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Stories of the Twentieth Century for the Twenty-First

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Abstract

During the twentieth century, emerging and advanced economy financial crises bore some distinct qualitative similarities, although several features of emerging markets made their economies more volatile and crisis prone. For the advanced economies, the build-up and repercussions of the twenty-first century's first global crisis were similar to earlier crisis events. Emerging economies, however, displayed surprising resilience in 2007-2009. In light of evidence on past crises, this resilience may reflect the widespread avoidance of leverage booms during the 2000s, as well as the pursuit of more stable monetary and fiscal policies.

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In September 1976, Britain's Labour government announced that it would seek a rescue loan from the International Monetary Fund. After Portugal's subsequent approaches to the IMF in 1977 and 1983, a quarter century would pass before another high-income country sought the institution's support – a period during which the Fund lent exclusively to crisis-stricken countries in the developing world. But Iceland's approach to the Fund in the autumn of 2008 was soon followed by sovereign debt crises in Greece and Ireland virulent enough to force them, too, to seek official external support. At the time of writing (December 2010), the governments of other high-income countries such as Portugal and Spain face credible threats of losing access to credit. Of course, these startling recent developments arose in part as collateral damage from the much broader global financial crisis that began in 2007 in the financial markets of the United States.

The financial and economic collapse in advanced countries caught most academic, business, and policy economists off guard. After the mid-1970s, an unstated consensus developed that financial crises were mainly emerging-market affairs. True, advanced countries such as Finland, Norway, Sweden, and Japan experienced systemic banking crises in the 1980s and 1990s. Around the same time, European countries also went through currency devaluation crises, in some cases related to banking crises. While painful, these crises were less frequent and generally less devastating than widespread cataclysms such as the 1980s developing-country debt crisis or the 1997-98 Asian and Russian crises. Only countries in the lower income groups, it was believed, would ever need any more to seek IMF support because of a sudden stop in external finance. Sovereign default by an advanced country was unthinkable; nothing of the sort had happened since the 1930s, when many developing countries likewise defaulted (Díaz-Alejandro (1983)).

Buttressing the consensus view of emerging markets as much more vulnerable to financial

crisis was a large catalog of mutually reinforcing structural weaknesses that researchers identified over the years. These range from limited financial development, to faulty governance structures, to over-regulated markets, to extensive dollarization of domestic and external liabilities, to "fear of floating" the exchange rate. The mature advanced countries, it was held, were much more robust in all of these areas, and therefore were in a position to derive big net benefits from liberalized and open financial markets. But after the Asian crisis (if not before), most economists accepted the need for emerging markets to tread cautiously. In the light of this narrative, and in the light of late twentieth-century crisis experience, the global crisis of 2007-2009 therefore produced another surprise. While some emerging countries – notably several in the pre-1989 Soviet bloc – suffered greatly in the crisis, others proved remarkably resilient, often experiencing smaller output declines and faster recoveries than those in the advanced countries.

Figure 1, which shows detrended real GDP growth rates for the advanced countries and the six groups of emerging market economies (EMEs), illustrates these patterns.[1] The Commonwealth of Independent States and Central and Eastern Europe suffered the harshest growth declines, with the former losing 9.5 percent in 2009 and the latter 7.4 percent, relative to trend. (We will discuss some reasons for these steep losses below.) Outside of these regions, the advanced countries – primarily the United States, the European Union, and Japan –

[1]Data come from the IMF's October 2010 *World Economic Outlook* (WEO); growth rates for 2010 are IMF forecasts. For each country grouping, the growth rate of GDP is a weighted average of constant-price GDP growth rates for individual countries, the country weights being shares of GDP (measured at purchasing power parity) in group GDP (also measured at PPP). For Figure 1 we define a group's trend real growth rate as the average of annual growth rates over 1980-2010 (except for the Russian federation and Central and Eastern Europe, where we use the 1994-2010 average). Our country groupings differ from those used by the WEO in two respects. First, we classify recent graduates to the OECD such as Mexico, Israel, and Korea as EMEs rather than advanced economies. Second, because our discussion stresses international financial linkages and financial vulnerabilities, we exclude from consideration lower-income developing countries with relatively undeveloped financial sectors and relatively limited financial openness. An appendix lists the countries in our analysis, by category. A number of other analyses have noted the relative resilience of the EMEs in the recent global crisis. For a survey, see Kose and Prasad (2010).

suffered most, with detrended growth rates of –2.3 percent in 2008, –5.8 percent in 2009, and 0.0 percent in 2010. The figure also shows, however, that the Asia, Middle East-North Africa, and Sub-Saharan Africa groups had relatively mild slowdowns in 2009. While EMEs in Latin America suffered a 2009 growth loss not too far below that of the advanced countries, this group fared much better in both 2008 and 2010. And there is considerable heterogeneity within the region. Brazil, for example, suffered only a minor slowdown in 2009, while growing very strongly in both contiguous years.

Figure 1 also shows that the decade of the 2000s until 2009 was a boom period for EMEs, with growth generally far above the long-run trend. Supporting this exceptional growth were low interest rates in the advanced economies and rising world commodity prices. Indeed, a notable absence of major emerging-market crises for several years following the 2002 crises in Argentina and Uruguay led some to speculate that the "Great Moderation" had fundamentally altered prospects for financial stability in EMEs; and the IMF, which derives its operating revenue from crisis lending, felt obliged both to downsize and to rethink its global role. Historically, EME booms often have led to crashes, and while this pattern recurred just east of the euro zone, the retrenchment elsewhere in the developing world was milder. Following the September 2008 Lehman Brothers failure, financial flows to emerging markets certainly contracted abruptly, world export demand collapsed temporarily, and many EME currencies depreciated sharply. But most of the emerging world escaped systemic banking crises and sovereign defaults. The outcome was very different from that of the 1980s debt crisis, which also originated in a context of deep global recession.

In this paper we compare features of economic crises in advanced and developing economies. The 2007-2009 crisis, with its seemingly divergent impacts on the advanced economies and different EMEs, can yield clues about the fundamental causes and consequences of crises. We

can hope to learn by comparing the characteristics of crises in different epochs, by comparing across economies at distinct stages of development, and by distinguishing among different types of crisis and different mechanisms of international transmission or contagion. An important conclusion is that crises in emerging and advanced economies have their origins in very similar underlying factors – most importantly, a buildup of domestic and external leverage in a context of explicit or implicit government guarantees to a liberalized financial sector.[2] Thus, the recent U.S. experience, like that of some euro zone economies, has many hallmarks of earlier "emerging market" crises in Latin America and Asia. An economy's structural features determine the likelihood that one or more causal factors triggers a crisis, as well as the severity of its effects; but these are differences of degree, not of kind. At least over the first decade of the twenty-first century, structural evolution appears to have raised the crisis sensitivity of advanced economies relative to that of many emerging economies, making the latest global crisis work out quite differently so far from twentieth-century crises for many EMEs. We add the qualifier "so far" because, as we shall see below, current EME financial inflows and credit expansion, fueled by both the EMEs' relative economic strength and continuing expansive monetary policies in richer countries, may signal financial problems down the road.

The plan of this paper is as follows. In section I we distinguish among alternative varieties of financial crisis and discuss the structural weaknesses of EMEs that have tended over the past to make them especially susceptible to crises. We compare the frequency of different types of crisis in advanced economies and EMEs. Section II analyzes key economic data from advanced economies and EMEs around different types of crisis. Our goal is to

[2]This theme is familiar from studies such as Díaz-Alejandro (1985), McKinnon and Pill (1996), Kaminsky and Reinhart (1999), Gourinchas et al. (2001), Tornell (2001), Mendoza and Terrones (2008), Schularick and Taylor (2009), and Reinhart and Reinhart (2010).

compare salient features of similar crises in advanced and emerging economies, as well as differences between past crises and the 2007-2009 crisis. In the light of that evidence and a developing body of empirical research, Section III advances hypotheses about why the recent global crisis was worse for the rich countries than for many less-developed countries, and why the impact differed so markedly across different emerging regions. Section IV concludes.

1 Crisis Types and Emerging Market Vulnerabilities

Economists have studied many types of financial crisis, but our analysis is restricted to three that tend to be closely interrelated in practice: currency crises (in which a managed exchange rate falls to speculative pressure), banking crises (including instability in the shadow banking system), government funding crises (involving default or market fears of explicit default on internal or external public debt). Banking crises can involve a limited range of institutions, so that their collateral impact on the core of the financial system is contained, as in the United States Savings and Loan crisis. We focus instead on systemic banking crises, which endanger the entire economy (and possibly, through various channels of contagion, foreign economies).

The links between "twin" banking and currency crises are well known. As documented by Kaminsky and Reinhart (1999), banking crises tend to begin ahead of currency crises when the two occur together, with flight from the financial system and government liquidity support for banks soon leading to flight from the currency and thus, massive depreciation. Currency depreciation fears exacerbate (and may themselves cause) banking problems as domestic-currency depositors switch into foreign exchange perhaps due to higher interest

rates as authorities try (usually in vain) to defend the currency. If banks or bank borrowers have unhedged debts denominated in foreign currency, currency depreciation inflates the real value of bank liabilities or, by rendering bank borrowers insolvent, reduces bank assets.

A systemic banking crisis, especially if exacerbated by currency depreciation, can jeopardize the public finances as the government intervenes to guarantee bank liabilities, acquire impaired bank assets, or inject capital. If sufficiently expensive, these bailout measures may add a third sibling – a sovereign default crisis – to the twins. Of course, a default crisis may originate in simple fiscal profligacy rather than a private-sector financial collapse, although currency and banking problems are likely to follow. Default on public debt must be explicit if government bonds are indexed or foreign-currency denominated, but for debts in domestic currency, default may (but need not) take the form of surprise inflation.[3] In this paper we consider only explicit default episodes.

Data from the 1970s through 2007 (covering the impact as well as the frequency of events) suggests that emerging markets have been particularly susceptible to currency, banking, and sovereign default crises. A large empirical literature seeks to document the timing of financial crises, and while alternative criteria can yield somewhat different conclusions (especially with regard to timing), the broad empirical regularities concerning crisis incidence are fairly uncontroversial, We draw our dating of banking and sovereign default crises from Reinhart and Rogoff (2009) and Laeven and Valencia (2010). To date EME currency crises we use the criterion of Frankel and Rose (1996) – a 25 percent or greater nominal currency depreciation over a year that is also a 10 percent increase in the annual rate of depreciation. For advanced economies we use the chronology of Bordo et al. (2001), which extends through 1997. After 1997 there were no true currency crises in advanced countries until Iceland's

[3]See Reinhart and Rogoff (2009), part III.

	Currency	Banking	Default
Advanced	43	5	0
Emerging	107	46	52
Total	150	51	52

Source: Authors' calculations.

Table 1: Crisis Incidence in Advanced and Emerging Economies, 1970-2006

in 2008, notwithstanding the ersatz crises some authors have identified using mechanical criteria.

Table 1 shows that in the past, crises in general have been much more prevalent in EMEs. All of the 52 (external and internal) sovereign default episodes occurred in EMEs, although one or more peripheral euro zone countries could well join the list soon. Forty-six of the 51 systemic banking crises have taken place in EMEs, and EMEs have had more than twice as many currency crises, often-times not in conjunction with banking crises.[4]

Several characteristics of EMEs differentiate them from advanced economies, and have made them especially crisis-prone in the past. Countries naturally differ among each other, making generalizations imperfect, but a majority of the features we describe below have applied to most EMEs. In turn, these distinctive features mostly stem from a deeper source: a level of institutional quality generally lower than that in advanced economies.

Economists believe that the efficacy of a country's governance institutions is central to understanding its income per capita, as well as other key features of its economic performance. While quantitative measures of institutional quality are necessarily crude, they uniformly point to lower average quality in the emerging world compared with mature economies.[5] In

[4]The five systemic advanced-country banking crises occurred in Spain, Japan, Norway, Finland, and Sweden.

[5]Naturally there are exceptions. For example, Chile in 2010 surpassed the United States on Transparency International's inverse index of corruption (and in the same year entered the OECD). Nonetheless, there is a strong positive correlation between the Transparency International index and real per capita GDP. The World Bank's Worldwide Governance Indicators project measures institutional quality along six dimensions:

turn, these shortcomings in governance are closely linked to most of the items on economists' standard list of emerging-market weaknesses, which emerged out of twentieth-century experience:

- *Political and economic instability.* Political instability breeds economic instability, as illustrated by the relatively more variable EME growth rates through 2007 shown in Figure 1 (see, for example, Acemoglu et al. (2003)). Macro policies tend to be procyclical (Kaminsky et al. (2005)) due to conflicts over windfalls in good times and the absence of predictable and widely accepted mechanisms to allocate losses in bad. Inflation is a favored method of resolving distributional disputes that the political process cannot settle (Rajan and Tokatlidis (2005)). Difficulty in levying and collecting taxes worsens the fiscal position overall, contributing both to procyclicality and the reliance on inflation. Volatility may be heightened by undiversified export mixes, for example, reliance on a few main commodity exports.

- *Undeveloped and unstable financial markets.* Unreliable contract enforcement dictates a reliance on relatively simple, information-insensitive, noncontingent financial contracts. Imperfect protection of equity investors fosters ownership concentration and limits gains from risk sharing, domestic and international (Stulz (2005)). At the same time, government restrictions may discourage competition and innovation in financial markets, allowing connected lending and other forms of cronyism to flourish. A lack of financial depth limits the economy's ability to absorb economic shocks. While bureaucratic restrictions abound, effective enforcement of prudential standards often lags

voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption. All of these measures correlate positively with per capita income. Of course, there is a two-way causality, since institutional imperfections impede wealth accumulation but likewise are more likely when resources for investment in institutional quality are low.

because of opaque accounting practices, corruption, and a lack of expertise. Weak political institutions limit the checks and balances needed to minimize abuses. As Díaz-Alejandro (1985)(p. 20) observes in his classic analysis of Latin American financial instability, "[D]emocracy, whatever its more fundamental virtues, is an important technical input for a healthy domestic financial system." An expectation that government will bail out failing financial institutions, validated by experience in Latin America, Asia, and elsewhere, creates moral hazard. This spells trouble when financial transactions are liberalized (externally or domestically) without adequate prior safeguards (see, for example, Demirgüç-Kunt and Detragiache (2000); Honohan and Klingebiel (2003)).

- *Dollarization, original sin, and currency mismatches.* Frequent recourse to inflationary finance in the past has created a tendency for financial contracts to be denominated in a stable foreign currency, such as the U.S. dollar or euro (Eichengreen et al. (2003); Goldstein and Turner (2004); Rajan and Tokatlidis (2005)). This tendency applies both to internal contracts and external loan agreements; in the latter context, the inability to borrow from foreigners in domestic currency is conventionally referred to as "original sin." Domestic liability dollarization has an important advantage for creditors over alternative form of real principal protection, such as price-level indexation: it does not depend on government discretion with respect to inflation measurement or the timing of inflation adjustment. Unfortunately, dollarization of liabilities is likely to entail a short position in dollars for the home banking system, either explicitly or implicitly, because even bank loans to domestic customers that are denominated in dollars on paper are likely to go bust when a sudden currency depreciation raises the real value of the loan. For a sample of about a hundred developing economies, Nicolo et al. (2005)

document the links between macro instability and dollarization of bank deposits and between dollarization and financial instability. At the national level, original sin implies that currency depreciation will raise the real value of external debt. Through these mechanisms, as we have noted, sharp currency depreciations can lead to financial crises.

- *Fear of floating*. Even where emerging markets have not literally pegged their currencies' foreign exchange values, they have shown less willingness to tolerate sharp exchange rate movements than the advanced countries (Calvo and Reinhart (2002); Hausmann et al. (2001)). Fear of sharp appreciation and its negative effect on exports is evidenced in the recent controversy over "currency wars." Particularly when an EME is financially open and faces financial inflows, as has been the case for many in recent years, intervention to resist currency appreciation, coupled with incomplete sterilization of reserve inflows, may undermine domestic inflation targets, bid up asset prices, and push domestic credit expansion to dangerous levels. EMEs also have feared sharp currency depreciation, as depreciation can cause debt deflation (in the presence of currency mismatch) and a jump in inflation. Indeed, once the domestic currency begins to depreciate, dollar debtors may scramble for that currency in order to unwind short positions, leading to further depreciation and heightened financial distress. Some argue that the government's reluctance to allow sharp exchange rate movements in the past has itself contributed to currency mismatch – there may be an expectation that official intervention to support the exchange rate will allow dollar debtors to close out their short positions at public expense (Mishkin (1998); Burnside et al. (2001); Schneider and Tornell (2004)).[6]

[6]For the argument that fixed exchange rates are not a primary cause of currency mismatch, see Honig (2009).

- *Sudden stops and debt intolerance.* EMEs have been vulnerable to sudden stops in foreign lending, which may require not only a sharp reduction in the current account deficit also but abrupt demands for repayment of short-term external debt (Calvo and Reinhart (2000); Edwards (2004); Forbes and Warnock (2010)). Unless the country can draw on official foreign exchange reserves or relatively liquid gross assets held abroad by the private sector, such events typically will be associated with abrupt currency depreciation and the associated financial repercussions. Financial fragility and the government's weakness in generating resources for debt repayment are conducive to volatility in capital flows. At the same time, credit rationing may occur at external debt levels far below those that advanced countries seem able to sustain – a phenomenon that has been labeled "debt intolerance" by Reinhart et al. (2003).

- *Over regulation of nonfinancial markets.* Heavy regulation in product and labor markets reduces flexibility in resource reallocation following economic shocks. In particular, structural rigidities help explain the fear of floating, because unexpected exchange rate movements have magnified effects on sectoral imbalances and intersectoral adjustment costs. Thickets of administrative barriers to economic activity, such as licensing requirements, promote corruption as well as inefficiency.

In view of this array of structural defects, it is all the more impressive that emerging markets did not suffer even more in the recent global crisis. As we discuss below, many observers believe that some EMEs have made progress repairing or at least compensating for these weaknesses. On the other hand, recent events make mature economies appear suddenly vulnerable to some aspects of these "emerging-market" weaknesses. Advanced countries still score generally well in terms of political and economic stability, ability to use

the exchange rate as a shock absorber, and flexibility in nonfinancial markets.[7] But their financial markets have caused problems.[8]

Consider *financial development*. This area of relative advanced-country "strength" arguably exacerbated the effects of the crisis in the rich economies. Table 2 shows ratios of total commercial bank assets relative to GDP in 2009 for a range of countries. (Total banking system assets are greater. The 2009 numbers already reflect deleveraging relative to 2007.) As is apparent, emerging markets, in general, have smaller banking systems than the mature economies.[9] Furthermore, there is a remarkable divergence in the *growth rates* of banking assets between 2003 and 2009. EU bank assets increased by a staggering 61 percent and United States bank assets at nearly half that rate, whereas EME bank assets grew by far less – emerging Europe showing the fastest rate of increase – or shrank. Underlying the very high overall EU ratio to GDP in Table 2 are ratios of 349.2 percent for Belgium, 491.5 percent for the United Kingdom, and 597 percent for Ireland.

In EU and other rich countries, lax prudential oversight in the face of the rapid financial-market expansion of the 2000s has increased the level of financial risk. In marked contrast to the pre-2007 experience summarized in Table 1, ten advanced countries had systemic banking crises in 2007-2009 and a further six had milder (but still costly) "borderline" systemic crises (according to the classifications of Laeven and Valencia (2010)). Only two EMEs (Latvia and

[7] Of course there are exceptions, for example, the structural labor-market rigidities leading to high unemployment in some advanced countries.

[8] Arguably the widespread resistance to recognizing advanced-country financial weaknesses until now represents past escapes from disaster, as well as an important element of denial. Reviewing the U.S. financial market turmoil of late 1998, for example, Lamfalussy (2000) (p. 140f) wrote, "If such developments can take place in the model market of the world, what is the practical value of recommending that emerging markets copy this model?"

[9] United States banking assets appear moderate in relation to GDP due to the importance of the shadow banking sector, which is much less developed in other high-income countries. The Asia aggregate in Table 2 includes the (now) high-income "newly industrializing Asia" group consisting of Hong Kong, Korea, Singapore, and Taiwan. These countries generally have banking systems more extensive than those in poorer emerging Asian countries.

	2003	2009	Change (percent of GDP)
European Union	210.3	271.3	61.0
United States	71.0	100.3	29.3
Japan	168.4	174.5	6.1
Asia	144.2	142.6	−1.6
Emerging Europe	33.6	50.6	17.0
Latin American and Caribbean	51.9	64.5	12.6
Middle East and North Africa	78.7	69.6	−9.1
Sub-saharan Africa	71.3	47.6	−23.8
World	136.5	160.7	24.2

Source: IMF, *Global Financial Stability Report*, various issues.

Table 2: Commercial Bank Assets as a Percentage of GDP

Ukraine) had systemic banking crises in those years, while four more (Hungary, Kazakhstan, Russia, and Slovenia) had borderline systemic crises.[10]

Experience in emerging and advanced economies alike shows that no government will allow a domestic financial system collapse if it can marshal the resources to prevent it. Apparently, moral hazard does not discriminate across income levels. The sizes of some advanced-country bank balance sheets, however, make obvious the dangers to the rich countries' public finances of broad banking system guarantees Other things equal, fiscal support of the banking system in times of stress may be more feasible for the government budget of an EME, whereas for some advanced economies even a year's GDP might not suffice to handle a severe systemic crisis. While all the industrial countries currently face aggravated fiscal adjustment challenges as a result of past interventions to support their financial sectors, countries with banking-system balance sheets that are multiples of GDP are especially at risk for the future. Sovereign defaults (which themselves are likely to have adverse political

[10]In 2008, Mongolia, which we consider to be a non-emerging developing country, also had a systemic banking crisis according to Laeven and Valencia (2010). Their list does not include some more limited events, such as Nigeria's 2009 banking stress.

consequences) are no longer unthinkable for rich countries. The events leading to Ireland's recent sovereign debt problems are a case in point.[11]

High levels of intermediation in mature financial markets have likewise given rise to substantial *currency mismatches*. Extensive European bank investments in U.S. subprime-related securities, financed by short-term wholesale dollar borrowing, led to dollar shortages in 2007-2009 when dollar funding markets froze. The dollar appreciated sharply. Federal Reserve swap lines, first extended in December 2007 and renewed several times since then, were particularly helpful for European banks seeking to avoid distress sales of dollar assets (although the swaps were made available to a small group of EMEs as well). The European banks' plight demonstrates how, even in an advanced-country crisis, maturity or other mismatches between foreign currency assets and liabilities can rapidly morph into currency mismatch.

Finally, advanced economies also saw *sudden stops* in the aftermath of the Lehman collapse. United States balance of payments data, for example, show that from 2008:IV through 2009:II, foreign lenders ceased lending to the U.S. and indeed, liquidated nearly $165 billion in U.S. assets. Unlike emerging markets, however, U.S. residents hold a stock of gross foreign assets that is higher than GDP. As a result, they were able to meet foreign repayment demands, at the same time financing a continuing current account deficit, by selling off their own assets located abroad. Since the sell-off included claims on emerging markets, it is all the more striking that a majority of EMEs did not suffer financial collapse in the crisis.

[11] Even leaving aside their partial coverage of the banking system, the numbers in Table 2 may not accurately represent the potential claim on public sector resources arising from bank rescues. Some of the assets measured in these numbers are held by banks with primarily foreign operations, and little connection on either the asset or liability side to the domestic economy. On the other hand, a government could face pressures to rescue a domestically-owned bank with primarily foreign operations.

We summarize as follows. Crises of several types have been frequent since 1970 (and of course were common in earlier epochs). Because of several structural weaknesses in the polities and economies of emerging markets, crises have been much more common there. However, some features of advanced economies that sometimes are viewed as strengths – notably financial depth – pose threats as well, given limited prudential oversight, bailout expectations, and other market incentives for socially excessive risk taking. At the same time, some EMEs have labored over the early twenty-first century to reduce their vulnerabilities, and these efforts may have borne fruit in the recent crisis. We next turn to the data to compare EME and advanced-country performance.

2 Some Empirics of Crises: Emerging and Advanced Economies, Then and Now

Two types of comparison (across country types and across time) interest us. These are motivated by two questions: How have crises differed, in their precursors and aftermaths, between emerging and advanced economies? And in both sets of countries, how does the crisis of 2007-2009 differ from earlier crises? Ultimately, we hope the data will help us to understand the different experiences of advanced and emerging economies, as well as of different regional groupings of emerging economies, in the recent crisis.

In the spirit of Eichengreen et al. (1995), Kaminsky and Reinhart (1999), and several subsequent authors, we examine the behavior of key economic variables around crisis episodes. We focus on variables which, according to theory and earlier empirical research, are likely to play a causal role in determining the probability of a crisis, are likely to be affected by a crisis, or both. While Kaminsky and Reinhart average their data over cross sections con-

sisting of country-crisis pairs, relying on different cross sections for information on different crisis types, we take an alternative approach. Instead, we estimate directly how an economic variable's conditional expectation depends on temporal distance from each of three types of crisis – default (internal or external), banking, and currency – given the proximity of other crisis types.

More specifically, we examine the behavior of output, domestic credit, the current account balance, external leverage, the real interest rate, the real exchange rate, international reserves, and fiscal variables. The relevance of most of these variables will be obvious. For example, a rapid buildup of domestic credit can undermine a currency peg as the central bank loses foreign exchange reserves, while simultaneously setting the stage for a private banking collapse and a setback to government solvency. Likewise, significant real currency appreciation has often preceded financial crises, although it is certainly not a necessary condition for a crisis to occur.

2.1 Methodology

Consider a variable of interest y_{it}, where subscript i refers to the country and subscript t to the period. Our approach is to estimate the conditional expectation of y_{it} as a function of the temporal distance from various types of crisis, relative to a common "tranquil times" baseline. As discussed in the previous section, our benchmark estimation considers four possible crisis types: domestic and external default, systemic banking crisis, currency crisis, and the global financial crisis of 2008.[12]

[12] As noted earlier, we date domestic and external defaults following Reinhart and Rogoff (2009); systemic banking crises according to Laeven and Valencia (2010); EME currency crises following the criteria set out in Frankel and Rose (1996); and advanced countries currency crisis according to the Bordo et al. (2001) classification. We assume that all countries were potentially affected by the global financial crisis, which we view as starting in 2008, when it first became truly systemic.

We postulate the following *fixed-effects panel specification*:

$$y_{it} = \alpha_i + \beta_{ds}\delta_{ds} + \beta_{bs}\delta_{bs} + \beta_{cs}\delta_{cs} + \beta_{gs}\delta_{gs} + \epsilon_{it}. \tag{1}$$

In equation (1), δ_{js} denotes a dummy variable equal to 1 when country i is s periods away from a crisis of type j in period t.The index j denotes, respectively, default (d), systemic banking crisis (b), currency crisis (c) and the 2008 global financial crisis (g). We set the event window around crisis episodes to 11 years (five years before, five years after) so as to allow the relatively slow adjustment that typically follows a financial crisis (Reinhart and Rogoff (2009); Reinhart and Reinhart (2010)). The regression also allows for country fixed effects α_i. Finally, the error term ϵ_{it} captures all the remaining variation in the realization of the variable of interest.

A number of observations about our empirical specification are relevant at this stage. First, the coefficients β_{js} are our primary parameters of interest. They measure the conditional effect of a crisis of type j on variable y over the event window $-5 \leq s \leq 5$ *relative to "tranquil times."*[13] Since the "tranquil time" baseline is *common* to all types of crisis, we are measuring the impact of different crises relative to a common reference level. This is important because it will allows us to measure directly and compare how different macro and financial variables evolve over different crisis episodes. In particular, comparison of β_{gs} and β_{js} for $j \neq g$, provides us with a direct assessment of the similarities between the recent global financial crisis and earlier crises of various kinds.

Second, because we consider that all countries are "treated" by the recent global financial crisis, the coefficients β_{gs} have the interpretation of year-effects for the period 2003-2010.

[13]Tranquil times are implicitly defined as the country-year observations that do not fall into any crisis-event window.

Hence, β_{gs} measures the deviation of the cross section average in the corresponding years from the "tranquil time" baseline, itself estimated over the period 1973-2003 and purged of crisis episodes. Unlike simple deviations from trend (which potentially include earlier crisis episodes), we therefore construct a potentially cleaner estimate of the build-up and subsequent impact of the global financial crisis.[14]

Third, our specification easily handles repeat or multiple crises, with one important caveat. For instance, the estimated conditional mean for a country one year away from a currency crisis and one year after a banking crisis is simply $\hat{\beta}_{-1c} + \hat{\beta}_{1b}$. There is no need to decide whether recurrent episodes are really part of a single larger crisis, or to extend event-windows to encompass different crisis manifestations. The caveat, as the formula above illustrates clearly, is that our specification does not allow for *interaction effects*. In other words, it does not allow for the amplification and feedback effects between different types of crisis or repeated crises. The effect of a twin banking and currency crisis, in the simplified setting we assume, is simply the sum of the effect of an isolated banking crisis, $\hat{\beta}_b$, and an isolated currency crisis, $\hat{\beta}_c$. This simplification has potentially important drawbacks, as our earlier discussion of potential two-way feedback loops between currency and banking crises shows.[15] Potential linkages also exist also between banking crisis and domestic or sovereign defaults episodes.

These concerns can be addressed by estimating a variation of equation (1) that includes interaction effects:

[14] Obviously, our approach still requires that we control for non-stationarities in the data; otherwise the "tranquil time" benchmark would not be appropriate.

[15] There are numerous discusions in the literature, including Kaminsky and Reinhart (1999), Obstfeld (2004), Rajan and Tokatlidis (2005), and references therein.

$$y_{it} = \alpha_i + \sum_j \beta_{js}\delta_{js} + \sum_{jk} \beta_{jks}\delta_{jks} + \epsilon_{it}. \quad (2)$$

In equation (2) δ_{jks} is a dummy equal to one when country i is s periods away from joint crisis of type j and k in period t.[16] The corresponding coefficients β_{jks} have a particularly simple interpretation in the case where $\delta_{jk} = \delta_j\delta_k$, that is, when δ_{jk} is simply the interaction of the crisis dummies of type j and k. In that case, β_{jks} represents the difference-in-difference estimator of the effect of a joint crisis, over and above the effect of an isolated crisis. In theory, this specification allows us to test directly for interaction effects of the kind described in the literature.[17] In practice, including all types of crisis and all possible interactions quickly makes all coefficients statistically insignificant. Given the focus in the literature on twin banking and currency crises, we implemented a version of equation (2) involving banking and currency crisis episodes only (along with their interaction).[18] Nevertheless, we found that estimates of the interaction terms β_{cbs}, while sometimes large in magnitude, were most often statistically insignificant. This finding suggests that, while banking and currency crises can potentially interact in major ways, the effects do not appear systematic. In what follows, we therefore omit interactions terms, mentioning their relevance only when appropriate.

Finally, we implement equation (1) separately on advanced and emerging market economies. As the discussion of the preceding section made clear, allowing for different crisis dynamics

[16] In practice, we allow for the fact that joint crises have some dynamic features and need not necessarily happen in exactly the same year. We set δ_{jk0} equal to 1 if a crisis of type j or k occurs in year t, a crisis of type j or k occurs in year $t+1$, but there is no crisis of type j or k in year $t-1$.

[17] By contrast, Kaminsky and Reinhart (1999) do not estimate the treatment effect of a joint crisis, relative to an isolated crisis. They report estimates of the effect of a joint crisis, that is, $\beta_c + \beta_b + \beta_{cb}$, and unconditional estimates of the effect of a crisis of type j. For example, for a currency crisis, the effect they estimate corresponds to the sum $\beta_c + \beta_b E[\delta_b|\delta_c = 1] + \beta_{cb} E[\delta_{cb}|\delta_c = 1]$.

[18] Indeed, twin banking-currency crises are quite prevalent in our sample. Of the five systemic banking crises for advanced economies, three are twin banking-currency crises – Spain (1977), Finland (1991), and Sweden (1991) – whereas the remaining two – Norway (1991) and Japan (1997) – are isolated banking crises. Of the 42 banking crises in EMEs, 36 are twinned with currency crises according to our classification.

for the two groups of countries will allow us to answer two important questions: How have the crises of EMEs and advanced economies differed in the past (that is, is $\hat{\beta}_{js}^{eme}$ different from $\hat{\beta}_{js}^{adv}$)? And how does the current crisis differ from earlier crises (that is, is $\hat{\beta}_{gs}^{adv}$ or β_{gs}^{eme} similar to $\hat{\beta}_{js}^{adv}$ or $\hat{\beta}_{js}^{eme}$)?

2.2 Findings

We now systematically evaluate the relative behavior of various macroeconomic and financial variables around crises events by estimating equation (1). We consider 11 variables, covering various aspects of the domestic, external, real, and financial environment.[19] Our sample consists of 22 advanced economies and 57 EMEs for which we have consistent annual data between the beginning of the modern floating exchange rate era in 1973 and 2010.[20]

We begin with a measure of *real activity*, the output gap, constructed as deviations of the log of real output from a linear trend. The results from the estimation of equation (1) are presented in the top panel of figure 2. Because we will make repeated use of that figure, let us spend some time describing the information it contains. The top row, labeled "EM," reports the estimates for our sample of 57 emerging market economies. The bottom row, labeled "ADV," reports the coefficients of advanced economies. Each column (labeled, respectively "Default," "Banking," "Currency," and "2008") refers to a different type of crisis. Finally, in each panel the solid line reports the coefficients $\hat{\beta}_{js}$ over the event window, together with a 95 percent confidence interval.[21] The beginning of a crisis ($s = 0$ in event time) is indicated

[19] All data sources are described in appendix B.

[20] The geographic distribution of countries is as follows: 13 Latin American, 11 Asian, 10 Middle East and North African, 3 Sub-Saharan African, 5 CIS, and 15 Central and Eastern European.

[21] That is, we report approximately two standard deviations on each side of the estimated coefficients. Our estimates are based on robust (White) standard errors. Similar results (but with somewhat larger standard errors) are obtained when clustering EMEs by region. Given the global propagation of trade and especially finacial shocks, however, the theoretical basis for regional clustering seems weak.

by a vertical dashed line.

Figure 1(a) presents interesting and well documented patterns. Looking at the first three columns for EMEs, output tends to be significantly above trend (a positive output gap) in the years preceding default and banking crises, relative to tranquil times. This is true both for EMEs as well as advanced countries (bottom row). The estimated output gap is large – up to 5 percent. By contrast, in the run up to a currency crisis, the output gap is negative – slightly for advanced economies but more so for EMEs. This pattern is consistent with the view that banking crises are often preceded by periods of exuberant and often unsustainable levels of economic activity, fueled by cheap credit. The contrasting morose environment that precedes currency crises often reflects the contractionary efforts imposed by a central bank trying to defend a currency peg under attack, the fact that currency crisis can occur precisely when economic conditions take a turn for the worse and investors lose confidence in the willingness of authorities to defend the peg, or following a period of above average domestic inflation that appreciates the currency and worsens external balances, depressing aggregate activity.

All crises are associated with a significant decline in the output gap relative to tranquil times. Output recovers relatively quickly in the aftermath of an advanced country currency crisis, but less so after an EME currency crisis, perhaps because of pervasive negative wealth effects of the type highlighted in the literature on contractionary devaluation. Levels of economic activity remain depressed for a significant period following an advanced country banking crisis or an EME default episode, a finding similar to those of Reinhart and Rogoff (2009) and Reinhart and Reinhart (2010). The comparison between advanced and EME banking crises reveals another difference. Both groups of countries experience abnormally high economic activity before a banking crisis, slightly more so for our sample of five advanced

country banking crises (3.8 percent for EMEs and 4.8 percent for advanced countries). The decline in output is also slightly larger for advanced economies. More remarkable, perhaps, the recovery from banking crises is markedly slower for advanced countries. Five years after the beginning of the systemic phase of the banking crisis (which may itself have been preceded by extended periods of financial distress), output remains quite depressed for these countries. By contrast, emerging markets appear somewhat more resilient. This last result may be a consequence of the higher level of development and sophistication of advanced economies' banking and financial sectors. As the example of Japan illustrates, once impaired, an economy with a complex financial system may take much more than five years to recover.

Lastly, a comparison of previous crises and the recent global crisis reveals a number of facts. First, the run up to the 2008 crisis, like earlier financial crises, was characterized by a period of above-trend economic activity. The positive output gap is especially salient for emerging countries (reaching a peak of 7.3 percent in 2008), but also for advanced economies (2.9 percent in 2007). From that point on, two things are worth noting. First, the slowdown in emerging markets, to a gap of 3.4 percent, remained moderate (with output remaining above trend). Further, projections from the International Monetary Fund's *World Economic Outlook* indicate that the EME output gap is likely to increase in 2010 to 4.2 percent. This confirms the evidence presented in figure 1: on the whole, emerging markets displayed remarkable resilience. By contrast, the slowdown in advanced economies has been severe, with a negative output gap of 5.6 percent in 2009, estimated to grow to 6.6 percent in 2010. The overall slowdown is even larger for advanced economies than those experienced during earlier major banking crisis. Based on the severity of the output slowdown, the recent experience of advanced economies resembles most that of earlier systemic banking crisis episodes, except on a larger and broader scale.

The bottom panel of figure 2 reports our findings for consumer price inflation.[22] Inflation was a serious issue for emerging economies in the last part of the twentieth century. It was elevated, relative to tranquil times, before all types of crisis, and sometimes increased further afterward, as any constraint on looser monetary policy disappeared after a currency crisis, or as the temptation to inflate nominal claims away proved irresistible. For advanced economies, in contrast, inflation remained relatively subdued, especially during banking crises. The contrast with the recent crisis is striking: Consumer price inflation in emerging economies, although increasing between 2003 and 2008 as a result of the rapid increase in food and commodity prices, has remained significantly below average after 2008.

Next we investigate the behavior of the public finances. The top panel of figure 3 reports our estimates for the dynamics of gross public debt (as a fraction of GDP) around crises.[23] While many estimates are statistically insignificant or borderline, the overall patterns presents some notable features. First, the fiscal position worsens significantly in the aftermath of any crisis, for both country groups. The ratio of public debt to GDP increases most dramatically for advanced country banking crises, with the next most dramatic effect being after EME currency crises. A number of channels are probably responsible for the advanced country deterioration. First, government bailouts of insolvent domestic financial sectors constitute direct fiscal costs. Second, as the economy slows down markedly in the aftermath of crisis, the ratio of public debt to GDP tends to increase both for mechanical reasons, as the denominator in the ratio decreases, but also because of rapidly growing public

[22] Because some countries in our sample experienced high or even hyper inflations, we estimate equation (1) using median regression. Notably, Argentina, Brazil, Peru, Belarus, Kazakhstan, Ukraine, Bulgaria, Croatia, Macedonia, and Slovenia all experienced annual inflation rates in excess of of 1,000 percent at some point in our sample. The standard errors on the median regression were constructed by bootstrap.

[23] Data on public debt refers to either central or general government debt, as collated by Reinhart and Rogoff (2009).

deficits.[24] In the case of EME currency crises, devaluation or depreciation raises the home-currency value of public debt denominated in foreign currency, worsening the fiscal position through an adverse valuation effect.

Consider now the 2008 crisis. While emerging countries started with relatively high debt levels, the period from 2003 to 2008 was one of rapid fiscal consolidation, with an improvement in the ratio of public debt to GDP representing 11.4 percent of output. On average, emerging economies approached the crisis in a position of unprecedented fiscal strength, allowing them to apply fiscal stimulus when needed much more freely than in the past. The fiscal health of the advanced economies, however, was significantly stretched even before the crisis, with a public debt in excess of baseline by about 10 percent of GDP. The subsequent deterioration in fiscal position, by an additional double-digit percentage of GDP, is threatening the sustainability of a number of industrial countries' public debts. Examining public deficits rather than debts, we find a similar pattern.

The bottom part of figure 3 reports our estimates for the real interest rate, measured as the ex-post real rate on three-month Treasury bills.[25]. Contrary to some theories of the financial boom-crash cycle, we find little evidence that prior crises were preceded by periods of historically low real interest rates, except perhaps a few years prior to EME banking crises. In the recent period, however, interest rates have been historically and persistently low for both EMEs and advanced economies. While prior episodes of low real interest rates may have fueled consumption and borrowing bonanzas, laying the groundwork for a subsequent crisis, this does not seem to have been the case this time around. On the contrary, the recent period of low interest rates seems mostly to have helped consolidate the balance sheets of various

[24] Our estimates indicate that for advanced economies, the public deficit worsens on average by 9 percent of GDP following a banking crisis. Most of that deterioration likely reflects the additional outlays and loss of revenues as the economy enters a protracted recession.

[25] We also estimate a median regression for the real interest rate

EME agents, public and private. We have already documented the behavior of government debt.

We now turn to the evolution of two measures of leverage, internal and external. Our measure of internal leverage is the ratio of domestic credit to output. Based on data availability, our preferred measure of domestic credit consists of the total claims of depository corporations, minus net claims on central government, as collected in the International Monetary Fund's *International Financial Statistics*.[26] For economies with simple financial systems, the outstanding credit to GDP ratio is likely to be a good proxy for total bank assets (cf. table 2). The top panel of figure 4 reports our estimates. Two main results are apparent. First, past banking crises were associated with significant build-ups in credit to GDP.[27] At its peak, excess credit represents 25 percent of output prior to advanced country banking crises, and 7 percent for EMEs. Second, the build-up of credit in the years prior to the recent crisis was similar for advanced countries (between 22 and 24 percent of GDP). While the build-up for emerging economies also seems significant (8.8 percent of GDP), it is entirely concentrated in the Central and Eastern European countries while other emerging regions display no significant increase in credit to GDP (see panel (b) of figure 7). Emerging Europe also fared particularly poorly in the crisis, as we have seen. Within that region, increases in domestic credit are widespread and particularly pronounced in Bulgaria, Estonia, Latvia, Lithuania and Slovenia. We conjecture that the explosion in domestic credit in most of these countries is intimately tied to the process of their integration into the European Union and the adoption of the euro.[28]

[26] While excluding claims on the central government, our measure of credit includes claims on state and local governments.

[27] That the build-up is larger for advanced economies is not surprising, given these countries' higher level of financial development.

[28] EU membership was an advantage to these countries once the crisis broke, since even those not in the euro zone benefited from central EU sources of financial support, as well as support from Sweden, whose

Next we turn to our measure of external leverage. By analogy with the balance sheet of a financial institution, we propose to define external leverage as the ratio of a country's total assets to its gross equity liabilities (domestic and foreign). High leverage indicates that a country is financing a large portion of its asset holdings through external debt issuance. After some simple algebra (detailed in the appendix), our measure of external leverage can be expressed as

$$l^i = \frac{V^i + A^i}{V^i + NA^i + E^{ij}}, \tag{3}$$

where V^i is the market capitalization of domestic assets in country i, A^i denotes gross external assets, NA^i represents the net foreign asset position of country i (equal to gross external assets A^i minus gross external liabilities L^i), and E^{ij} denotes gross equity and direct investment external liabilities. A simple expression in terms of observables comes from assuming that the market value of domestic assets is a proportional to output:$V^i = \pi Y^i$.[29] A reasonable value for π is probably somewhere between 2 and 4 and we will set $\pi = 3$ for our calculations. Under this assumption, the external leverage ratio can be written as:

$$l^i = \frac{\pi + A^i/Y^i}{\pi + NA^i/Y^i + E^{ij}/Y^i}. \tag{4}$$

This expression has a number of intuitive features. First, observe that because $NA^i + E^{ij} \leq A^i$, external leverage is always larger than 1. It is exactly equal to 1 when all gross external liabilities are financed by equity: $NA^i = A^i - E^{ij}$. Second, the notion of external leverage is different from the gross or net asset position. The reason is simple: A country may have large but offsetting gross positions financed by equity. Because equity claims do not entail

banks were heavily invested in emerging Europe.

[29]This assumption is an obvious oversimplification. Yet it is a reasonable approximation if Tobin's average q is constant, since in that case the market value of domestic assets is proportional to the domestic capital stock (replacement value), which is quite stable relative to output.

a fixed payment stream, and are junior to debt claims they do not threaten a country with external illiquidity or insolvency. [30]

Figure 3(b) reports our estimates of external leverage, based on the updated Lane and Milesi-Ferretti (2007) data on gross external positions (which extend through 2007). While external leverage tended to be high or to increase prior to earlier emerging market default and currency crises, it was below the tranquil times baseline in the current crisis. Advanced economies, on the other hand, show an elevated and increasing level of external leverage. By 2007, the deviation from tranquil times indicates that through foreign borrowing, each unit of domestically owned equity was leveraged 32 percent more than in tranquil times.

Our results show several dimensions along which emerging markets became more resilient, relative to advanced economies, in the years prior to the recent global crisis. On the macroeconomic side, they achieved price stability and a sound fiscal position. On the financial side, with the exception of some Central and Eastern European countries, EMEs did not sharply increase domestic leverage, despite relatively low real interest rates. They also maintained historically low levels of external leverage. In contrast, fiscal conditions in advanced economies deteriorated markedly prior to the crisis, reducing the fiscal space for the authorities to respond to the crisis. At the same time, advanced countries' domestic and external leverage increased markedly.

The top panel of figure 5 reports the evolution of the current account surplus, relative to output. We observe a significant improvement in the current account in the aftermath of currency crises, especially for emerging market economies, and also after default episodes. For EMEs, the sharp current account reversals associated with sudden stops are evident.

[30] The leverage ratio is positive as long as $\pi + NA^i/Y^i + E^{ij}/Y^i > 0$, that is, as long as the net foreign position is not too negative. Since $E^{ij}/Y^i > 0$, the right hand side is always larger than π. So with π between 2 and 4, this definition would be problematic only when the net foreign asset position is below -200 to -400 percent of GDP.

Perhaps surprisingly, the largest and most persistent current account deficits seem to appear prior to advanced countries' systemic banking crises. For the recent crisis, the estimates indicate that most countries were running, on average, larger surpluses relative to tranquil times, especially the EMEs.[31] These generally decline, on average, as the crisis approaches and then bounce back to higher surpluses in 2009 as spending falls. The bottom panel of figure 5 reports the (log) deviation of the real exchange rate from a linear trend. (An increase is a real depreciation of the domestic currency.) All types of EME crisis (not just currency crises) tend to be associated with large real depreciations. These currency movements are larger and more abrupt than those generally observed for advanced countries. For both country groups we observe that depreciation tends to occur *after* the onset of systemic banking crises, a result similar to that found by Kaminsky and Reinhart (1999). In 2008, by contrast, we notice smaller movements in real exchange rates, for either country group, although EME exchange rates were generally stronger (compared to tranquil times) ahead of the crisis, in part a result of buoyant commodity prices.[32]

Figure 6 shows the behavior of two variables that have been prominent in discussions of crisis effects on EMEs: foreign exchange reserves and short-term external debt (both relative to output). For EMEs and advanced countries alike, but most markedly for the former, reserves (upper panel) are low prior to currency crises and tend to be rebuilt after the crisis. They fall prior to default crises but then continue downward, presumably as

[31] Of course, not all countries can be above their average since the world's current account sums to zero by definition. However, since our estimates are unweighted, our results are consistent with a few large countries such as the U.S. running large deficits, while many other countries are in surplus. In addition, a large statistical discrepancy characterizes global current account data for the mid-2000s: The world as a whole appears to be substantially in surplus.

[32] The real exchange rates shown are bilateral rates against a "canonical" central currency. See appendix B for details. The unavailability of multilateral effective rates for most countries dictated this choice. Thus, for the advanced countries, the 2008 depreciation shown in panel (b) of figure 5 does not include the behavior of the U.S. dollar (whose real exchange rate against itself is constant).

alternative external financing dries up. Reserves also fall around systemic banking crises. The large buildup of EME reserves prior to the 2008 crisis is evident, as is the fall in EME reserves in 2008 itself and the subsequent return to rapid accumulation. World Bank data on short-term foreign debt are available only for EMEs. Levels appear elevated before all types of crisis, including the 2008 crisis, but the marginal increase in prior debt associated with default crises *per se* is rather small and insignificant. It is notable that after banking crises, short-term debts seem to rise. Shortening of maturities could reflect an unwillingness of foreign lenders to extend longer-term credits after a banking crisis.

In figure 7 we look more closely at the emerging region hit hardest by the 2008 crisis, Central and Eastern Europe (CEE), and we compare it to other EMEs. CEE had a bigger output boom and a much bigger crash (panel (a)). It had a much bigger domestic credit boom (panel (b)). Its external leverage was high relative to tranquil times and rose, whereas it was low and stationary relative to tranquil times in other EMEs (panel (c)). For emerging Europe, the current account was in deficit relative to tranquil times prior to the crisis, while it was in surplus elsewhere in the emerging world, and for emerging Europe there was a dramatic move from deficit to surplus in 2009 (panel (d)). The CEE countries, but not other EMEs, show a high and rising ratio of short-term foreign debt to GDP prior to 2008 (panel (e)). Finally, the real exchange rate (in deviation from trend) does not appear out of line in CEE prior to the crisis, but depreciates after 2008 as these economies experience nominal depreciation and/or deflation (panel(f)). By contrast, for the remaining EMEs, many of which export primary commodities, real exchange rates appeared to strengthen in the years leading to the crisis. With the exception of the real appreciation indicator (which always must be interpreted with caution), the CEE countries appear markedly more vulnerable than other EMEs on a range of standard fragility measures. Thus, the greater output cost they

bore is consistent with theory. Other recent empirical work on the incidence of the crisis, which we describe next, generally supports this conclusion.

2.3 Related Empirical Research

A number of econometric studies, conducted as the crisis unfolded and during the course of recovery, have attempted to link crisis severity in individual countries to various macroeconomic characteristics and preconditions. Some of the studies also attempt to ascertain the nature of the shocks hitting different economies.[33] Are the findings in these papers consistent with the conclusions of our own comparisons of crisis experience across country groups and across time?

The preceding studies generally differ from each other in the country groups they study, in their measurement of declines in economic activity, and in the period over which economic decline is measured. Moreover, they all face the difficulty of accurately controlling for a variety of relevant differences across diverse groups of economies. Nonetheless, a few factors stand out as predictors of crisis intensity in several of the exercises. Among the variables that appear important in several studies are prior financial liberalization, prior current account deficits, short-term external debt levels, and prior domestic credit growth.[34] These findings match theoretical expectation. A liberalized financial system that is lending heavily is likely more susceptible to a crash if financial supervision is week. A country that is borrowing

[33] A partial list of contributions includes Chamon et al. (2012), Berglöf et al. (2009), Berkmen et al. (2009), Blanchard et al. (2010), Claessens et al. (2010), Frankel and Saravelos (2010), Giannone et al. (forthcoming), International-Monetary-Fund (2010), Lane and Milesi-Ferretti (forthcoming), and Rose and Spiegel (2010a), Rose and Spiegel (2010b), Rose and Spiegel (2010c).

[34] These broad generalizations naturally still leave individual country observations such as Germany, which suffered a banking crisis because of financial contagion, notwithstanding a large current account surplus, no real estate appreciation, and a competitive real exchange rate. The recent findings are consistent with earlier work, for example that of Gupta et al. (2007), who found that post-1970 currency crises were more likely to be contractionary for financially open economies that had experienced large capital inflows.

abroad to support home expenditure is vulnerable to a sudden stop, which will be magnified if short-term foreign debts simultaneously cannot be renewed.

It seems reasonable that a larger stock of international reserves would have mitigated crisis effects, as these can be spent down in the event of a sudden stop. But several studies, including Rose and Spiegel (2010c), detect no role for reserves. On the contrary, Frankel and Saravelos (2010) argue that reserves affected several measures of crisis incidence, while International-Monetary-Fund (2010) argues for a positive but diminishing marginal productivity of reserves.[35] It may be that many countries (notwithstanding a few exceptions such as Russia) hoarded reserves during the crisis, as suggested by the rather moderate average decline shown in the figure above. Policy makers in EMEs apparently view large reserve stocks as having been useful, if the recent resumption of rapid EME reserve accumulation is any indication.

Rose and Spiegel (2010c), following up on their two earlier papers (Rose and Spiegel (2010a); Rose and Spiegel (2010b)), provide a useful compendium and critique of the econometric literature and findings. In particular, they provide a set of univariate regressions, for various country groupings, of different measures of output loss on some of the key vulnerability indicators stressed in the literature. Among the variables entering significantly in those regressions are credit market regulation (more regulation lessens crisis intensity); the prior current account surplus (a bigger surplus lessens crisis intensity); prior short-term foreign debt (more debt raises crisis intensity); prior real estate appreciation (more appreciation raises crisis intensity); and prior growth (but not level of) bank credit (higher growth raises crisis intensity). For example, as we saw above, countries in emerging Europe had current account deficits and credit booms, and these are empirically correlated with larger output

[35] Obstfeld et al. (2009) find an effect of reserves on currency depreciation.

declines in the recent recession. Rose and Spiegel find no econometric evidence that exchange rate pegs played a role but anecdotal evidence still suggests that exchange-rate flexibility was an advantage. Hungary and the Baltics, with fixed exchange rates, suffered more than Poland, with a floating rate (cf. the finding in Berglöf et al. (2009)). The current problems of peripheral euro zone countries might be mitigated if they could devalue their currencies.

The findings above are quite consistent with the most of the empirical regularities we discussed earlier, both regarding the recent global crisis and earlier ones. Rose and Spiegel (2010c) go on to show, however, that the statistical significance of the preceding factors is much lower when subsets of them are entered jointly in various regressions measuring crisis intensity. To us, this does not contradict the idea that crises (especially banking crises such as prevailed over 2007-08) are generated and intensified by factors (such as financial development in an environment of lax supervision and moral hazard) that simultaneously generate a nexus of collinear responses: bigger external deficits and debt, domestic asset-price inflation, and credit booms. Thus, we view the evidence as supportive of the view that where EMEs' showed resilience in the recent crisis, this was due in part to their avoidance of excessive foreign and domestic leverage.

3 Conclusion

The Great Depression of the 1930s resulted from an international monetary system featuring financial instability, severe and seemingly intractable global imbalances, and fixed exchange rates. The crisis of 2007-2009 likewise emerged in a setting of unstable finance and global imbalances, though only a few countries – mainly on the internal or external peripheries of the euro zone – have borne the additional burden of fixed exchange rates this time (Eichengreen

and Temin (2010)).

As Díaz-Alejandro (1983) pointed out, countries in Latin America were able partially to decouple from richer countries during the 1930s by leaving the gold standard and defaulting on foreign debts. This strategy ushered in a long period of inward looking and ultimately destructive politics and policies. To the extent that emerging markets have escaped the worst of the global crisis of 2007-2009, they have done so in part through economic and institutional reforms that may have altered the old patterns of the twentieth century, and thus seem likely to be conducive to long-run growth. Importantly, many emerging market economies (with notable exceptions in emerging Europe) avoided big credit booms in the 2000s, booms which often preceded earlier crises. One hypothesis is that emerging markets have been shielded by their relatively less developed financial markets. If so, it is possible that the resulting reduction in economic volatility has come at the expense of long-run growth, though a firm judgment requires much further research.

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Appendices

A Measuring External Leverage

Consider the balance sheet of a country i. The asset side includes V^i, the value of domestic assets, E^{ji}, the value of gross holdings of equity and direct investment in the rest of the world (j), and D^{ji}, the gross holdings of foreign debt (loans and portfolio debt). The liability side includes E^{ij}, the gross foreign holdings of domestic equity and direct investment, D^{ij}, the gross foreign holdings of domestic debt, and a residual item, W^i, that measures the 'net worth' of the country's residents. Consider this balance sheet as the balance sheet of a financial intermediary, that borrows money abroad (D^{ij}), raises equity (E^{ij}) and invests in foreign (E^{ji} and D^{ji}) and domestic (V^i) assets. Viewed as a financial intermediary, the balance sheet is particularly vulnerable when most of the assets are financed with senior claims such as debt. A measure of this vulnerability is our measure of external leverage, defined as the ratio of total assets ($V^i + E^{ji} + D^{ji}$) relative to equity liabilities ($W^i + E^{ij}$):

$$l^i = \frac{V^i + E^{ji} + D^{ji}}{W^i + E^{ij}}$$

Gross external assets A^i satisfy: $A^i = E^{ji} + D^{ji}$. Similarly, gross external liabilities L^i satisfy: $L^i = E^{ij} + D^{ij}$. Net foreign assets are then $NA^i = A^i - L^i$. Using these definitions, we can substitute into our measure of leverage to obtain:

$$l^i = \frac{V^i + A^i}{V^i + NA^i + E^{ij}}$$

B Data

- Table 1: See appendix C for the list of countries and crisis.
- Table 2: IMF, Global Financial Stability Reports, September 2004-October 2010, Statistical Appendix, Table 3.
- Figure 1: IMF's October 2010 *World Economic Outlook* (WEO). Growth rates for 2010 are IMF forecasts. For each country grouping, the growth rate of GDP is a weighted average of constant-price GDP growth rates for individual countries, the country weights being shares of GDP (measured at purchasing power parity) in group GDP (also measured at PPP). We define a group's trend real growth rate as the average of annual growth rates over 1980-2010 (except for the Russian federation and Central and Eastern Europe, where we use the 1994-2010 average).

- Figure 2(a): Output Gap. Real output is constructed from nominal output in local currency units divided by the GDP deflator. Annual data on nominal GDP and GDP deflator is obtained from the World Bank's *World Development Indicators* (WDI), the IMF's *International Financial Statistics* (IFS) and WEO databases and the Organization for Economic Cooperation and Development's (OECD) *National Accounts* database. The output gap is constructed as the residual from a regression of log output on a time trend.

- Figure 2(b): Inflation Rate. Rate of change of the Consumer Price Index. Source: WDI, IFS and OECD. Inflation for 2010 constructed from IMF forecasts in the October 2010 WEO.

- Figure 3(a): Gross Public Debt. Gross central government debt as a ratio to GDP from Reinhart and Rogoff (2009). When central government debt is not available, we use Gross general government debt, also from Reinhart and Rogoff (2009). Data are available at http://terpconnect.umd.edu/ creinhar/Courses.html

- Figure 3(b): Real Interest Rate. Ex-post real interest rate defined as the 3-month annualized T-bill rate from IFS and the *Global Financial Database* (GFD), deflated by the realized CPI-inflation rate over the following year.

- Figure 4(a): Domestic Credit. Domestic credit data in domestic currency is obtained from the IFS. Based on data availability, our benchmark data consists of total domestic claims of depository corporations (central banks and other depository corporations)- IFS line 32- minus net claims on central government -IFS line 32an-. Exceptions are as follows: Brazil (Claims on private sector and other financial corporations of other depository institutions -IFS lines 22d+22g); Argentina, Australia and Ivory Coast (Claims on private sector and other financial corporations of depository institutions - IFS lines 32d+32g); Norway (domestic credit data from Schularick and Taylor (2009)). Domestic credit divided by nominal GDP in domestic currency. Due to changes in the IFS presentation of monetary statistics as well as changes in coverage, we visually identified 21 jumps in the data. To allow for these jumps, as well as trends in the financial deepening, we regress the credit/GDP variable on linear trends with breaks corresponding to the jumps in the data and construct the residual.

- Figure 4(b): External Leverage. Constructed according to equation (4). Gross external assets, gross external liabilities, gross equity and direct investment liabilities in US dollar from Lane and Milesi-Ferretti (2007). All data are divided by nominal GDP in US dollar from WDI.

- Figure 5(a): Current Account. Annual data in US dollar from IFS Balance of Payment data. Divided by output in US dollar from WDI.

- Figure 5(b): Real Exchange Rate. Except as noted below, the real exchange rate denotes the bilateral US dollar real exchange rate constructed as the nominal end of period exchange rate against the US dollar (from the IFS and GFD) expressed in domestic currency units per US dollar, times the US GDP deflator and divided by the domestic GDP deflator. For members of the eurozone, CEE countries and Ivory Coast, the real exchange rate denotes instead the bilateral real exchange rate against Germany, using the nominal exchange rate with the euro after 1999 (with the Deutschemark before that date), and the German GDP deflator. The log-deviation from trend is constructed as the residual from a regression of the log of the real exchange rate on a time trend.

- Figure 6(a): Foreign Reserves. Total foreign exchange reserves in US dollar from IFS (line 1.d.d), divided by GDP in US dollar from WDI.

- Figure 6(b): Short-Term External Debt. data from the World Bank's *Global Development Finance* database. Divided by GDP in US dollar from WDI.

C List of Countries and Crises

The list of emerging market economies comprises all countries for which data are available that listed in either the EMBIG index, the FTSE Group of Advanced or Secondary Emerging markets, the MSCI-Barra classification of emerging economies, and the Dow-Jones list of emerging markets. Our final list contains 57 emerging market economies grouped in 6 regional groupings.[36] In addition, we compile data for 22 advanced economies.[37] We draw our dating of default crises (domestic and external) from Reinhart and Rogoff (2009). Our dating of systemic banking crisis is from Laeven and Valencia (2010). To date EME currency crises we use the criterion of Frankel and Rose (1996) – a 25 percent or greater nominal currency depreciation over a year that is also a 10 percent increase in the annual rate of depreciation. For advanced economies we use the chronology of Bordo et al. (2001), which extends through 1997. After 1997 there were no true currency crises in advanced countries

[36]The list of EMEs is as follows. **Middle East and North Africa**: Egypt, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Oman, Tunisia, United Arab Emirates. **Latin America**: Argentina, Brazil, Chile, Colombia, Dominican Republic, Ecuador, El Salvador, Jamaica, Mexico, Panama, Peru, Uruguay, Venezuela. **Asia**: China, Hong Kong, India, Indonesia, Korea, Malaysia, Pakistan, Philippines, Singapore, Sri Lanka, Thailand. **Sub-saharan Africa**: Côte d'Ivoire, Nigeria, South Africa. **Commonwealth of Independent States**: Belarus, Georgia, Kazakhstan, Russian Federation, Ukraine. **Central and Eastern European**: Bosnia, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Poland, Romania, Serbia, Slovak Republic, Slovenia, Turkey.

[37]The list of advanced economies is follows: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

until Iceland's in 2008, notwithstanding the ersatz crises some authors have identified using mechanical criteria.

Table 3: Crises Episodes, 1973-2007.

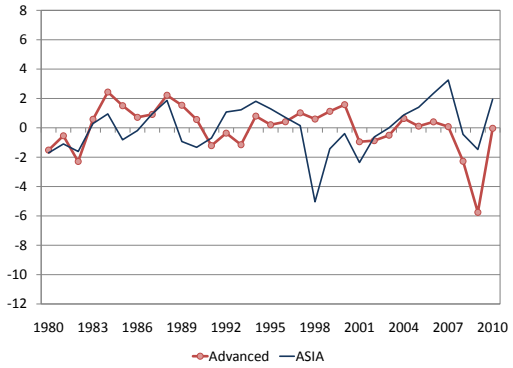
Country	Currency Crisis	Banking Crisis (Systemic)	Defaults (Domestic and External)
Argentina	1980, 1982, 1984, 1987, 1989, 2002	1980, 1989, 1994, 2001	1982, 1989, 2001
Australia	1976, 1983, 1985		
Belarus	2000		
Belgium	1982		
Brazil	1976, 1979, 1983, 1986, 1991, 1999, 2002	1990	1983, 1986, 1990
Côte d'Ivoire	1981, 1994	1988	1983, 2000
Canada	1981, 1986		
Chile	1974, 1976, 1982, 1985	1976, 1981	1983
China	1984, 1989, 1994	1998	
Colombia	1985, 1997	1982, 1998	
Croatia		1998	
Denmark	1976, 1992, 1993		
Dominican Republic	1985, 1990, 2002	2003	1982, 2005
Ecuador	1982, 1984, 1987, 1995, 1998	1981, 1996, 1998	1984, 1999, 2000
Egypt	1979, 1989, 2003	1980	1984
El Salvador	1986, 1990		1981
Finland	1986, 1991, 1993	1991	
France	1992		
Georgia	1998		
Greece	1983, 1985		
Hungary	1995		
Iceland	1975, 1978, 1981, 1984		
India	1991		
Indonesia	1978, 1983, 1986, 1997, 2000	1997	1998
Ireland	1976, 1986, 1992		
Israel	1977, 1983	1977	
Italy	1976, 1992, 1995		
Jamaica	1978, 1983, 1991	1996	1978
Japan	1979	1997	
Jordan	1988		1989
Kazakhstan	1999		
Korea	1980, 1997	1997	

continued on next page

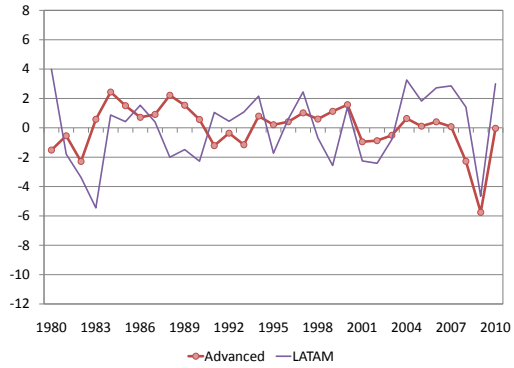
Table 3 continued from previous page

Country	Currency Crisis	Banking Crisis	Defaults
Kuwait		1982	
Macedonia	1997		
Malaysia	1997	1997	
Mexico	1976, 1982, 1985, 1994	1981, 1994	1982
Morocco	1985	1990	1980
New Zealand	1975, 1978, 1980, 1984, 1988		
Nigeria	1985, 1989, 1992, 1999	1992	1982, 1986, 2001, 2004
Norway	1986	1991	
Pakistan	1982		
Panama		1988	1983, 1987, 1989
Peru	1976, 1978, 1980, 1982, 1985, 1990	1983, 1999	1978, 1980, 1984, 1985
Philippines	1983, 1997	1983, 1997	1983
Portugal	1976, 1978, 1983		
Romania	1990, 1995	1990	1982
Russian Federation	1998	1998	1991, 1998
Serbia	2000		
Slovak Republic		1998	
South Africa	1975, 1981, 1984, 1989, 1996, 2001	1978, 1989	1985, 1989, 1993
Spain	1976, 1982, 1992, 1995	1977	
Sri Lanka	1977	1989	1980, 1996
Sweden	1992	1991	
Switzerland	1977		
Thailand	1996	1983, 1996	
Tunisia	1986		
Turkey	1977, 1981, 1984, 1988, 1994, 1999, 2000	1981, 1994	1978
Ukraine	1998	1997	1998
United Kingdom	1976, 1992		
Uruguay	1974, 1982, 1987, 1990, 2002	1981, 2002	1983, 1987, 1990
Venezuela	1983, 1989, 1992, 1995, 2002, 2004	1993	1983, 1990, 1993, 1995, 2004

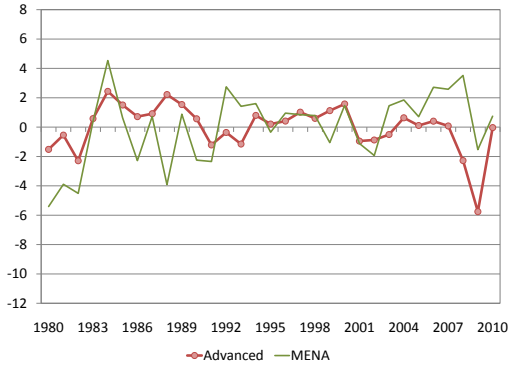
(a) Emerging Asia



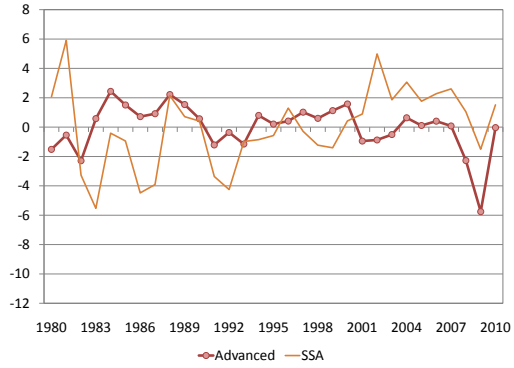
(b) Emerging Latin America



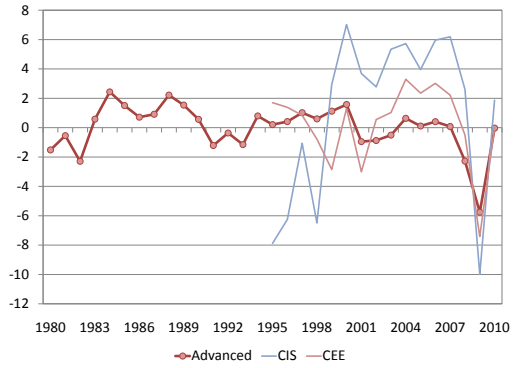
(c) Emerging Middle East & North Africa



(d) Emerging Sub-Saharan Africa



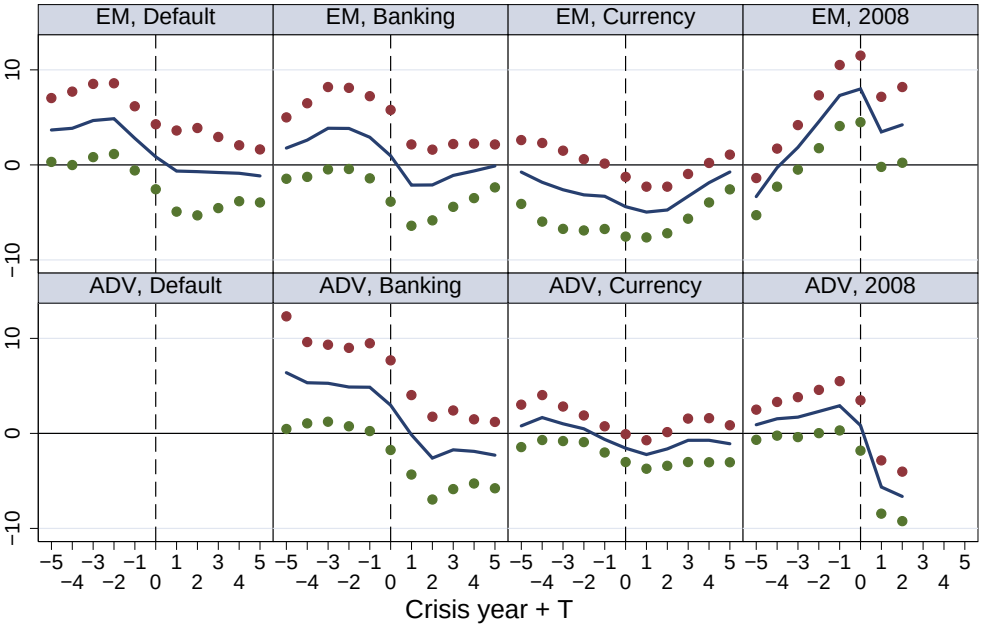
(e) Emerging Central & Eastern Europe & CIS



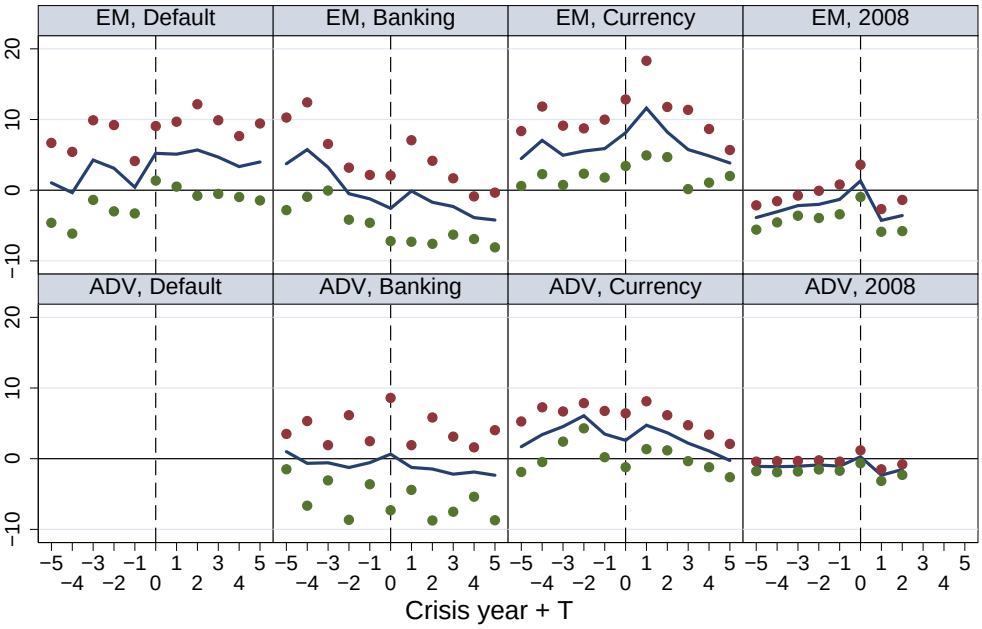
Source: World Economic Outlook, October 2010. Author's Calculations. Each panel reports the growth rate of output of the corresponding regions in deviation from the region's average growth rate.

Figure 1: Detrended Real Output Growth, by regions (percent p.a.)

(a) Output Gap (log deviation from trend in percent p.a.)



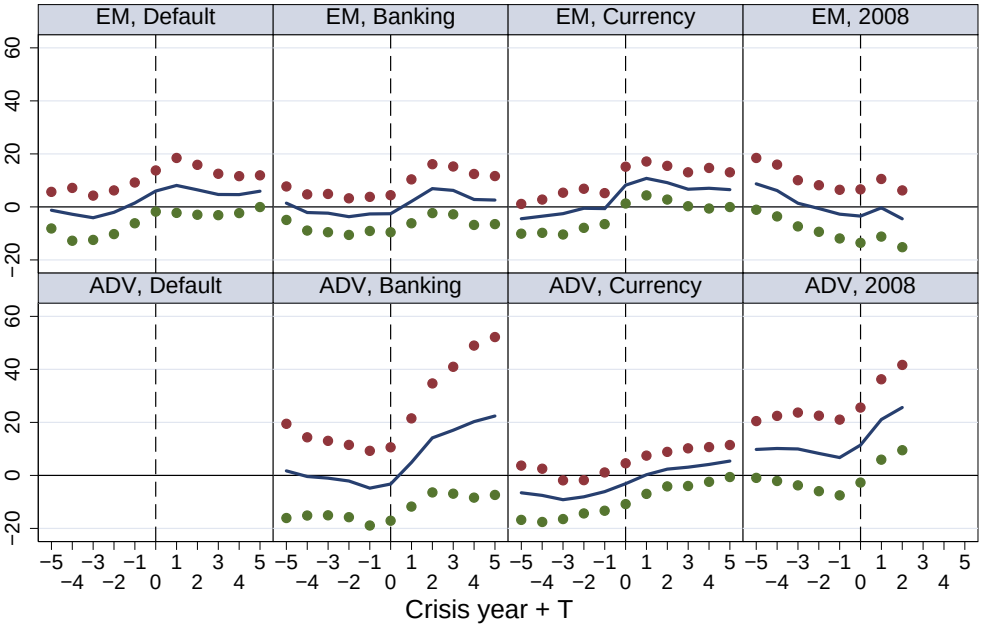
(b) Inflation Rate (percent p.a.)



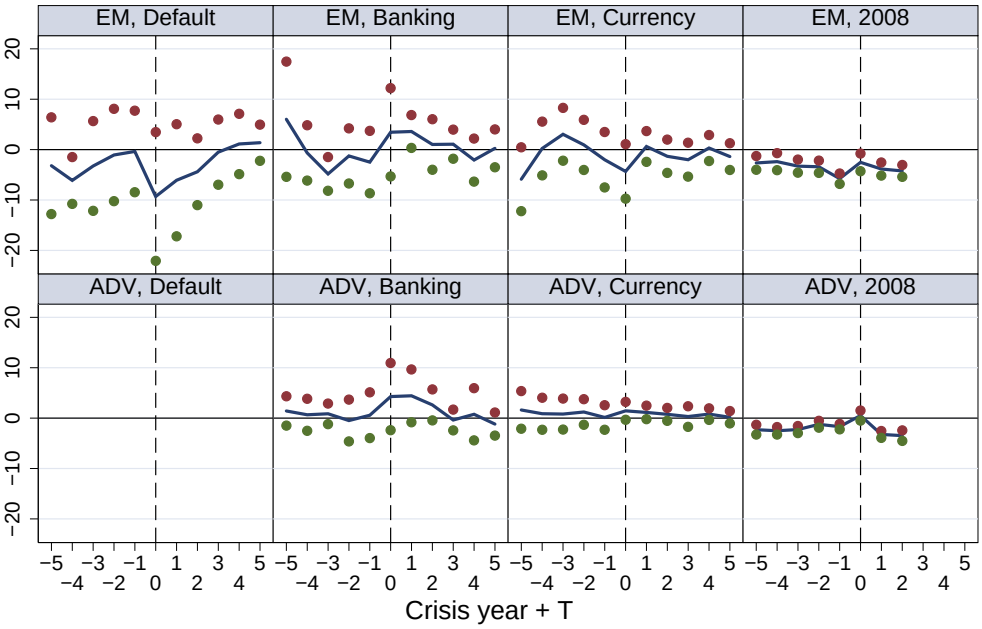
Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for emerging market economies; in the bottom row for advanced economies. The dots denote a 95% confidence interval for each conditional mean. For inflation, a median regression is estimated.

Figure 2: Empirical Regularities during Past and Present Crisis (1): Output Gap and Inflation

(a) Gross Public Debt percent of GDP)



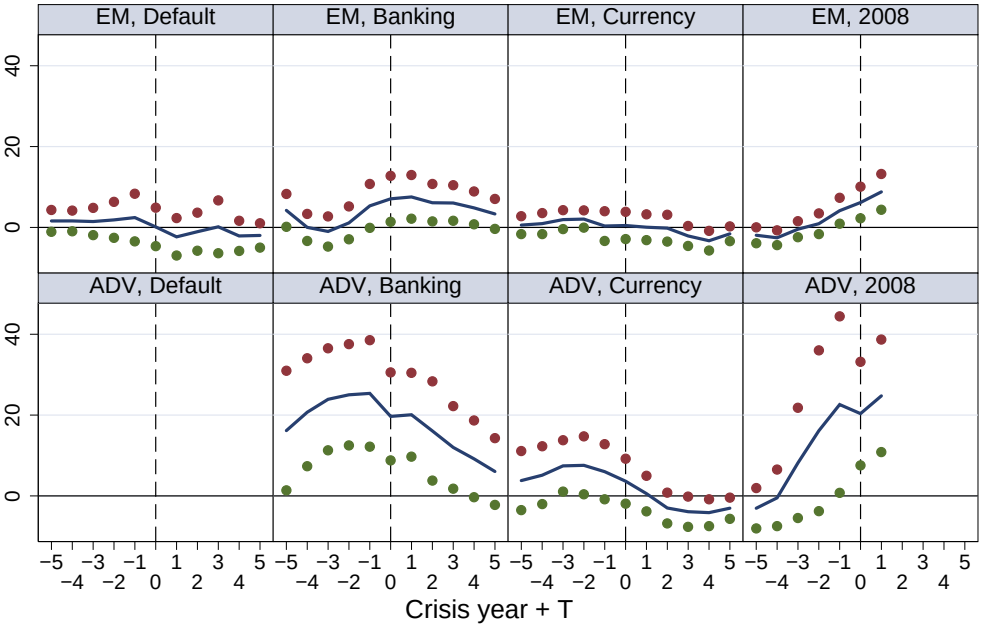
(b) Real Interest Rate (percent p.a.)



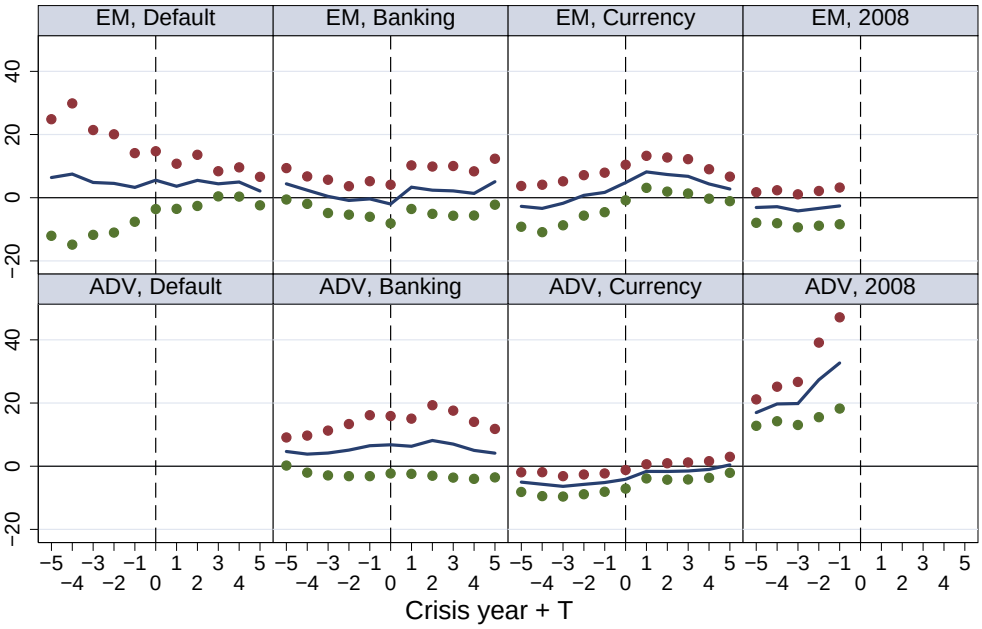
Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for emerging market economies; in the bottom row for advanced economies. The dots denote a 95% confidence interval for each conditional mean. For the real interest rate, a median regression is estimated.

Figure 3: Empirical Regularities during Past and Present Crisis (2): Public Debt and Real Interest Rates

(a) Domestic Credit (percent of GDP)



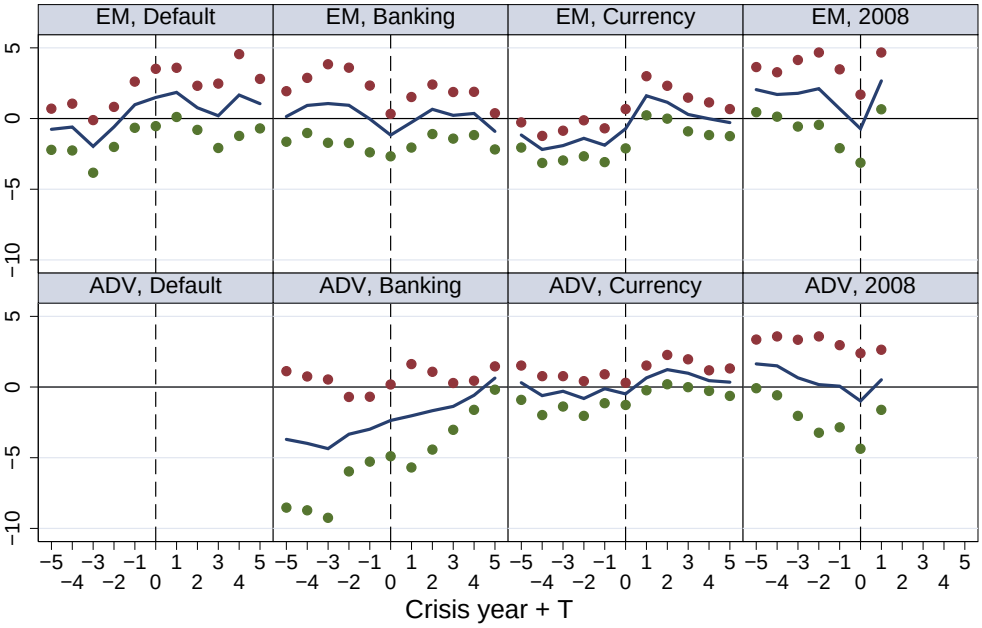
(b) External Leverage



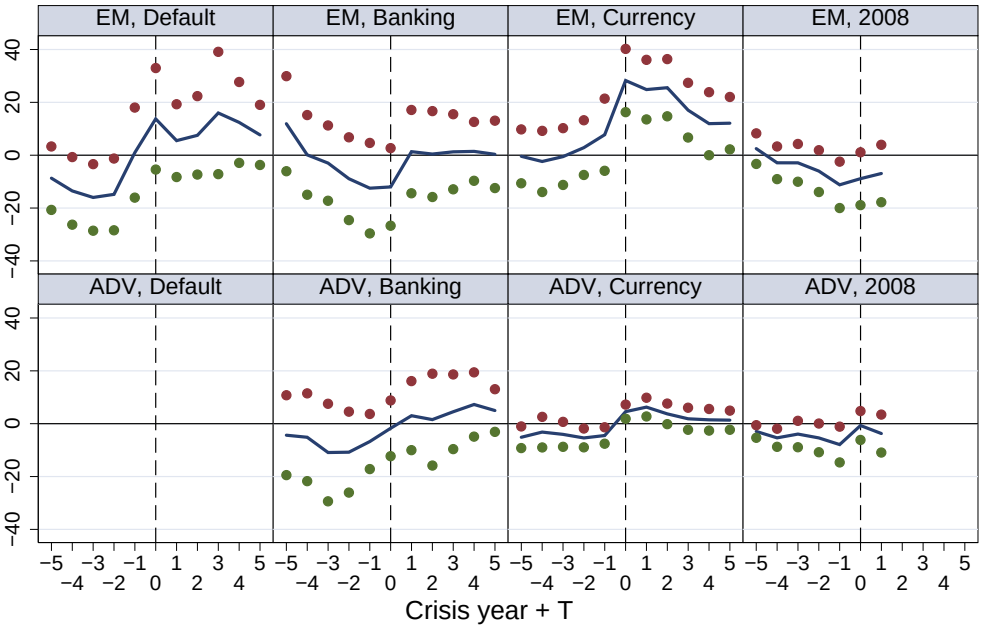
Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for emerging market economies; in the bottom row for advanced economies. The dots denote a 95% confidence interval for each conditional mean.

Figure 4: Empirical Regularities during Past and Present Crisis (3): Internal and External Leverage

(a) Current Account (percent of GDP)



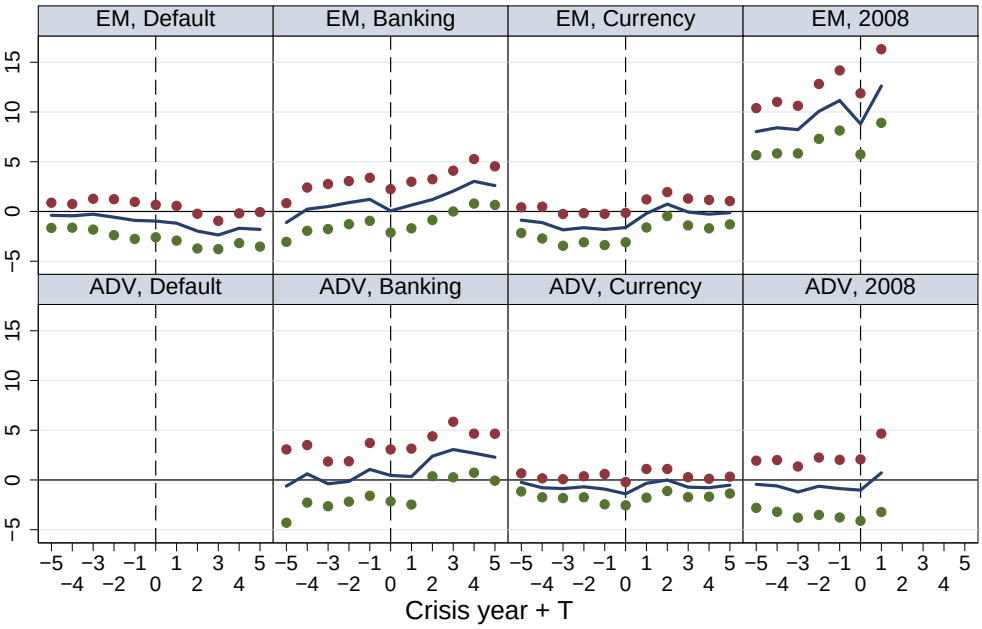
(b) Real Exchange Rate (log deviation from trend in percent)



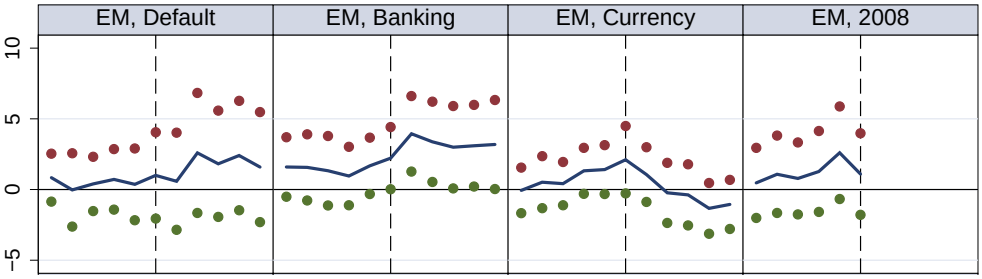
Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for emerging market economies; in the bottom row for advanced economies. The dots denote a 95% confidence interval for each conditional mean.

Figure 5: Empirical Regularities during Past and Present Crisis (3): Current Account and Real Exchange Rate

(a) Foreign Reserves (percent of GDP)



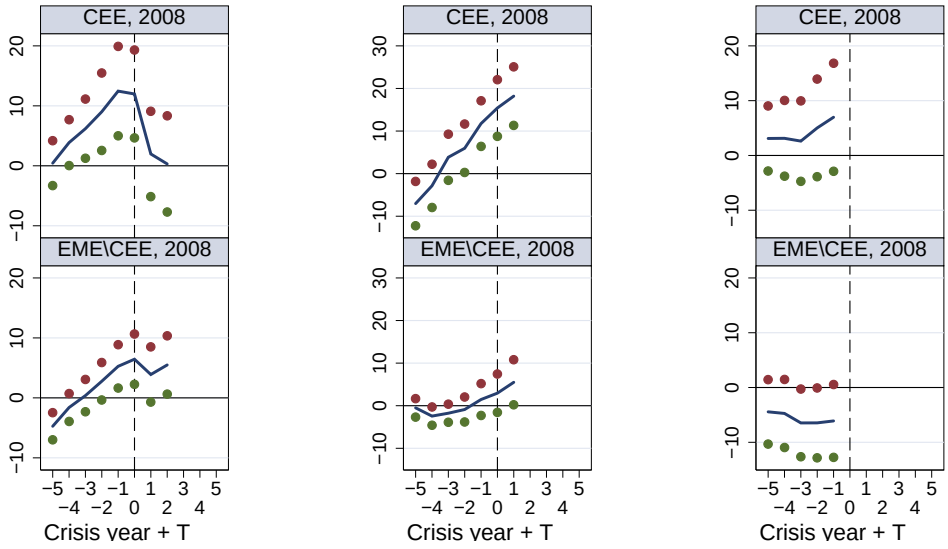
(b) Short-Term External Debt (percent of GDP)



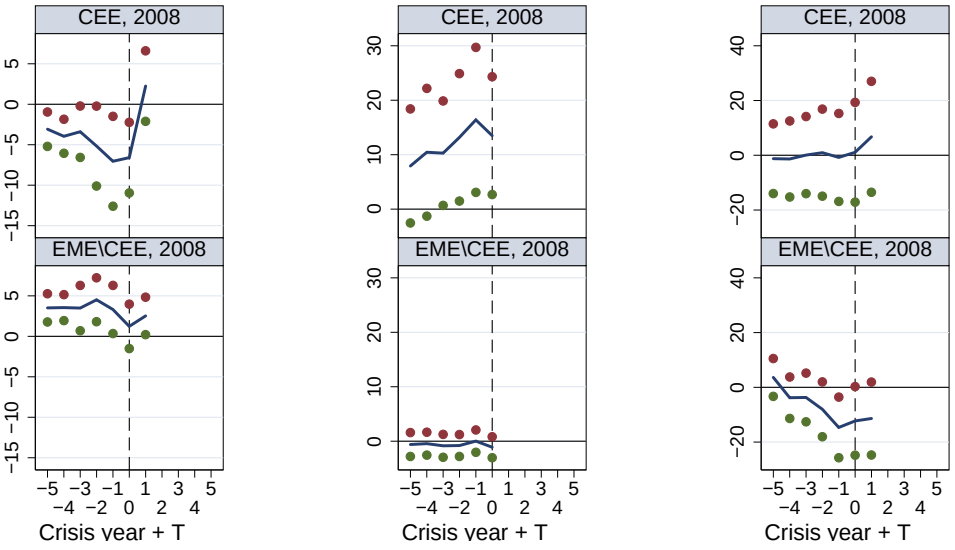
Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for emerging market economies; in the bottom row for advanced economies. The dots denote a 95% confidence interval for each conditional mean. Short-term external debt only available for EMEs.

Figure 6: Empirical Regularities during Past and Present Crisis (4): Foreign Reserves and Short Term External Debt

(a) Output Gap (% dev. from trend) **(b) Domestic Credit (% of GDP)** **(c) External Leverage**



(d) Current Account Surplus (% of GDP) **(e) Short-Term External Debt (% of GDP)** **(f) Real Exchange Rate (% dev. from trend)**



Source: Author's Calculations. Estimation of equation 1 on annual data, between 1973 and 2010. The estimates of conditional means of each variable, relative to 'tranquil times' are reported on the vertical axis. The horizontal axes represents the number of years before (negative sign) and after a crisis of a given type (in the different columns). Estimates in the top row are for central and eastern european economies; in the bottom row for other emerging economies. The dots denote a 95% confidence interval for each conditional mean.

Figure 7: Empirical Regularities during the 2008 Crisis: CEE vs other Emerging Market Economies