Aizenman et al. (2008) have shown that these three measures of the trilemma are linearly related. Therefore, it is most appropriate to include two of the indexes simultaneously, rather than individually or all three jointly.[14] 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, that may allow us to observe whether international reserves 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. More specifically, for the estimation on economic growth, X_{it} includes income per capita from the initial year of each five-year panel, average investment ratio to GDP, years of schooling (based on Barro and Lee, 2001), population growth, trade openness (=(EX+IM)/GDP), and private credit creation (% of GDP) as a measure of financial development. The regressions on output volatility, inflation volatility, and the level of inflation include relative income (to the U.S. based on PWT per capita real income); its quadratic term; trade openness; the TOT shock defined as the five-year standard deviation of trade openness times TOT growth; fiscal procyclicality (measured as the correlations between HP-detrended government spending series and HP-detrended real GDP series); (five-year average of) M2 growth; private credit creation (as % of GDP), the inflation rate; and inflation volatility, with some variation of included variables depending on the dependent variable. Z_t is a vector of global shocks that includes the change in U.S. real interest rate; the 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 estimation model is also extended by including a vector, $ExtFin_{it}$, of external finances, that includes net FDI inflows, net portfolio inflows, net 'other' inflows (which mostly include bank lending), 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

[14] That means that for each dependent variable, three types of regressions, i.e., those with three different combinations of two trilemma variables, are estimated.

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.

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 regression is conducted for the group of developing countries (LDC) and a subgroup of emerging market countries (EMG). The estimation model for economic growth will be based upon the one used in Kose et al. (2009), namely, OLS with fixed effects and system GMM, and the model for output volatility, inflation volatility, and the level of inflation upon Aizenman et al. (2008), i.e., the robust regression model that downweights outliers that can arise in both the dependent variable and explanatory variables such as inflation volatility.

3.1 Estimation Results of the Basic Models

3.1.1 Output Growth

For the estimation, we use a parsimonious model akin to that of Kose et al. (2009), and three estimation methods: pooled OLS, Fixed Effects (FE) model (with robust standard errors clustered by country) to factor out country-specific effects, and system GMM to control for potential endogeneity.[15] We test the variables that are often found significant as mentioned above.[16] The regression results are reported in Tables 1-1 and 1-2 for developing countries and emerging market countries, respectively, for the three estimation methods.

In both Tables 1-1 and 1-2, across different models, the results for the macroeconomic control variables are mostly consistent with the literature. The negative coefficient on the (log of) initial per capita income level evidences the convergence effect (though not found in the GMM estimation); the investment ratio, and population growth less significantly, are positive and negative contributors to per capita output growth, respectively; and financial development is found to be a positive contributor but only in the OLS estimation. Trade openness has an

[15] For the fixed effects estimation, time fixed effects are also included. The system GMM estimation is conducted using the two step method and Windmeijer (2005) standard errors with finite-sample correction. We treat initial levels of per capita income; investment ratio, total years of school, and population growth rate as endogenous and instrument using 2nd lag. Time fixed effects are also included in the estimation and treated as exogenous instruments.

[16] Neither the IR variable nor the interaction terms between trilemma variables and IR are included in the estimation because of the lack of theoretical rationale for the link between IR holding and economic growth.

ambiguous effect; it is a negative factor in the OLS model for the LDC sample whereas it turns to be a positive one for the EMG when the FE model is used.

The trilemma variables enter the estimation relatively weakly, but this is consistent with the ambivalent theoretical predictions of the trilemma policy choices as discussed above. The effect of the trilemma variables is only captured by the FE model for both LDC and EMG sample. Greater exchange rate stability is expected to lead higher economic growth, a consistent result with Dubas et al. (2005) and De Grauwe and Schnabl (2004). These findings may indicate that exchange rate stability promote price stability and predictability for investment, thereby lowering the country risk premium and eventually the interest rate. While we must be aware that the FE model fails to incorporate cross-sectional variation and that the number of observations for the time dimension is small, these results may capture the effect of policy changes.

Beside the econometric issues, we must also note that there is a possibility that the *KAOPEN* index may not capture the actual ebb and flow of cross border capital and its impact. Edwards (1999) discusses that the private sector often circumvents capital account restrictions, nullifying the expected effect of regulatory capital controls. More recently, China's *de facto* openness, despite its *de jure* closeness, is often the subject of researchers (Aizenmand and Glick, 2008, Prasad and Wei, 2007, and Shah and Patnaik, 2009).

Against this backdrop, we augment our estimation model by including *de facto* measures of capital account openness – measured by net inflows of FDI, portfolio investment, and bank lending – to incorporate the effect of actual external financing. Including these variables may address two important issues with the Asian economies. First, on the *de facto* basis, Asia is more financially open than what the *de jure* measures show (Shah and Patnaik, 2009). Hence, it is important to include *de facto* measures of financial openness while controlling for *de jure* levels of financial openness.[17] Second, as Figure 5 shows, Asia is on average a net recipient of FDI, but is a net provider of portfolio investment and bank lending. Hence, using net inflows of different types of capital should add more subtlety to the analysis.

Tables 2-1 and 2-2 report the results for developing countries and emerging market economies, respectively, from the augmented model that includes the net inflows of FDI, portfolio investment and 'other' investment (which mostly consists of bank lending), short-term

[17] We could also argue that while the *de jure* measures may reflect policy makers' intentions, *de facto* ones may represent actuality in cross-border capital flows.

debt, and total debt service. To conserve space, the estimation results on the basic macroeconomic control variables are omitted. We also note that this estimation exercise loses many observations especially for economies with medium-income levels, such as Korea and Singapore, because the debt-related variables are not available for developing economies with relatively high income levels. Also, to isolate the effect of external financing from currency crises, we include a dummy for currency crises.[18]

The estimation results for the trilemma variables are mostly intact. Exchange rate stability continues to be a growth enhancer in the FE models of both samples. Financial openness is now found to be a growth enhancer in one of the system-GMM models for the EMG group. Among the external finance variables, not surprisingly, the variable for total debt services (as % of GNI) is found to hamper output growth, especially for the LDC sample. Short-term debt is also negatively associated with economic growth, but only in the OLS models.

The variables for net capital inflows do not appear to perform well, except for net 'other' or bank lending inflows in some of the models. This result has an important implication for Asia because bank lending is the most pervasive form of cross-border capital flow in the region. Our results present some, but weak evidence that cross-border bank lending may have supplemented domestic saving and contributed to economic growth.

3.1.2 Output Volatility

One of the reasons for the relatively weak results for the trilemma configurations in the growth regression can be because policy arrangements relevant to the trilemma may primarily affect the volatilities in output or inflation, and then indirectly, output growth. Hnatkovska and Loayza (2005) find tat macroeconomic volatility and long-run economic growth are negatively related, and that the negative link is considerably larger for the last two decades.[19] As such, we now investigate the effect of the trilemma configurations on other variables relevant to

[18] 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 percentage loss in international reserves, and the nominal interest rate. The weights are inversely related to the pooled variance of changes in each component over the sample of countries, with an adjustment for countries that experienced hyperinflation following Kaminsky and Reinhart (1999). For countries without the necessary data to compute the EMP index, the currency crisis classifications in Glick and Hutchison (2001) and Kaminsky and Reinhart are used.

[19] They also investigate the determinants of the negative link and find that the negative link can be exacerbated by underdevelopment of institutions, intermediate stages of financial development, and inability to conduct countercyclical fiscal policies.

macroeconomic performances by replacing the dependent variable of equation (1) with the variables for output volatility, inflation volatility, and the level of inflation. The estimation results are shown in Tables 3-1 and 3-2.

Overall, macroeconomic variables retain the characteristics consistent with what has been found in the literature. In the regression for output volatility (shown in columns (1) through (3) of Tables 3-1 and 3-2), 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, et al. (2001) who argue that volatility in world goods through trade openness can raise output volatility.[20] Countries with procyclical fiscal policy tend to experience more output volatility while countries with more developed financial markets tend to experience lower output volatility though they are not statistically significant.[21] The results hold qualitatively for the subsample of emerging market countries though the statistical significance tends to appear weaker.

Among the trilemma indexes, monetary independence is found to have a significantly negative effect on output volatility; the greater monetary independence one embraces, the less output volatility the country tends to experience, naturally reflecting the impact of stabilization measures.[22,23] Mishkin and Schmidt-Hebbel (2007) find that countries that adopt inflation

[20] 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).

[21] For theoretical predictions on the effect of financial development, refer to Aghion, et al. (1999) and Caballero and Krishnamurthy (2001). For empirical findings, see Blankenau, et al. (2001) and Kose et al. (2003).

[22] Once the interaction term between monetary independence and IR holding is removed from the estimation model, the coefficient of monetary independence becomes significantly negative with the 5% significance level in model (1) of the LDC sample and in models (1) and (2) of the EMG sample.

[23] 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.

targeting – one form of increasing monetary independence – are found to reduce output volatility, and that the effect is bigger among emerging market countries.[24] This volatility reducing effect of monetary independence may explain the tendency for developing countries, especially non-emerging market ones, to not reduce the extent of monetary independence over years.

Countries with more stable exchange rate tend to experience higher output volatility for both LDC and EMG groups, 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 (2003) 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 13 - 18% of GDP.[25] 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 2.7-2.9 percentage points.[26] China, whose exchange rate stability index is as high as 0.97 and whose ratio of reserves holding to GDP is 40% in 2002-06, is able to reduce volatility by 1.4-1.7 percentage points.

When the model is extended to incorporate external finances, whose results are reported in Tables 4-1 and 4-2, generally, the control variables remain qualitatively unchanged, but the trilemma variables slightly increase their statistical significance. Among the trilemma indexes, greater monetary independence continues to be a output volatility reducer. The nonlinear effect of greater exchange rate stability in interaction with IR holding remains, but the threshold level is found to be 12.6% of GDP in model (3) for developing countries and 18-19% for emerging market countries.

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[24] 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.

[25] In Model (3) of Table 3-1, $\hat{\alpha}_1 TLM_{it} + \hat{\alpha}_3 (TLM_{it} \times IR_{it})$ for ERS is found to be $0.009 ERS_{it} - 0.067(ERS_{it} \times IR_{it})$ or $(0.009 - 0.067 IR_{it}) ERS_{it}$. In order for ERS to have a negative impact, $0.009 - 0.067 IR_{it} < 0$, and therefore, it must be that $IR_{it} > 0.009 / 0.067 = 0.13$.

[26] See Moreno and Spiegel (1997) for earlier study of trilemma configurations in Singapore.

Countries with more open capital account tend to experience lower output volatility according to Table 4-1. However, those with higher IR holding than 23% of GDP can experience higher volatility by pursuing more financial openness, which is somewhat counterintuitive.[27]

Among the external finance variables, 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 which experience macroeconomic turmoil often experience an increase in inflows of banking lending or "hot money" such as portfolio investment. Total debt service is found to be a positive contributor to output volatility while short-term debt does not seem to have an effect. This results contrasts with the conventional wisdom regarding short term external debt.[28]

3.1.3 Inflation Volatility

The regression models for inflation volatility do not turn out to be as significant as those for output volatility including the performance of the trilemma indexes. The findings on the macro variables are generally consistent with the literature. Countries with higher relative income tend to experience lower inflation volatility, and naturally, those with higher levels of inflation and those which experience currency crises are expected to experience higher inflation volatility. The TOT shock increases inflation volatility, but only for emerging market countries.

The performance of the trilemma indexes appears to be the weakest for this group of estimations. However, exchange rate stability is now a volatility increasing factor, which is contrary to what has been found in the literature (such as Ghosh, et al., 1997) and somewhat counterintuitive, because countries with more fixity in their exchange rates should experience lower inflation and thereby lower inflation volatility. One possible explanation is that countries with fixed exchange rates tend to lack fiscal discipline and eventually experience devaluation as

[27] The result of model (2) in Table 4-1 is consistent with those of models (1) and (3). That is, model (2) predicts that if a country increases its level of monetary independence and financial openness concurrently, it could reduce output volatility. As long as the concept of the trilemma holds true, i.e., the three policy goals are linearly related, as Aizenman et al. (2008) empirically proved, the efforts of increasing both *MI* and *KAOPEN* is essentially the same as lowering the level of exchange rate stability. Models (1) and (3) predict that lower ERS leads to lower output volatility. But these models also predict that if the country holds IR more than thresholds, it would have to face higher output volatility, which is found in model (2).

[28] One might suspect that this result can be driven by multicollinearity between the short-term debt variable and the variables for the various net inflows. However, even when the three net inflow variables are removed from the models, still the total debt service continues to be a positive factor while the short-term debt variable continue to be an insignificant one.

Tornell and Velasco (2000) argue.[29] When we include the interaction term between the crisis dummy and the ERS variable to isolate the effect of exchange rate stability for the crisis countries, the estimated coefficient on ERS still remains with the same magnitude and statistical significance.

Even when the model incorporates external finances, the estimation results remain to be weak, except for FDI inflows and total debt service. While FDI inflows are found to be inflation stabilizers, total debt service can be destabilizing inflation, both consistent with the literature.

3.1.4. Medium-run Level of Inflation

The models for the medium-run level of inflation fit as well as those for output volatility. Higher inflation volatility, higher M2 growth, and oil price shocks are associated with higher inflation. 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.

Among the trilemma variables, greater exchange rate stability leads to lower inflation for both developing and emerging market countries, 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.

The estimations for both 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 for the LDC regressions.

The negative association between "openness" and inflation has been the subject of debate as globalization has proceeded.[30] Romer (1993), extending the Barro-Gordon (1983) model, verified that the more open to trade a country becomes, the less motivated its monetary

[29] Tornell and Velasco argue that while countries with flexible exchange rates face the cost of having lax fiscal policy immediately, countries with fixed exchange rates tend to lack fiscal discipline because "under fixed rates bad behavior today leads to punishment tomorrow."
[30] Rogoff (2003) argues that globalization contributes to dwindling mark-ups, and therefore, disinflation.

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.[31] Here, across different subsamples of developing countries, we present evidence consistent with the negative openness-inflation relationship.

The extended version of the regressions that incorporate external finances generally retain the same characteristics. But for emerging market economies, the interaction term between ERS and international reserves holding is found to have a positive impact on the rate of inflation. Models (8) and (9) in Table 4-2 show that if the ratio of reserves holding to GDP is greater than around 24%, the efforts of pursuing exchange rate stability can help *increase* the level of inflation. This means that countries with excess levels of reserves holding will eventually face the limit in the efforts of fully sterilizing foreign exchange intervention to maintain exchange rate stability, thereby experiencing higher inflation. In the LDC sample (Table 4-1), we can find the same kind of threshold in models (8) and (9); financial openness can lead to lower inflation, but only up to the case when IR hold is below 21-22% as a ratio to GDP. Considering that only in a financially open economy, monetary authorities face the need for foreign exchange interventions, the threshold of IR holding for financial openness can be interpreted in the same way as that for exchange rate stability. This means that there are a limit to sterilized interventions, and that it is more binding for financially open economies. Aizenman and Glick (2008) and Glick and Hutchison (2008) show that China has started facing more inflationary pressure in 2007 when allegedly intervening the foreign exchange market intensively to sustain exchange rate stability. This finding indicates that sterilized interventions would eventually lead to a rise in expected inflation if they are conducted as an effort to maintain monetary independence and exchange rate stability while having somewhat open financial markets. The rise in the inflationary pressure provides evidence that policy makers cannot evade the constraint of the trilemma.

Lastly, among the external finances variables, FDI is found to be an inflation reducer. One possible explanation is that countries tend to stabilize inflation movement to attract FDI. Lastly, and unsurprisingly, higher levels of total debt services are found to help increase inflation for the LDC sample.

[31] Loungani et al. (2001) provides empirical evidence that countries with greater restrictions on capital mobility face steeper Phillips curves.

3.2. Implications for Asia

In the growth regressions, we learned that investment ratios, exchange rate stability, financial openness, bank lending inflows, and low levels of total debt services are the positive contributors to economic growth among developing countries. How do there variables behave for the Asian economies? In Figure 4, we have seen that Asia on average maintained the medium level of exchange rate stability, but that its level is not as high as that of other non-Asian developing countries. Asian economies, especially those with emerging markets, have achieved the medium level of financial openness since the 1980s, but have not experienced rapid financial liberalization as Latin American emerging market countries have done. Figure 5 reports that Asian emerging market economies are currently net recipients of FDI and net providers of portfolio and bank lending after the Asian crisis. Before the crisis, however, both emerging and non-emerging Asian economies were more dependent on bank lending than FDI.[32] Both short-term debt as a ratio to total external debt and total debt service as a ratio to GNI have stayed at relatively high levels for this group of economies.[33] Given these observations, the drive for high economic growth among Asian emerging market economies can be narrowed down to high investment ratios and high levels of bank lending inflows. Especially with respect to the link between Asia and globalization, as many researcher have discussed, one of the keys to economic success is the high level of openness to bank lending, which may have had synergistic relationship with domestic investment.

The estimation results on the determinants of output volatility also provide some interesting insights on Asian economic development. The finding that countries can reverse the volatility-increasing effect of greater exchange rate stability by holding higher levels of international reserves than some threshold (around 13-18% of GDP) may explain the reason why many Asia developing countries hold higher levels of IR. Unraveling the motive for IR holding also has an important implication for the current global crisis. Some economists argue that the efforts made by Asian economies to hold international reserves in an attempt to stabilize their exchange rates could have expanded liquidity rapidly in global capital markets and contributed to finance profligacy in the advanced countries including the housing bubble in the United States.

[32] It must be noted that the scales are different among different panels of figures in Figure 5.
[33] We must remind that the debt data are not available for emerging market economies with relatively high income levels such as Hong Kong, Korea, and Singapore.

Hence, we do need to shed further light on how IR holding and the exchange rate regime interacts with each other.

Figure 6 shows the marginal interactive effects between ERS and IR based on the estimates from Column 3 of Table 3-2. For presentation purposes, the EMG group of countries is divided into three subgroups: (a) an Asian group, (b) a Latin American group, and (c) all 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. The solid horizontal line refers to the threshold of IR at 18% of GDP, above which higher levels of ERS has a negative impact on output volatility. [34] For example, the solid contour line above the threshold shows the combinations of ERS and IR that lead to a one percentage point reduction in output volatility. In the figure, the further toward the northeast corner in the panel, i.e., the higher level of ERS *and* IR a country pursues, the more negative the impact 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 the impact 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.[35]

These diagrams highlight several interesting observations. First, between the 1992-96 and 2002-06 periods, a period which encompasses the last wave of global crises whose epicenter was in Asia, many countries, especially those in East Asia and Eastern Europe, increased their IR holding above the threshold. Second, 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). Last, there are only a handful of economies that have achieved combinations of ERS and IR that reduce output volatility significantly. Such economies

[34] In Model (3) in Table 3-2, $\hat{\alpha}_1 TLM_{it} + \hat{\alpha}_3 (TLM_{it} \times IR_{it})$ for ERS is found to be $0.012ERS_{it} - 0.066(ERS_{it} \times IR_{it})$. If the marginal effect is –1%, it must be that $-0.01 = 0.012ERS_{it} - 0.066(ERS_{it} \times IR_{it})$. If we solve this for *IR*, then we obtain $IR_{it} = \frac{0.012}{0.066} - \frac{-0.01}{0.066ERS_{it}}$. We repeat this calculation for the –2% impact, –3% impact, etc. so as to create the other contours.

[35] The estimated coefficient on IR (level) is significantly positive in Column (1) of Table 3-2, which indicates the volatility-enhancing effect of IR itself. Hence, it is essentially a trade-off between holding more IR and pursuing greater exchange rate stability once the level of IR surpasses the threshold level. The analysis presented in Figure 6 focuses on the marginal effect of ERS and how it changes depending on the level of IR while keeping in mind that higher levels of IR is volatility-increasing.

include Botswana, China, Hong Kong, Malaysia, Jordan, and Singapore. However, the fact that three Asian economies are among the countries with large IR holding and great ERS may explain why Asian economies are often perceived to be currency manipulators although they are more of exceptions than the rule.

4. Further Investigation into Output Volatility and Trilemma Choices

4.1 Channels to Output Volatility

Given the current state of the world economy, one cannot help but focus on the estimation results for output volatility. One natural question that arises is through what channels do these factors contribute to output volatility. To answer this question, we estimate similar models for output volatility but replace the dependent variable with real exchange rate stability, through which net exports can be affected, and the volatility of investment. This exercise should help us examine whether and to what extent policy choices can differ depending on the extent of economic openness.

4.1.1 Results on Investment Volatility and Real Exchange Rate Volatility

The results shown in columns (1) through (3) and those (4) through (6) of Table 5 correspond to the investment volatility and real exchange rate stability specifications, respectively. However, for the estimation of the real exchange rate stability, some of the explanatory variables are changed; the variables for the change in the U.S. real interest rate, fiscal procyclicality, and financial development (measured by private credit creation as a ratio to GDP) are dropped from the estimation, and replaced with inflation volatility, and differentials in inflation volatility between the home and base countries are included instead.[36]

By comparing the results of these different specifications with dependent variables, we can make some interesting observations. First, we can also observe the negative effect of monetary independence in the investment volatility estimation as we did in that on output volatility. However, if the level of IR holding is above 15-20% of GDP, higher monetary independence could lead to higher volatility in investment. This may be because higher levels of international reserves could lead to higher levels of liquidity, thus to more volatile movement in

[36] Interest rate differentials are also tested, but did not turn out to be significant. Therefore, they are not included in the estimation.

the cost of capital. Second, while a higher degree of exchange rate stability could (unsurprisingly) induce greater real exchange rate stability, it could also lead to more volatile investment. But as was the case with output volatility, if the level of IR holding exceeds a given threshold, greater exchange rate stability reduces investment volatility.[37] Third, financial openness has a negative impact on both real exchange rate stability and investment volatility. Hence, we can conclude that financial liberalization could help reduce output volatility by making both real exchange rate and investment more stable. Last, the investment volatility regressions show that net portfolio and bank lending inflows can be volatility-increasing, although banking lending inflows can reduce real exchange rate volatility.

4.1.2 Results on Other Aspects of Macroeconomic Performance

Additionally, we repeat the same exercise for additional variables pertaining to other aspects of macroeconomic performance, namely, the volatility of final consumption – the sum of private consumption and government expenditure, the volatility of gross national income (GNI), and the ratio of the two variables. The motivation for these estimations is twofold. First, we need to ensure if there is any other channels than investment and net exports through which the trilemma policy configurations can affect output volatility. Second, the ratio of the volatility of GNI to that of final consumption is essentially a proxy to the measure of risk sharing. In other words, a higher value of the ratio means a smaller volatility of final consumption compared to that of GNI, which can arise when economic agents successfully diversify risk and smooth consumption. Hence, if trilemma policy choices are found to reduce the ratio, that can be interpreted as evidence for successful international risk sharing.[38]

The regression results for final consumption volatility are not robust in terms of not only the macroeconomic control variables, but also of the trilemma variables (not reported). Although the weak estimation results may indicate a possibility of misspecification in these regressions, this finding suggests at least that the channel of final consumption can be ruled out; it is either investment or net exports through which trilemma configurations affect output volatility.

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[37] The threshold levels of IR holding are 18% and 28% of GDP in models (1) and (3) in Table 5-1, respectively. They are 14% and 26% in models (1) and (3) in Table 5-2, respectively.

[38] However, plotting the time series of the ratio of final consumption volatility to GNI volatility is not promising. While the ratio appears to be trending up moderately among industrialized countries, i.e., they are reaping the benefits of diversifying risk and smoothing consumption, there is no discernable trend for the group of developing economies.

While the estimation results for GNI are found to be quite similar to the estimation of output volatility, the estimation on the ratio of GNI volatility to final consumption volatility do not perform well at all. Considering that home bias is much more pervasive in developing countries, the insignificant results are not surprising. Developing countries are not reaping the benefits of international risk sharing, though that could also mean that there is room for these countries to reap the benefit from financial liberalization.

4.2 Policy Implications and Asia

In the previous exercise, we found different dynamics between the investment volatility model and the model on real exchange rate volatility. This difference should suggest that the effect of international macroeconomic policy configurations differ depending upon how much weight policy makes place between these two policy goals. For example, if policy makers put greater weight on real exchange rate stability, it is better to pursue more exchange rate stability and greater financial openness (which implies lower levels of monetary independence), which could have a volatility enhancing impact on investment and output, although the answer depends on the level of IR holding. More concretely, the results from model (1) in Table 5-2 show that greater (weaker) monetary independence increase (decrease) real exchange rate volatility. The estimation results also indicate that the threshold of IR holding level (as a ratio to GDP) for greater (weaker) monetary independence to have a positive (negative) effect on investment volatility is 15% of GDP whereas that for greater (weaker) exchange rate stability to have a negative (positive) effect is 16%. Hence, if an emerging market country holds a higher level of IR than 16% and tries to pursue a higher level of exchange rate stability and a *lower* level monetary independence (i.e., a combination of greater exchange rate stability and greater financial openness), it could achieve lower levels of not only real exchange rate stability, but also investment. This result may explain why many emerging market countries, especially those which are more open to international trade such as Asian emerging market economies, tend to prefer exchange rate stability and holding a massive amount of IR while also pursuing financial liberalization.

This finding has a significant relevance to Asian economies. Panel (a) in Figure 7 shows the average ratio of trade openness (the sum of exports and imports as a ratio to GDP) to the investment rate (as a ratio to GDP) between 1990 and 2006 for different groups of developing

countries. While the ratio for the group of non-emerging market Asian developing economies is below the average for the entire group of developing countries, the ratio for the Asian emerging market economies (EMG) is the highest among the regional subgroups. This means that the results shown in columns (4) through (6) of Tables 5-1 and 5-2 are more relevant to this group of economies than any other groups. Our estimation results indicate that more open economies could reduce volatility in both investment and real exchange rate by pursuing more stable exchange rate as long as they hold higher levels of IR. Panels (b) through (d) show the period averages of IR holding (% of GDP), ERS, and MI, respectively. In Panel (b), the level of IR holding for the Asian EMG is much greater than the threshold of 15-16% we just discussed above, though both ERS and MI are around the group averages of developing countries. These panels of figures at least indicate that Asian emerging market economies seem to have pursued international macroeconomic policies that allow their massive IR holding to reduce the level of volatility in both investment and the real exchange rates. In fact, according to Figure 8, the level of investment volatility for Asian EMGs is lower than any other groups of developing countries and comparable to that of industrialized countries (except for the 1990s because of the Asian crisis). These economies have also achieved low levels of real exchange rate volatility, again comparably to that of industrialized countries.

Figure 9 illustrates the estimated effects of the three trilemma variables on investment volatility and real exchange rate volatility calculated using the estimation results shown in Table 5-1.[39] The panels of Figure 9 allow us to make four interesting observations for the Asian economies. First, exchange rate stability and its interaction with IR holding have contributed significantly to lowering the real exchange rate volatility over years, which is also the case with the non-Asian developing economies (bottom two panels). Second, among Asian developing economies, exchange rate stability and its interaction with IR holding lowered investment volatility especially in the 2002-06 period. Third, the three policies, on net, appear to have contributed negatively to volatilities in both investment and real exchange rate in the post-Asian

[39] That is, the bars in the panels of figures refer to $\hat{\alpha}_1 TLM_{it} + \hat{\alpha}_3 (TLM_{it} \times IR_{it})$ for each of the trilemma indexes and its interaction with IR holding. The estimated effects are calculated using the estimated coefficients and actual values for the trilemma indexes and the IR ratio. However, because only two out of the three trilemma variables are included in the estimations, the estimation results from two types of regressions: one with *MI* and *ERS* included in TLM_{it} and the other with *ERS* and *KAOPEN*, are used to calculate the estimated effects for all the three indexes. The estimated effect of ERS is, however, based on the average of the estimated coefficients for the two regressions.

crisis period. Last, the effect of financial openness and IR holding is minimal for this group of economies.

For the non-Asian developing economies, on the other hand, it is monetary independence that has been a negative contributor to investment volatility over years though its impact dwindled in the last period. Furthermore, unlike the Asian subgroup, exchange rate stability has been a *positive* contributor to investment volatility though its impact seems to have been trending downward. Hence, the Asian economies seem to have been able to lessen the volatilities of investment and real exchange rate by pursuing greater ERS and having high levels of IR especially in the last five-year period.

5. Concluding Remarks

About one year after the onset of the most severe global crisis since the Great Depression, in the summer of 2009, we started observing some signs of recovery, though none of them yet suggested sustainable recovery. Among the economies with signs of recovery, Asia has impressed the world with its most robust recovery, attracting scrutiny from both the academic and policy communities.[40] This paper attempted to make an addition to the scrutiny by focusing on how the region has dealt with the waves of financial globalization through configuring international macroeconomic policies. For this exploration, we have focused on a fundamental principle in international finance, called the "impossible trinity" or "trilemma" – an economy can concurrently implement at full capacity only two out of the three international macroeconomic policies: monetary independence, exchange rate stability, and financial openness.

The "trilemma indexes" developed by Aizenman et al. (2008) allow us to trace the changing patterns of the trilemma configurations among countries and bring to light striking differences between the choices of industrialized and developing countries during 1970-2007. The recent trend suggests that industrialized countries 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. Emerging market countries, on the other hand, appear to be converging towards a "middle ground" with managed exchange rate flexibility,

[40] See the August 15, 2009 issue of *The Economist* for a report on Asia's recovery from the financial crisis of 2008-09.

while maintaining medium levels of monetary independence and financial integration. Interestingly, for Asian emerging market economies, convergence is not a recent phenomenon; since as early as the 1980s, the three indexes have been clustered around the middle range, though exchange rate stability has been the most pervasive policy choice over time. Another, more recent iconic trait of this group of economies is the high level of international reserves holding, which this paper also incorporates into the analysis.

The fact that policy configurations based on the trilemma have evolved over years must mean that combinations of the three policies should have strengths and weaknesses in terms of managing the macroeconomy. As such, this study examined how trilemma policy configurations can affect various aspects of macroeconomic performances, namely, per capita output growth, output volatility, inflation volatility, and the medium-term rate of inflation in an attempt to explain why the economies in the Asian region, especially those with emerging markets, have achieved stable macroeconomic development. To reveal potential uniqueness of the Asian economies, we resorted to panel data analysis to examine the correlation between trilemma configurations and macroeconomic performances while properly controlling for the complexity of other macroeconomic conditions.

A series of empirical analyses yielded interesting findings. First, the results from the growth regressions provided very weak evidence that per capita economic growth can be affected by policy choices among the three trilemma policies as well as external finances such as cross-border flows of FDI, portfolio investment, and bank lending. This finding is not surprising given that theory predicts conflicting effects on economic growth for all the three policy goals. Our estimation results confirmed the ambivalence.

Second, we investigated how the policy configurations based on the trilemma affect other macroeconomic performances such as output volatility, inflation volatility, and the medium-term level of inflation, and found some of the policy choices significantly affect output volatility and the rate of inflation. More specifically, higher levels of monetary independence are associated with lower output volatility. Countries with higher levels of exchange rate fixity tend to experience higher output volatility though this effect can be mitigated by holding a higher level of international reserves than the threshold of about 20% of GDP. This result is consistent with the phenomenon of many emerging market countries accumulating massive international reserves.

We also found that countries with greater monetary autonomy tend to experience higher inflation while countries with higher exchange rate stability tend to experience lower inflation. Furthermore, financial openness helps a country to achieve lower inflation. However, we found some evidence that if countries pursue greater exchange rate stability and financial openness while holding a sizeable amount of international reserves through foreign exchange intervention, they can experience a rise in the level of inflation, suggesting that countries with excess levels of reserves holding may eventually face a limit in foreign exchange sterilization.

We focused on the impact of the trilemma policy configurations on output volatility and examined through what channels the trilemma policy configurations affect output volatility. The estimation results of the regression on investment volatility turned out to share similar characteristics with the regression on output volatility, suggesting that trilemma policy configurations and external finances affect output volatility through investment. More specifically, like in the estimation on output volatility, greater monetary independence is found to help reduce investment volatility. However, if the level of IR holding gets above 15-20% of GDP, greater monetary independence would become volatility-enhancing for investment by providing too much liquidity and thereby making the cost of capital too volatile. While a higher degree of exchange rate stability could stabilize the real exchange rate movement, it could also make investment volatile, though the volatility-enhancing effect of exchange rate stability on investment can be cancelled by holding higher levels of IR. Greater financial openness is found to help reduce real exchange rate volatility. These results indicate that policy makers in a more open economy would prefer pursuing greater exchange rate stability and greater financial openness while holding a massive amount of IR because this policy combination would help them stabilize both investment and real exchange rate. This finding might help explain why open-small economies in East Asia hold massive amounts of IR.

Overall, Asian economies, especially the ones with emerging markets, are found to be equipped with macroeconomic policy configurations that help the economies to dampen the volatilities in both investment and real exchange rate. These economies' sizeable amount of international reserves holding appears to help enhance the stabilizing effect of the trilemma policy choices, which explains the recent phenomenal buildup of international reserves in the region.

Appendix 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.[41]

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.[42,43]

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:

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

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[41] 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*.

[42] 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.

[43] We note one important caveat about this index. Among some countries and in some years, especially early ones, 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 ($corr(i_i, i_j)$ in the formula) undefined. Since we treat the undefined *corr* the same as zero, it makes the MI index value 0.5. One may think that the policy interest rate being constant (regardless of the base country's interest rate) is a sign of monetary independence. However, it can reflect the possibilities not only that 1) the home country's monetary policy is independent from the base country's; but also 2) the home country uses other tools to implement monetary policy than manipulating the interest rates, such as changing the required reserve ratios and providing some window guidance (while leaving the policy interest rate unchanged); and/or that 3) the home country implements a strong control on financial intermediary, including credit rationing, that makes the policy interest rate appear constant. To make the matter more complicated, some countries have used 2) and 3) to exercise monetary independence while others have used them while strictly following the base country's monetary policy. The bottom line is that it is impossible to incorporate these issues in the calculation of MI without over- or under-estimating the degree of monetary independence. Therefore, assigning an MI value of 0.5 for such a case should be a reasonable compromise. However, it does not preclude the necessity of robustness checks on the index, which we plan to undertake.

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.[44] 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.[45] Higher values of this 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.[46] 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.[47] 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.[48]

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.[49] The data set we examine does not include the United States.

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[44] 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.

[45] 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).

[46] 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.

[47] This index is described in greater detail in Chinn and Ito (2008).

[48] *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.

[49] 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 *MI* and *ERS* are updated to 2008 while *KAOPEN* is updated only to 2007 because the information ion *AREAER* is available up to 2007.

Appendix 2: List of "Asian Economies" in the Sample

	Emerging Market Economies (EMG)
Armenia*	0
Azerbaijan*	0
Bangladesh	0
Bhutan*	0
Cambodia	1
China	1
Fiji	0
Georgia	0
Hong Kong, China	1
India	1
Indonesia	1
Kazakhstan*	0
Kyrgyz Republic*	0
Korea, Rep.	1
Lao PDR	0
Malaysia	1
Maldives*	0
Micronesia, Fed. Sts.*	0
Mongolia	0
Myanmar*	0
Nepal	0
Pakistan	0
Papua New Guinea*	0
Philippines	1
Samoa*	0
Singapore	1
Solomon Islands	0
Sri Lanka	0
Tajikistan*	0
Thailand	1
Tonga*	0
Turkmenistan*	0
Uzbekistan	0
Vietnam	1

Note: * - not included in the regression estimations

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Table 1-1: The Impact of the Trilemma Configurations on Economic Growth: Less Developed Countries (LDC)

	(1) Pooled	(2) FE	(3) sys-GMM	(4) Pooled	(5) FE	(6) sys-GMM	(7) Pooled	(8) FE	(9) sys-GMM
Ln initial income per capita	-0.003	-0.031	0.007	-0.003	-0.033	0.014	-0.003	-0.031	0.011
	[0.003]	[0.007]***	[0.011]	[0.003]	[0.007]***	[0.013]	[0.003]	[0.007]***	[0.012]
Investment as % of GDP, WDI	0.115	0.085	0.176	0.114	0.072	0.172	0.113	0.072	0.172
	[0.018]***	[0.028]***	[0.041]***	[0.018]***	[0.030]**	[0.041]***	[0.018]***	[0.029]**	[0.042]***
Total years of schooling	0.001	0.001	-0.003	0.001	0.002	-0.004	0.001	0.001	-0.003
(Barro-Lee)	[0.001]	[0.003]	[0.003]	[0.001]	[0.003]	[0.003]	[0.001]	[0.003]	[0.003]
Population growth	-0.49	0.075	-0.449	-0.497	0.101	-0.349	-0.504	0.102	-0.284
	[0.238]**	[0.258]	[0.363]	[0.241]**	[0.274]	[0.383]	[0.240]**	[0.250]	[0.363]
Private credit creation	0.023	-0.008	0.023	0.024	-0.004	0.02	0.023	-0.01	0.019
	[0.006]***	[0.012]	[0.020]	[0.006]***	[0.012]	[0.021]	[0.006]***	[0.012]	[0.021]
Trade openness	-0.005	0.006	-0.016	-0.005	0.006	-0.016	-0.006	0.008	-0.015
	[0.003]	[0.009]	[0.016]	[0.003]*	[0.010]	[0.011]	[0.003]*	[0.009]	[0.013]
Monetary Independence (MI)	0.01	0.003	0.02	0.009	0.005	0.017			
	[0.011]	[0.012]	[0.024]	[0.011]	[0.013]	[0.021]			
Exch. rate stability (ERS)	0.007	0.028	0.006				0.005	0.026	0.001
	[0.005]	[0.007]***	[0.016]				[0.005]	[0.007]***	[0.014]
Capital Account Openness (KAOPEN)				0.007	0.018	-0.014	0.006	0.016	-0.013
				[0.005]	[0.007]**	[0.014]	[0.005]	[0.007]**	[0.013]
Observations	417	417	417	417	417	417	417	417	417
Adjusted R-squared	0.23	0.42		0.23	0.41		0.23	0.41	
Hansen test of overident. (p-value)			0.639			0.586			0.583
Arellano-Bond test for AR(2) (p-value)			0.315			0.121			0.161

Robust standard errors in brackets* significant at 10%; ** significant at 5%; *** significant at 1%. For the fixed effects estimation, country and time fixed effects are included and robust standard errors are clustered by country. The system GMM estimation is conducted using two step method and Windmeijer standard errors with finite-sample correction and treating all explanatory variables treated as endogenous and instrumented using 2nd lag. The Hansen test is conducted against the null hypothesis of no overidentifying restrictions, and the Arellano-Bond test is conducted to test the null hypothesis of no serial correlation for AR(2) errors.

Table 1-2: The Impact of the Trilemma Configurations on Economic Growth: Emerging Market Countries (EMG)

	(1) Pooled	(2) FE	(3) sys-GMM	(4) Pooled	(5) FE	(6) sys-GMM	(7) Pooled	(8) FE	(9) sys-GMM
Ln initial income per capita	-0.012	-0.035	-0.029	-0.014	-0.034	-0.023	-0.013	-0.031	-0.028
	[0.004]***	[0.006]***	[0.027]	[0.003]***	[0.007]***	[0.022]	[0.004]***	[0.007]***	[0.029]
Investment as % of GDP, WDI	0.171	0.143	0.248	0.168	0.137	0.266	0.164	0.125	0.24
	[0.026]***	[0.039]***	[0.062]***	[0.026]***	[0.038]***	[0.049]***	[0.027]***	[0.038]***	[0.070]***
Total years of schooling	0.002	0.002	0.005	0.001	0.003	0.003	0.001	0.002	0.004
(Barro-Lee)	[0.001]	[0.004]	[0.004]	[0.001]	[0.004]	[0.005]	[0.001]	[0.004]	[0.004]
Population growth	-0.977	-0.09	-1.883	-1.027	-0.256	-1.485	-1.003	-0.237	-1.636
	[0.367]***	[0.777]	[1.159]$^{11\%}$	[0.375]***	[0.745]	[1.029]	[0.373]***	[0.732]	[1.154]
Private credit creation	0.011	-0.018	-0.001	0.013	-0.017	-0.007	0.012	-0.021	-0.014
	[0.007]	[0.019]	[0.038]	[0.007]*	[0.020]	[0.034]	[0.007]*	[0.019]	[0.041]
Trade openness	0.004	0.016	0.014	0.002	0.023	0.015	0.003	0.023	0.017
	[0.003]	[0.008]*	[0.016]	[0.003]	[0.010]**	[0.014]	[0.003]	[0.010]**	[0.016]
Monetary Independence (MI)	0.012	0.013	0.035	0.015	0.016	0.018			
	[0.013]	[0.016]	[0.058]	[0.014]	[0.016]	[0.037]			
Exch. rate stability (ERS)	0.007	0.022	0.013				0.006	0.019	0.007
	[0.009]	[0.008]***	[0.037]				[0.009]	[0.008]*	[0.033]
Capital Account Openness (KAOPEN)				0.009	0.025	0.006	0.007	0.022	0.017
				[0.007]	[0.012]**	[0.018]	[0.006]	[0.011]*	[0.023]
Observations	196	196	196	196	196	196	196	196	196
Adjusted R-squared	0.32	0.47		0.33	0.48		0.32	0.49	
Hansen test of overident. (p-value)			1.00			1.00			1.00
Arellano-Bond test for AR(2) (p-value)			0.786			0.507			0.715

Robust standard errors in brackets* significant at 10%; ** significant at 5%; *** significant at 1%. For the fixed effects estimation, country and time fixed effects are included and robust standard errors are clustered by country. The system GMM estimation is conducted using two step method and Windmeijer standard errors with finite-sample correction and treating all explanatory variables treated as endogenous and instrumented using 2nd lag. The Hansen test is conducted against the null hypothesis of no overidentifying restrictions, and the Arellano-Bond test is conducted to test the null hypothesis of no serial correlation for AR(2) errors.

Table 2-1: The Impact of the Trilemma Configurations and External Financing on Economic Growth: Less Developed Countries (LDC)

	(1) Pooled	(2) FE	(3) sys-GMM	(4) Pooled	(5) FE	(6) sys-GMM	(7) Pooled	(8) FE	(9) sys-GMM
Private credit creation	0.03	-0.004	0.042	0.03	0.004	0.045	0.03	-0.007	0.048
	[0.007]***	[0.017]	[0.023]*	[0.007]***	[0.018]	[0.023]*	[0.007]***	[0.016]	[0.022]**
Trade openness	-0.008	0.016	-0.021	-0.008	0.017	-0.029	-0.009	0.022	-0.015
	[0.005]	[0.011]	[0.015]	[0.005]	[0.012]	[0.015]*	[0.005]*	[0.011]*	[0.019]
Monetary Independence (MI)	0.013	0.003	0.016	0.013	0.005	0.018			
	[0.013]	[0.012]	[0.024]	[0.013]	[0.013]	[0.025]			
Exch. rate stability	0.002	0.028	-0.018				0.001	0.026	-0.013
	[0.005]	[0.007]***	[0.024]				[0.005]	[0.007]***	[0.022]
KA Openness				0.004	0.018	-0.002	0.003	0.016	-0.013
				[0.006]	[0.007]**	[0.013]	[0.005]	[0.007]**	[0.017]
Net FDI inflows/GDP	0.069	-0.002	0.127	0.061	-0.044	0.168	0.059	-0.038	0.214
	[0.100]	[0.108]	[0.241]	[0.101]	[0.107]	[0.188]	[0.104]	[0.108]	[0.231]
Net portfolio inflows/GDP	0.094	0.132	0.456	0.094	0.155	0.423	0.111	0.15	0.456
	[0.103]	[0.109]	[0.478]	[0.105]	[0.123]	[0.406]	[0.101]	[0.122]	[0.374]
Net 'other' inflows/GDP	0.079	0.023	0.127	0.073	0.016	0.154	0.07	0.002	0.131
	[0.053]	[0.072]	[0.092]	[0.053]	[0.076]	[0.079]*	[0.053]	[0.071]	[0.083]$^{12\%}$
Short-term Debt	-0.041	-0.003	-0.061	-0.042	-0.007	-0.047	-0.042	-0.005	-0.054
(as % of total external debt)	[0.019]**	[0.018]	[0.063]	[0.019]**	[0.019]	[0.041]	[0.019]**	[0.018]	[0.049]
Total debt service	-0.176	-0.052	-0.193	-0.18	-0.078	-0.207	-0.177	-0.049	-0.111
(as % of GNI)	[0.049]***	[0.091]	[0.119]$^{11\%}$	[0.049]***	[0.092]	[0.131]$^{12\%}$	[0.050]***	[0.087]	[0.120]
Observations	325	325	325	325	325	325	325	325	325
Adjusted R-squared	0.27	0.42		0.27	0.41		0.27	0.43	
Hansen test of overident. (p-value)			0.973			0.968			0.979
Arellano-Bond test for AR(2) (p-value)			0.436			0.152			0.166

Notes: The estimation models do include the benchmark macroeconomic variables and other characteristic dummies though their estimation results are omitted to conserve space. Robust standard errors in brackets* significant at 10%; ** significant at 5%; *** significant at 1%. For the fixed effects estimation, country and time fixed effects are included and robust standard errors are clustered by country. The system GMM estimation is conducted using two step method and Windmeijer standard errors with finite-sample correction and treating all explanatory variables treated as endogenous and instrumented using 2nd lag. The Hansen test is conducted against the null hypothesis of no overidentifying restrictions, and the Arellano-Bond test is conducted to test the null hypothesis of no serial correlation for AR(2) errors.

Table 2-2: The Impact of the Trilemma Configurations and External Financing on Economic Growth: Emerging Market Countries (EMG)

	(1) Pooled	(2) FE	(3) sys-GMM	(4) Pooled	(5) FE	(6) sys-GMM	(7) Pooled	(8) FE	(9) sys-GMM
Private credit creation	0.018	0.005	0.146	0.02	0.006	0.059	0.019	-0.003	-0.01
	[0.009]*	[0.024]	[0.124]	[0.010]**	[0.027]	[0.154]	[0.009]**	[0.024]	[0.117]
Trade openness	0.01	0.02	-0.061	0.009	0.027	-0.076	0.01	0.03	-0.114
	[0.008]	[0.010]*	[0.135]	[0.007]	[0.017]	[0.127]	[0.007]	[0.016]*	[0.140]
Monetary Independence (MI)	0.005	0.005	-0.023	0.006	0.006	-0.101			
	[0.015]	[0.017]	[0.101]	[0.016]	[0.019]	[0.131]			
Exch. rate stability	0.009	0.021	0.056				0.008	0.019	0.046
	[0.008]	[0.007]***	[0.041]				[0.007]	[0.007]**	[0.040]
KA Openness				0.006	0.018	0.048	0.005	0.016	0.024
				[0.008]	[0.015]	[0.019]**	[0.007]	[0.014]	[0.047]
Net FDI inflows/GDP	0.143	0.069	0.651	0.134	0.01	-0.142	0.125	0.015	0.475
	[0.132]	[0.114]	[1.153]	[0.129]	[0.136]	[1.205]	[0.131]	[0.138]	[1.150]
Net portfolio inflows/GDP	0.241	0.163	0.861	0.249	0.226	0.482	0.24	0.181	0.688
	[0.126]*	[0.114]	[0.600]	[0.130]*	[0.135]	[0.896]	[0.128]*	[0.127]	[1.765]
Net 'other' inflows/GDP	0.11	0.112	0.463	0.104	0.101	0.36	0.109	0.092	0.084
	[0.084]	[0.116]	[0.124]***	[0.085]	[0.125]	[0.393]	[0.083]	[0.120]	[0.360]
Short-term Debt	-0.027	0	0.03	-0.03	-0.01	-0.139	-0.028	-0.003	-0.075
(as % of total external debt)	[0.023]	[0.023]	[0.085]	[0.023]	[0.024]	[0.124]	[0.023]	[0.022]	[0.193]
Total debt service	-0.284	-0.139	0.466	-0.284	-0.134	-0.163	-0.286	-0.117	0.25
(as % of GNI)	[0.068]***	[0.123]	[0.877]	[0.069]***	[0.126]	[1.124]	[0.068]***	[0.121]	[0.990]
Observations	150	150	150	150	150	150	150	150	150
Adjusted R-squared	0.42	0.49		0.42	0.48		0.43	0.50	
Hansen test of overident. (p-value)			1.00			1.00			1.00
Arellano-Bond test for AR(2) (p-value)			0.904			0.695			0.492

Notes: The estimation models do include the benchmark macroeconomic variables and other characteristic dummies though their estimation results are omitted to conserve space. Robust standard errors in brackets* significant at 10%; ** significant at 5%; *** significant at 1%. For the fixed effects estimation, country and time fixed effects are included and robust standard errors are clustered by country. The system GMM estimation is conducted using two step method and Windmeijer standard errors with finite-sample correction and treating all explanatory variables treated as endogenous and instrumented using 2nd lag. The Hansen test is conducted against the null hypothesis of no overidentifying restrictions, and the Arellano-Bond test is conducted to test the null hypothesis of no serial correlation for AR(2) errors.

Table 3-1: The Macroeconomic Impact of the Trilemma Configurations: Less Developed Countries (LDC)

	Output volatility			Inflation volatility			Level of inflation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relative Income	-0.059	-0.056	-0.064	-0.071	-0.069	-0.061	-0.125	-0.068	-0.096
	[0.019]***	[0.019]***	[0.019]***	[0.025]***	[0.026]***	[0.026]**	[0.046]***	[0.049]	[0.047]**
Relative Income, sq.	0.094	0.094	0.112	0.072	0.061	0.049	0.207	0.123	0.167
	[0.022]***	[0.024]***	[0.024]***	[0.032]**	[0.034]*	[0.034]	[0.055]***	[0.060]**	[0.058]***
Change in US real interest rate	0.126	0.126	0.132						
	[0.041]***	[0.042]***	[0.041]***						
Volatility of TOT*OPN	0.03	0.03	0.027	0.012	0.015	0.012	0	-0.001	-0.002
	[0.007]***	[0.007]***	[0.007]***	[0.010]	[0.010]	[0.010]	[0.016]	[0.017]	[0.016]
Inflation volatility	0.026	0.024	0.027	0.235	0.23	0.236	0.336	0.317	0.328
(or rate of inflation in (4)-(6))	[0.006]***	[0.006]***	[0.006]***	[0.010]***	[0.010]***	[0.010]***	[0.014]***	[0.014]***	[0.014]***
Fiscal Procyclicality	0.004	0.004	0.004				0.002	0.005	0.002
	[0.002]**	[0.002]**	[0.002]**				[0.004]	[0.004]	[0.004]
Relative oil price shocks				0.003	0.004	0.003	0.029	0.023	0.026
				[0.003]	[0.003]	[0.003]	[0.005]***	[0.005]***	[0.005]***
World Output Gap							0.641	0.396	0.601
							[0.273]**	[0.282]	[0.267]**
Trade openness							-0.012	-0.016	-0.011
							[0.007]*	[0.007]**	[0.007]*
M2 growth							0.381	0.419	0.373
							[0.019]***	[0.019]***	[0.019]***
Private credit creation	-0.002	-0.004	-0.001				-0.008	-0.004	-0.011
	[0.005]	[0.005]	[0.005]				[0.012]	[0.012]	[0.012]
Total Reserve (as % of GDP)	0.059	0.015	0.067	0.032	-0.016	-0.023	-0.085	-0.08	-0.142
	[0.038]	[0.032]	[0.024]***	[0.055]	[0.046]	[0.033]	[0.091]	[0.079]	[0.055]***
Monetary Independence (MI)	-0.013	-0.019		-0.003	-0.008		0.012	0.017	
	[0.011]	[0.011]*		[0.016]	[0.016]		[0.027]	[0.027]	
MI x reserves	-0.026	0.012		-0.057	-0.031		-0.019	-0.027	
	[0.063]	[0.060]		[0.090]	[0.086]		[0.148]	[0.146]	
Exchange Rate Stability (ERS)	0.006		0.009	0.015		0.014	-0.058		-0.06
	[0.005]		[0.005]*	[0.008]*		[0.007]*	[0.013]***		[0.012]***
ERS x reserves	-0.06		-0.067	-0.028		-0.013	0.074		0.083
	[0.031]**		[0.029]**	[0.043]		[0.041]	[0.072]		[0.067]
KA Openness		-0.003	0		0.002	0.002		-0.048	-0.045
		[0.005]	[0.005]		[0.008]	[0.007]		[0.013]***	[0.012]***
KAOPEN x reserves		-0.008	-0.027		0.028	0.035		0.126	0.1
		[0.025]	[0.024]		[0.034]	[0.034]		[0.062]**	[0.058]*
Observations	417	417	417	417	417	417	417	417	417
Adjusted R-squared	0.26	0.25	0.26	0.64	0.63	0.64	0.84	0.83	0.84

Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The regional dummies are included in the regressions for output and inflation, so is the dummy for oil exporters in the output volatility regression. But the estimated coefficients of these dummies are not reported to conserve space..

Table 3-2: The Macroeconomic Impact of the Trilemma Configurations: Emerging Market Countries (EMG)

	Output volatility			Inflation volatility			Level of inflation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relative Income	-0.043	-0.031	-0.043	-0.076	-0.08	-0.076	-0.074	-0.022	-0.044
	[0.024]*	[0.025]	[0.025]*	[0.033]**	[0.035]**	[0.036]**	[0.084]	[0.080]	[0.084]
Relative Income, sq.	0.058	0.041	0.058	0.085	0.081	0.075	0.12	0.078	0.096
	[0.030]*	[0.033]	[0.034]*	[0.042]**	[0.048]*	[0.051]	[0.104]	[0.102]	[0.108]
Change in US real interest rate	0.157	0.145	0.155						
	[0.049]***	[0.050]***	[0.049]***						
Volatility of TOT*OPN	0.021	0.025	0.02	0.098	0.104	0.095	0.063	0.034	0.047
	[0.013]	[0.013]*	[0.013]	[0.018]***	[0.018]***	[0.019]***	[0.040]	[0.037]	[0.037]
Inflation volatility	0.038	0.036	0.037	0.202	0.207	0.21	0.348	0.387	0.38
(or rate of inflation in (4)-(6))	[0.007]***	[0.007]***	[0.007]***	[0.011]***	[0.011]***	[0.011]***	[0.022]***	[0.021]***	[0.021]***
Fiscal Procyclicality	0.003	0.003	0.003				-0.003	-0.003	-0.004
	[0.002]	[0.002]	[0.002]				[0.007]	[0.006]	[0.006]
Relative oil price shocks				-0.002	-0.001	-0.001	0.01	0.003	0.006
				[0.004]	[0.004]	[0.004]	[0.008]	[0.007]	[0.007]
World Output Gap							0.911	0.778	0.855
							[0.412]**	[0.380]**	[0.385]**
Trade openness							0	0.002	0.002
							[0.010]	[0.010]	[0.010]
M2 volatility							0.455	0.424	0.415
							[0.028]***	[0.027]***	[0.027]***
Private credit creation	-0.002	-0.005	-0.002				-0.02	-0.026	-0.026
	[0.005]	[0.005]	[0.005]				[0.018]	[0.016]	[0.017]
Total Reserve (as % of GDP)	0.085	0.024	0.059	0.027	0.004	-0.019	-0.164	-0.087	-0.106
	[0.036]**	[0.035]	[0.023]**	[0.053]	[0.050]	[0.034]	[0.111]	[0.096]	[0.068]
Monetary Independence (MI)	-0.008	-0.016		-0.001	0		-0.022	-0.028	
	[0.013]	[0.014]		[0.020]	[0.020]		[0.040]	[0.038]	
MI x reserves	-0.048	-0.007		-0.063	-0.046		0.099	0.039	
	[0.060]	[0.059]		[0.086]	[0.085]		[0.179]	[0.165]	
Exchange Rate Stability (ERS)	0.011		0.012	0.009		0.007	-0.053		-0.04
	[0.007]*		[0.007]*	[0.010]		[0.010]	[0.021]**		[0.020]**
ERS x reserves	-0.073		-0.066	-0.013		-0.003	0.12		0.096
	[0.032]**		[0.030]**	[0.045]		[0.044]	[0.095]		[0.087]
KA Openness		-0.005	-0.002		0.008	0.007		-0.047	-0.043
		[0.006]	[0.006]		[0.009]	[0.009]		[0.017]***	[0.017]**
KAOPEN x reserves		0.013	0.004		0.01	0.016		0.037	0.025
		[0.026]	[0.025]		[0.038]	[0.038]		[0.077]	[0.077]
Observations	196	196	196	196	196	196	196	196	196
Adjusted R-squared	0.3	0.27	0.29	0.74	0.74	0.74	0.87	0.89	0.89

Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The regional dummies are included in the regressions for output and inflation, so is the dummy for oil exporters in the output volatility regression. But the estimated coefficients of these dummies are not reported to conserve space.

Table 4-1: The Impact of the Trilemma Configurations and External Financing: Less Developed Countries (LDC)

	Output volatility			Inflation volatility			Level of inflation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Currency Crisis	0.005	0.005	0.005	0.01	0.011	0.011	0.031	0.032	0.029
	[0.003]*	[0.003]*	[0.003]*	[0.004]**	[0.004]**	[0.004]**	[0.006]***	[0.007]***	[0.006]***
Private credit creation	-0.003	-0.008	-0.005				-0.018	-0.014	-0.019
	[0.006]	[0.006]	[0.007]				[0.017]	[0.017]	[0.016]
Total Reserve (as % of GDP)	0.072	-0.055	0.065	0.026	0.005	-0.065	-0.053	-0.182	-0.198
	[0.052]	[0.052]	[0.034]*	[0.079]	[0.079]	[0.053]	[0.122]	[0.123]	[0.076]***
Monetary Independence (MI)	-0.019	-0.035		-0.011	-0.016		-0.002	-0.017	
	[0.014]	[0.014]**		[0.021]	[0.022]		[0.033]	[0.034]	
MI x reserves	0.005	0.112		-0.108	-0.064		-0.04	0.055	
	[0.085]	[0.089]		[0.128]	[0.136]		[0.199]	[0.208]	
Exchange Rate Stability (ERS)	0.008		0.012	0.005		0.006	-0.04		-0.04
	[0.007]		[0.006]*	[0.010]		[0.010]	[0.016]**		[0.015]***
ERS x reserves	-0.086		-0.095	0.045		0.054	0.074		0.071
	[0.044]*		[0.044]**	[0.067]		[0.067]	[0.104]		[0.098]
KA Openness		-0.02	-0.014		0.003	0		-0.055	-0.055
		[0.008]**	[0.008]*		[0.012]	[0.012]		[0.019]***	[0.018]***
KAOPEN x reserves		0.086	0.048		0.047	0.077		0.261	0.254
		[0.045]*	[0.042]		[0.069]	[0.066]		[0.107]**	[0.097]***
Net FDI inflows/GDP	0.047	0.092	0.109	-0.23	-0.264	-0.272	-0.477	-0.442	-0.441
	[0.068]	[0.071]	[0.070]	[0.102]**	[0.108]**	[0.108]**	[0.177]***	[0.184]**	[0.173]**
Net portfolio inflows/GDP	0.241	0.289	0.286	0.247	0.375	0.388	0.064	0.297	0.228
	[0.122]**	[0.129]**	[0.127]**	[0.183]	[0.194]*	[0.195]**	[0.286]	[0.302]	[0.287]
Net 'other' inflows/GDP	0.069	0.063	0.071	-0.001	-0.026	-0.014	0.037	0.09	0.045
	[0.029]**	[0.029]**	[0.029]**	[0.044]	[0.046]	[0.046]	[0.069]	[0.070]	[0.068]
Short-term Debt	-0.009	-0.008	-0.007	0.016	0.016	0.013	-0.007	-0.003	0.012
(as % of total external debt)	[0.016]	[0.016]	[0.016]	[0.022]	[0.023]	[0.023]	[0.037]	[0.038]	[0.036]
Total debt service	0.063	0.081	0.078	0.12	0.104	0.115	0.176	0.184	0.154
(as % of GNI)	[0.035]*	[0.035]**	[0.035]**	[0.051]**	[0.052]**	[0.052]**	[0.088]**	[0.088]**	[0.086]*
Observations	311	311	311	311	311	311	311	310	310
Adjusted R-squared	0.37	0.39	0.4	0.67	0.66	0.66	0.86	0.86	0.86

Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The dummy for Sub-Saharan countries is included in the regressions for output and inflation volatility, so are the dummies for Latin America and Caribbean and East Europe and Central Asia in the regression for the level of inflation. “Trade openness” that is insignificant is omitted from presentation to conserve space.

Table 4-2: The Impact of the Trilemma Configurations and External Financing: Emerging Market Countries (EMG)

	Output volatility			Inflation volatility			Level of inflation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Currency Crisis	0.004	0.007	0.004	0.003	0.004	0.004	0.024	0.017	0.02
	[0.003]	[0.003]**	[0.004]	[0.005]	[0.005]	[0.005]	[0.010]**	[0.009]*	[0.010]**
Private credit creation	0	-0.005	0.001				-0.037	-0.027	-0.043
	[0.007]	[0.007]	[0.007]				[0.026]	[0.022]	[0.025]*
Total Reserve (as % of GDP)	0.087	-0.043	0.096	-0.003	0.019	-0.038	-0.18	-0.242	-0.176
	[0.055]	[0.056]	[0.035]***	[0.078]	[0.083]	[0.050]	[0.162]	[0.153]	[0.098]*
Monetary Independence (MI)	-0.018	-0.038		-0.007	0.002		-0.037	-0.051	
	[0.017]	[0.018]**		[0.025]	[0.026]		[0.051]	[0.048]	
MI x reserves	0.008	0.096		-0.042	-0.06		0.063	0.14	
	[0.088]	[0.094]		[0.125]	[0.138]		[0.257]	[0.249]	
Exchange Rate Stability (ERS)	0.023		0.028	-0.013		-0.013	-0.06		-0.053
	[0.009]**		[0.009]***	[0.013]		[0.013]	[0.028]**		[0.026]**
ERS x reserves	-0.125		-0.15	0.046		0.05	0.25		0.225
	[0.052]**		[0.051]***	[0.073]		[0.072]	[0.151]**		[0.140]$^{11\%}$
KA Openness		-0.01	-0.002		0.004	0.003		-0.065	-0.045
		[0.009]	[0.009]		[0.014]	[0.013]		[0.024]***	[0.024]*
KAOPEN x reserves		0.062	0.016		0.016	0.03		0.252	0.11
		[0.047]	[0.042]		[0.069]	[0.061]		[0.126]**	[0.121]
Net FDI inflows/GDP	-0.121	-0.105	-0.155	-0.195	-0.215	-0.216	-0.847	-0.598	-0.678
	[0.107]	[0.112]	[0.113]	[0.155]	[0.163]	[0.163]	[0.345]**	[0.324]*	[0.347]*
Net portfolio inflows/GDP	-0.113	-0.048	-0.081	-0.232	-0.132	-0.172	-0.34	-0.06	-0.159
	[0.140]	[0.145]	[0.147]	[0.197]	[0.206]	[0.207]	[0.411]	[0.383]	[0.412]
Net 'other' inflows/GDP	0.025	0.017	0.022	-0.051	-0.051	-0.056	0.016	0.059	0.018
	[0.037]	[0.037]	[0.037]	[0.056]	[0.056]	[0.057]	[0.121]	[0.107]	[0.116]
Short-term Debt	-0.013	-0.008	-0.011	0.036	0.032	0.034	0.047	0.041	0.069
(as % of total external debt)	[0.019]	[0.019]	[0.019]	[0.025]	[0.025]	[0.025]	[0.058]	[0.052]	[0.057]
Total debt service	0.008	0.037	0.011	0.098	0.089	0.099	0.197	0.07	0.206
(as % of GNI)	[0.044]	[0.044]	[0.044]	[0.061]	[0.062]	[0.062]	[0.164]	[0.147]	[0.159]
Observations	154	154	154	151	151	151	151	151	151
Adjusted R-squared	0.45	0.29	0.46	0.77	0.76	0.77	0.88	0.91	0.89

Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The dummy for Sub-Saharan countries is included in the regressions for output and inflation volatility, so are the dummies for Latin America and Caribbean and East Europe and Central Asia in the regression for the level of inflation.

Table 5-1: Determinants of Output Volatility: Less Developed Countries (LDC)

	Investment volatility			Real exchange rate volatility		
	(1)	(2)	(3)	(4)	(5)	(6)
Relative Income	-0.1	-0.15	-0.125	-0.016	0.027	-0.015
	[0.143]	[0.142]	[0.139]	[0.020]	[0.031]	[0.020]
Relative Income, sq.	0.121	0.239	0.211	0.017	-0.041	0.019
	[0.264]	[0.265]	[0.258]	[0.037]	[0.057]	[0.038]
Change in US real interest rate	0.39	0.306	0.259			
	[0.199]*	[0.198]	[0.194]			
Volatility of TOT*OPN	0.095	0.121	0.103	0.008	0.011	0.008
	[0.036]***	[0.036]***	[0.035]***	[0.005]	[0.008]	[0.005]
Inflation volatility	0.134	0.133	0.131	0.038	0.031	0.038
(Infl. vol. differentials in (4)-(6))	[0.025]***	[0.025]***	[0.025]***	[0.003]***	[0.005]***	[0.004]***
Fiscal Procyclicality	-0.001	0.003	0.004			
	[0.009]	[0.009]	[0.009]			
Trade openness				-0.005	-0.011	-0.005
				[0.003]*	[0.004]***	[0.003]*
Currency Crisis	0.01	0.002	0.007	0.009	0.013	0.009
	[0.011]	[0.011]	[0.011]	[0.002]***	[0.002]***	[0.002]***
Private credit creation	-0.011	-0.012	-0.001			
	[0.026]	[0.026]	[0.025]			
Total Reserve (as % of GDP)	-0.229	-0.393	0.158	0.022	0.038	-0.013
	[0.210]	[0.205]*	[0.132]	[0.030]	[0.045]	[0.019]
Monetary Independence (MI)	-0.181	-0.159		0.004	0.024	
	[0.056]***	[0.057]***		[0.008]	[0.012]**	
MI x reserves	1.193	0.785		-0.049	-0.086	
	[0.342]***	[0.351]**		[0.048]	[0.076]	
Exchange Rate Stability (ERS)	0.077		0.07	-0.037		-0.038
	[0.026]***		[0.025]***	[0.004]***		[0.004]***
ERS x reserves	-0.413		-0.254	-0.007		0.001
	[0.179]**		[0.170]	[0.025]		[0.024]
KA Openness		-0.042	-0.012		-0.008	-0.004
		[0.032]	[0.030]		[0.007]	[0.004]
KAOPEN x reserves		0.223	0.051		0.029	0.019
		[0.178]	[0.165]		[0.038]	[0.024]
Net FDI inflows/GDP	0.327	0.347	0.25	-0.041	-0.088	-0.033
	[0.274]	[0.280]	[0.272]	[0.041]	[0.064]	[0.042]
Net portfolio inflows/GDP	1.48	1.414	1.364	0.052	0.046	0.054
	[0.493]***	[0.508]***	[0.494]***	[0.069]	[0.108]	[0.071]
Net 'other' inflows/GDP	0.376	0.38	0.418	-0.028	-0.014	-0.028
	[0.116]***	[0.116]***	[0.112]***	[0.016]*	[0.025]	[0.016]*
Short-term Debt	-0.042	-0.042	-0.042	0.006	0.004	0.007
(as % of total external debt)	[0.063]	[0.063]	[0.062]	[0.008]	[0.013]	[0.008]
Total debt service	0.264	0.232	0.213	0.02	0.081	0.02
(as % of GNI)	[0.140]*	[0.138]*	[0.136]	[0.020]	[0.031]***	[0.021]
Observations	309	309	309	310	310	310
Adjusted R-squared	0.31	0.26	0.25	0.63	0.29	0.63

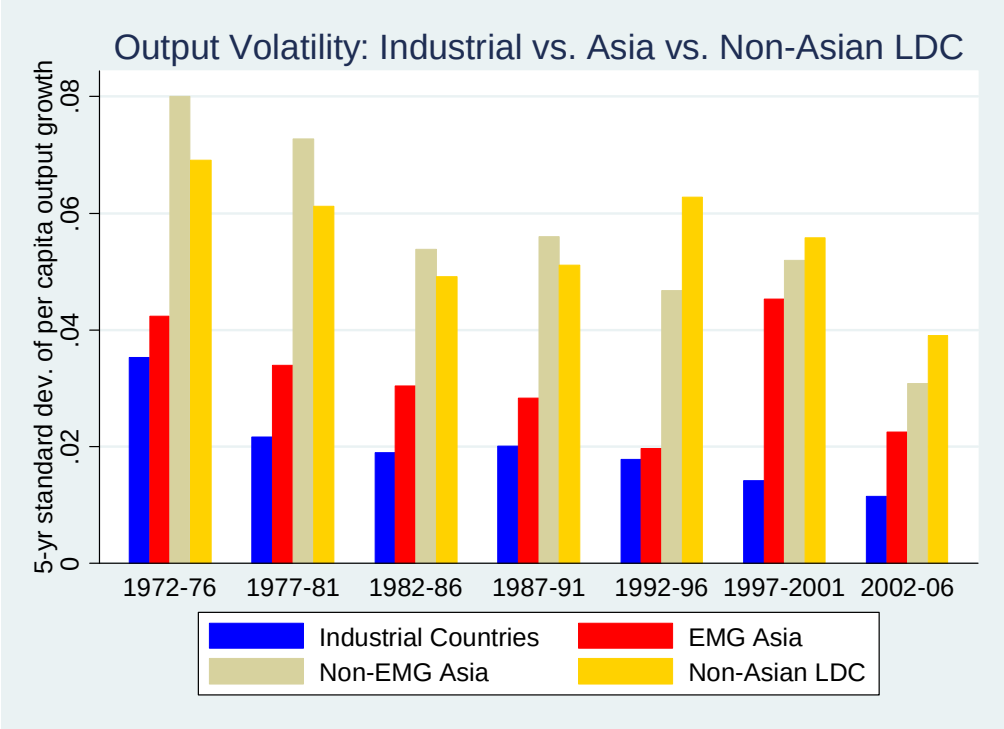
Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The dummy for Sub-Saharan countries is included in the regressions for output and inflation volatility, so are the dummies for Latin America and Caribbean and East Europe and Central Asia in the regression for the level of inflation.

Table 5-2: Determinants of Output Volatility Emerging Market Countries (EMG)

	Investment volatility			Real exchange rate volatility		
	(1)	(2)	(3)	(4)	(5)	(6)
Relative Income	0.237	0.119	0.193	-0.045	0.072	-0.073
	[0.254]	[0.272]	[0.255]	[0.054]	[0.074]	[0.050]
Relative Income, sq.	-0.625	-0.36	-0.452	0.099	-0.108	0.176
	[0.557]	[0.604]	[0.561]	[0.118]	[0.166]	[0.112]
Change in US real interest rate	-0.1	-0.07	-0.134			
	[0.218]	[0.232]	[0.212]			
Volatility of TOT*OPN	-0.098	-0.022	-0.09	0.021	0.002	0.019
	[0.056]*	[0.059]	[0.055]	[0.011]*	[0.016]	[0.010]*
Inflation volatility	0.143	0.151	0.142	0.05	0.038	0.051
(Infl. vol. differentials in (4)-(6))	[0.028]***	[0.029]***	[0.027]***	[0.006]***	[0.008]***	[0.005]***
Fiscal Procyclicality	0.017	0.014	0.02			
	[0.010]	[0.011]	[0.010]*			
Trade openness				-0.004	-0.004	-0.006
				[0.005]	[0.006]	[0.004]
Currency Crisis	0.038	0.033	0.034	0.011	0.013	0.009
	[0.012]***	[0.013]**	[0.012]***	[0.003]***	[0.003]***	[0.002]***
Private credit creation	0.025	0.004	0.033			
	[0.024]	[0.025]	[0.024]			
Total Reserve (as % of GDP)	-0.374	-1.045	0.368	0.035	0.052	0.001
	[0.192]*	[0.211]***	[0.118]***	[0.040]	[0.058]	[0.023]
Monetary Independence (MI)	-0.286	-0.365		0.027	0.042	
	[0.060]***	[0.066]***		[0.013]**	[0.018]**	
MI x reserves	1.867	2.095		-0.068	-0.123	
	[0.306]***	[0.353]***		[0.064]	[0.096]	
Exchange Rate Stability (ERS)	0.127		0.121	-0.039		-0.037
	[0.032]***		[0.030]***	[0.007]***		[0.006]***
ERS x reserves	-0.818		-0.583	-0.012		-0.006
	[0.183]***		[0.173]***	[0.037]		[0.033]
KA Openness		-0.065	0.026		-0.001	-0.009
		[0.034]*	[0.029]		[0.009]	[0.006]
KAOPEN x reserves		0.414	-0.138		-0.013	0.011
		[0.175]**	[0.144]		[0.047]	[0.028]
Net FDI inflows/GDP	-0.216	0.237	-0.433	-0.054	-0.114	0.024
	[0.373]	[0.422]	[0.384]	[0.081]	[0.117]	[0.077]
Net portfolio inflows/GDP	0.76	1.34	0.736	-0.043	-0.149	-0.018
	[0.488]	[0.543]**	[0.497]	[0.102]	[0.147]	[0.097]
Net 'other' inflows/GDP	0.586	0.637	0.6	-0.078	-0.08	-0.056
	[0.131]***	[0.139]***	[0.127]***	[0.027]***	[0.038]**	[0.025]**
Short-term Debt	-0.102	-0.07	-0.113	0.014	-0.002	0.009
(as % of total external debt)	[0.067]	[0.072]	[0.066]*	[0.013]	[0.017]	[0.011]
Total debt service	0.172	0.277	0.182	0.027	0.034	0.032
(as % of GNI)	[0.155]	[0.165]*	[0.151]	[0.038]	[0.052]	[0.035]
Observations	149	149	149	151	151	151
Adjusted R-squared	0.62	0.49	0.49	0.68	0.39	0.69

Robust regressions are implemented. * significant at 10%; ** significant at 5%; *** significant at 1%. The dummy for Sub-Saharan countries is included in the regressions for output and inflation volatility, so are the dummies for Latin America and Caribbean and East Europe and Central Asia in the regression for the level of inflation.

Figure 1: Output Volatility, 1972 – 2006



Notes: Output volatility is measured by five-year standard deviations of the growth rate of per capita output. The data for per capita output are extracted from the PWT database. Appendix 2 shows the countries included as "EMG Asia" or emerging market economies in Asia.

Figure 2: The Trilemma

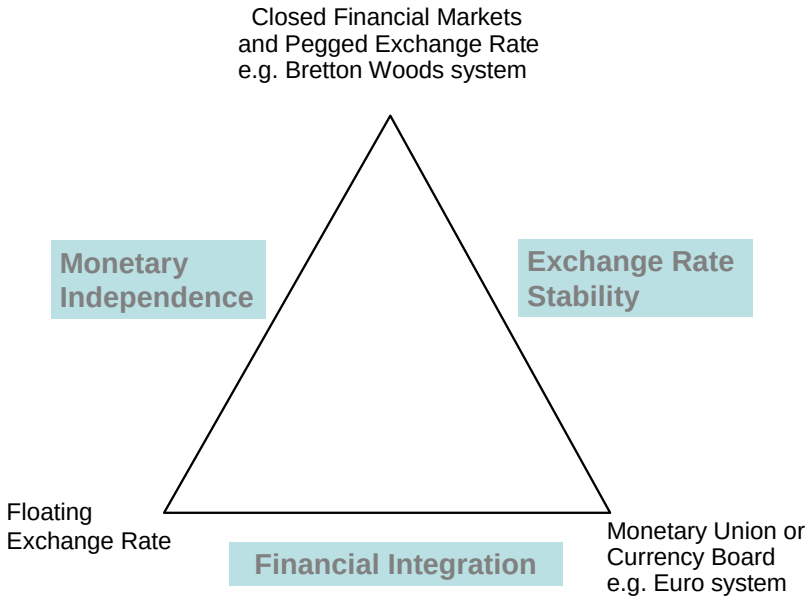
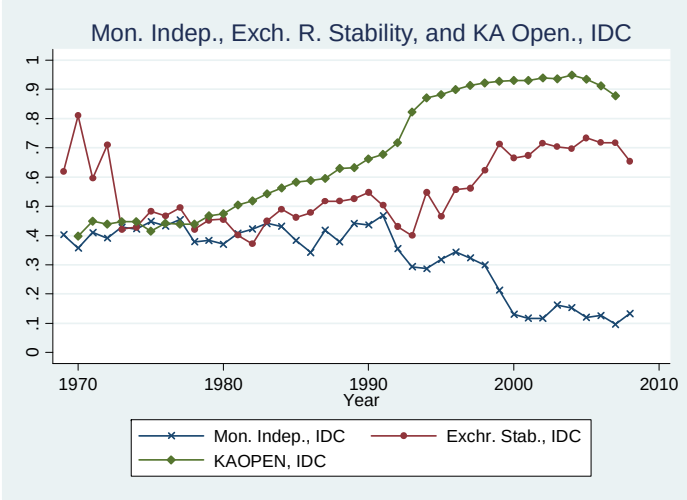
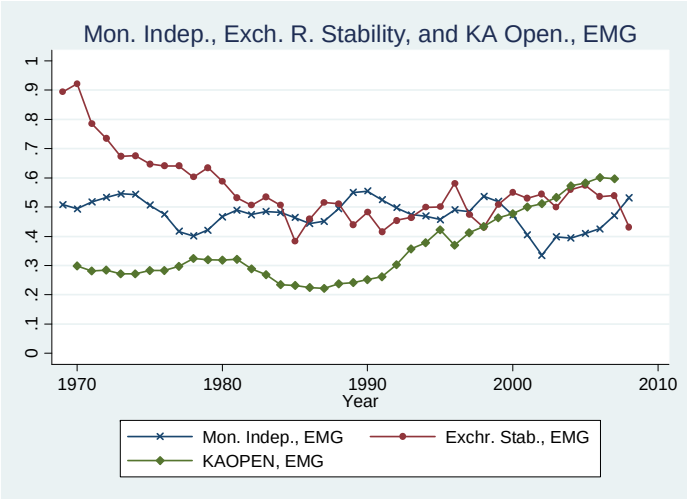


Figure 3: Development of the Trilemma Configurations Over Time

(a) Industrialized Countries



(b) Emerging Market Countries



(c) Non-Emerging Market Developing Countries

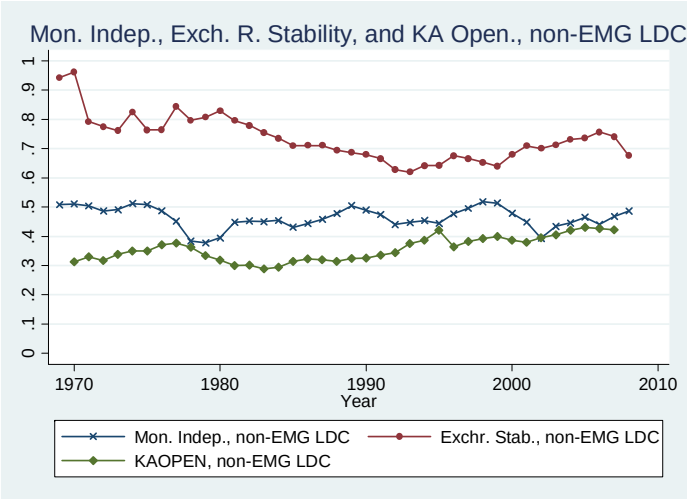


Figure 4: The "Diamond Charts": Variation of the Trilemma and IR Configurations Across Different Country Groups

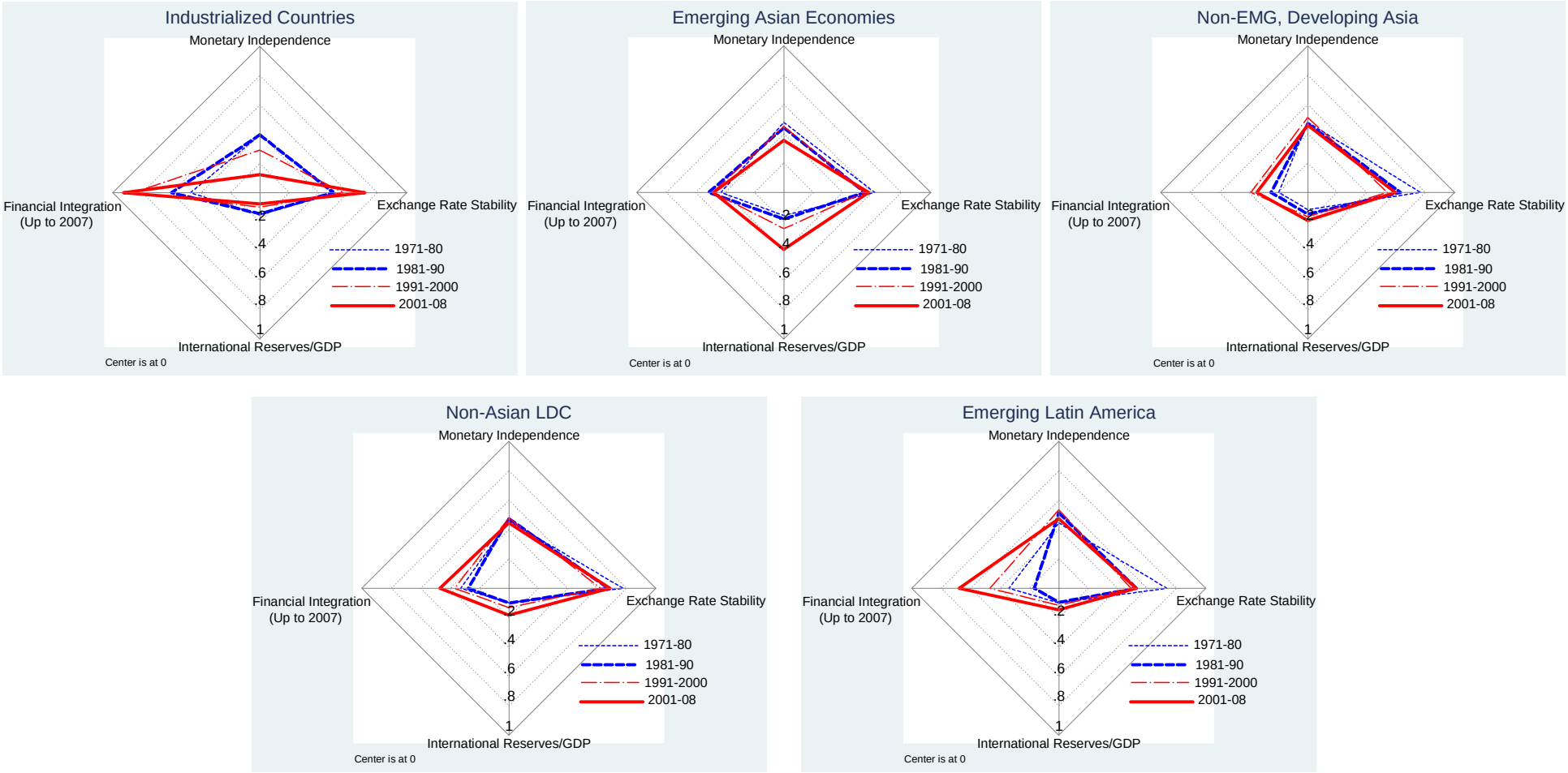
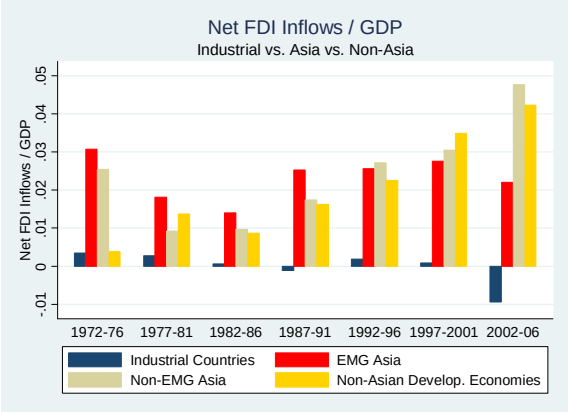
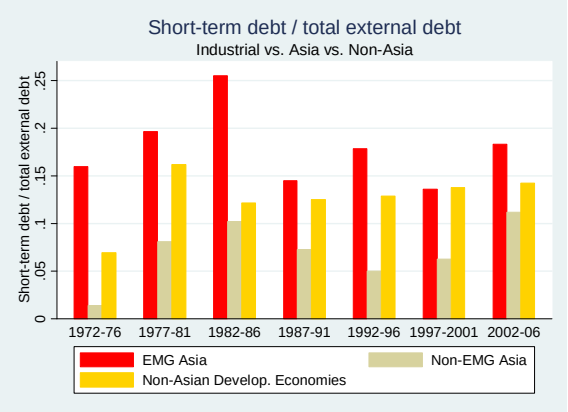
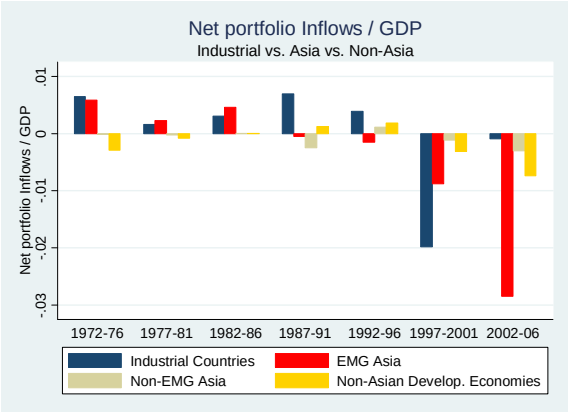
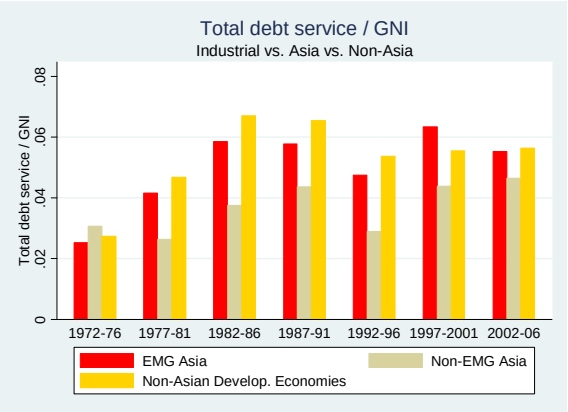


Figure 5: Regional Comparison of Net Capital Inflows









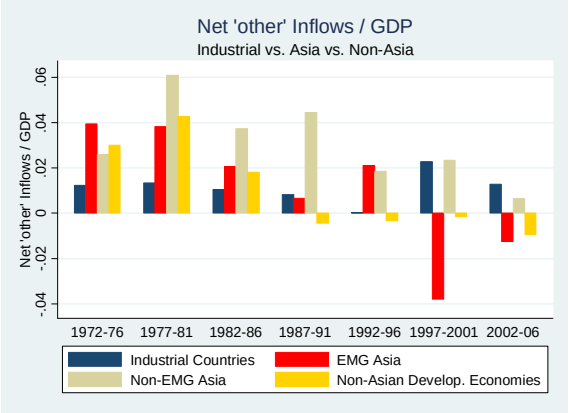
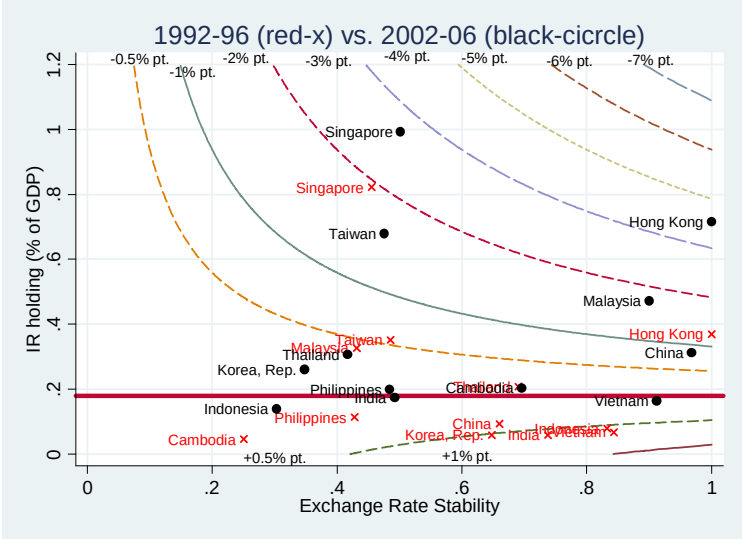
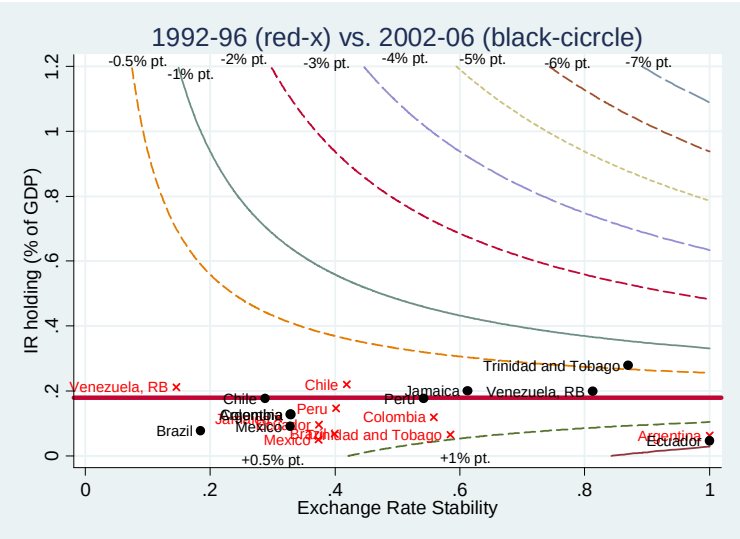


Figure 6: Interactive Effects of Exchange Rate Stability and IR Holding

(a) Asian EMGs



(b) Latin American EMGs



(c) Other EMGs

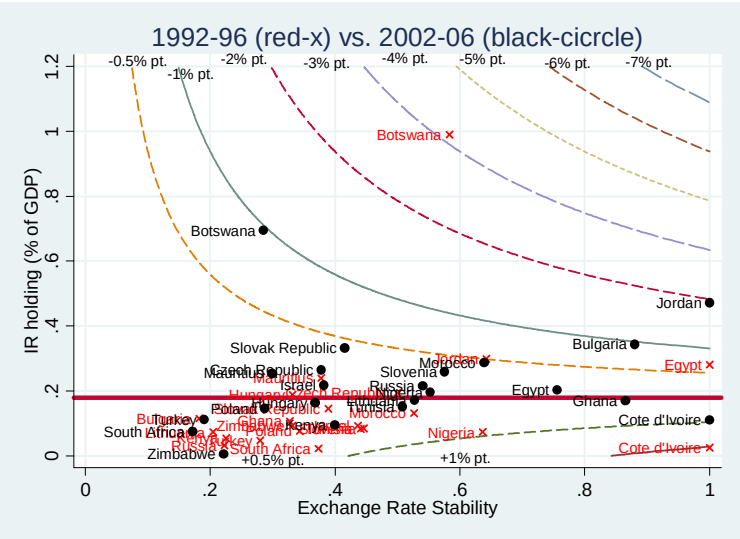


Figure 7: Regional Comparison of Trade Openness and Exchange Rate Stability

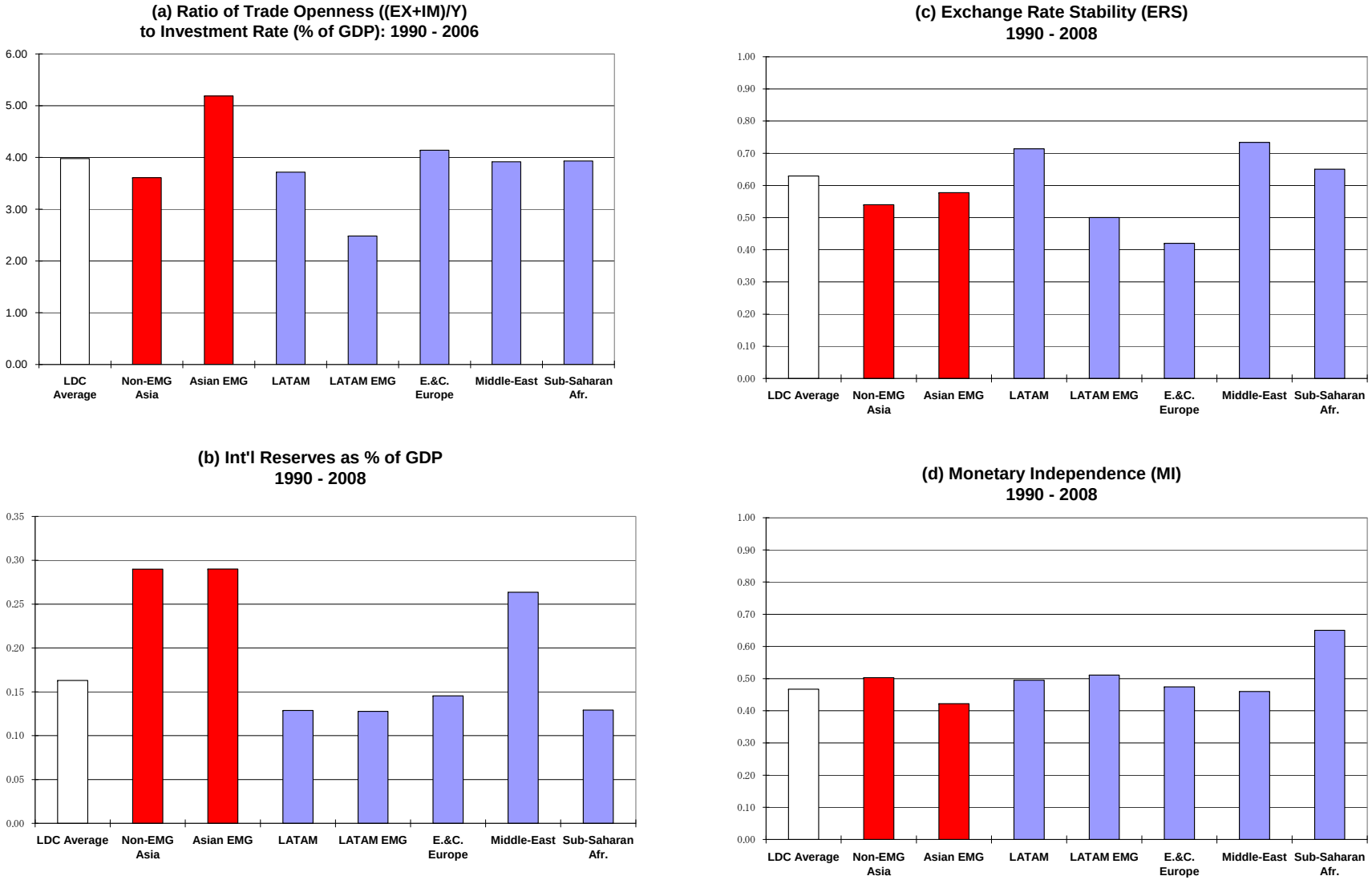
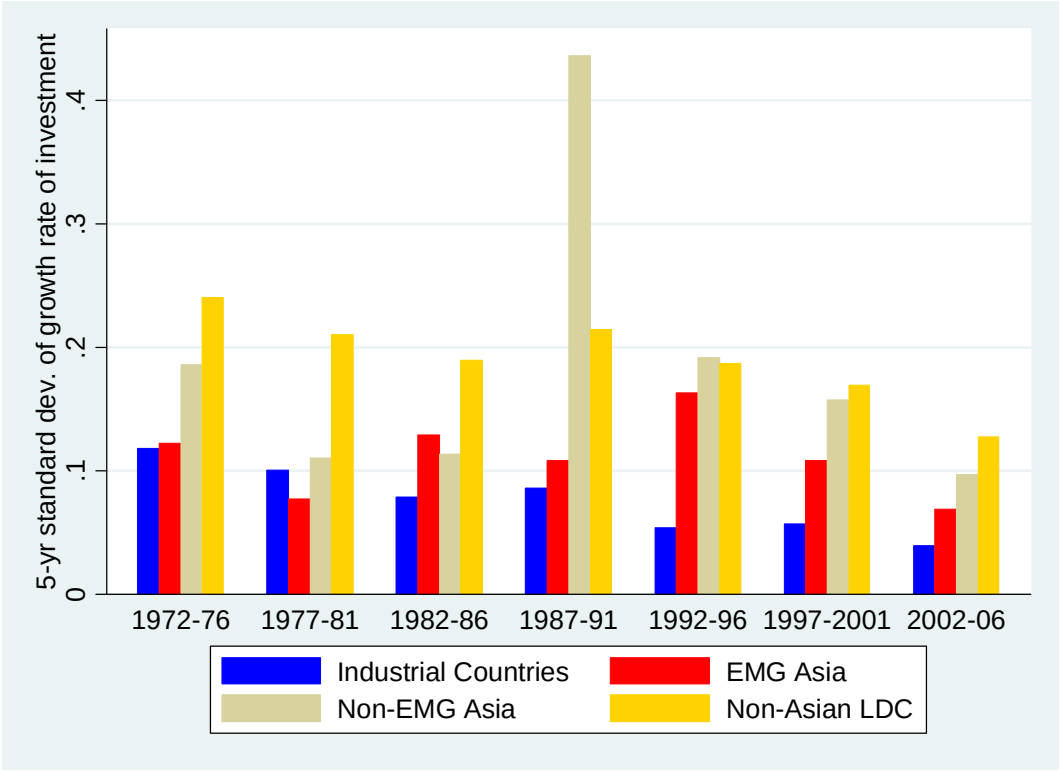


Figure 8: Regional Comparison of Investment Volatility and Real Exchange Rate Volatility

(a) Investment Volatility



(b) Real Exchange Rate Volatility

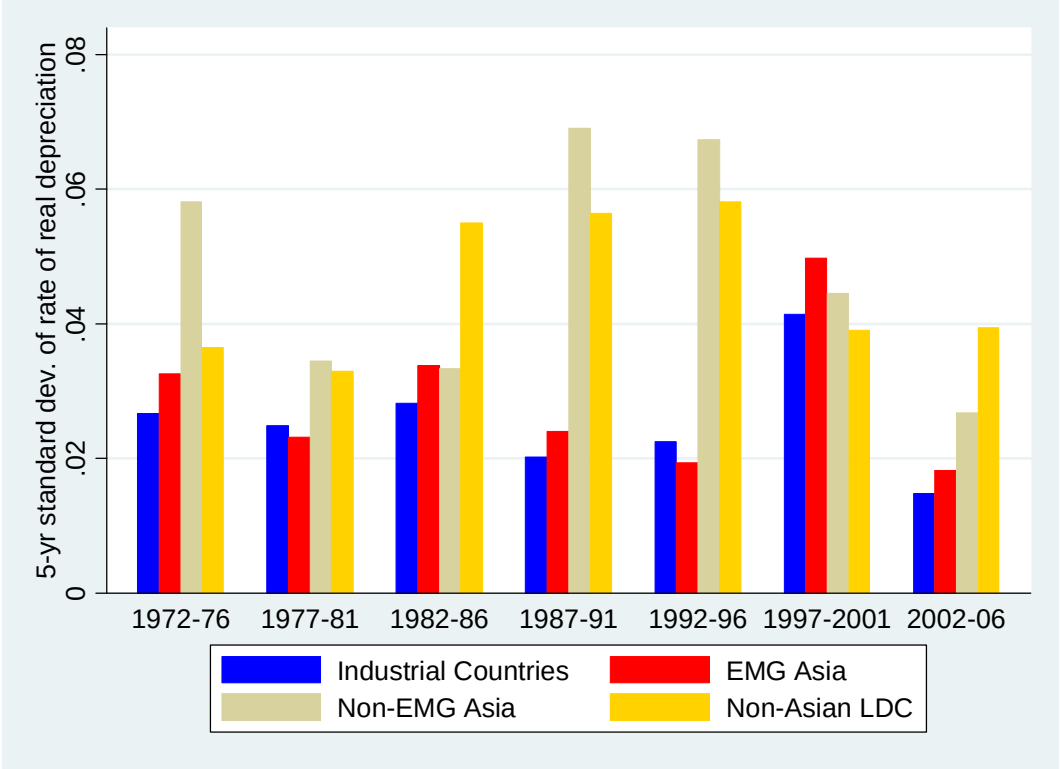
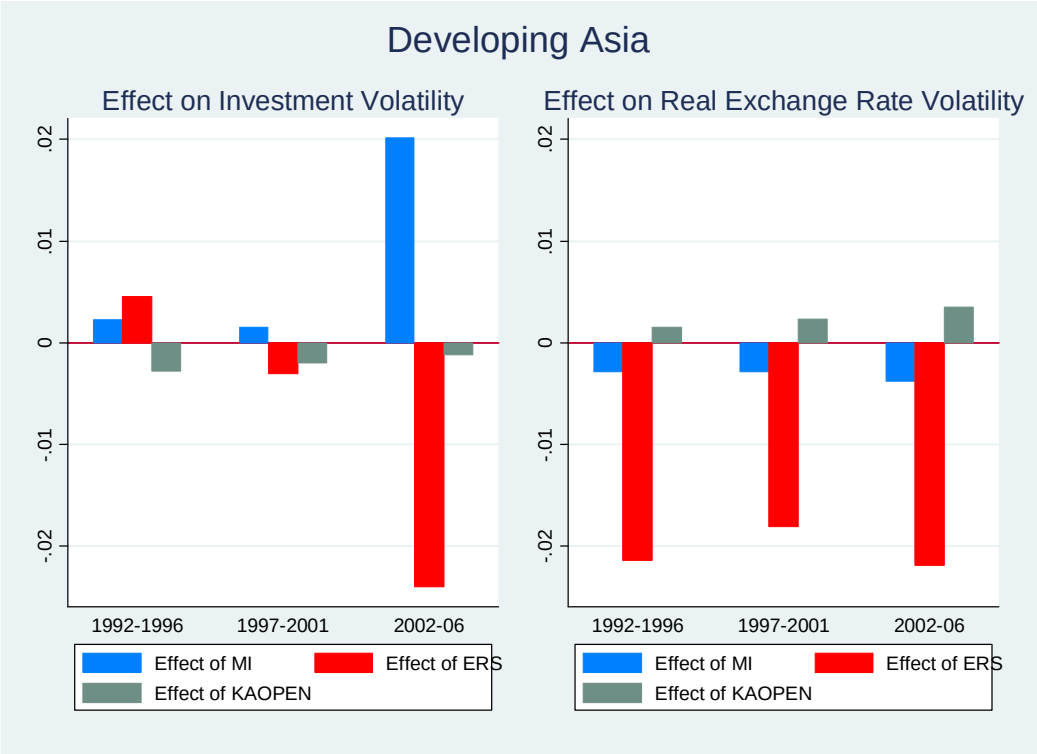
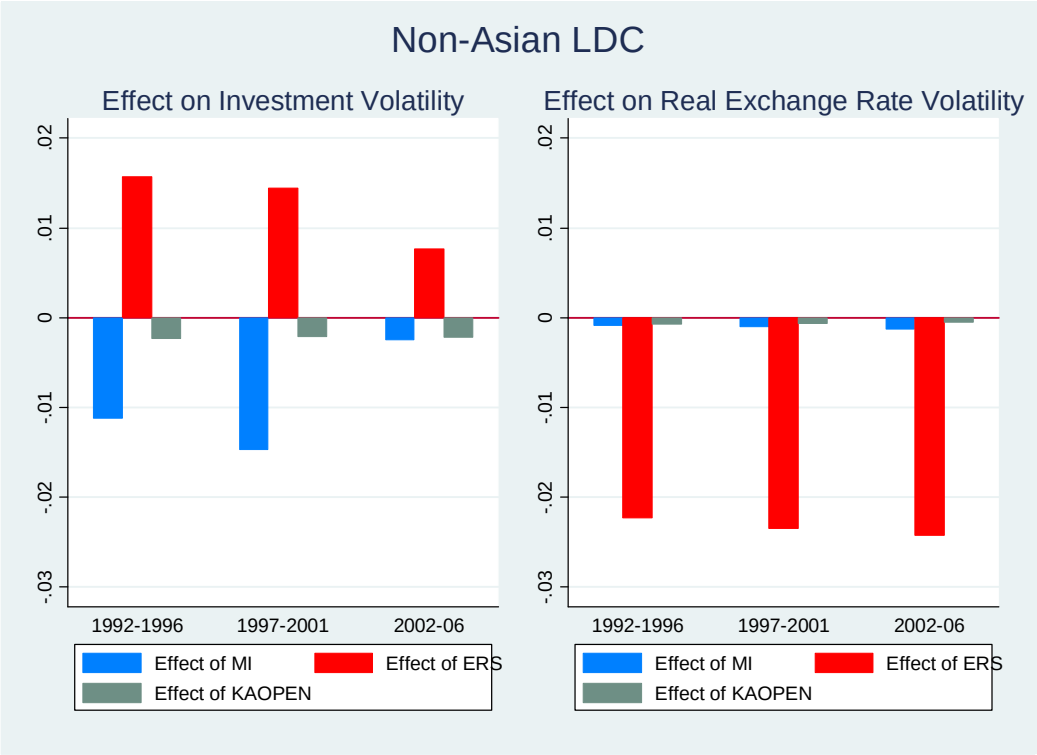


Figure 9: The Impacts of the Trilemma Configurations on Investment Volatility and Real Exchange Rate Volatility

(a) Developing Asia



(b) Non-Asian Developing Economies