

The More Divergent, the Better? Lessons on Trilemma Policies and Crises for Asia

JOSHUA AIZENMAN AND HIRO ITO*

This paper investigates the potential impacts of the degree of divergence in open macroeconomic policies in the context of the trilemma hypothesis. Using an index that measures the extent of policy divergence among the three trilemma policy choices—monetary independence, exchange rate stability, and financial openness—we find that emerging market economies have adopted trilemma policy combinations with the smallest degree of policy divergence in the last 15 years. We then investigate whether and to what extent the degree of open macro policy convergence affects the probability of a crisis and find that a developing or emerging market economy with a higher degree of policy divergence is more likely to experience a currency or debt crisis. We also compare the development of trilemma policies around the crisis period for the groups of Latin American crisis countries in the 1980s and the Asian crisis countries in the 1990s. We find that Latin American crisis countries tended to close their capital accounts in the aftermath of a crisis, while that is not the case for the Asian crisis countries. The Asian crisis countries tended to reduce the degree of policy divergence in the aftermath of the crisis, which possibly meant they decided to adopt open macro policies that made their economies less prone to a crisis.

Keywords: impossible trinity, international reserves, financial liberalization, financial crisis, exchange rate regime

JEL codes: F31, F36, F41, O24

I. Introduction

Managing policies amid economic turbulence is never an easy task, especially when the world economy is highly integrated and markets are intertwined. History is full of episodes where a certain international monetary system or regime meets an abrupt end such as the collapse of the Bretton Woods system in the early 1970s

*Joshua Aizenman: Economics and School of International Relations, University of Southern California, University Park, Los Angeles, CA 90089-0043. Phone: +1-213-740-4066. Email: aizenman@usc.edu. Hiro Ito (corresponding author): Department of Economics, Portland State University, 1721 SW Broadway, Portland, OR 97201. Tel/Fax: +1-503-725-3930/3945. Email: ito@pdx.edu. The financial support of faculty research funds of University of Southern California and Portland State University is gratefully acknowledged. This paper was prepared for the *Asian Development Review* Conference held by the Asian Development Bank in Manila, Philippines, March 25–26, 2013. We would like to thank Peter Morgan and conference participants for their useful comments and suggestions.

or during the financial crises experienced by many emerging market economies in the 1980s and 1990s. These abrupt endings of regimes often involve crises or some sort of financial turbulence. No matter what form of international monetary system or regime they decide to replace the old ones with, countries always end up adopting a combination of three policy goals: monetary independence, exchange rate stability, and financial openness, with different degrees of attainment in each, that is, a powerful hypothesis called the “impossible trinity” or the “trilemma” dictates open macro policy management. Countries may simultaneously choose two—but not all—of the three policy goals to the full extent, or adopt a combination of intermediate degrees of all or two of the three policy goals.

Theory and empirical evidence also tell us that each one of the three trilemma policy choices can be a double-edged sword as recognized by a significant amount of recent literature.¹ To make matters more complicated, the effect of each policy choice can differ depending on the policy choice it is paired with. For example, exchange rate stability can be more destabilizing if paired with financial openness, while it can be stabilizing if paired with greater monetary autonomy.

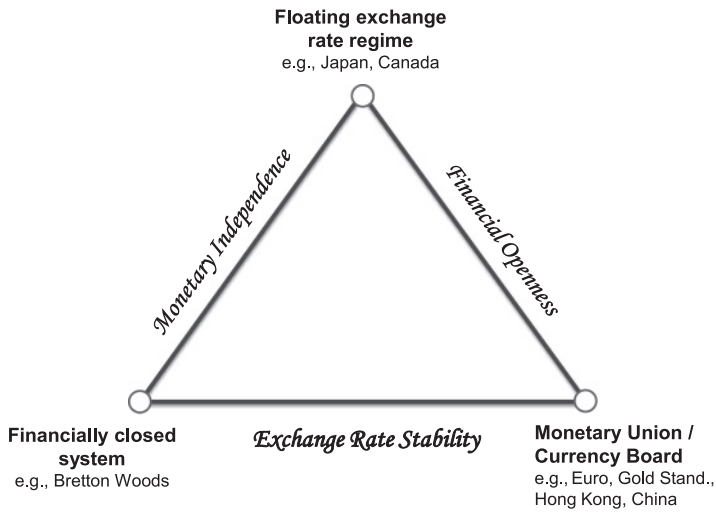
Furthermore, countries rarely face the stark polarized binary choices often envisioned by policy makers and researchers. In the textbook trilemma triangle (Figure 1), each of the three sides represents the full attainment of the three policy goals. We can locate the euro system or the gold standard at the corner representing complete financial openness and exchange rate stability, while the Bretton Woods system can be placed at the corner representing complete exchange rate stability and monetary independence. When a country attempts to mix all three policy choices, implementing these at intermediate levels, such a combination would be located somewhere inside the trilemma triangle. The bottom line is, as Mundell (1963) argued, the extent of achievement of the three policy choices must be linearly related to each other.²

Obviously, different policy combinations must have different macroeconomic effects. Now, the question is, how can the location of a country’s policy combination in the trilemma triangle affect its macroeconomic performance, especially in terms of avoiding traumatic economic turbulence such as financial crises?

Against this backdrop, we first construct in Section II a metric that measures the degree of divergence among the three trilemma policies while incorporating its relative position to the global trend. With this index, we then evaluate the patterns of divergence of trilemma policy combinations in the last 4 decades. In Section III,

¹For monetary independence, refer to Obstfeld et al. (2005), Shambaugh (2004), and Frankel et al. (2004). 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 Henry (2007), Kose et al. (2006), Prasad et al. (2003), and Prasad and Rajan (2008).

²In other words, if there are measures representing the levels of attainment in the three policy choices, such measures must add up to a constant. This has been empirically proven by Aizenman et al. (2012), and Ito and Kawai (2012).

Figure 1. **The Trilemma Triangle**

Source: Authors' representation.

we implement a series of empirical exercises to examine the impact of the degree of trilemma policy divergence on macroeconomic performance, namely the probability of the onset of currency, banking, and debt crises. At the end of this section, we also compare the degree of policy divergence and trilemma policy arrangements between the Latin American crisis countries in the 1980s and the Asian crisis countries in the 1990s, and identify commonalities and differences between these crisis periods. In Section IV, we present the main findings and conclusions of the paper.

II. Divergence of the Trilemma Policy Choices

A. Why Does the Extent of Policy Divergence Matter?

While there are only three kinds of polarized policy combinations among the three trilemma policies, i.e., the three vertexes in the triangle in Figure 1, once intermediate levels for each policy are allowed, there can exist an infinite number of open macro policy combinations. Until recently, researchers have tended to focus on debating the merits and demerits of polarized monetary regimes. Fischer (2001) argued the unstable nature of intermediate exchange rate regimes, pointing out that such regimes are more prone to experience a crisis in a financially globalized world. Frankel (1999), while admitting that regimes with “corner solutions” can be simple and transparent in showing government commitment to maintaining a regime, argued that avoiding intermediate regimes is not always the best solution

for countries, especially developing ones. Willett (2003) argued that the issue is not so much about whether polarized or intermediate regimes are more or less stable, but about whether the macroeconomic conditions of an economy are consistent with its monetary regime. The crises that occurred among emerging market economies in the 1980s and 1990s and, to a similar extent, the global financial crisis of 2008–2009, have raised questions about the global trend of financial liberalization, leading researchers to debate the merits and demerits of greater financial openness.

Despite the debate, regimes with corner solutions are more of a rarity. In other words, most countries often operate “somewhere inside the triangle.” For example, some countries implement partial financial integration while trying to retain control over exchange rate movement and preserving monetary policy autonomy. This sort of clustering of the three policies inside the trilemma triangle, or the “middle-ground convergence,” has been characteristic of emerging market economies (EMGs in this paper) in recent decades as observed by Aizenman, Chinn, and Ito (2012). The authors also note that such middle-ground convergence has been more evident among Asian EMGs in recent years.

By adopting converged policy combinations, these economies may have been trying to dampen the negative effects that may arise from adopting polarized policy regimes. Interestingly, the period when middle convergence started to become more evident among EMGs coincides with the time when some of these economies began to accumulate sizable international reserves (IR) as if trying to buffer the trade-off arising from the trilemma, again a more evident trend among Asian EMGs.³

A natural question that arises is how the location within the trilemma triangle can affect macroeconomic performance, especially when we focus on the risk of experiencing a financial crisis, which this paper focuses on. Before exploring this question, however, we want to raise one more important issue, that is, even if certain open macro policy combinations were found to affect the likelihood of a country experiencing a crisis, such correlations may not be merely a function of the country’s own macroeconomic policies.

A country’s open macro policies need to be evaluated in greater context, compared with policies adopted by other countries. For example, a fixed exchange rate regime would have different effects on the economy depending on whether or not most of the other countries also adopt fixed exchange rate regimes as they did during the Bretton Woods period. As another example, the consequence of liberalizing financial markets should also differ between the 1960s, when most of the countries also had closed financial markets, and in recent years, when many countries have been moving toward the direction of full financial liberalization.

³Aizenman et al. (2010) empirically show that pursuing greater exchange rate stability can increase output volatility for developing economies, but that this effect can be mitigated by holding a greater amount of international reserves than the threshold of about 20% of GDP.

When we think about the history of international monetary systems, countries anecdotally have tended to adopt monetary regimes prevalent in other countries, making the types of monetary regimes across countries correlated with each other. Such correlated behavior can be global as in the case of the gold standard in the pre-World War II era or the Bretton Woods system, regional as in the euro system, or clustered around similar income levels as evidenced by the recent middle-ground convergence observed among emerging market economies.

When many countries tend to adopt similar monetary regimes, this herding behavior would create externalities, lowering the cost of a country following such a global or regional trend, or the “mean behavior.” Conversely, herding behavior in the choice of monetary regimes could also raise the opportunity cost of deviating from it, unless the country that deviates from the “mean behavior” has healthy fundamentals or solid institutions including well-functioning financial markets. In this sense, the pursuit of forming a monetary union by some European countries, we could argue, can be sustainable only if they are equipped with appropriate levels of institutional development and good fundamentals.⁴ Hence, again, it is important to evaluate the combinations of open macro policies in a global context or in comparison to other countries.

In this paper, we will particularly focus on the impact of a triad policy combination on the likelihood of financial crisis. By financial crisis, we mean three kinds of financial crises: currency, banking, and debt crises. While it may not be difficult to consider the relationship between the degrees of policy divergence and their impact on currency crisis, the same may not be true for a banking or debt crisis, where the relationships may not be as straightforward. However, the macroeconomic performance in a banking or debt crisis, or the probability of its occurrence, can be direct functions of the triad policy coordination.

As regards a banking crisis, the recent European experience makes it clear that the choice of monetary regime can affect the likelihood of a banking crisis. In the case of the euro crisis, participating in the monetary union had made it easier for certain countries such as Ireland, Spain, and Cyprus to experience a surge in capital flows in an unsustainable fashion. Such capital influx ended up sowing seeds of the ongoing banking and debt crises in these countries. The situation could have been different if these countries had not participated in the fixed exchange rate arrangement because such a regime rids countries with highly open financial markets of monetary independence.

The debt crisis in emerging market economies in the 1980s and 1990s and that in Southern Europe such as Greece can also be explained similarly in the context of the trilemma. For emerging market economies, the predominant global trend for financial liberalization had turned the trilemma into a dilemma between

⁴Furthermore, it means the current crisis situation faced by some of the euro countries can be explained by their weak fundamentals and institutional development.

pursuing greater monetary autonomy (with more flexible exchange rates) and greater exchange rate stability (with less monetary autonomy). Facing the “original sin” (Eichengreen and Hausman 1999), many emerging market economies had chosen the path of greater exchange rate stability while the inevitably weaker monetary independence made these economies more vulnerable to external shocks.

Thus, not just for currency crisis, but also for banking or debt crisis, how the three trilemma policies are coordinated by individual countries and where they stand in the global context can be important factors.

B. Measure of Policy Divergence and Its Patterns

To see how much convergence or divergence is taking place among the three trilemma policy choices and to be able to evaluate it in a global context, we construct a “measure of divergence” in the triad policies. For that, we use the “trilemma indexes” introduced by Aizenman, Chinn, and Ito (2010, 2012).

The trilemma indexes measure the degree of achievement in each of the three policy choices for more than 170 economies from 1970 to 2010.⁵ The monetary independence index (MI) is based on the correlation between a country’s interest rate and the base country’s interest rate. The index for exchange rate stability (ERS) is an invert of exchange rate volatility, i.e., the standard deviation of the monthly rate of depreciation, using the exchange rate between the home and base economies. The degree of financial integration is measured by the Chinn–Ito (2006, 2008) capital controls index (KAOPEN).⁶

Using these indexes, we define the “measure of policy divergence” as:

$$d_{it} = \sqrt{(MI_{r_{it}} - 1)^2 + (ERS_{r_{it}} - 1)^2 + (KAOPEN_{r_{it}} - 1)^2} \quad (1)$$

where $X_{r_{it}} = \frac{X_{it}}{\bar{X}_t}$ for $X = MI, ERS,$ and $KAOPEN$, and \bar{X}_t is the cross-country average of X in year t .^{7,8} Appendix 1 lists all the countries for which d is available.

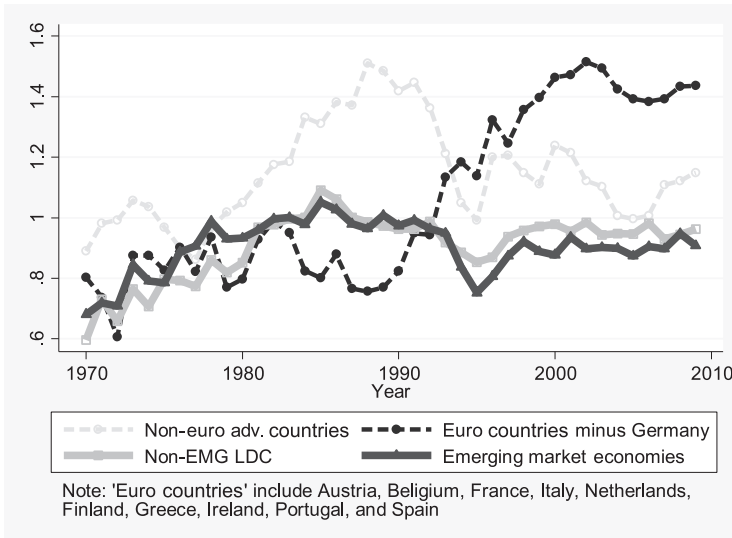
⁵The indexes are available at http://web.pdx.edu/~ito/trilemma_indexes.htm.

⁶Refer to Aizenman et al. (2012) or the index’s website for the details of construction of the indexes.

⁷The cross-country average (\bar{X}_t) is the sample average of X including both industrialized and developing countries for year t .

⁸One could argue that if the extent of achievement of the three trilemma policy choices is linearly related as theoretically predicted, the above formula for d does not have to contain all the three indexes—it would need only any two of the three trilemma indexes. However, we do not assume the linearity to hold strictly, i.e., the linearity does not have to hold every single year. In other words, we assume that there is some room for policy choices to deviate from the trilemma constraint. In fact, policy makers sometimes intentionally or unintentionally challenge the constraint of the trilemma by implementing a policy combination that is not consistent with the trilemma hypothesis. Before aborting the fixed exchange rate arrangement for the Thai baht, Thai policy makers attempted to challenge the trilemma by pursuing both greater monetary independence and exchange rate stability without imposing capital controls. Also, holding a massive amount of international reserves may allow countries from deviating from the constraint of the trilemma in the short run.

Figure 2. Degree of Policy Dispersions among Different Income Groups of Economies



Source: Authors' computations.

1. Long-run Trends

Figure 2 illustrates the average of the policy divergence measure, d_{it} , for different subgroups of economies based on income levels.⁹ We can make several interesting observations based on this figure. For the last 2 decades, advanced economies tended to have combinations of distinctive policies. Not surprisingly, the euro country group has the highest degree of policy divergence among the country groups, followed by the group of non-euro advanced countries. Higher income countries may be able to afford to have divergent policy combinations.

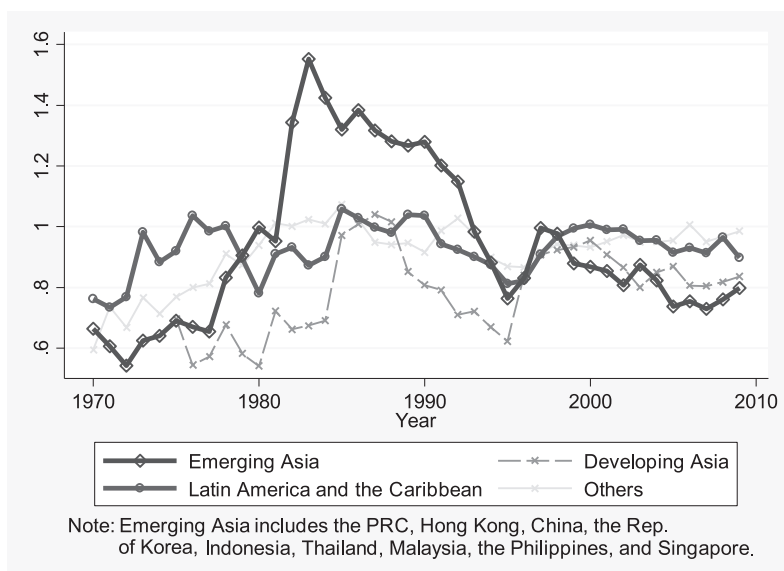
The group of emerging market economies has had the lowest degree of policy convergence in the last 2 decades. Since the beginning of the 1980s, developing economies, whether or not they are emerging markets, have had relatively stable movement in the degree of policy convergence, except for the mid-1990s when both subgroups of developing economies experienced a drop in the degree of policy divergence. Interestingly, the policy convergence measure tends to rise around the times of the crises, such as during 1982, 1997–1998, and 2008–2009, or the Mexican debt crisis, Asian financial crisis, and global financial crisis, respectively.¹⁰

We are also curious to see if there are any regional characteristics in the formation of triad open macro policies. As we have discussed, externalities can

⁹Country groupings are shown in Appendix 1.

¹⁰To see what is driving the trajectories in Figure 2, it is helpful to look at the group mean of the ratios of each of the three indexes to its cross-country mean, i.e., $\frac{X_i}{\bar{X}}$, with X for monetary policy independence (MI), exchange rate stability (ERS), and financial openness ($KAOPEN$). For this, one can refer to Aizenman and Ito (2012).

Figure 3. Degree of Policy Dispersions among Different Regional Economies



Source: Authors' computations.

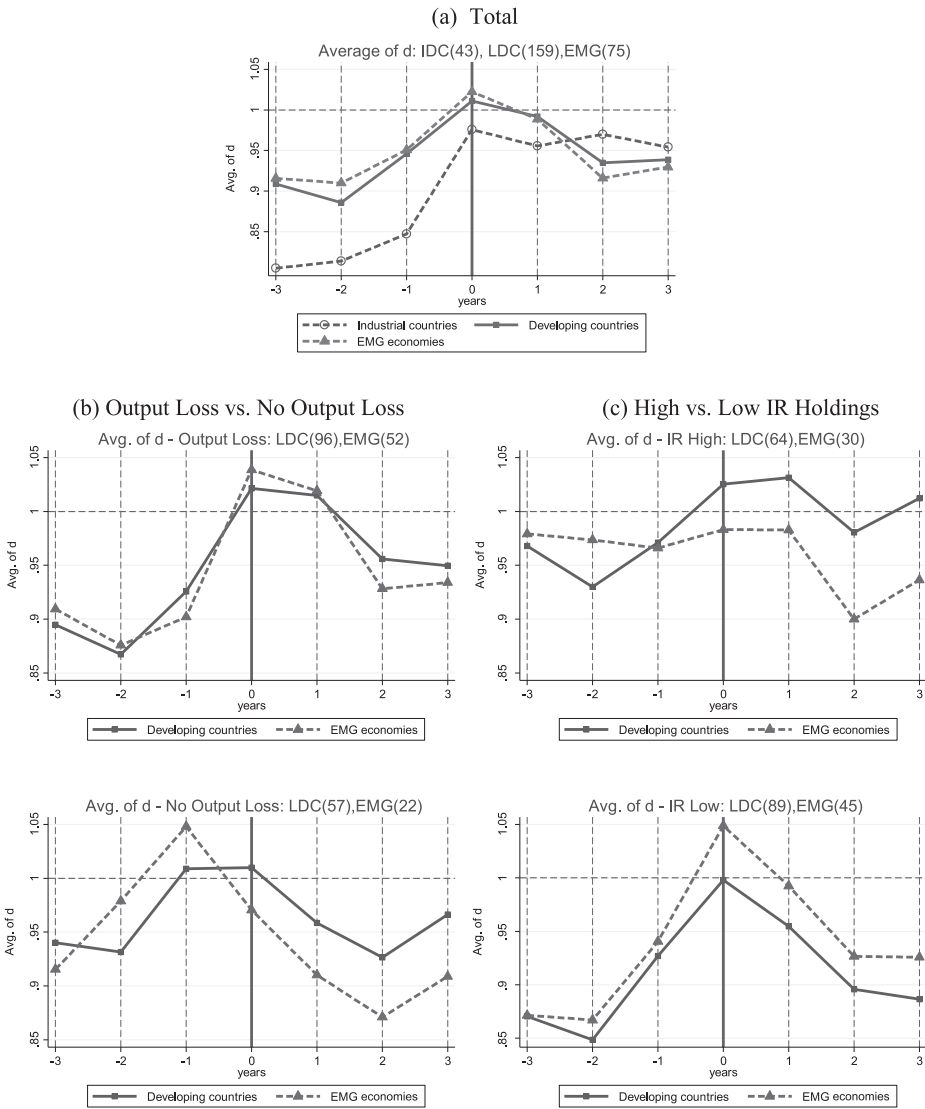
play a role in concerting policy decisions of neighboring countries in a region while possibly increasing the cost of shying away from regional policy coordination. Furthermore, there can be regional economic integration such as in the case of the East Asian supply chain network or a monetary policy arrangement as in the case of the Gulf Cooperation Council (GCC). Hence, comparisons among geographical groups of economies should shed another ray of light on the differences in the characteristics of triad open macro policies among economies. Figure 3 illustrates the averages of the policy dispersion measure for different regional country groups but focusing on Latin American and Asian economies.

We can make an interesting observation that since the last few years of the 1990s, which coincides with the Asian crisis period, the degrees of policy divergence have been persistently small among all regional groups.¹¹ This policy convergence among developing economies may reflect the great moderation, but the convergence seems to be still in place in the last few years of the sample corresponding to the years of the global financial crisis. Additionally, despite their high levels of policy divergence in the 1980s, emerging market economies in Asia have been experiencing their lowest levels of policy divergence in the last decade.¹²

¹¹This is also true for Middle Eastern or North African countries (not reported).

¹²Asian emerging market economies (and countries in the Middle East, though not reported) experienced high levels of policy divergence from the beginning of the 1980s to the early 1990s. This is partly because Latin American countries, many of which went through debt crises, retrenched financial openness around the same period, dragging down the average and making financial liberalization efforts by Asian emerging market economies especially distinctive.

Figure 4. Average of the Measure of Policy Divergence over Currency Crisis

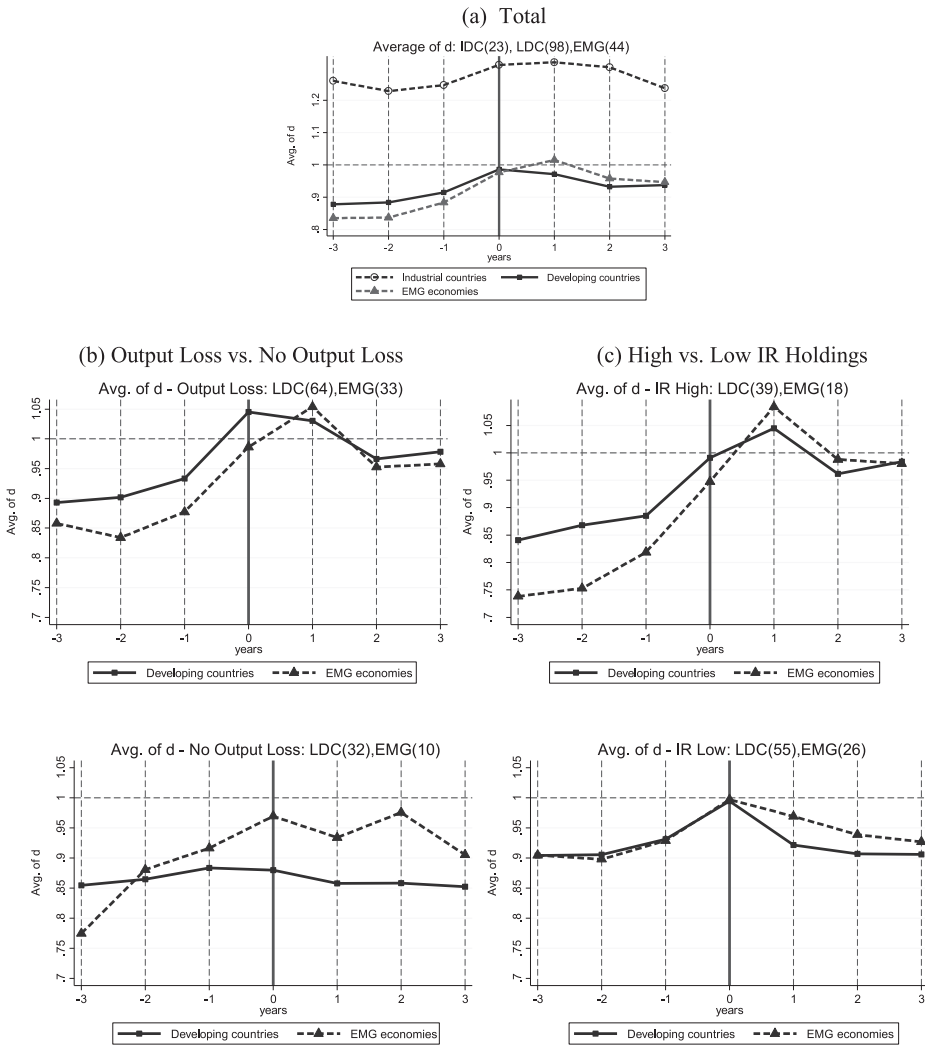


Note: Figures in parentheses indicate the number of economies included in calculating the average.
Source: Authors' computations.

2. Behavior of d around the Time of a Crisis

Let us observe the behavior of the measure of policy dispersion around the time of a financial crisis. Figures 4–6 show the development of the cross-country average of the degree of policy divergence for different subsamples of economies

Figure 5. Average of the Measure of Policy Divergence over Banking Crisis

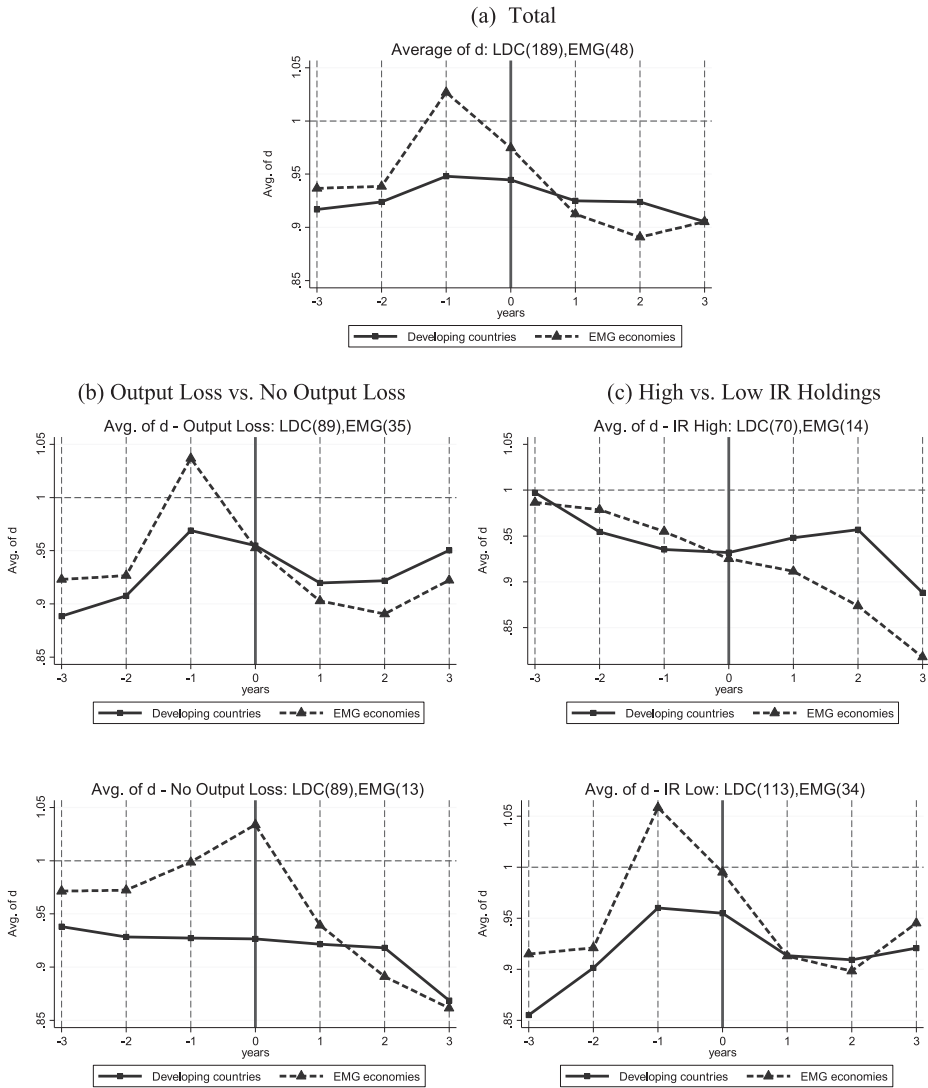


Note: Figures in parentheses indicate the number of economies included in calculating the average.
 Source: Authors' computations.

in the periods covering currency, banking, and debt crises (specifically, the time spanning 3 years before the first year of the crisis and 3 years after, i.e., $[t_0 - 3, t_0 + 3]$).¹³ In each figure, Panel (a) shows the development of the subsample averages of d for industrialized economies (IDC), developing countries (LDC), and

¹³The methods for identifying the three types of crises are explained in Appendix 2.

Figure 6. Average of the Measure of Policy Divergence over Debt Crisis



Note: Figures in parentheses indicate the number of countries included in calculating the average.
 Source: Authors' computations.

EMGs.¹⁴ Panel (b) shows the development of the averages of d for crisis countries that experienced positive LDC output losses as a result of a crisis (top) and those that

¹⁴We define EMGs as the countries classified as either emerging or frontier during the period of 1980–1997 by the International Financial Corporation, plus Hong Kong, China, and Singapore.

experienced output gains (bottom).¹⁵ Panel (c) compares the development of the averages of d for the crisis countries with high IR holdings from those having low IR holdings, where “high” means that IR holdings as a share of gross domestic product (GDP) is higher than the annual cross-country median of all the countries in the entire sample, including crisis and non-crisis economies as of the year before the crisis occurrence ($t_0 - 1$).

We can make several interesting observations. In all three kinds of crises, d follows a hump-shape pattern with the peak occurring at the first year for currency crises (t_0); a year after onset for banking crises ($t_0 + 1$); and a year before onset for debt crises ($t_0 - 1$). In currency and banking crises, for crisis countries that experienced output losses, the measure of policy divergence tends to stay at high levels during the first and second years of the crisis. In the case of crisis countries that did not experience output losses, d tends to peak the year before the onset of the crisis. This may imply that these countries could avoid output losses by preemptively implementing stabilization measures that end up raising the degree of policy divergence.¹⁶

For the currency or banking crisis countries with low IR holding, there is a distinct rise in d at the onset of the crisis and a distinct fall afterwards. For countries with high IR holdings, however, the peak occurs in the second year of the crisis. This generalization is more apparent for the high IR holding countries with output losses (not reported). These findings suggest that if a country experiences a currency or banking crisis and does not hold high levels of IR, the country needs to implement policies that raise d , whereas d peaks more slowly for high IR holders.

It is harder to generalize the movement of d for debt crisis countries. Panel (c) shows that holding higher levels of IR seems to allow a crisis country to raise d prior to the onset of a crisis. However, debt crisis countries that experience a peak in d prior to the onset of a crisis tend to be the ones that experience output losses, which seem to be contrary to the cases of currency or banking crisis countries. Those with high IR holdings tend to lower the level of d around the time of the crisis, which again we do not observe among currency or banking crisis countries.

There is a limit to what we can infer from observing unconditional means of the measure of policy divergence around the time of the crisis. We now move on to a more formal analysis on the degree of policy divergence and examine how d can affect the probability of crisis onsets.

¹⁵Output losses are defined as the cumulative sum of the differences between actual and trend real GDP over the 4-year period, i.e., $[t_0, t_0 + 3]$. Trend real GDP is based on the HP-filtered real GDP series over the 20-year-long pre-crisis period $[t_0 - 20, t_0 - 1]$. A crisis is defined to involve output losses or gains based on whether the cumulative sum is positive or negative. In a sense, the existence of output losses is based on “output losses in ex post,” not strictly as of the first year of the crisis.

¹⁶We do not treat d as an exogenous variable; that is, d can respond endogenously to a crisis.

III. Empirical Analysis

A. Probability of Crisis Occurrence

We now estimate the probability of different types of crises to examine whether and to what extent the degree of relative policy divergence affects the likelihood of a currency, banking, or debt crisis. The identification methods for each of the crisis are explained in Appendix 2.

For each type of crisis, we assign the value of 1 to a binary variable y_t when country i experiences the onset of a crisis in year t , and 0, otherwise.¹⁷ We hypothesize the probability that a crisis will occur, $\Pr(y_t = 1)$, is a function of a vector of characteristics associated with observations in year t , or X_t , and the parameter vector β , with the control variables in X lagged 1 year to avoid endogeneity issues. Using the panel data composed of more than 100 economies for the period 1970–2010, the log of the following function is maximized with respect to the unknown parameters through nonlinear maximum likelihood.¹⁸

$$\ln L(\beta) = \sum_{i=1}^m [y_t \ln F(\beta' X_t) + (1 - y_t) \ln(1 - F(\beta' X_t))] \quad (2)$$

where m indicates the number of economies times the number of observations for each economy and the function $F(\cdot)$ is the standardized normal distribution.

The following variables are included in the vector of characteristics, X_t . The choice of the variables is based on past literature, except for that related to the degree of trilemma policy convergence. The variables included in the estimation are the following:¹⁹

- (i) Relative income to the US – Per capita income levels from the Penn World Table (PWT) are normalized as a ratio to the US per capita income level.
- (ii) International reserves (IR) – IR holdings, excluding gold, as a ratio to GDP.
- (iii) Per capita output growth – The growth rate of GDP per capita (in local currency).
- (iv) Private credit growth – The (first-difference) change in the ratio of private credit creation to GDP.
- (v) Net debt inflows – The ratio of (external debt liabilities – external debt assets) to GDP. Original data are from Lane and Milesi-Ferretti (2007 and updates).

¹⁷We only focus on the *onset* of a crisis, that is, the first year of the crisis. This means that we do not investigate the persistence of a crisis situation if it lasts longer than 1 year.

¹⁸The economies included in the estimation are those with an asterisk in Appendix 1.

¹⁹Unless mentioned otherwise, data for these variables are extracted from publicly available datasets (such as the *World Development Indicators*, *International Financial Statistics*, and *World Economic Outlook*).

- (vi) Gross external financial exposure – The ratio of (total external assets + total external liabilities) to GDP, also from the Lane and Milesi-Ferretti dataset, included as deviations from the 5-year average of the ratios. After the global financial crisis, in addition to net capital flows or investment positions, gross capital flows have been identified as a potential destabilizing factor.²⁰
- (vii) Real exchange rate overvaluation – Defined as deviations from a fitted trend in the real exchange rate. The real exchange rate is calculated using the exchange rate between economy i and its base economy (Aizenman et al. 2011) and the consumer price inflation (CPI) of the two economies. Higher values of this variable indicate that the real exchange rate value is lower (i.e., appreciated) than its time trend.
- (viii) Exchange rate stability (ERS) and financial openness (KAOPEN) – Both are from the trilemma indexes of Aizenman, Chinn, and Ito (2012).
- (ix) Triad policy divergence measure – The discussed measure of triad policy divergence, d_{it} .
- (x) Standard deviation of the triad policy divergence measure – The standard deviation of d_{it} over a period of 5 years from $t-5$ through $t-1$. This is included to examine the impact of the stability level of the trilemma policy combinations.
- (xi) Other crises – The dummies for the other types of crises that occur either concurrently (t) or in the previous year ($t-1$) are also included.
- (xii) Contagion – To see the impact of other crises in the same geographical region, we also include a variable that represents the effect of regional contagion. The variable to be included is defined as:

$$Contagion_{i,t}^n = \sum_{\substack{j=1 \\ j \neq i}}^{P_K} \omega_{jk} \cdot CD_{i,t}^n \quad (3)$$

where $CD_{i,t}^n$ is a crisis dummy for type n crisis (i.e., currency, banking, or debt) and ω_{jk} is the weight based on GDP in purchasing power parity (PPP) for economy j ($j \neq i$) in region K . Hence, the variable $Contagion^n$ is the weighted sum of the dummy variables for the economies in the region economy i belongs to, excluding the weighted dummy of economy i itself.²¹ The basic assumptions are, 1), the more economies in the same geographical region experience crises, the more likely it is

²⁰See Borio and Disyatat (2011); Obstfeld (2012a, 2012b); and Bruno and Shin (2012) for the arguments on how gross external financial exposure matters for financial and economic stability. However, it must be noted that gross external financial exposure may also mean a higher level of ability to diversify risk, which may work as a stabilizing factor.

²¹The regions we consider are: North and South America, East and Southeast Asia and the Pacific, South Asia, Europe (including both Western, Eastern, and Central Europe), and Sub-Saharan Africa, the Middle East, and North Africa.

for economy i to experience a crisis, and 2), that the contagious effect is larger for bigger economies.

We apply the above probit estimation model to the full sample that includes both industrialized and developing countries, the IDC sample, the LDC sample, and a subsample of EMGs. The baseline estimation results are reported in Table 1, which reports the marginal effects of the explanatory variables assuming that variables take mean values (except for the dummy variables).^{22,23}

B. Estimation Results: The Determinants of Crisis Occurrences

We make observations of the estimations mainly for the samples of developing and emerging market economies.

1. Currency Crisis

Most of the explanatory variables turn out to be qualitatively consistent with the findings in the literature (e.g., Kaminsky and Reinhart 1999, Kaminsky et al. 1998, Glick and Hutchison 2001, and Kaminsky 2003), though statistical significance varies by the sample group. Countries with real appreciation (compared to the time trend) tend to experience a currency crisis, but significantly only for the group of industrialized countries. Rapid growth in private credit creation (as a ratio to GDP) leads to a currency crisis especially for emerging market economies. Not surprisingly, externally indebted countries tend to experience a currency crisis. However, despite the prevalent strong belief of its effectiveness, IR holdings do not affect the probability of the onset of a currency crisis.

For developing countries, a country experiencing a banking crisis concurrently or in the previous year tends to experience a twin crisis with a currency crisis—banking crisis increases the probability of a currency crisis by 10–12 percentage points. Debt crisis, however, does not seem to lead to a twin crisis with a currency crisis.

Regional contagion is also found to affect the probability of a currency crisis. The more countries experience either a currency or banking crisis in the same region, the more likely it is for a country to experience a currency crisis, although a debt crisis does not have such a contagion effect.

²²The variables that are persistently insignificant and therefore dropped from the estimation include: trade openness, measured by the sum of export and import values as a ratio to GDP; the dummy for countries' engagement in both internal and external armed conflicts; the dummies for commodity exporters and manufacturing exporters; the degree of fiscal procyclicality, which is measured by the correlation between HP-detrended output and government expenditure; the dummy for the existence of deposit insurance; volatility of terms-of-trade income shocks; and the dummy for hyperinflation (with the annual rate of inflation exceeding 40%).

²³In the estimation for debt crisis, the estimation results for the full or IDC sample are not reported because there is no debt crisis data for industrialized countries in our sample period (which ends in 2010).

Table 1. Probit Estimations on the Probabilities of Different Types of Crisis Occurrences

	(1) Currency Full	(2) Currency IDC	(3) Currency LDC	(4) Currency EMG	(5) Banking FULL	(6) Banking IDC	(7) Banking LDC	(8) Banking EMG	(9) Debt LDC	(10) Debt EMG
Relative income ($t-1$)	0.041 (0.015)***	0.051 (0.035)	0.064 (0.027)**	0.026 (0.040)	-0.017 (0.014)	0.001 (0.004)	0.012 (0.026)	0.026 (0.037)	-0.108 (0.049)**	-0.023 (0.026)
IR holdings ($t-1$)	-0.004 (0.041)	-0.156 (0.135)	0.001 (0.044)	0.008 (0.075)	-0.093 (0.041)**	0.003 (0.016)	-0.131 (0.047)***	-0.122 (0.064)*	-0.124 (0.050)**	-0.079 (0.031)**
Per capita output growth ($t-1$)	-0.071 (0.078)	-0.243 (0.206)	-0.032 (0.077)	0.016 (0.161)	-0.124 (0.067)*	-0.063 (0.053)	-0.063 (0.069)	-0.032 (0.115)	-0.134 (0.113)	-0.214 (0.088)**
Private credit growth ($t-1$)	0.015 (0.067)	0.056 (0.079)	0.035 (0.088)	0.190 (0.096)**	0.097 (0.045)**	0.002 (0.012)	0.209 (0.070)***	0.150 (0.076)**	-0.104 (0.128)	-0.070 (0.065)
Net debt ($t-1$)	0.006 (0.006)	-0.004 (0.015)	0.021 (0.007)***	0.052 (0.023)**	0.008 (0.006)	0.005 (0.004)	0.007 (0.008)	-0.002 (0.016)	0.046 (0.015)***	0.006 (0.012)
Real exchange overvaluation ($t-1$)	0.019 (0.010)*	0.105 (0.041)**	0.007 (0.009)	-0.004 (0.020)	0.005 (0.013)	0.010 (0.008)	0.003 (0.015)	0.011 (0.020)	-0.002 (0.014)	-0.001 (0.011)
Financial exposure ($t-1$)	-0.017 (0.006)***	-0.023 (0.011)**	-0.002 (0.009)	-0.025 (0.019)	0.013 (0.004)***	0.004 (0.004)	0.015 (0.006)***	0.010 (0.007)	-0.007 (0.016)	-0.012 (0.014)
ERS ($t-1$)	-0.012 (0.011)	-0.025 (0.019)	0.006 (0.012)	0.001 (0.018)	0.009 (0.009)	-0.002 (0.004)	0.009 (0.011)	0.020 (0.017)	0.035 (0.016)**	0.016 (0.012)
KAOPEN ($t-1$)	-0.042 (0.015)***	-0.027 (0.024)	-0.024 (0.015)	-0.023 (0.021)	-0.009 (0.012)	-0.003 (0.007)	-0.011 (0.013)	-0.015 (0.018)	-0.001 (0.016)	-0.016 (0.011)
Tri. pol. conv. ($t-1$)	0.001 (0.011)	-0.022 (0.014)	0.036 (0.014)***	0.043 (0.019)**	0.005 (0.010)	0.002 (0.003)	-0.000 (0.013)	0.011 (0.017)	0.051 (0.017)***	0.024 (0.010)**
Tri. pol. conv., std. dev. ($t-5/t-1$)	0.035 (0.036)	-0.001 (0.053)	0.039 (0.041)	0.052 (0.057)	0.045 (0.033)	0.012 (0.012)	0.027 (0.042)	0.024 (0.056)	0.081 (0.053) ^{13%}	0.038 (0.025) ^{11%}

Continued.

Table 1. *Continued.*

	(1) Currency Full	(2) Currency IDC	(3) Currency LDC	(4) Currency EMG	(5) Banking FULL	(6) Banking IDC	(7) Banking LDC	(8) Banking EMG	(9) Debt LDC	(10) Debt EMG
Contagion: Currency (<i>t</i> or <i>t</i> - 1)	0.143 (0.030)***	0.078 (0.047)*	0.135 (0.031)***	0.117 (0.066)*	-0.050 (0.035)	-0.024 (0.021)	-0.042 (0.036)	0.025 (0.049)	0.076 (0.040)*	-0.019 (0.045)
Contagion: Banking (<i>t</i> or <i>t</i> - 1)	0.035 (0.025)	-0.034 (0.036)	0.055 (0.024)**	0.093 (0.034)***	0.124 (0.018)***	0.027 (0.026)	0.073 (0.019)***	0.089 (0.027)***	-0.022 (0.038)	0.007 (0.025)
Contagion: Debt (<i>t</i> or <i>t</i> - 1)	-0.015 (0.032)	-0.075 (0.127)	-0.003 (0.034)	0.046 (0.061)	0.005 (0.043)	0.046 (0.044)	-0.023 (0.034)	0.005 (0.056)	-0.234 (0.053)***	-0.129 (0.034)***
Banking crisis (<i>t</i> or <i>t</i> - 1)	0.102 (0.029)***		0.107 (0.032)***	0.124 (0.044)***					0.030 (0.024)	0.027 (0.019)
Debt crisis (<i>t</i> or <i>t</i> - 1)	0.007 (0.014)		0.001 (0.012)	0.009 (0.024)	-0.004 (0.009)		-0.006 (0.010)	0.011 (0.020)		
Currency crisis (<i>t</i> or <i>t</i> - 1)					0.056 (0.020)***		0.092 (0.028)***	0.091 (0.033)***	0.030 (0.023)	0.019 (0.016)
<i>N</i>	2,407	662	1,745	932	2,372	627	1,745	906	1,562	847

IDC = industrialized countries, LDC = developing countries, EMG = emerging market economies, * = $p < 0.1$, ** = $p < 0.05$, *** = $p < 0.01$.
 Note: The table reports the change in the probability of a crisis in response to a 1-unit change in the variable evaluated at the mean of all variables (multiply by 100, to convert into percentages) with associated z-statistic (for hypothesis of no effect) in parentheses below. Robust standard errors in parentheses.
 Source: Authors' computations.

Interestingly, we find that developing or emerging market economies that pursue more divergent triad policies from the global trend (as of the year prior to the crisis) are more likely to experience a currency crisis, but the opposite impact is true for industrialized countries, while the degree of triad policy stability does not matter for any of the subsamples. The positive impact of greater policy divergence on the likelihood of a currency crisis occurring among developing countries may mean that adopting a combination of open macro policies that deviates from the global trend would involve opportunity costs for these countries. This may explain why many developing countries have tended in recent years to either adopt triad policies with middle-ground convergence, or hold a massive amount of IR, or both. In contrast, for industrialized countries, a combination of diverse policies might help countries avoid a currency crisis, though the effect is only marginally significant. This suggests that industrialized countries can afford to pursue a higher degree of policy divergence with their established policy credibility.

2. Banking Crisis

Generally, the banking crisis estimations also yield results qualitatively consistent with other studies on the same subject (for instance, Demirgüç-Kunt and Detragiache 1998, von Hagen and Ho 2007, Joyce 2011, and Duttagupta and Cashin 2011), though with varying levels of statistical significance. Unlike in the currency crisis estimation, the amount of IR holdings matters for the onset of a banking crisis and lowers the probability of a banking crisis occurring among developing and emerging market economies. Developing or emerging market economies with faster credit growth tend to experience banking crisis, though such is not the case for industrialized countries. While the extent of real exchange rate overvaluation does not matter, the degree of exchange rate stability marginally increases the probability of the onset of a banking crisis for emerging market economies. Greater external financial exposure does increase the probability of a banking crisis for developing countries.

Banking crisis is also found to be contagious for developing or emerging market economies. If other economies in the same region experience a banking crisis, this could cause a banking crisis in the home economy. Also, we again have evidence of twin currency and banking crises.

Neither the degree of triad policy divergence nor the degree of instability of the triad policies affects the probability of a banking crisis occurring for any of the subsamples. Among the three types of financial crises, a banking crisis seems to be the most weakly linked to the extent of triad policy divergence. One possibility for the weak link is that a certain monetary regime affects other macroeconomic conditions in such a way that these conditions would have a more direct impact on the financial system.

In column (7) of Table 1, which reports the estimation results for the LDC group, credit growth and financial exposure were found to be positive contributors to the likelihood of an occurrence of a banking crisis. We can surmise that triad policy divergence affects the probability of a banking crisis occurring, but only through these two variables. Capital can flow to markets that are distinctively different from other markets. In the literature, it has been argued that a policy regime with high degrees of exchange rate stability and financial openness would often make an economy more conducive to the influx of capital flows, eventually experiencing a boom and bust cycle. That tendency can be stronger if a certain market or economy adopts a monetary regime that is more distinct from the global trend—which can be captured by d —compared to when many others adopt a similar monetary regime (e.g., the Bretton Woods system). In sum, the effect of triad policy divergence could be masked by changes in macroeconomic conditions that might have a bigger impact on the likelihood of a banking crisis.

3. Debt Crisis

Not surprisingly, the more indebted externally a country is, the more likely it is to experience a debt crisis. While greater external financial exposure does not contribute to the probability of a debt crisis, a country pursuing greater exchange rate stability tends to experience a debt crisis. This result suggests that countries with fixed exchange rate regimes experience moral hazard in their debt financing—a fixed exchange rate policy may induce overborrowing in hard currency. It may also be possible that a country with a fixed exchange rate tends to procrastinate its policy adjustments even when macroeconomic conditions require an adjustment (usually devaluation) of its currency, letting the peg duration increase the political cost of devaluation. These findings are consistent with the negative impact of IR holding on the probability of a debt crisis occurring.

Currency crisis in the same region could also lead to an occurrence of a debt crisis. The significantly negative sign on the debt crisis contagion variable is somewhat puzzling. However, this may mean that once a country in the same geographical proximity, especially an economically larger one, experiences a debt crisis and goes through some form of rescheduling, such actions may calm down the sovereignty bond market for other countries in the region with similar income levels.

Again, a higher degree of triad policy divergence tends to lead to a debt crisis. If a country pursues a distinctly more divergent triad policy compared to the global trend, this may cause stress on the economy. Possibly, investors would start suspecting the sustainability of the country's policy management and therefore question its future ability to repay the debt. Such stress may become self-fulfilling and eventually force the country to experience a debt crisis. The instability of the triad policy combination also matters though only with marginal significance.

This also implies that unstable open macro policy management may weaken the credibility of the country in terms of its policy management and debt sustainability and lead investors to launch a speculative attack on the country's sovereign bond markets.

4. Impact of IR Holdings

Can the impact of the degree of triad policy convergence, d , on the probability of crisis occurrence be conditional on another factor, such as IR holdings? One may expect that a greater amount of foreign reserves might help lessen the positive effect of d on the probability of experiencing a crisis. If that is the case, countries with lower amounts of IR holdings may be likely to experience a crisis once they increase the levels of d , while those with higher amounts may not. To examine this, we re-estimate the probit model while dividing the sample into two groups: one composed of country-year pairs with IR holdings that are higher than the annual median (as of $t - 1$) and the other comprising those with IR holdings that are lower than the median.

Table 2 reports the results for IR holdings, d , the volatility of d , and private credit growth for both high and low IR regimes.²⁴ The coefficient on d is statistically significant among low IR holders for the debt crisis estimation while it is not significant for high IR holders. These findings are consistent with our prior. However, for the currency crisis estimation, the estimate on d is significant for the high IR holding regime for both developing and emerging market groups. This result is somewhat counterintuitive. To interpret this result, it is possible that economies with high IR holdings experience other macroeconomic symptoms that create an environment where higher policy dispersion can lead to an occurrence of a crisis.

Interestingly, private credit growth is a positive contributor to the likelihood of a currency or banking crisis occurring in developing or emerging market countries that have high IR holdings. However, this is not the case for low IR holders. Private credit growth is also not a significant contributor to the probability of a debt crisis occurring irrespective of the IR regime. These results suggest that in the high IR regime, IR holdings tend to induce higher credit growth, which may in turn lead to a currency or banking crisis. In such an environment, pursuing a higher degree of policy divergence is riskier and tends to lead to a currency crisis. The distinct role of private credit growth in currency and debt crises may explain the twists in the results of their estimations.

²⁴The estimates of the other variables (i.e., those not reported in Table 2) are omitted from the presentation to conserve space. They are available from the authors upon request.

Table 2. Interactive Effects of IR on the Probabilities of Different Types of Crisis Occurrences

	(1) Currency Full	(2) Currency IDC	(3) Currency LDC	(4) Currency EMG	(5) Banking FULL	(6) Banking IDC	(7) Banking LDC	(8) Banking EMG	(9) Debt LDC	(10) Debt EMG
High IR Holders										
Private credit growth	0.172	0.059	0.173	0.188	0.208	-	0.239	0.126	0.005	0.001
(<i>t</i> - 1)	(0.076)**	(0.071)	(0.071)**	(0.074)**	(0.058)***	-	(0.068)***	(0.060)**	(0.087)	(0.013)
IR holdings (<i>t</i> - 1)	0.015	-0.072	0.050	0.054	-0.040	-	-0.041	-0.009	-0.086	-0.015
	(0.037)	(0.141)	(0.035)	(0.048)	(0.030)	-	(0.036)	(0.032)	(0.044)*	(0.015)
Tri. pol. conv. (<i>t</i> - <i>I</i>)	0.013	0.003	0.033	0.032	-0.002	-	-0.003	0.004	0.025	0.004
	(0.014)	(0.018)	(0.015)**	(0.014)**	(0.009)	-	(0.011)	(0.008)	(0.016)	(0.004)
Tri. pol. conv., std. dev.	-0.029	-0.012	-0.029	-0.011	0.065	-	0.060	0.057	-0.011	0.006
(<i>t</i> - 5/ <i>t</i> - <i>I</i>)	(0.042)	(0.041)	(0.042)	(0.035)	(0.030)**	-	(0.036)*	(0.029)*	(0.049)	(0.007)
<i>N</i>	1,102	178	924	517	1,103	-	933	504	860	497
Low IR Holders										
Private credit growth	-0.130	-0.251	-0.082	-0.009	-0.171	-0.155	-0.067	-0.054	-0.193	-0.461
(<i>t</i> - 1)	(0.103)	(0.175)	(0.111)	(0.319)	(0.108)	(0.095)	(0.125)	(0.203)	(0.201)	(0.205)**
IR holdings (<i>t</i> - 1)	-0.402	-0.345	-0.305	-0.308	-0.336	-0.056	-0.470	-0.600	-0.405	-0.279
	(0.144)***	(0.203)*	(0.171)*	(0.404)	(0.125)***	(0.062)	(0.184)**	(0.288)**	(0.246)*	(0.309)
Tri. pol. conv. (<i>t</i> - <i>I</i>)	-0.018	-0.020	0.013	0.011	0.002	-0.000	-0.000	0.014	0.064	0.051
	(0.014)	(0.012)*	(0.022)	(0.039)	(0.012)	(0.005)	(0.022)	(0.027)	(0.028)**	(0.030)*
Tri. pol. conv., std. dev.	0.071	-0.003	0.080	0.152	-0.045	0.012	-0.092	-0.217	0.173	0.087
(<i>t</i> - 5/ <i>t</i> - <i>I</i>)	(0.047)	(0.048)	(0.063)	(0.120)	(0.044)	(0.012)	(0.068)	(0.091)**	(0.093)*	(0.076)
<i>N</i>	1,293	480	813	411	1,257	453	804	398	695	347

IR = international reserves, IDC = industrialized countries, LDC = developing countries, EMG = emerging market economies, * = *p* < 0.1, ** = *p* < 0.05, *** = *p* < 0.01. Note: The table reports the change in the probability of a crisis in response to a 1-unit change in the variable evaluated at the mean of all variables (multiply by 100, to convert into percentages). Robust standard errors in parentheses with associated z-statistic (for hypothesis of no effect) in parentheses below. The estimates of the other variables than those reported in Table 2 are omitted from the presentation to conserve space. The results of the estimation for the IDC high-IR regime are not reported because of the small sample size, but they are available from the authors upon request. Source: Authors' computations.

Furthermore, the finding that, for the low IR regime, the estimate on the IR holdings variable is persistently negative among all the samples and significant among most of them, suggests that the effect of IR holdings can be nonlinear. In other words, the effect of an incremental change in the level of IR holdings may be larger for lower IR holders than for higher IR holders.

C. What Do the Estimation Results Tell Us about the Experiences in Latin America and Asia?

Now, we examine what we can learn from the estimation results as well as actual crisis experiences. In particular, we take a look at the two big crisis episodes in the 1980s and 1990s, namely the Latin American debt crisis in the early 1980s and the Asian crisis of 1997–1998.

Figure 7 shows the averages of d around the crisis period for the Latin American and Asian country groups.²⁵ The year of a crisis onset (year 0 in the graph) differs between the sample groups, and also among the countries within the Latin American group. For each Latin American country, year 0 indicates the year when the crisis is the most severe among the years 1981, 1982, or 1983.²⁶ For the Asian countries, year 0 is always 1997. The figure illustrates the sample average of d over the period from 5 years before ($t_0 - 5$) through 5 years after ($t_0 + 5$) the crisis year.

From the figure, we can see that Latin American countries tend to have higher d in the period prior to the crisis compared to their Asian counterparts. Second, for this group of crisis countries, the policy divergence variable increases over the post-crisis period. Third, for the Asian group, d rises rapidly when the crisis breaks out, making it look like more countries are increasing the level of policy divergence in response to the occurrence of a crisis. Fourth, unlike their Latin American counterparts, d drops in the second year after the crisis for the Asian countries and remains at relatively low levels afterwards.

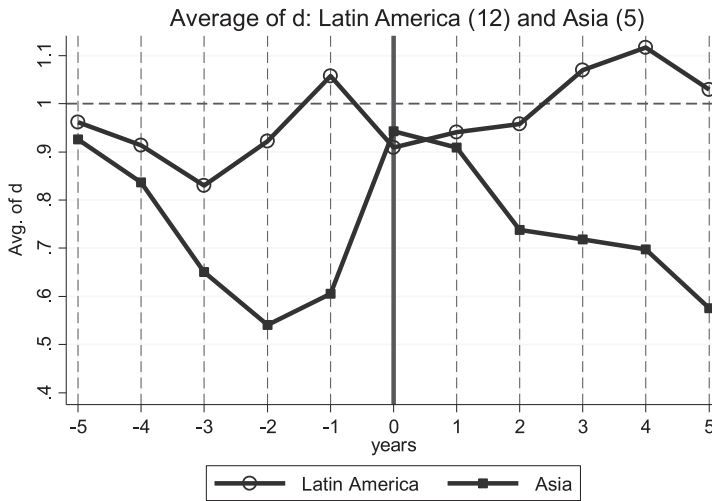
The fact that d remains at relatively lower levels in the post-crisis period may suggest that Asian countries have possibly adopted policy combinations that would help reduce the likelihood of repeating a crisis. As far as the post-crisis period is concerned, Asian crisis countries appear more crisis-proof than Latin American countries in the 1980s.

Considering the previous finding that the positive correlation between the degree of policy dispersion and the likelihood of a currency crisis survives even if

²⁵The Latin American crisis countries include Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Peru, Uruguay, and Venezuela. The Asian crisis countries include Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand.

²⁶The year with the “most severe crisis” is identified among the years 1981, 1982, and 1983 as the starting year for different types of crises that occur in the following consecutive years, or the year when a twin or triple crisis occurs.

Figure 7. The Average of the Measure of Policy Divergence for Latin America and Asia



Note: Latin America includes: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Peru, Uruguay, and Venezuela. Asia includes Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand. For each of the Latin American countries, year 0 indicates the year when the crisis was the most severe among the years 1981, 1982, and 1983 (i.e., year 0 varies among the countries). For the Asian countries, “year 0” is 1997.

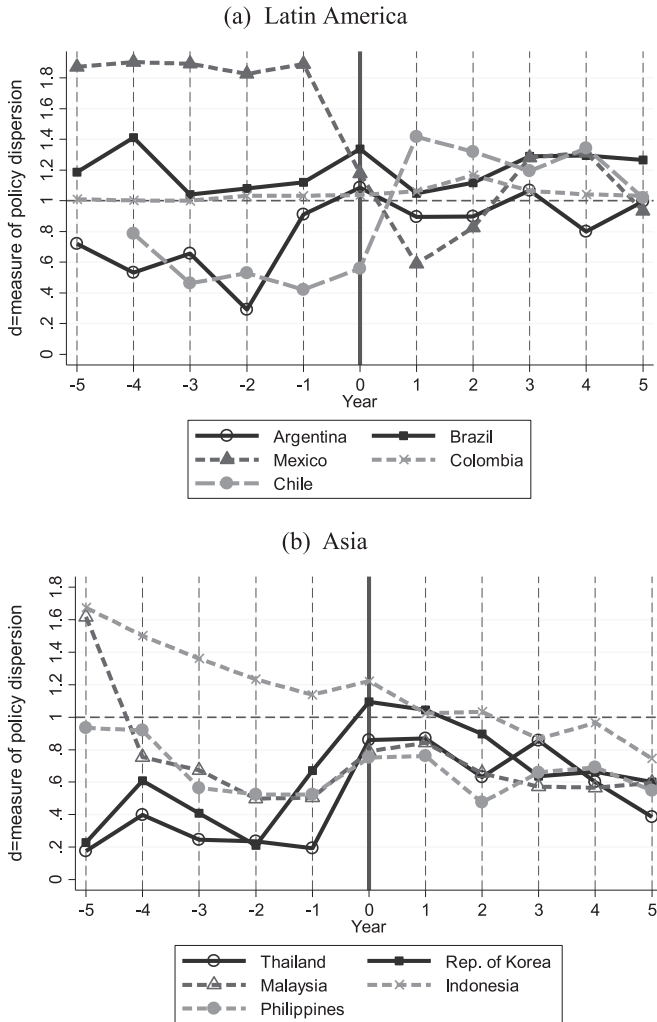
Source: Authors’ computations.

a country holds a large amount of foreign reserves (Table 2), Asian crisis countries’ efforts to maintain lower levels of policy dispersion from the global trend do matter and may have helped these countries to stay less crisis-prone in the post-crisis years.

In Figure 8, we can observe the development of the measure of policy divergence for individual crisis countries: Argentina, Brazil, Chile, Colombia, and Mexico in panel (a) and Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand in panel (b). The individual countries’ experiences provide interesting information that may be masked by the average behaviors illustrated in Figure 7.

First, the movement of d is more diverse among Latin American crisis countries than their Asian counterparts. Second, the degree of diversity is especially greater before the crisis-breakout year for Latin American countries and diminishes as years go by in the post-crisis period. Among Asian countries, except Indonesia, the level and movement of d tends to be more homogenous, which suggests that the extent of policy coordination is greater in the Asian region. Third, among the countries in Asia, the peak of d tends to be clustered around the first year of a crisis occurrence, preceded by lower levels of d , and followed again by lower d , but moderately higher than in the pre-crisis years. Such a generalization is not applicable to Latin American countries. Last, as we observed in Figure 7, Asian crisis

Figure 8. Measures of Policy Divergence for Latin American and Asian Crisis Countries



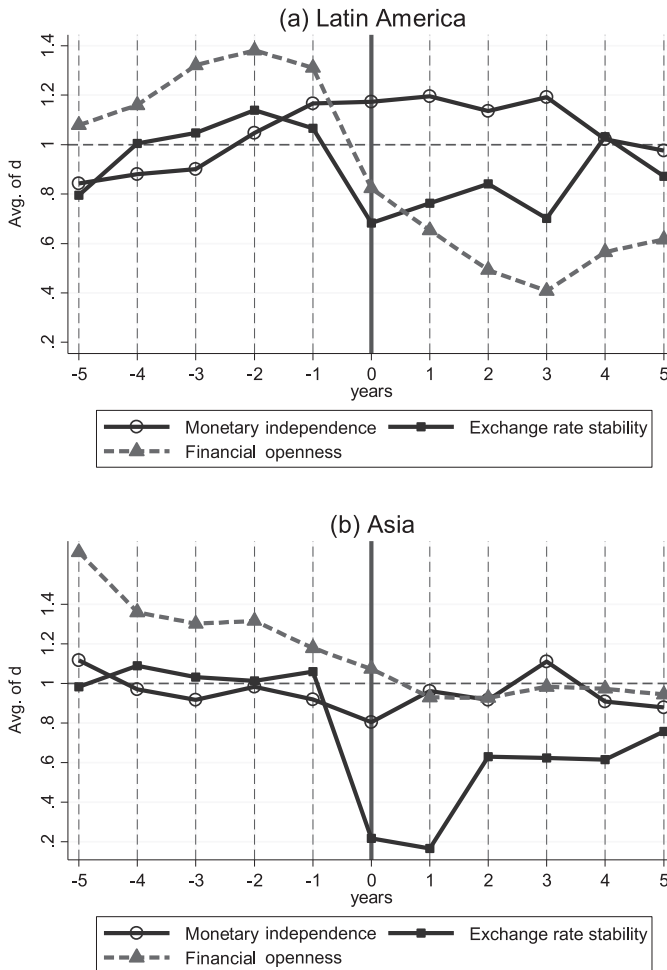
Note: Latin America includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Peru, Uruguay, and Venezuela. Asia includes Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand. For each of the Latin American countries, year 0 indicates the year when the crisis was the most severe among the years 1981, 1982, and 1983 (i.e., year 0 varies among the countries). For the Asian countries, year 0 is 1997.

Source: Authors' computations.

countries tend to implement policy combinations in a way that homogeneously leads to declining d over post-crisis years, which is not observable among Latin American crisis countries.

Figure 9 takes a closer look at the policy combinations of the countries from the two regions. It illustrates the development of the sample averages of

Figure 9. Average Deviations from the Means for Each Trilemma Index over a Crisis for Latin America and Asia



Note: Latin America includes Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Mexico, Peru, Uruguay, and Venezuela. Asia includes Indonesia, the Republic of Korea, Malaysia, the Philippines, and Thailand. For each of the Latin American countries, year 0 indicates the year when the crisis was the most severe among the years 1981, 1982, and 1983 (i.e., year 0 varies among the countries). For the Asian countries, year 0 is 1997.
 Source: Authors' computations.

mean deviations for each of the three trilemma policy indexes (i.e., $MI_r = MI/\overline{MI}$, $ERS_r = ERS/\overline{ERS}$, and $KAOPEN_r = KAOPEN/\overline{KAOPEN}$) for both groups. This figure allows us to see how the movement in the three trilemma indexes is driving the results we saw in Figures 7 and 8.

According to this figure, while both Latin American and Asian countries experienced the crisis with relatively high levels of financial openness, Latin

American countries significantly reduced the level of financial openness in the post-crisis period. The mean deviations of the financial openness index (not reported) show that countries such as Bolivia, Chile, Mexico, and Argentina reduced the degree of financial openness with respect to the global trend significantly. Asian crisis countries such as Indonesia and Malaysia also reduced the level of financial openness but by a lesser degree than their Latin American counterparts. Considering that Latin American countries did not have high domestic savings in the pre-debt crisis years while Asian countries did by the 1990s, the Latin American countries could have been more vulnerable to external shocks. That may explain the difference in their responses, in terms of financial openness, in the post-crisis years.

Both groups experienced a fall in the level of exchange rate stability, but the extent of the drop is greater for Asian countries on average. The smaller decline in the extent of exchange rate stability for Latin American crisis countries is partly due to the relatively dispersed timing of abandonment of fixed exchange rate regimes. While Asian crisis countries aborted their fixed exchange rate arrangements as soon as they experienced a currency crisis, the responses of Latin American countries to a crisis occurrence in terms of exchange rate stability differ widely across the countries. Some countries allowed exchange rate flexibility immediately after experiencing a crisis, while others tried to maintain exchange rate stability. Furthermore, all the Asian countries, except for Malaysia, maintained exchange rate flexibility in the 5-year post-crisis period, while such homogeneity is not observed among Latin American counterparts.

Asian crisis countries have maintained stable levels of monetary independence throughout the pre-crisis and post-crisis period, though it did lose some degree of monetary independence at the time the crisis occurred. As was the case with exchange rate stability, the movement of the monetary independence indexes for the Asian countries is much more homogeneous than for Latin American countries, again suggesting greater policy coordination among these countries. On average, Latin American countries moderately increased the level of monetary independence a year before the crisis through 3 years after its occurrence.

Because of the way the variable d is constructed, if any of the three indexes is far from the value of 1, the value of d would tend to rise. Given that, we can observe that Asian crisis countries have maintained relatively low levels of d because they tend to be “conformists” to the world trend in terms of monetary independence and financial openness. Despite the often-discussed anecdotes, Asian crisis countries have maintained relatively low levels of exchange rate stability, which allowed these countries to have more conformist trilemma policy combinations.

Latin American countries in the post-crisis period in the 1980s tended to have a combination of the three distinct policies. They retained high (i.e., greater-than-average) levels of monetary independence with lower exchange rate stability. Most importantly, these countries decided to seclude themselves from international

financial markets. Ironically, such a policy response may have left the countries exposed to a crisis-prone state—though there are surely other factors that contributed to keeping them prone to a crisis.

Given these findings, what makes Asia different is that, despite the turbulent experience of the Asian crisis, Asian countries have decided not to move away from the global trend of financial liberalization. As Aizenman et al. (2011) show, these economies seem to have decided to learn how to surf on the waves of financial globalization rather than run away from them.

IV. Conclusion

We have examined the impact of open macro policies on the economies from the perspective of the powerful hypothesis of the trilemma—an economy may not simultaneously pursue full achievement of all three policy goals of monetary independence, exchange rate stability, and financial openness. In this paper, we shed light on a new aspect of the problem by focusing on the degree of policy divergence, i.e., how far an economy's trilemma policy combination differs from the world trend.

We find a wider variation in the degree of policy divergence across economies of different income levels and geographical groups. Industrialized countries, most notably the euro countries, have tended to adopt more diverse trilemma policy combinations since the early 1990s. In the last 15 years or so, emerging market economies have adopted trilemma policy combinations with the smallest degree of policy divergence. Given that this group of economies has achieved relatively stable output performance, lower levels of policy divergence may have been one of the keys to their stability.

To investigate this, we formally tested the effect of the degree of policy divergence on the probability of crisis occurrences. We found that a developing or emerging market economy with a higher degree of policy divergence is more likely to experience a currency or debt crisis. However, for industrialized countries, a higher degree of policy divergence tends to *reduce* the probability of a currency or banking crisis.

We also found that by holding large volumes of IRs, developing countries can avoid facing the correlation between wider policy divergence and a higher level of likelihood of experiencing a debt crisis—but high IR holders, interestingly, also face a *positive* correlation between wider policy divergence and the likelihood of experiencing a currency crisis. Our results also suggest a nonlinearity in the effect of foreign reserves; that is, the effect of an incremental change in the level of IR holdings may be larger for lower IR holders.

When we examined the development of trilemma policies around the crisis period for Latin American crisis countries in the 1980s and the Asian crisis countries in the 1990s, we found that these two groups of countries had gone through distinctly different policy development patterns around the time of the crisis. The biggest

difference between the two groups is that Latin American crisis countries tended to close their capital accounts in the aftermath of a crisis, while this is not the case among the Asian crisis countries. That Asian crisis countries tended to reduce the degree of policy divergence in the aftermath of the crisis possibly meant that they decided to adopt open macro policies that are less conducive to a crisis. That decision has been paired with a strong incentive to hold a great amount of international reserves. By observing how crisis-prone conditions can be perennial for emerging market economies as what happened to Latin American countries, Asian countries, including those that did not experience a crisis such as the People's Republic of China (PRC), seemed to have decided to become a cautious implementer of open macro policies. In the highly integrated world economy, this decision is no surprise to anyone.

References

- Aizenman, Joshua, Menzie Chinn, and Hiro Ito. 2010. The Emerging Global Financial Architecture: Tracing and Evaluating the New Patterns of the Trilemma's Configurations. *Journal of International Money and Finance* 29(4):615–641.
- Aizenman, Joshua, Menzie Chinn, and Hiro Ito. 2011. Surfing the Waves of Globalization: Asia and Financial Globalization in the Context of the Trilemma. *Journal of the Japanese and International Economies* 25(3):290–320.
- Aizenman, Joshua, Menzie Chinn, and Hiro Ito. 2012. The 'Impossible Trinity' Hypothesis in an Era of Global Imbalances: Measurement and Testing. Working paper, University of Wisconsin, Madison. Forthcoming in *Review of International Economics*.
- Aizenman, Joshua, and Hiro Ito. 2012. Trilemma Policy Convergence Patterns and Output Volatility. *North American Journal of Economics and Finance* 23(3):269–285.
- Babbel, David. 1995. Insuring Sovereign Debt against Default. World Bank Discussion Paper Series. Washington, DC: World Bank.
- Beim, David, and Charles Calomiris. 2001. *Emerging Financial Markets*. New York: McGraw-Hill/Irwin Publishers.
- Borio, Claudio, and Piti Disyatat. 2011. Global Imbalances and the Financial Crisis: Link or No Link? BIS Working Paper No. 346. Basel, Switzerland: Bank for International Settlements.
- Bruno, Valentina, and Hyun Song Shin. 2012. Capital Flows, Cross-Border Banking, and Global Liquidity. Working paper, Princeton University, New Jersey.
- Chinn, Menzie, and Hiro Ito. 2006. What Matters for Financial Development? Capital Controls, Institutions, and Interactions. *Journal of Development Economics* 81(1):163–192.
- Chinn, Menzie, and Hiro Ito. 2008. A New Measure of Financial Openness. *Journal of Comparative Policy Analysis* 10(3):309–322.
- Demirgüç-Kunt, Asli, and Enrica Detragiache. 1998. The Determinants of Banking Crises in Developing and Developed Countries. *IMF Staff Papers* 45(1):81–109.
- Duttagupta, Rupa, and Paul Cashin. 2011. Anatomy of Banking Crises in Developing and Emerging Market Countries. *Journal of International Money and Finance* 30(2):354–376.
- Eichengreen, Barry, and Ricardo Hausmann. 1999. Exchange Rates and Financial Fragility. In *New Challenges for Monetary Policy*. Proceedings of a symposium sponsored by the Federal Reserve Bank of Kansas City.

- Eichengreen, Barry, and David Leblang. 2003. Exchange Rates and Cohesion: Historical Perspectives and Political-Economy Considerations. *Journal of Common Market Studies* 41(5):797–822.
- Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1995. Exchange Market Mayhem: The Antecedents and Aftermaths of Speculative Attacks. *Economic Policy* 21:249–312.
- Eichengreen, Barry, Andrew Rose, and Charles Wyplosz. 1996. Contagious Currency Crises: First Tests. *Scandinavian Journal of Economics* 98(4):463–484.
- Fischer, Stanley. 2001. Exchange Rate Regimes: Is the Bipolar View Correct? *Journal of Economic Perspectives* 15(2):3–24.
- Frankel, Jeffrey. 1999. No Single Currency Regime is Right for All Countries or at All Times. Essays in International Finance No. 215. Princeton, NJ: Princeton University Press.
- Frankel, Jeffrey, Sergio Schmukler, and Luis Servén. 2004. Global Transmission of Interest Rates: Monetary Independence and Currency Regime. *Journal of International Money and Finance* 23(5):701–733.
- Ghosh, Atish, Anne-Marie Gulde, Jonathan Ostry, and Holger Wolf. 1997. Does the Nominal Exchange Rate Regime Matter? NBER Working Paper No. 5874. Cambridge, Mass: National Bureau of Economic Research.
- Glick, Reuven, and Michael Hutchison. 2001. Banking and Currency Crises: How Common Are Twins? In Reuven Glick, Ramon Moreno, and Mark Spiegel, eds. *Financial Crises in Emerging Markets*. Chapter 2. Cambridge, UK: Cambridge University Press.
- Henry, Peter Blair. 2007. Capital Account Liberalization: Theory, Evidence, and Speculation. *Journal of Economic Literature* 45(4):887–935.
- Ito, Hiro, and Masahiro Kawai. 2012. New Measures of the Trilemma Hypothesis and Their Implications for Asia. ADBI Working Paper No. 381. Tokyo, Japan: Asian Development Bank Institute.
- Joyce, Joseph. 2011. Financial Globalization and Banking Crises in Emerging Markets. *Open Economies Review* 22(5):875–895.
- Kaminsky, Graciela. 2003. Varieties of Currency Crises. NBER Working Paper No. 10193. Cambridge, Mass: National Bureau of Economic Research.
- Kaminsky, Graciela, and Carmen Reinhart. 1999. The Twin Crises: The Causes of Banking and Balance-of-Payments Problems. *American Economic Review* 89(3):473–500.
- Kaminsky, Graciela, Saul Lizondo, and Carmen Reinhart. 1998. Leading Indicators of Currency Crises. *IMF Staff Papers* 45(1):1–48.
- Kose, Ayhan, Eswar Prasad, Kenneth Rogoff, and Shang-Jin Wei. 2006. Financial Globalization: A Reappraisal. IMF Working Paper No. WP/06/189. Washington, DC: International Monetary Fund.
- Laeven, Luc, and Fabian Valencia. 2008. Systematic Banking Crises: A New Database. IMF Working Paper No. WP/08/224. Washington, DC: International Monetary Fund.
- Laeven, Luc, and Fabian Valencia. 2010. Resolution of Banking Crises: The Good, the Bad, and the Ugly. IMF Working Paper No. 10/44. Washington, DC: International Monetary Fund.
- Laeven, Luc, and Fabian Valencia. 2012. Systematic Banking Crises: A New Database. IMF Working Paper No. WP/12/163. Washington, DC: International Monetary Fund.
- Lane, Philip R., and Gian Maria Milesi-Ferretti. 2007. The External Wealth of Nations Mark II: Revised and Extended Estimates of Foreign Assets and Liabilities, 1970–2004. *Journal of International Economics* 73(2):223–250.

- Levy-Yeyati, Eduardo, and Federico Sturzenegger. 2003. To Float or to Fix: Evidence on the Impact of Exchange Rate Regimes on Growth. *American Economic Review* 93(4):1173–1193.
- Mundell, Robert. 1963. Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates. *Canadian Journal of Economic and Political Science* 29(4):475–485.
- Obstfeld, Maurice. 2012a. Financial Flows, Financial Crises, and Global Imbalances. *Journal of International Money and Finance* 31(3):469–480.
- Obstfeld, Maurice. 2012b. Does the Current Account Still Matter? *American Economic Review* 102(3):1–23.
- Obstfeld, Maurice, Jay Shambaugh, and Alan Taylor. 2005. The Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility. *Review of Economics and Statistics* 87(3):423–438.
- Prasad, Eswar, and Raghuram Rajan. 2008. A Pragmatic Approach to Capital Account Liberalization. NBER Working Paper No. 14051. Cambridge, Mass: National Bureau of Economic Research.
- Prasad, Eswar, Kenneth Rogoff, Shang-Jin Wei, and M. Ayan Kose. 2003. Effects of Financial Globalization on Developing Countries: Some Empirical Evidence. IMF Occasional Paper No. 220. Washington, DC: International Monetary Fund.
- Reinhart, Carmen, and Kenneth Rogoff. 2008. The Forgotten History of Domestic Debt. NBER Working Paper No. 13946. Cambridge, Mass: National Bureau of Economic Research.
- Reinhart, Carmen, and Kenneth Rogoff. 2009. *This Time is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.
- Shambaugh, Jay. 2004. The Effects of Fixed Exchange Rates on Monetary Policy. *Quarterly Journal of Economics* 119(1):301–352.
- von Hagen, Jürgen, and Tai-Kuang Ho. 2007. Money Market Pressure and the Determinants of Banking Crises. *Journal of Money, Credit and Banking*. Blackwell Publishing. 39(5): 1037–1066, 08.
- Willett, Thomas. 2003. Fear of Floating Needn't Imply Fixed Rates: An OCA Approach to the Operation of Stable Intermediate Currency Regimes. *Open Economies Review* 14(1):71–91.
- World Bank. 2012. *Global Development Finance—External Debt of Developing Countries*. Washington, DC: World Bank.

Appendix 1: List of Economies*Industrialized Countries*

1	193	Australia*	46	522	Cambodia, (E)
2	122	Austria*	47	622	Cameroon*
3	124	Belgium*	48	624	Cape Verde*
4	156	Canada*	49	626	Central African Republic*
5	128	Denmark*	50	628	Chad*
6	172	Finland*	51	228	Chile*, (E)
7	132	France*	52	924	PRC*, (E)
8	134	Germany*	53	233	Colombia*, (E)
9	174	Greece*	54	632	Comoros
10	176	Iceland*	55	636	Congo, Dem. Rep.
11	178	Ireland*	56	634	Congo, Rep.
12	136	Italy*	57	238	Costa Rica*
13	158	Japan*	58	960	Croatia*
14	181	Malta	59	423	Cyprus
15	138	Netherlands*	60	935	Czech Republic*, (E)
16	196	New Zealand*	61	611	Djibouti
17	142	Norway*	62	321	Dominica
18	182	Portugal*	63	243	Dominican Republic*
19	184	Spain*	64	248	Ecuador, (E)
20	144	Sweden*	65	469	Egypt, Arab Rep.*, (E)
21	146	Switzerland*	66	253	El Salvador*
22	112	United Kingdom*	67	642	Eq. Guinea*
<i>Developing Countries: (E) denotes</i>			68	939	Estonia*
<i>emerging market economies</i>			69	644	Ethiopia
23	914	Albania*	70	819	Fiji
24	612	Algeria*	71	646	Gabon
25	614	Angola*	72	648	Gambia, The
26	311	Antigua and Barbuda	73	915	Georgia*
27	213	Argentina*, (E)	74	652	Ghana*, (E)
28	911	Armenia*	75	328	Grenada
29	314	Aruba	76	258	Guatemala*
30	912	Azerbaijan	77	656	Guinea
31	313	Bahamas, The	78	654	Guinea-Bissau*
32	419	Bahrain	79	336	Guyana*
33	513	Bangladesh*	80	263	Haiti
34	316	Barbados	81	268	Honduras*
35	913	Belarus	82	532	Hong Kong, China*, (E)
36	339	Belize	83	944	Hungary*, (E)
37	638	Benin*	84	534	India*, (E)
38	514	Bhutan	85	536	Indonesia*, (E)
39	218	Bolivia*	86	429	Iran, Islamic Rep.
40	616	Botswana, (E)	87	436	Israel*, (E)
41	223	Brazil*, (E)	88	343	Jamaica*, (E)
42	918	Bulgaria*, (E)	89	439	Jordan*, (E)
43	748	Burkina Faso*	90	916	Kazakhstan*
44	618	Burundi*	91	664	Kenya*, (E)
45	662	Cote d'Ivoire*, (E)	92	542	Korea, Rep. of*, (E)

93	443	Kuwait*	136	456	Saudi Arabia
94	917	Kyrgyz Republic*	137	722	Senegal*
95	544	Lao PDR	138	718	Seychelles
96	941	Latvia*	139	724	Sierra Leone*
97	446	Lebanon	140	576	Singapore*, (E)
98	666	Lesotho	141	936	Slovak Republic*, (E)
99	668	Liberia	142	961	Slovenia*, (E)
100	672	Libya	143	813	Solomon Islands
101	946	Lithuania*, (E)	144	199	South Africa*, (E)
102	674	Madagascar*	145	524	Sri Lanka*
103	676	Malawi	146	361	St. Kitts and Nevis
104	548	Malaysia*, (E)	147	362	St. Lucia
105	556	Maldives	148	364	St. Vincent & the Grenadines
106	678	Mali*	149	732	Sudan
107	682	Mauritania*	150	366	Suriname
108	684	Mauritius*, (E)	151	734	Swaziland*
109	273	Mexico*, (E)	152	463	Syrian Arab Republic
110	868	Micronesia, Fed. Sts. of	153	923	Tajikistan
111	921	Moldova	154	738	Tanzania*
112	948	Mongolia*	155	578	Thailand*, (E)
113	686	Morocco*, (E)	156	742	Togo*
114	688	Mozambique*	157	866	Tonga
115	518	Myanmar	158	369	Trinidad and Tobago, (E)
116	728	Namibia	159	744	Tunisia*, (E)
117	558	Nepal*	160	186	Turkey*, (E)
118	353	Netherlands Antilles	161	746	Uganda*
119	278	Nicaragua	162	926	Ukraine
120	692	Niger*	163	298	Uruguay*
121	694	Nigeria*, (E)	164	846	Vanuatu
122	449	Oman	165	299	Venezuela, RB*, (E)
123	564	Pakistan	166	582	Viet Nam*, (E)
124	283	Panama*	167	474	Yemen, Rep.*
125	853	Papua New Guinea	168	754	Zambia*
126	288	Paraguay*	169	698	Zimbabwe*, (E)
127	293	Peru*, (E)			
128	566	Philippines*, (E)			
129	964	Poland*, (E)			
130	453	Qatar			
131	968	Romania*			
132	922	Russian Federation*, (E)			
133	714	Rwanda			
134	716	Sao Tome and Principe			
135	862	Samoa			

(E) = emerging market economies.

Note: Countries with "*" are the ones included in the regression estimations.

Source: Authors' representations.

Appendix 2: Crisis Identification

A2.1. Currency Crisis

We identify a currency crisis based on the conventional exchange rate market pressure (EMP) index pioneered by Eichengreen et al. (1995, 1996). The EMP index is defined as a weighted average of monthly changes in the nominal exchange rate, the international reserve loss in percentage, and the nominal interest rate. The nominal exchange rate is calculated against the base country used to construct the trilemma indexes (see Aizenman et al. 2010).²⁷ The weights are inversely related to the pooled variance of changes in each component over the sample countries. As many others do, we use two standard deviations of the EMP as the threshold to identify a currency crisis. For countries where data for the EMP are not available, we supplement the crisis dummy with currency crisis identification by Reinhart and Rogoff (2009). The crisis dummy is available for 1970–2010.

A2.2. Banking Crisis

Identification of a banking crisis is based on data developed by Laeven and Valencia (2008, 2010) and its update (Laeven and Valencia, 2012). Laeven and Valencia (2008, 2010) define a systematic banking crisis if an economy is showing “significant signs of financial distress in the banking system” (e.g., significant bank runs, losses in the banking system, and/or bank liquidations) *and* if the government has taken “significant banking policy intervention measures in response to significant losses in the banking system.” They consider “significant banking policy intervention measures” to have been taken if at least three out of the following six measures have been used: (i) extensive liquidity support (5% of deposits and liabilities to nonresidents), (ii) bank restructuring gross costs (at least 3% of GDP), (iii) significant bank nationalizations, (iv) significant guarantees, (v) significant asset purchases (at least 5% of GDP), and (vi) deposit freezes and/or bank holidays. See Laeven and Valencia (2008) for more details. We also supplement the data with the Reinhart and Rogoff data. The data are available for 1970–2010.

A2.3. Debt Crisis

A debt crisis is identified using the dataset by Reinhart and Rogoff (2009). They identify a sovereign default when a country fails to meet a principle or interest payment on the due date. Alternatively, a debt crisis is identified when “rescheduled

²⁷The “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 United Kingdom, and the US. The base country can change, as in the case of Ireland. Ireland’s base country was the UK until the mid-1970s but changed to Germany since Ireland joined the EMS.

debt is ultimately extinguished in terms less favorable than the original obligation.” We also augment the Reinhart and Rogoff data using information from Babel (1995), Beim and Calomiris (2001), Reinhart and Rogoff (2008), and the World Bank’s *Global Development Finance* (2012). The data are available for 1970–2010.

A2.4. Twin Crises

A twin crisis is identified when one type of crisis occurs while another type occurs in the immediate previous year ($t_0 - 1$), the same year (t_0), or the immediate following year ($t_0 + 1$).