

# IMF Working Paper

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## Systemic Banking Crises Database: An Update

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**IMF Working Paper**

Research Department

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**Abstract**

We update the widely used banking crises database by Laeven and Valencia (2008, 2010) with new information on recent and ongoing crises, including updated information on policy responses and outcomes (i.e. fiscal costs, output losses, and increases in public debt). We also update our dating of sovereign debt and currency crises. The database includes all systemic banking, currency, and sovereign debt crises during the period 1970–2011. The data show some striking differences in policy responses between advanced and emerging economies as well as many similarities between past and ongoing crises.

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## I. INTRODUCTION

It has been five years since the start of a global financial crisis that has given rise to the largest wave of banking crises seen since the Great Depression. Unlike previous crises over this period, the recent wave of crises has (thus far) affected mostly advanced economies. The effects of the crises are still lingering and in many cases the crisis is still ongoing.

This paper updates the banking crises database of Laeven and Valencia (2008), which was published prior to this recent wave of crises. The update adds information on recent crisis episodes, and presents descriptive statistics on the frequency of banking crises, their resolution, and their real effects. We show that some of the recent banking crises rank among the costliest crises in terms of fiscal outlays and output losses. In total, we identify 147 banking crises, of which 13 are borderline events, over the period 1970–2011. We also count 218 currency crises and 66 sovereign crises over this period.

We also collect data on policy responses for a subset of the 147 episodes identified, allowing for a comparison of the policy mix used to resolve banking crises. We find that monetary and fiscal policies are used more extensively during banking crises in advanced economies than in emerging and developing countries. One explanation is that advanced economies have better financing options to use countercyclical fiscal policy and generally have more space to use monetary policy. Consistent with the greater reliance on macroeconomic policies in advanced economies, we find that fiscal outlays associated with financial sector interventions (including bank recapitalization with public funds) in advanced economies are about half that in emerging and developing countries, despite relatively larger banking systems in advanced economies.

In terms of the real effects of banking crises, we find that advanced economies tend to experience larger output losses and increases in public debt than emerging and developing countries. These larger output losses in advanced economies are to some extent driven by deeper banking systems, which makes a banking crisis more disruptive (Kroszner, Laeven, and Klingebiel, 2007). The relatively larger increase in public debt in advanced economies is related to larger output losses and a greater use of countercyclical fiscal policy. Although expansionary macroeconomic policies indirectly support banks by enhancing their growth prospects, such policies risk slowing down actual bank restructuring. Indeed, the large gap that has arisen in recent crises between the market and book values of bank equity points to significant recapitalization needs of banks in some countries.

The remainder of the paper is organized as follows. Section II updates the list of banking crises, presenting a complete list of banking crises for the period 1970–2011. Section III presents the updated list of currency and sovereign crises since 1970. Section IV presents the policy responses and outcomes in terms of fiscal costs and real costs during banking crises. Section V concludes.

## II. BANKING CRISES EPISODES

A banking crisis is defined as systemic if two conditions are met:

- 1) Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations)
- 2) Significant banking policy intervention measures in response to significant losses in the banking system.

We consider the first year that both criteria are met to be the year when the crisis became systemic. We consider policy interventions in the banking sector to be significant if at least three out of the following six measures have been used:<sup>2</sup>

- 1) extensive liquidity support (5 percent of deposits and liabilities to nonresidents)
- 2) bank restructuring gross costs (at least 3 percent of GDP)
- 3) significant bank nationalizations
- 4) significant guarantees put in place
- 5) significant asset purchases (at least 5 percent of GDP)
- 6) deposit freezes and/or bank holidays.

In implementing this definition of systemic interventions, we consider liquidity support to be extensive when the ratio of central bank claims on the financial sector to deposits and foreign liabilities exceeds 5 percent and more than doubles relative to its pre-crisis level.<sup>3</sup> We also include any liquidity support extended directly by the Treasury. This measure of liquidity captures the impact of currency swap lines among central banks, as the amounts swapped and extended to the financial sector will generally be included in central bank claims on the financial sector. However, it does not include liquidity that subsidiaries of a multinational bank receive in a foreign country. For instance, liquidity provided by the Federal Reserve to

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<sup>2</sup> We express our measure of fiscal costs in terms of GDP rather than the size of a country's financial system to control for the ability of a country's economy to support its financial system. This naturally results in higher measured fiscal costs for economies with larger financial systems. We nevertheless also report, whenever available, fiscal costs expressed in percent of financial system assets.

<sup>3</sup> We exclude domestic non-deposit liabilities from the denominator of this ratio because information on such liabilities is not readily available on a gross basis. For euro area countries, we also consider liquidity support to be extensive if in a given semester the increase in this ratio is at least 5 percentage points. The reason is that data on euro area central bank claims are confounded by large volumes of settlements and cross-border claims between banks in the Eurosystem. As a result, the central banks of some euro area countries (notably Germany and Luxembourg) had already large pre-crisis levels of claims on the financial sector.

U.S. subsidiaries of Swiss banks would not be measured as liquidity support in Switzerland, but would be included in U.S. liquidity support. However, this limitation has no impact on the identification of systemic crises in our sample. A broader related aspect is that some crises do not originate domestically but are imported from abroad when foreign subsidiaries of domestic banks get in trouble. One concrete example among recent crisis cases is Austria, where most of the problems originated in Austrian banks' foreign subsidiaries.

Bank restructuring costs are defined as gross fiscal outlays directed to the restructuring of the financial sector, such as recapitalization costs. We exclude liquidity assistance from the treasury because we include this in our measure of liquidity support. We consider restructuring costs to be significant if they exceed 3 percent of GDP. We focus on gross fiscal costs instead of net because the gross amount reflects the intensity of the intervention.

Asset purchases from financial institutions include those implemented through the treasury or the central bank. We define significant asset purchases as those exceeding 5 percent of GDP.<sup>4</sup>

A significant guarantee on bank liabilities indicates that either a full protection of liabilities has been issued or that guarantees have been extended to non-deposit liabilities of banks.<sup>5</sup> Actions that only raise the level of deposit insurance coverage are not included.

Significant nationalizations are takeovers by the government of systemically important financial institutions and include cases where the government takes a majority stake in the capital of such financial institutions.

In the past, some countries intervened in their financial sectors using a combination of less than three of these measures but on a large scale (for example, by nationalizing all major banks in the country). Therefore, we consider a sufficient condition for a crisis episode to be deemed systemic when either (i) a country's banking system exhibits significant losses resulting in a share of nonperforming loans above 20 percent or bank closures of at least 20 percent of banking system assets) or (ii) fiscal restructuring costs of the banking sector are sufficiently high exceeding 5 percent of GDP.

### **A. Ongoing Banking Crises**

Table 1 lists recent and ongoing cases that meet our definition of a systemic banking crisis. A number of changes compared to Laeven and Valencia (2010) are noteworthy. First, in the previous release we had classified Spain, Greece, and Kazakhstan as borderline systemic

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<sup>4</sup> Asset purchases also provide liquidity to the system. Therefore, an estimate of total liquidity injected would include schemes such as the Special Liquidity Scheme (185 bn pounds sterling) in the United Kingdom and Norway's Bond Exchange Scheme (230 bn kronas), as well as liquidity provided directly by the Treasury.

<sup>5</sup> Although we do not consider a quantitative threshold for this criteria, in all cases guarantees involved significant financial sector commitments relative to the size of the corresponding economies.

banking crises because they met only two of our significant policy intervention criteria. With fiscal costs in the first two cases now surpassing our threshold and significant nationalizations taken place in the third case, three conditions are met and therefore they are now labeled as systemic banking crises. A second important change is the addition of the banking crisis in Nigeria. In 2009, Nigeria deployed significant liquidity support and guarantees on bank liabilities. In 2010, Nigeria established an asset management company, and in 2011 a significant transfer of nonperforming loans took place, with total fiscal costs associated with bank restructuring by far exceeding our threshold.

Table 1. Systemic Banking Crises, 2007–2011

Country	Start of crisis	Date when systemic	Extensive liquidity support	Significant guarantees on liabilities	Significant restructuring costs	Significant asset purchases	Significant nationalizations
<i>Systemic Cases</i>							
Austria	2008	2008	✓	✓	✓		✓
Belgium	2008	2008	✓	✓	✓		✓
Denmark	2008	2009	✓	✓			✓
Germany	2008	2009	✓	✓			✓
Greece	2008	2009	✓	✓	✓		
Iceland	2008	2008	✓	✓	✓		✓
Ireland	2008	2009	✓	✓	✓	✓	✓
Kazakhstan	2008	2010	✓		✓		✓
Latvia	2008	2008	✓	✓			✓
Luxembourg	2008	2008	✓	✓	✓		✓
Mongolia	2008	2009	✓	✓	✓		✓
Netherlands	2008	2008	✓	✓	✓		✓
Nigeria	2009	2011	✓	✓	✓	✓	✓
Spain	2008	2011	✓	✓	✓		
Ukraine	2008	2009	✓		✓		✓
United Kingdom	2007	2008	✓	✓	✓	✓	✓
United States	2007	2008	✓	✓	✓	✓	✓
<i>Borderline Cases</i>							
France	2008		✓	✓			
Hungary	2008		✓	✓			
Italy	2008		✓	✓			
Portugal	2008		✓	✓			
Russia	2008		✓	✓			
Slovenia	2008		✓	✓			
Sweden	2008		✓	✓			
Switzerland	2008		✓			✓	

Source: Authors' calculations.

Notes: Systemic banking crises are defined as cases where at least three of the listed interventions took place, whereas borderline cases are those that almost met our definition of a systemic crisis. Extensive liquidity support is defined as a situation where the amount of central bank claims on the financial sector and liquidity support from the Treasury exceeds 5 percent of deposits and foreign liabilities and is at least twice as large as pre-crisis levels; direct bank restructuring costs are considered significant when they exceed 3 percent of GDP and exclude liquidity and asset purchase outlays; guarantees on liabilities are considered significant when they include actions that guarantee liabilities of financial institutions other than just increasing deposit insurance coverage limits; nationalizations are significant when they affect systemic financial institutions.

We have also added Italy to the list of borderline systemic banking crises because in 2011 liquidity support to the banking system surpassed our threshold. Prior to 2011, Italy had already provided significant guarantees on bank liabilities. Finally, we also update information on asset purchases in Ireland. In Laeven and Valencia (2010), we had not considered asset purchases by Ireland's National Asset Management Agency (NAMA) because transfers of assets had not started until after December 2009, our previous cutoff. Since then, NAMA has acquired loans with a face value of €74 billion from domestic financial institutions, qualifying as significant asset purchases according to our definition.

In this release, we refine our crisis dating by reporting the date when a crisis started, corresponding to the first signs of significant distress. This year corresponds to the start of the crisis as reported in Laeven and Valencia (2008, 2010). In addition, we report the date when the crisis became systemic, which we define as the date when our definition of a systemic crisis was first met.

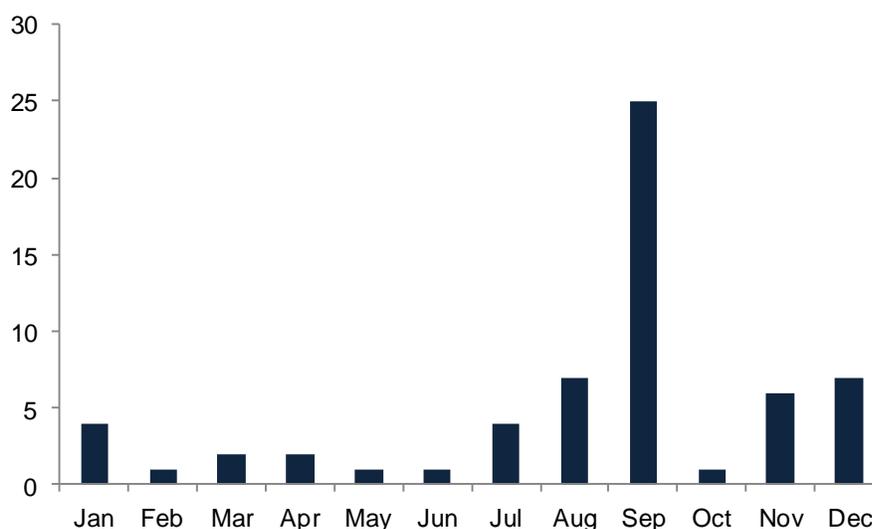
The starting dates for the recent crises are as follows: U.S. and U.K. start in 2007, Nigeria in 2009, and all the other cases in 2008. In each of these cases, banking systems showed significant signs of distress followed by government intervention during the starting year of the crisis. However, the crisis reached systemic proportions according to our definition only in 2009 in Denmark, Germany, Greece, Ireland, Mongolia, and Ukraine, in 2010 in Kazakhstan, and in 2011 in Nigeria and Spain.

We also include the corresponding month for the reported dates as well as the month when liquidity support peaked, allowing for an analysis of banking crises at a monthly frequency.<sup>6</sup> Figure 1 depicts the frequency of banking crises by month of all banking crises since the 1970s. An interesting pattern emerges: banking crises tend to start in the second half of the year, with large September and December effects.

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<sup>6</sup> Monthly crisis dates (including the start of the crisis, the date when the crisis became systemic, and the date when liquidity support peaked) can be found in the companion data file to this paper.

Figure 1. Frequency of Starting Month of Banking Crises

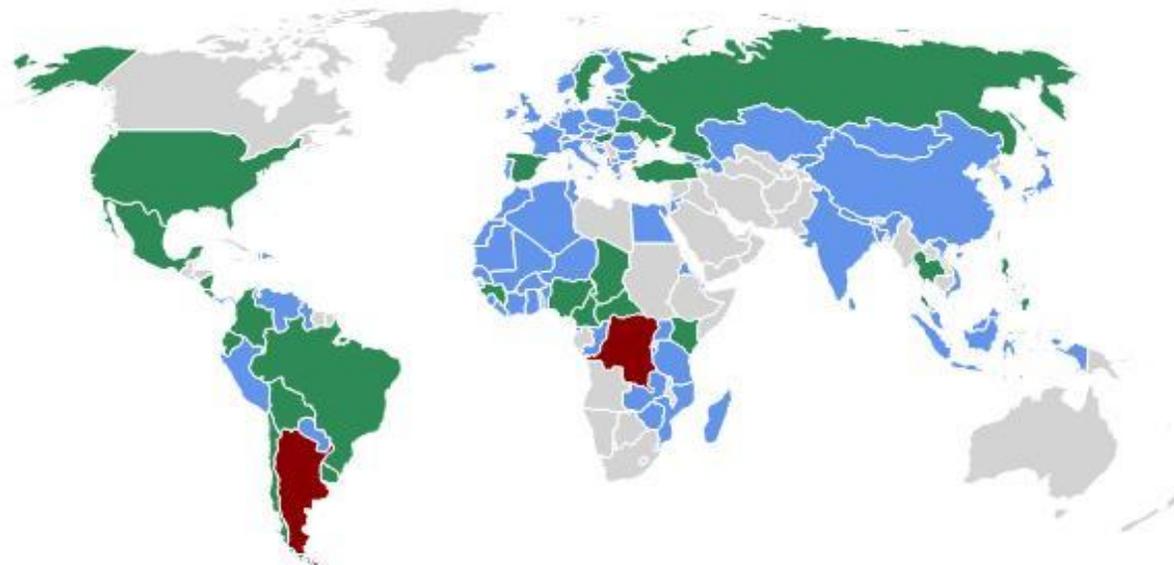


Source: Authors' calculations.

Banking crises are a worldwide phenomenon. Figure 2 shows the regional distribution of crises, highlighting countries that experienced multiple systemic banking crises during 1970–2011. Many countries experienced more than one crisis over this period, but only two countries, Argentina and the Democratic Republic of Congo, experienced more than two systemic banking crises.

In total, we count 147 banking crises since 1970, of which 13 are borderline events, including those reported in Table 1. The complete dataset, together with this paper, is available on the IMF website at <http://www.imf.org/external/pubind.htm>.

Figure 2. Frequency of Systemic Banking Crises Around the World, 1970–2011

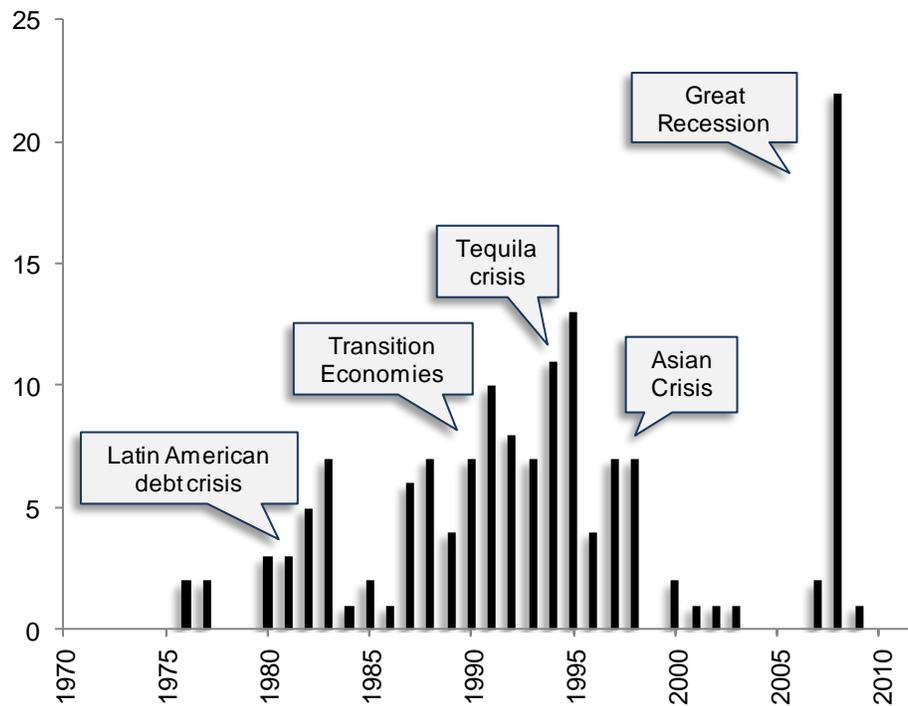


Source: Authors' calculations.

## B. Banking Crisis Cycles

Consistent with earlier work (e.g., Reinhart and Rogoff, 2009), we find that crises occur in waves. Figure 3 presents the number of banking crises that start in a given year, showing a marked pick up in crisis activity in the early 1980s. During the 1990s, there were three clusters of crises in the transition economies, in Latin America during the Tequila crisis, and in East Asia during the Asian financial crisis. The early 2000s were a relatively calm period, but ended with the most recent wave, consisting of the largest number of crises since 1970. These crisis cycles frequently coincide with credit cycles. Out of 129 banking crises episodes for which credit data are available, 45 episodes (or about one in three) were preceded by a credit boom.<sup>7</sup>

Figure 3. Banking Crises Cycles 1/



Source: Authors' calculations.

1/ Number of systemic banking crises starting in a given year.

<sup>7</sup> Following Dell'Ariccia et al. (2012), we define credit boom years as those during which the deviation of credit-to-GDP ratio relative to its trend is greater than 1.5 times its historical standard deviation and its annual growth rate exceeds 10 percent, or years during which the annual growth rate of the credit-to-GDP ratio exceeds 20 percent. A country-specific cubic trend is computed over the preceding 10-year period.

### III. CURRENCY AND SOVEREIGN DEBT CRISIS

In addition to updating our banking crisis dates and policy responses, we update the list of currency and sovereign debt crisis reported in Laeven and Valencia (2008). As in our earlier work, our definition of a currency crisis builds on Frankel and Rose (1996)'s approach. We define a currency crisis as a nominal depreciation of the currency vis-à-vis the U.S. dollar of at least 30 percent that is also at least 10 percentage points higher than the rate of depreciation in the year before.<sup>8</sup> Using this approach, 218 currency crises can be identified during the period 1970–2011, of which 10 episodes occur during 2008–2011.

We date episodes of sovereign debt default and restructuring by relying on information from Beim and Calomiris (2001), World Bank (2002), Sturzenegger and Zettelmeyer (2006), IMF Staff reports, and reports from rating agencies. The information compiled includes the year of sovereign default to private creditors and the year of debt rescheduling. Using this approach, we identify 66 episodes of sovereign debt crisis and debt restructuring during the period 1970–2011, of which 3 episodes during 2008–2011. Greece restructured its public debt in the first half of 2012, which yields one additional sovereign debt crisis case for the year 2012.<sup>9</sup>

#### A. Occurrence of Twin and Triplet Crises

Banking crises frequently occur together with currency or sovereign debt crises. Figure 4 reports the frequency with which simultaneous crises occur, including twin crises (the simultaneous occurrence of banking and currency, currency and sovereign debt, or banking and sovereign debt crises) or triplet crises (the simultaneous occurrence of banking, currency, and sovereign debt crises).<sup>10</sup> Triplet crises appear to be quite rare (we count only 8 such cases). Among twin crises, those associated with currency crises (either together with banking or sovereign debt crises) are most common, while those involving both banks and sovereign debt are least common.

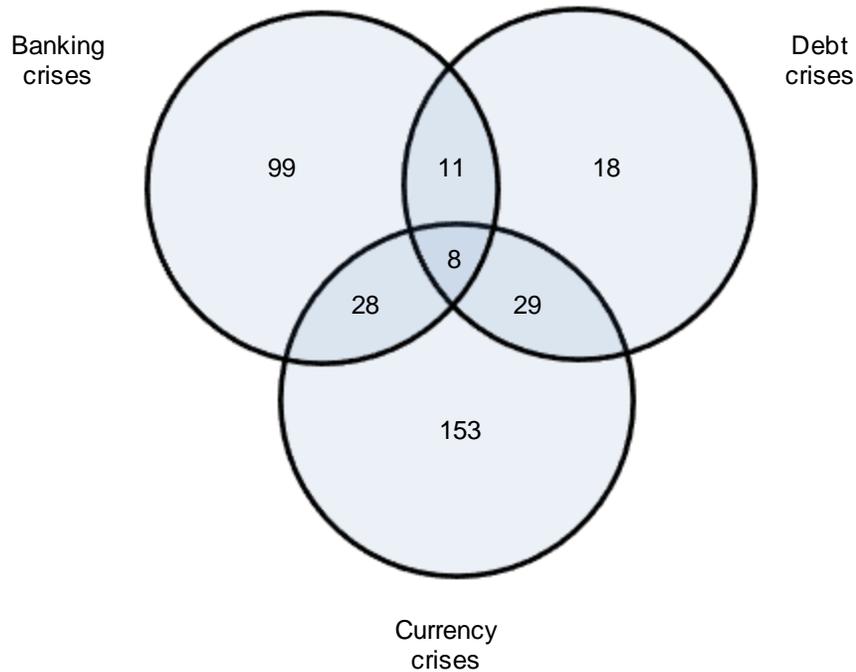
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<sup>8</sup> We compute exchange rate depreciation as the percent change of the end-of-period official nominal bilateral dollar exchange rate from the World Economic Outlook (WEO) database of the IMF. For countries that meet the currency crisis criteria for several continuous years, we use the first year of each 5-year window to identify the crisis.

<sup>9</sup> While Greece has not had a unilateral default, the restructuring of its debt involved using collective action clauses which amounted to a credit event for CDS purposes. Therefore, we consider it a sovereign debt crisis.

<sup>10</sup> We define a twin crisis in year  $t$  as a banking crisis in year  $t$ , combined with a currency (sovereign debt) crisis during the period  $[T-1, T+1]$ , and we define a triple crisis in year  $t$  as a banking crisis in year  $T$ , combined with a currency crisis during the period  $[T-1, T+1]$  and a sovereign debt crisis during the period  $[T-1, T+1]$ . Identifying the overlap between banking (currency) and sovereign crises follows the same approach, with  $T$  the year of a banking (currency) crisis.

Figure 4. Simultaneous Crises

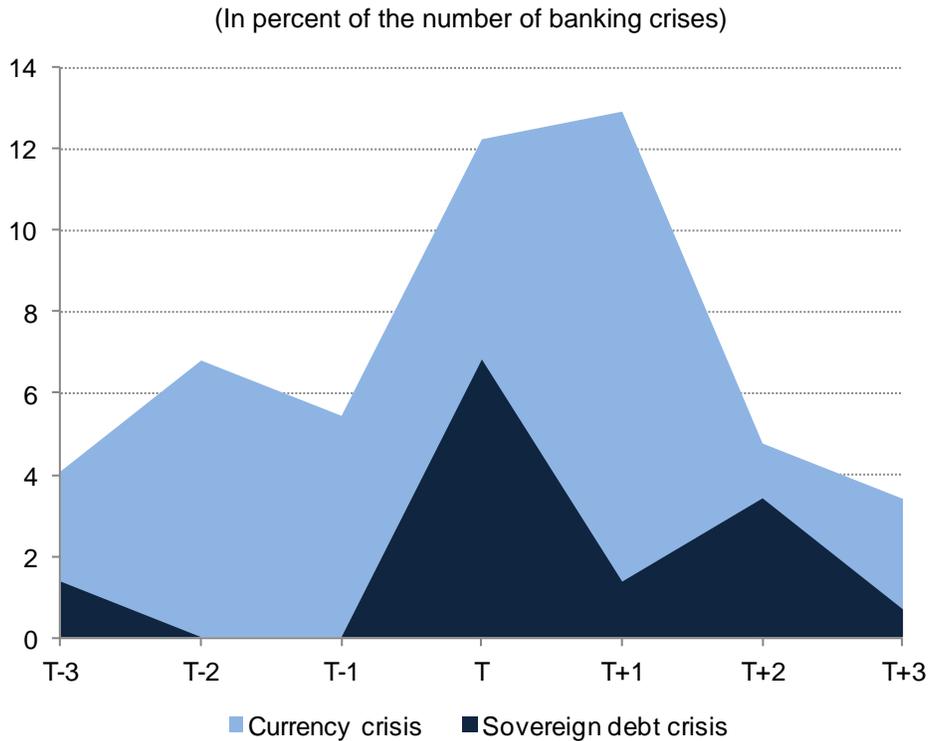


Source: Authors' calculations.

## B. Sequencing of Financial Crises

It is also common for banking crises to precede currency and sovereign debt crises (e.g., Kaminsky and Reinhart, 1999; Reinhart and Rogoff, 2011). Figure 5 shows the frequency of currency and sovereign debt crises (relative to the total number of banking crises) that take place in the same country as the banking crisis over the period T-3 to T+3, where T is the starting year of the banking crisis. We find that currency crises and especially sovereign debt crises tend to follow banking crises. While 16% of banking crises are preceded by a currency crisis in the same country within three years prior to the starting year of the banking crisis, 21% of banking crises are followed by a currency crisis within three years following the starting year of the banking crisis. The difference is even starker for sovereign debt crises. Only 1% of banking crises in our sample are preceded by a sovereign debt crisis within three years prior to the start of the banking crisis, whereas 5% of banking crises are followed by a sovereign debt crisis within three years of the onset of the banking crisis.

Figure 5. Timing of Currency and Sovereign Debt Crises Relative to Banking Crises



Source: Authors' calculations.

Note: T denotes the starting year of the banking crisis.

#### IV. POLICY RESPONSES AND OUTCOMES IN BANKING CRISES

We update the policy responses during the crises, including monetary expansion and liquidity support, with information up to end-2011. This update is particularly relevant for recent crisis cases which had just started or were still unfolding at the time of writing our earlier data release in Laeven and Valencia (2010). In addition, we also update our estimates of the outcomes of banking crises, which include output losses, fiscal costs, increases in public debt, and peak nonperforming loans (NPLs).<sup>11</sup>

##### A. Policy Response

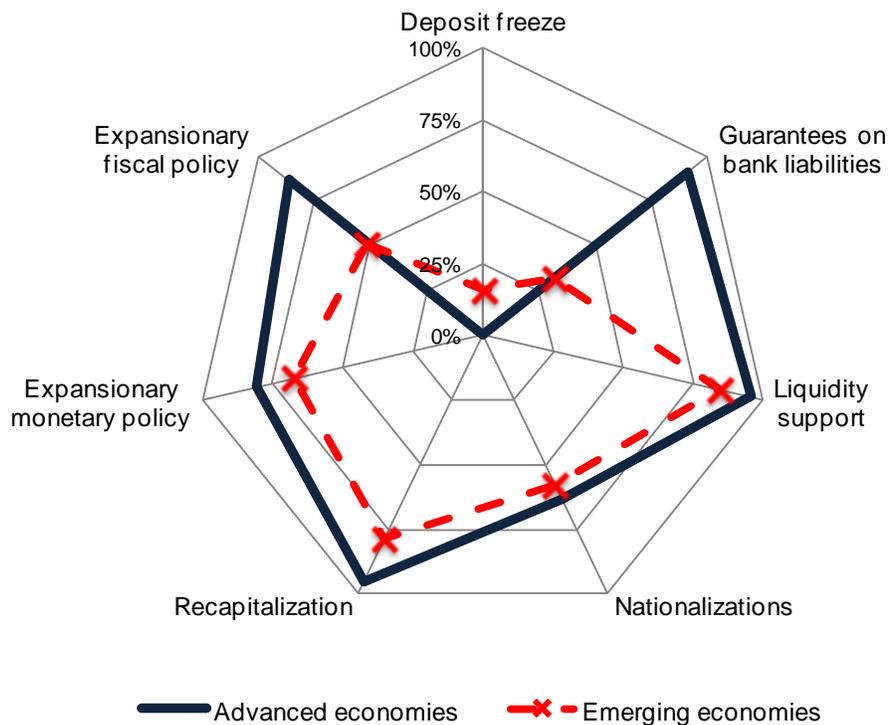
The differences in policy mix between advanced economies and emerging economies is summarized in Figure 6. The figure shows the fraction of episodes in which the corresponding policy was used, differentiating countries by income level.

<sup>11</sup> Comparisons based on NPL data should be interpreted with caution given that definitions of NPLs vary markedly across countries.

Deposit freezes, while rare, are most frequently used by emerging economies, whereas guarantees on bank liabilities are more common among advanced economies. Guarantees are more common among advanced economies, perhaps because of generally better institutions and access to international capital markets, rendering the announcement of guarantees more credible. However, as noted in Claessens et al. (2011), guarantees in recent crises were on average less comprehensive (more targeted) than in past crises, when they generally covered a broad set of liabilities and were mostly announced in the form of blanket guarantees.

We collect data on whether deposit insurance was in place at the start of the crisis for about half the crises episodes. In 70 percent of episodes for which we collected data, a deposit insurance scheme was already in place when the crisis erupted. Moreover, the data show that emerging economies are more likely to adopt deposit insurance around the time of a crisis. Only in 40 percent of cases, losses are imposed on bank creditors, suggesting that implicit guarantees are important. Recapitalization packages and extensive liquidity support are also more common in advanced countries, albeit only marginally, whereas nationalizations of financial institutions are equally common in advanced and other economies.

Figure 6. Differences in the Mix of Crisis Policies



Source: Authors' calculations.

To gain insights into the relative use of fiscal and monetary policy, we construct measures of expansionary fiscal and monetary policies (reported in our dataset as monetary and fiscal policy indices) that take a value of one if the policies are expansionary, and zero otherwise. We first

construct a variable equal to the difference between the increase in public debt (reported in Table 2) and the fiscal cost of bank intervention policies. The median for this variable is close to 7 percent. This means public debt, after subtracting increases in public debt resulting from fiscal outlays associated with financial intervention packages, increases by about 7 percent for the median country. We use this difference as a proxy for the magnitude of discretionary fiscal policies as well as automatic stabilizers. It is admittedly a crude measure, but it should provide a broad indication of the intensity of factors other than bank recapitalization that affected the fiscal position of a country, including discretionary fiscal policy.

For the purpose of the chart, we consider fiscal policy to be expansionary when this variable takes on a value that exceeds its mean by half a standard deviation. Similarly, we define expansionary monetary policy as instances when the increase in reserve money is half a standard deviation above its mean. Figure 6 shows that both expansionary monetary and fiscal policies were more commonly used in advanced economies. The difference, however, is much more pronounced in the case of fiscal policy. Because advanced economies have better access to financing large fiscal deficits, they are in a better position than other economies to allow for fiscal automatic stabilizers to operate during banking crises or even to enact countercyclical discretionary fiscal packages.

## B. Outcomes

We measure outcomes of the crises with four main variables: the fiscal costs of a crisis (computed as the direct fiscal outlays due to financial sector rescue packages), the output losses (computed as the cumulative loss in income relative to a pre-crisis trend), the increase in public debt, and the peak in NPL's. Direct fiscal costs include fiscal outlays committed to the financial sector from the start of the crisis up to end-2011.<sup>12</sup> Output losses are computed as deviations of actual GDP from its trend. The increase in public debt is measured as the change in the public debt-to-GDP ratio over the four-year period beginning with the crisis year.<sup>13</sup> Specifically, we compute the increase in public debt measured in percent of GDP over  $[T-1, T+3]$ , where T is the starting year of the crisis.<sup>14</sup>

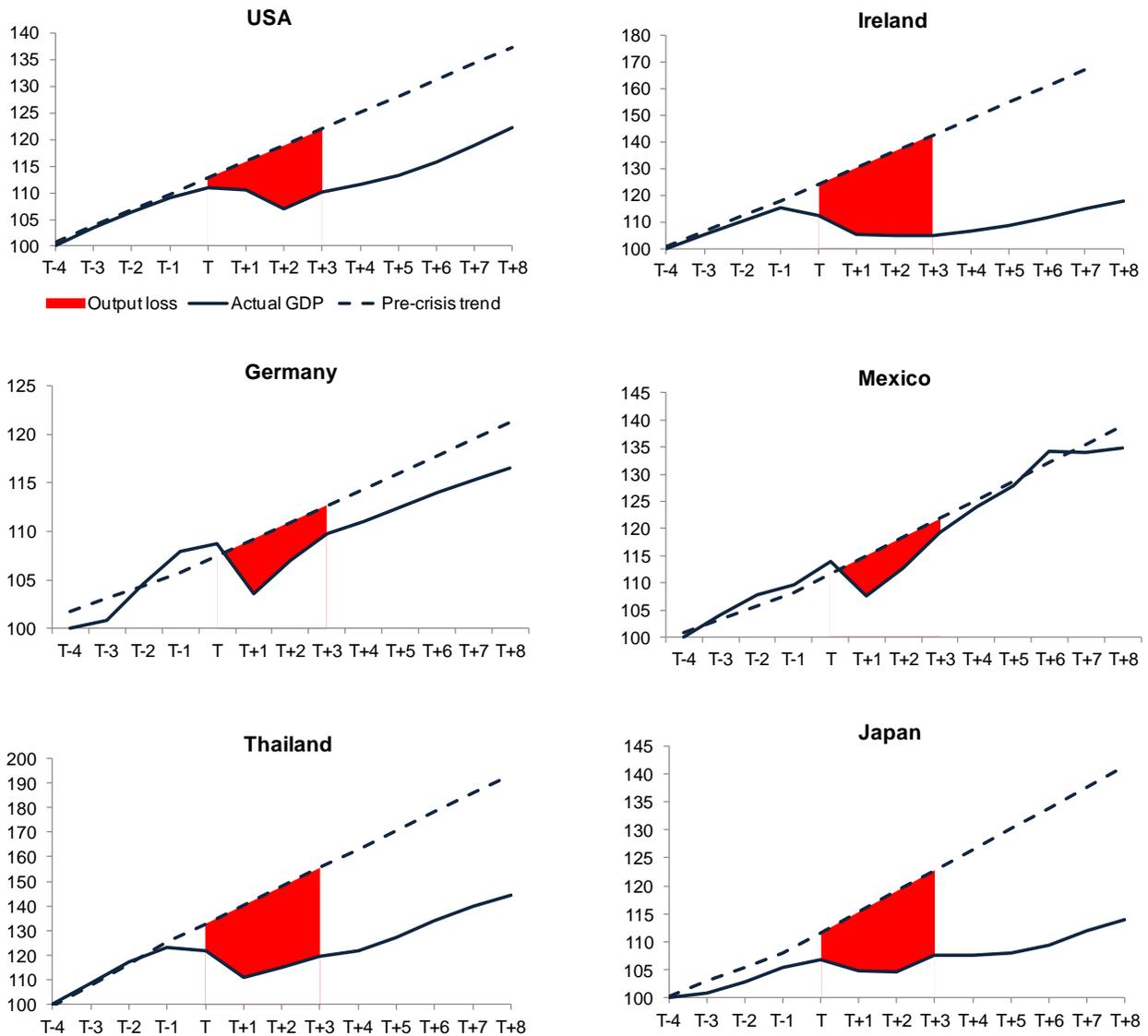
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<sup>12</sup> To compute fiscal costs we take the figures in domestic currency and divide by the GDP of the corresponding year when the outlays took place. For Greece, we include the recapitalization package included in the 2012 IMF program, although it had not been fully used as of May 2012.

<sup>13</sup> Output losses are computed as the cumulative sum of the differences between actual and trend real GDP over the period  $[T, T+3]$ , expressed as a percentage of trend real GDP, with T the starting year of the crisis. Trend real GDP is computed by applying an HP filter (with  $\lambda=100$ ) to the log of real GDP series over  $[T-20, T-1]$  (or shorter if data is not available, though we require at least 4 pre-crisis observations). Real GDP is extrapolated using the trend growth rate over the same period. Real GDP data are from the Fall 2011 WEO. This methodology is somewhat different than the one used in Laeven and Valencia (2008), which explains why the numbers changed.

<sup>14</sup> Our choice of data sources is guided by the availability of data on general government debt. When such data is not available, we use data on central government debt instead. Our primary data source is Abbas et al. (2010) for crisis episodes prior to 2007 and the Fall 2011 WEO for crisis episodes since 2007. When debt data are not available in Abbas et al. (2010), we use the OECD Analytical Database and IMF's Government Finance Statistics.

Figure 7. Output Losses for Selected Crises Episodes 1/



Sources: World Economic Outlook and authors' calculations.

1/Year T equals 2007 for USA, 2008 for Ireland and Germany, 1994 for Mexico, 1997 for Thailand and Japan. GDP in T-4 is set equal to 100.

Table 2 shows the median values for the outcome variables across all episodes reported in our database, over 1970–2011. Table A1 shows individual country level data. The episodes are classified according to income level at the time of the crisis. In addition to the outcome variables listed above, Table 2 also reports quantitative measures on policy intervention, which complements the frequency of tools used described in the previous section. We report peak liquidity support provided by central banks measured as the highest level of central bank claims

against financial institutions,<sup>15</sup> normalized by financial institutions' deposits and foreign liabilities. The difference between this peak and the pre-crisis level of central bank claims is reported as liquidity support provided during the crisis. We also report the duration of the crisis, computing as the difference between the end and start years of the crisis, measured in years. Finally, we report data on the monetary expansion computed as the change in the monetary base between its peak during the crisis and its level one year prior to the crisis, expressed in percentage points of GDP.<sup>16</sup>

Table 2. Banking Crises Outcomes, 1970–2011

Country	Output loss	Increase in debt	Monetary expansion	Fiscal costs	Fiscal costs	Duration	Peak liquidity	Liquidity support	Peak NPLs
Medians									
	In percent of GDP				In percent of financial system assets	In years	In percent of deposits and foreign liabilities		In percent of total loans
All	23.0	12.1	1.7	6.8	12.7	2.0	20.1	9.6	25.0
Advanced	32.9	21.4	8.3	3.8	2.1	3.0	11.5	5.7	4.0
Emerging	26.0	9.1	1.3	10.0	21.4	2.0	22.3	11.1	30.0
Developing	1.6	10.9	1.2	10.0	18.3	1.0	22.6	12.3	37.5

Source: Authors' calculations.

As in Laeven and Valencia (2010), we report end dates for each crisis, except for recent crises where our condition for determining the end of a crisis is not (yet) met.<sup>17</sup> We also report the peak level of nonperforming loans, over the period  $[T, T+5]$ , where  $T$  is the starting year of the crisis. For the recent episodes, where a 5-year window may not be available yet, the peak is computed over the period  $[T, \text{latest data available}]$ . These outcome variables are constructed for illustrative

<sup>15</sup> Liquidity support is computed as the ratio of central bank claims on deposit money banks (line 12 in IFS) to total deposits and liabilities to non-residents. Total deposits are computed as the sum of demand deposits (line 24), other deposits (line 25), and liabilities to non-residents (line 26). In the case of euro area economies, central bank claims on deposit money banks include Emergency Liquidity Assistance (ELA) operations conducted by national central banks within the Eurosystem.

<sup>16</sup> Data on reserve money come from IFS. For euro area countries, reserve money corresponds to the aggregation of currency issued and liabilities to depository corporations, divided by euro area GDP.

<sup>17</sup> We define the end of a crisis as the year before both real GDP growth and real credit growth are positive for at least two consecutive years. In case the first two years record positive growth in real GDP and real credit, the crisis end date equals the starting date of the crisis. In computing end dates, we use bank credit to the private sector (in national currency) from IFS (line 22d). Bank credit series are deflated using CPI from WEO. GDP in constant prices (in national currency) also comes from the WEO. When credit data is not available, the end date is determined as the first year before GDP growth is positive for at least two years. In all cases, we truncate the duration of a crisis at 5 years, starting from the first year of the crisis.

purposes to gauge the consequences of banking crises. It is important to note that they reflect the total impact of the crisis, including any feedback effects and other factors contemporaneous to the banking crisis. Therefore, when we report output losses or increases in debt, they should not be attributed to the banking crisis alone.

The data show that output losses and increases in public debt tend to be larger in advanced economies. Output losses in advanced economies are larger in part because with deeper financial systems, a banking crisis is more disruptive. Moreover, for the crises that started in 2007 onwards, the median output loss reaches 25 percent, whereas the non-crisis countries exhibit a median output loss of 0 percent. Clearly, countries that experienced a banking crisis suffered more than those which did not. In contrast, fiscal costs are larger in developing and emerging economies. This is the case irrespective of whether we measure fiscal costs in percent of GDP or in percent of financial system assets, to account for differences in the relative size of financial systems. In fact, the gap in fiscal costs between advanced and other economies widens substantially once we account for the size of financial systems.<sup>18</sup> Moreover, while increases in public debt during banking crises in emerging and developing economies are mostly due to fiscal outlays associated with financial sector intervention policies, in advanced economies such fiscal outlays constitute only a fraction of the overall increase in public debt, with discretionary fiscal policy and automatic stabilizers playing a much more important role.

We noted in the previous section a marked difference among advanced and other economies in the use of macroeconomic policies. Similarly, increases in public debt and monetary expansion tend to be larger in advanced economies than in emerging and developing economies. Note that the difference in monetary expansion between advanced economies versus emerging and developing countries is now significant, consistent with what one would expect, unlike our earlier results based on a binary measure of monetary expansion. Emerging and developing countries face capital outflows and large currency depreciations upon which they respond by tightening monetary policy.

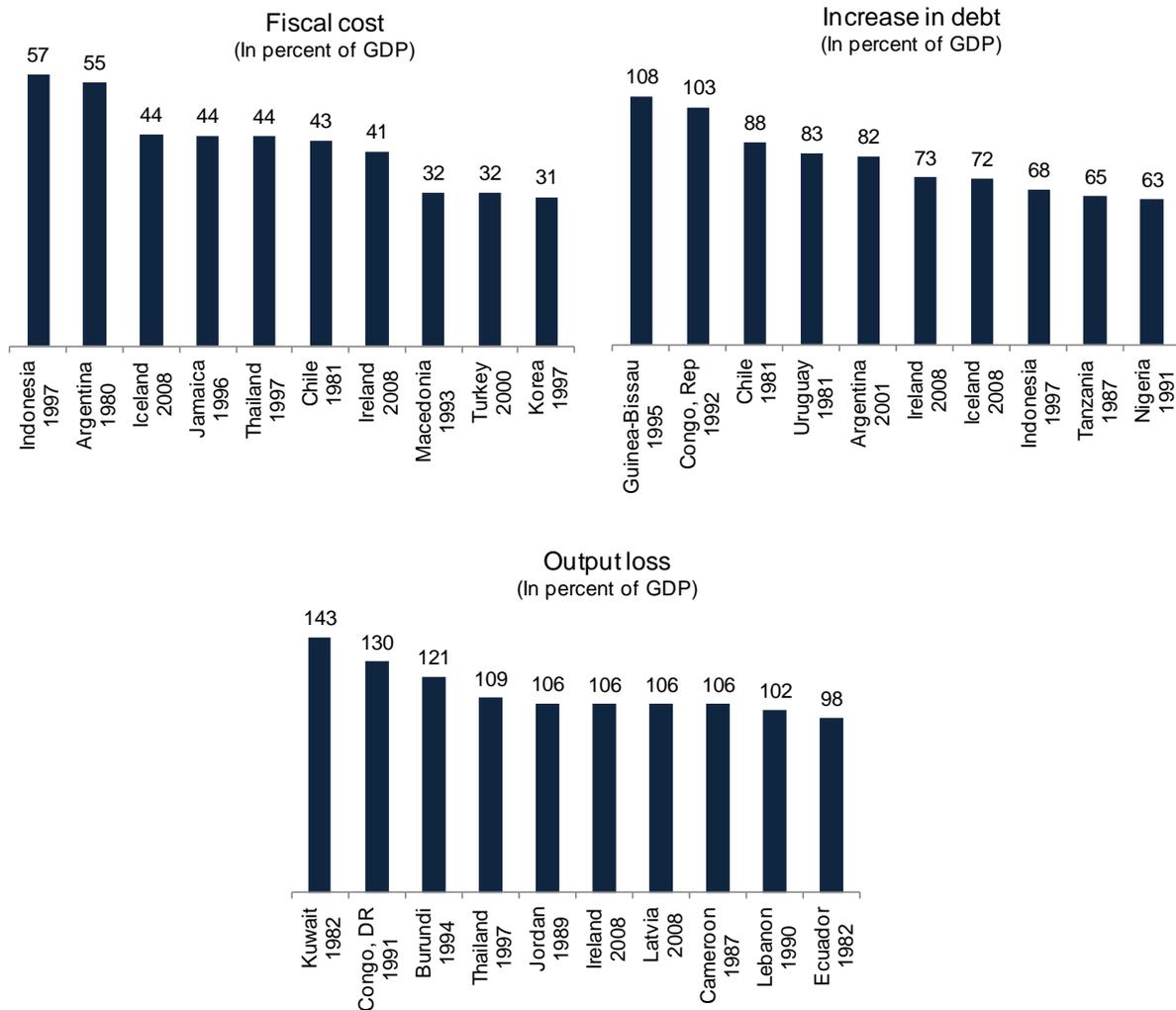
The greater reliance on macroeconomic tools may also explain why crises tend to last longer in advanced economies. If macroeconomic policies are used to avoid a sharp contraction in economic activity, this may discourage more active bank restructuring that would allow banks to recover more quickly and renew lending to the real economy, with the risk of prolonging the crisis and depressing growth for a prolonged period of time (see also Claessens et al., 2011).

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<sup>18</sup> Financial system assets data are taken from the World Bank's Financial Structure database. They consist of domestic claims on the private sector by banks and non-bank financial institutions. They exclude foreign claims by banks and non-bank financial institutions. In the case of European Union countries, for which cross-border claims can be sizeable, we instead use data from the European Central Bank (ECB) on the consolidated assets of financial institutions (excluding the Eurosystem and other national central banks), after netting out the aggregated balance sheet positions between financial institutions. Moreover, in the case of Iceland where cross-border claims are also sizable we use the assets of monetary and other financial institutions obtained from its national central bank.

The costs of banking crises vary markedly. Figure 8 reports the ten costliest crises in terms of fiscal costs, increases in public debt, and output losses. Along all three dimensions, recent and ongoing crises feature among the ten costliest crises since the 1970s. In terms of fiscal costs, the still ongoing banking crises in Iceland and Ireland already rank among the ten costliest crises. Fiscal costs have reached very high levels in Iceland and Ireland in part because of the relatively large size of the financial systems in these economies, amounting to multiples of GDP.

Figure 8. Costliest Banking Crises Since 1970

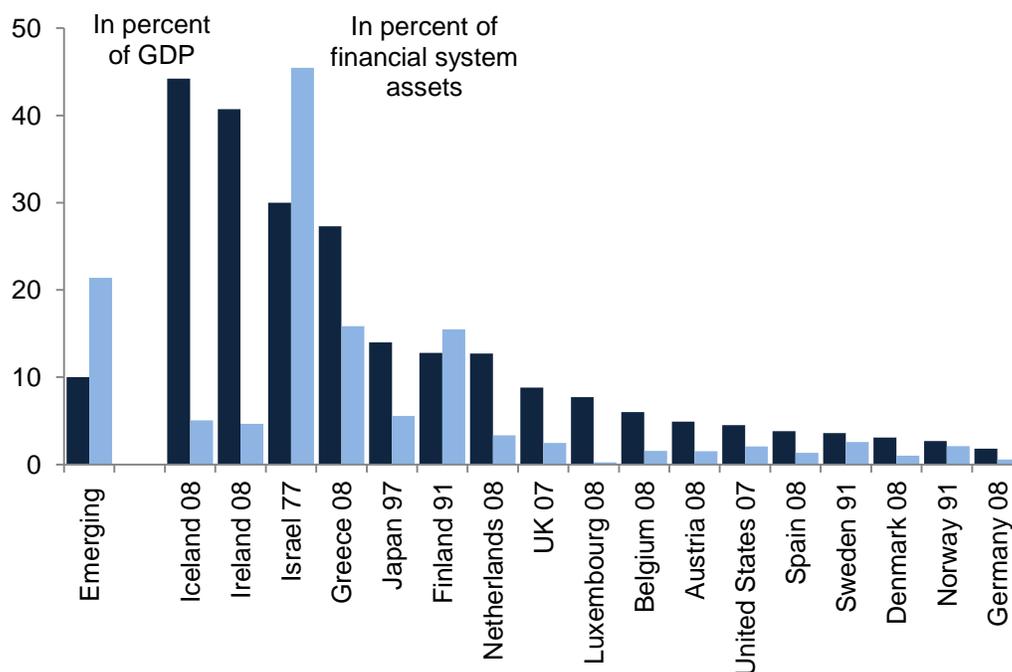


Source: Authors' calculations.

Iceland and Ireland also feature among the ten costliest banking crises in terms of overall increase in public debt, with public debt in both cases increasing by more than 70 percent of GDP within four years. In terms of output losses, the ongoing crises in Ireland and Latvia are among the ten costliest banking crises since the 1970s, with output losses exceeding 100 percent in both cases. Ireland holds the undesirable position of being the only country currently

undergoing a banking crisis that features among the top-ten of costliest banking crises along all three dimensions, making it the costliest banking crisis in advanced economies since at least the Great Depression. And the crisis in Ireland is still ongoing.

Figure 9. Fiscal Costs Relative to GDP and Financial System Assets



Source: Authors' calculations.

The size of the financial sector is an important driver of fiscal costs. Figure 9 shows a comparison between the median fiscal costs in emerging markets and advanced economies in our data, with fiscal costs expressed either in percent of GDP or in percent of financial system assets. For brevity, we only show the median value for emerging economies. For the median emerging market economy, fiscal costs double in magnitude when they are expressed in terms of financial system assets, highlighting the relatively low level of financial development in these economies. For advanced economies, Iceland, Ireland, and Israel stand out when fiscal costs are expressed relative to GDP, with Iceland being the costliest crisis in terms of fiscal costs to GDP at 44.2 percent of GDP. However, given the relatively large banking systems in Iceland and Ireland, fiscal costs are significantly lower in these countries when expressed relative to financial system assets. When normalized by financial system assets, the highest fiscal outlays took place during Israel's banking crisis of 1977.

Fiscal costs consist primarily of bank recapitalizations and asset purchases. Table A2 shows the breakdown of fiscal costs for the recent crises episodes, as well as detailed information on asset guarantees. The median fiscal cost for the recent episodes, excluding borderline cases, is 4.7

percent of GDP (2.8 percent with borderline episodes). Since most countries suffering a banking crises since 2007 are advanced economies, the median fiscal cost is similar to that for past crises in advanced economies. This number, however, is less than half of that for crises in emerging and developing countries. One explanation is that this time not all costs are born in the conventional way, that is, through a comprehensive restructuring of the banking system. Reliance on loose monetary policy can be seen as an alternative recapitalization of highly leveraged sectors, including financial institutions, albeit at a slower pace than through direct equity injections into financial institutions. Indeed, as shown in Table 3, the market valuation of financial institutions (as of end-2010) indicated in many cases still a sizable gap between the market and book value of banks. While overshooting in stock prices may be partly driving these gaps, they can also be interpreted as suggesting that some banks may have sizeable capital shortfalls. At the country level, the median gap between market and book values for banks with market-to-book values below one is about 3.3 percent of GDP.

Table 3. Comparison of Market and Accounting Values of Bank Equity, end-2010

Difference between market and book value of distressed banks 1/		
Country	In percent of GDP	In percent of total banking assets
Austria	4.7	2.9
Belgium 2/	6.7	2.4
Denmark	0.8	0.4
France	5.9	2.0
Germany	1.6	1.2
Greece	7.7	3.2
Ireland 2/	6.1	3.0
Italy	7.8	4.7
Kazakhstan 2/	0.4	0.8
Netherlands	4.6	1.8
Portugal 2/	3.3	2.3
Slovenia 2/	0.8	2.4
Spain	3.0	1.1
Sweden 2/	0.2	0.1
Switzerland	2.9	0.5
Ukraine 2/	0.0	0.1
United Kingdom	6.1	1.5
United States	1.5	1.1

Sources: Bankscope, Datastream, and authors' calculations.

1/ Country aggregate of the dollar value difference between the market and book values of bank equity for banks with a market-to-book value less than one. These gaps between market and book values of equity are expressed either relative to country GDP or total banking assets, where banking assets are computed by aggregating the consolidated balance sheets of individual banks in the sample at the country level.

2/ Country aggregate based on less than 5 banks.

Net fiscal costs, after asset recoveries, are significantly lower than gross outlays in some cases. For example, the Swiss authorities more than fully recovered the fiscal outlays associated with the convertible notes program offered in support of UBS. However, net fiscal outlays are not

necessarily the right metric for assessing the success of a government program because taxpayer money was put at great risk in the process and because government interventions associated with market failures can be welfare enhancing even when outlays are positive.

The recent wave of crises includes a significant number of countries in the euro area. Given that monetary policy is decided at the euro area level (plus financial institutions established in the euro area can freely provide their services throughout the euro area under EU “single passport” rules), it is interesting to compare crisis resolution policies and outcomes in the euro area with those in the United States when treating the euro area as a single economy.<sup>19</sup> The comparison is for illustrative purposes only because circumstances vary widely across countries within the euro area, but it serves the purpose of illustrating that the severity of crisis in the euro area, despite being unevenly spread among euro area countries, is comparable to that of the U.S. if the euro area could be seen as a single economy, enjoying not only a monetary union but also a common financial safety net, backed by some form of fiscal federalism. Table 4 shows the comparison when we aggregate resolution policies and outcomes across the euro area.

Table 4. Crises Outcomes and Resolution in the Euro Area and the United States

Country	Output loss	Increase in debt	Monetary expansion	Fiscal costs	Fiscal costs	Peak liquidity	Liquidity support	Peak NPLs
	In percent of GDP				In percent of financial system assets	In percent of deposits and foreign liabilities	In percent of total loans	
Euro area	23.0	19.9	8.3	3.9	1.7	19.3	13.3	3.8
United States	31.0	23.6	7.9	4.5	2.1	4.7	4.7	3.9

Source: Authors' calculations.

The table shows that according to our three metrics of crisis outcomes and costs (fiscal costs, output losses, and increases in public debt), the crisis in the euro area as a whole has thus far been comparable in magnitude to that in the United States. However, liquidity support has been much larger in the euro area, indicating the significant role played by the Eurosystem (including the ECB) in meeting liquidity needs of banks, including through Emergency Liquidity Assistance (ELA) and Long-Term Refinancing Operations (LTRO) operations. Nevertheless, monetary expansion has been similar thus far. Of course, with sovereign debt and banking sector problems continuing to put pressure on a number of euro area countries, and the increasing interlinkages between sovereign and banking sector risks, the final tally could be very different.

<sup>19</sup> Importantly, banking supervision and resolution are still largely a national affair in the euro area.

## V. CONCLUSIONS

This paper provides an update of the widely used IMF database on systemic banking crises by Laeven and Valencia (2008). Compared to our earlier version of the database, we add several recent crises, update information on output losses and fiscal costs for crises that are ongoing, and date banking crises not only at an annual frequency but also at a monthly frequency. These updates are particularly significant in the case of euro area economies that are currently experiencing banking crises.

The data point to several interesting issues that require further research. First, while traditionally costly banking crises were associated with emerging economies, more recent cases also involve advanced economies. This raises questions about whether there has been any systematic change that has led to increased fragility of banking systems in advanced economies that are otherwise generally perceived to enjoy deeper financial markets and higher quality institutions. Second, while macroeconomic policies have been used aggressively in recent advanced economy crises, actual bank restructuring has been relatively slow. This raises questions about the pace of recovery and the optimal policy mix in resolving financial crises in advanced economies.

Table A1. Banking Crises Dates and Costs, 1970–2011

Country	Start	End	Output loss 1/	Fiscal Costs 2/	Peak liquidity 3/	Liquidity support 3/	Peak NPLs 4/	Increase in public debt 5/	Monetary expansion 6/	Credit boom 7/
Albania 11/	1994	1994	...	...	7.6	...	26.8	...	...	...
Algeria	1990	1994 9/	41.4	...	37.6	29.9	30.0	19.1	-4.7	0
Argentina	1980	1982 8/	58.2	55.1	64.6	62.2	9.0	33.1	10.6	1
Argentina	1989	1991	12.6	6.0	151.6	135.7	27.0	-21.3	10.0	0
Argentina 10/	1995	1995	0.0	2.0	71.4	63.0	17.0	8.7	-0.8	1
Argentina	2001	2003	71.0	9.6	22.9	22.6	20.1	81.9	8.2	0
Armenia 4/	1994	1994 8/	...	...	41.4	23.0	...	...	...	0
Austria	2008	...	14.0	4.9	11.7	7.7	2.8	14.8	8.3	0
Azerbaijan 11/	1995	1995 8/	...	...	127.6	84.5	...	0.9	...	...
Bangladesh	1987	1987	0.0	...	26.0	2.8	20.0	3.5	1.4	0
Belarus 11/	1995	1995	...	...	35.8	...	...	-16.5	...	0
Belgium	2008	...	19.0	6.0	19.7	14.1	3.1	18.7	8.3	1
Benin	1988	1992 9/	14.9	17.0	99.6	48.6	80.0	5.7	13.0	1
Bolivia	1986	1986	49.2	...	57.5	25.9	30.0	-107.3	1.7	0
Bolivia	1994	1994	0.0	6.0	31.9	12.9	6.2	-19.2	1.6	1
Bosnia and Herzegovina 11/	1992	1996 9/	...	...	...	...	...	...	...	0
Brazil 10/	1990	1994 9/	62.3	0.0	11.3	10.7	...	-22.6	7.7	1
Brazil	1994	1998	0.0	13.2	20.1	17.6	16.0	-33.8	-4.3	1
Bulgaria	1996	1997	59.5	14.0	17.3	9.9	75.0	-30.1	-2.2	0
Burkina Faso	1990	1994	...	...	9.4	4.5	16.0	8.9	2.8	0
Burundi	1994	1998 9/	121.2	...	23.4	18.3	25.0	10.9	2.6	0
Cameroon	1987	1991 9/	105.5	...	59.1	40.9	65.0	18.0	1.0	0
Cameroon	1995	1997	8.1	...	12.3	6.2	30.0	-1.1	0.4	0
Cape Verde	1993	1993	0.0	...	4.0	...	30.0	18.2	-40.6	0
Central African Rep	1976	1976	0.0	...	90.8	10.5	...	-4.8	2.5	1
Central African Rep	1995	1996	9.0	...	24.8	20.9	40.0	-16.3	0.7	...
Chad	1983	1983	0.0	...	199.3	41.3	...	-7.2	-0.3	0
Chad	1992	1996 9/	0.0	...	120.9	41.4	35.0	27.1	-0.8	...
Chile	1976	1976	19.9	...	32.2	23.6	...	-69.5	1.6	0
Chile	1981	1985 9/	8.6	42.9	61.2	52.7	35.6	87.9	0.5	1
China, Mainland	1998	1998	19.4	18.0	62.0	7.2	20.0	11.2	0.0	0
Colombia	1982	1982	47.0	5.0	21.1	7.7	4.1	16.6	-0.8	1
Colombia	1998	2000	43.4	6.3	5.1	4.3	14.0	15.4	0.5	0
Congo, Dem Rep	1983	1983	1.4	...	20.0	18.9	...	39.5	...	0
Congo, Dem Rep	1991	1994 9/	129.5	...	44.7	30.2	...	42.2	...	0
Congo, Dem Rep	1994	1998 9/	79.0	...	77.3	77.1	75.0	39.3	...	0
Congo, Rep	1992	1994	47.4	...	30.7	16.6	...	103.5	1.4	0
Costa Rica	1987	1991	0.0	...	20.2	6.1	...	-27.5	2.9	0
Costa Rica	1994	1995	0.0	...	15.2	6.3	32.0	4.8	1.1	1
Cote d'Ivoire	1988	1992 9/	45.0	25.0	76.9	22.5	50.0	13.6	-3.3	0
Croatia 11/	1998	1999	...	6.9	3.2	3.1	10.5	14.1	5.2	0
Czech Republic 10/ 11/	1996	2000 9/	...	6.8	12.7	4.2	18.0	1.8	-1.3	0
Denmark	2008	...	36.0	3.1	20.1	11.4	4.5	24.9	1.2	0
Djibouti	1991	1995 9/	42.6	...	5.2	3.2	...	...	...	...
Dominican Rep	2003	2004	...	22.0	43.4	38.1	9.0	16.5	6.7	1
Ecuador	1982	1986 9/	98.2	...	146.7	100.0	...	24.4	-1.7	0
Ecuador	1998	2002	25.4	21.7	26.0	22.5	40.0	9.1	-0.5	1
Egypt	1980	1980	0.9	...	66.7	22.7	...	-4.2	-2.3	1
El Salvador	1989	1990	0.0	...	51.6	11.5	37.0	-29.6	...	1
Equatorial Guinea	1983	1983 8/	0.0	...	75.8	...	...	...	...	0
Eritrea	1993	1993 8/	...	...	...	...	...	...	...	0
Estonia 11/	1992	1994	...	1.9	30.9	...	7.0	...	...	0
Finland	1991	1995	69.6	12.8	12.0	5.5	13.0	43.6	...	1
France 10/	2008	...	23.0	1.0	8.9	7.4	4.0	17.3	8.3	0
Georgia 11/	1991	1995 9/	...	...	...	...	33.0	...	...	0

Country	Start	End	Output loss 1/	Fiscal Costs 2/	Peak liquidity 3/	Liquidity support 3/	Peak NPLs 4/	Increase in public debt 5/	Monetary expansion 6/	Credit boom 7/
Germany	2008	...	11.0	1.8	11.5	3.6	3.7	17.8	8.3	0
Ghana	1982	1983	45.3	6.0	0.2	0.1	35.0	15.5	-0.5	...
Greece	2008	...	43.0	27.3	44.3	42.3	14.7	44.5	8.3	1
Guinea	1985	1985 8/	0.0	3.0	...	...	...	...	...	0
Guinea	1993	1993	0.0	...	14.6	3.9	45.0	6.7	...	...
Guinea-Bissau	1995	1998	29.6	...	137.3	39.2	45.0	108.1	11.4	...
Guyana	1993	1993	0.0	...	1.8	1.7	...	-241.0	-10.5	0
Haiti	1994	1998	37.5	...	4.8	...	...	-119.4	-5.8	0
Hungary 11/	1991	1995 9/	0.0	10.0	47.0	4.6	23.0	19.6	4.5	0
Hungary 10/	2008	...	40.0	2.7	1.4	1.3	13.3	-0.3	-0.8	1
Iceland	2008	...	43.0	44.2	21.2	16.8	61.2	72.2	-2.3	1
India	1993	1993	0.0	...	4.3	3.6	20.0	-7.7	1.3	0
Indonesia	1997	2001 9/	69.0	56.8	23.1	17.2	32.5	67.6	4.5	0
Ireland	2008	...	106.0	40.7	20.0	16.3	12.9	72.8	8.3	1
Israel	1977	1977	76.0	30.0	43.2	16.5	...	...	28.4	1
Italy	2008	...	32.0	0.3	7.7	5.7	11.0	8.6	8.3	0
Jamaica	1996	1998	37.8	43.9	0.4	0.3	28.9	2.9	7.6	0
Japan	1997	2001 9/	45.0	14.0	2.4	1.6	35.0	41.7	7.2	0
Jordan	1989	1991	106.4	10.0	20.7	16.1	...	-61.0	15.5	0
Kazakhstan 10/	2008	...	0.0	3.7	5.5	5.0	31.9	9.1	3.3	0
Kenya	1985	1985	23.7	...	2.0	1.9	...	11.0	0.5	0
Kenya	1992	1994	50.3	...	25.2	24.3	...	12.1	7.4	0
Korea	1997	1998	57.6	31.2	27.4	11.9	35.0	9.9	-0.4	1
Kuwait	1982	1985	143.4	...	9.6	2.9	40.0	16.2	2.5	0
Kyrgyz Rep 11/	1995	1999 9/	...	...	286.1	51.8	85.0	42.9	...	0
Latvia 11/	1995	1996	...	3.0	9.2	5.5	20.0	0.4	...	...
Latvia	2008	...	106.0	5.6	3.6	3.4	15.9	28.1	-2.7	1
Lebanon	1990	1993	102.2	...	4.4	2.8	...	...	...	...
Liberia	1991	1995 9/	...	...	85.2	84.2	...	...	...	...
Lithuania 11/	1995	1996	...	3.1	27.5	18.9	32.2	10.8	...	0
Luxembourg	2008	...	36.0	7.7	14.7	4.1	1.3	14.6	8.3	...
Macedonia, FYR 11/	1993	1995	0.0	32.0	22.3	...	70.0	...	...	0
Madagascar	1988	1988	0.0	...	20.2	19.4	25.0	-25.8	1.0	0
Malaysia	1997	1999	31.4	16.4	9.7	8.8	30.0	0.2	4.0	1
Mali	1987	1991 9/	0.0	...	50.5	14.8	75.0	-11.3	1.7	0
Mauritania	1984	1984	7.5	15.0	48.4	27.7	70.0	...	1.2	0
Mexico	1981	1985 9/	26.6	...	5.3	2.6	...	22.6	5.0	0
Mexico	1994	1996	13.7	19.3	16.8	15.8	18.9	16.4	0.4	1
Mongolia	2008	...	0.0	4.2	10.5	9.4	...	-5.0	3.0	0
Morocco	1980	1984 9/	21.9	...	22.1	8.6	...	35.6	-1.0	0
Mozambique	1987	1991 9/	0.0	...	4.2	4.2	...	60.9	-36.6	0
Nepal	1988	1988	0.0	...	14.6	3.8	29.0	11.7	2.1	0
Netherlands	2008	...	23.0	12.7	5.9	3.7	3.2	26.8	8.3	0
Nicaragua	1990	1993	11.4	...	195.1	156.5	50.0	-31.0	...	...
Nicaragua	2000	2001	0.0	13.6	21.8	20.9	12.7	14.9	3.3	1
Niger	1983	1985	97.2	...	45.6	14.1	50.0	25.9	3.5	1
Nigeria	1991	1995 9/	0.0	...	6.6	5.4	77.0	63.3	7.2	...
Nigeria	2009	...	14.0	11.8	25.3	11.7	30.1	7.7	-0.5	0
Norway	1991	1993	5.1	2.7	16.9	4.2	16.4	19.2	0.5	0
Panama	1988	1989	85.0	12.9	3.6	3.2	...	-2.6	0.1	0
Paraguay	1995	1995	15.3	12.9	27.3	23.8	8.1	-1.2	3.2	1
Peru	1983	1983 8/	55.2	...	16.8	9.7	...	14.3	5.2	0
Philippines	1983	1986	91.7	3.0	19.4	1.5	19.0	44.8	8.4	1
Philippines 10/	1997	2001 9/	0.0	13.2	1.4	0.7	20.0	10.4	0.8	1
Poland 11/	1992	1994	0.0	3.5	45.9	8.7	24.0	-21.6	-0.7	0

Country	Start	End	Output loss 1/	Fiscal costs 2/	Peak liquidity 3/	Liquidity support 3/	Peak NPLs 4/	Increase in public debt 5/	Monetary expansion 6/	Credit boom 7/
Portugal 10/	2008	...	37.0	0.0	18.0	16.7	7.3	33.6	8.3	0
Romania 11/	1990	1992 8/	0.0	0.6	129.1	...	30.0	...	6.3	0
Russia 11/	1998	1998 8/	...	0.1	23.7	21.1	40.0	-7.1	...	0
Russia 10/	2008	...	0.0	2.3	24.8	23.9	9.6	6.4	1.0	1
São Tomé & Príncipe	1992	1992 8/	1.9	...	...	...	90.0	-706.3	...	0
Senegal	1988	1991	5.6	17.0	74.7	6.6	50.0	-14.2	2.0	0
Sierra Leone	1990	1994 9/	34.5	...	0.0	0.0	45.0	62.9	-0.8	...
Slovak Rep	1998 11/	2002 9/	0.0	...	13.0	4.8	35.0	15.4	-1.0	1
Slovenia 11/	1992	1992	...	14.6	10.0	...	3.6	...	...	0
Slovenia 10/	2008	...	38.0	3.6	10.2	9.6	12.1	18.0	8.3	1
Spain	1977	1981 9/	58.5	5.6	7.6	3.5	5.8	3.8	...	0
Spain	2008	...	39.0	3.8	8.3	6.4	5.8	30.7	8.3	1
Sri Lanka	1989	1991	19.6	5.0	8.0	2.0	35.0	-5.5	-1.0	0
Swaziland	1995	1999 9/	45.7	...	3.6	3.2	...	2.5	-1.0	0
Sweden	1991	1995	32.9	3.6	3.1	0.2	13.0	36.2	5.1	1
Sweden 10/	2008	...	25.0	0.7	13.2	13.0	2.0	11.1	6.3	0
Switzerland 10/	2008	...	0.0	1.1	4.6	3.0	0.5	-0.2	7.6	0
Tanzania	1987	1988	0.0	10.0	100.9	97.6	70.0	64.6	...	0
Thailand	1983	1983	24.8	0.7	8.5	2.0	...	15.7	0.3	0
Thailand	1997	2000	109.3	43.8	5.1	4.4	33.0	42.1	3.9	1
Togo	1993	1994	38.8	...	6.2	1.7	...	23.8	-3.0	0
Tunisia	1991	1991	1.3	3.0	31.5	15.1	...	4.2	0.1	1
Turkey	1982	1984	35.0	2.5	71.7	29.3	...	12.3	2.4	1
Turkey	2000	2001	37.0	32.0	20.5	15.2	27.6	15.3	...	1
Uganda	1994	1994	0.0	...	7.6	3.9	...	-26.9	0.6	...
Ukraine 11/	1998	1999	0.0	0.0	19.1	3.3	62.4	6.0	3.4	...
Ukraine	2008	...	2.0	4.5	30.1	9.2	15.5	28.9	1.7	1
United Kingdom	2007	...	25.0	8.8	9.0	5.6	4.0	24.4	9.4	1
United States 10/	1988	1988	0.0	3.7	0.1	0.1	4.1	10.5	-0.1	0
United States	2007	...	31.0	4.5	4.7	4.7	5.0	23.6	7.9	0
Uruguay	1981	1985 9/	38.1	31.2	24.6	18.5	...	83.3	3.2	1
Uruguay	2002	2005	27.4	20.0	12.8	7.9	36.3	37.0	2.0	1
Venezuela	1994	1998 9/	1.2	15.0	2.9	1.6	24.0	-23.0	1.3	0
Vietnam	1997	1997	0.0	10.0	64.9	24.8	35.0	-52.7	4.9	0
Yemen	1996	1996	16.4	...	0.8	0.7	...	-56.7	-12.4	0
Zambia	1995	1998	31.1	1.4	27.9	24.9	...	36.2	-1.7	...
Zimbabwe	1995	1999 9/	10.4	...	8.6	5.0	...	20.9	1.9	1

Sources: WEO, IFS, IMF Staff reports, Laeven and Valencia (2008), and authors' calculations.

1/ In percent of GDP. Output losses are computed as the cumulative sum of the differences between actual and trend real GDP over the period [T, T+3], expressed as a percentage of trend real GDP, with T the starting year of the crisis.

2/ In percent of GDP. Fiscal costs are defined as the component of gross fiscal outlays related to the restructuring of the financial sector. They include fiscal costs associated with bank recapitalizations but exclude asset purchases and direct liquidity assistance from the treasury.

3/ Liquidity is measured as the ratio of central bank claims on deposit money banks (line 12 in IFS) and liquidity support from the Treasury to total deposits and liabilities to non-residents. Total deposits are computed as the sum of demand deposits (line 24), other deposits (line 25), and liabilities to non-residents (line 26).

4/ In percent of total loans. NPLs data come from IMF Staff reports and Financial Soundness Indicators.

5/ In percent of GDP. The increase in public debt is measured over [T-1, T+3], where T is the starting year of the crisis. For the 2007-2009 crises, it is computed as the difference between pre- and post-crisis debt projections.

6/ In percent of GDP. Monetary expansion is computed as the change in the monetary base between its peak during the crisis and its level one year prior to the crisis. Monetary expansion is the same for all euro area countries, measured at the euro area level to reflect the common monetary policy.

7/ As defined in Dell'Ariccia et al. (2012).

8/ Credit data missing. For these countries, end dates are based on GDP growth only.

9/ We truncate the duration of crises at 5 years, starting with the first crisis year.

10/ Borderline cases.

11/ No output losses are reported for crises in transition economies that took place during the period of transition to market economies. Output losses are computed as the cumulative difference between actual and trend real GDP, expressed as a percentage of trend real GDP for the period [T, T+3] where T is the starting year of the crisis. Trend real GDP is computed by applying an HP filter ( $\lambda=100$ ) to the GDP series over [T-20, T-1].

Table A2. Direct Fiscal Outlays, Recoveries to Date, and Asset Guarantees, 2007–2011  
(In percent of GDP)

Country	Type of outlay	Specific fiscal outlay	Gross outlays 1/	Recoveries 2/	Net outlays
Austria	Recapitalization	Capital Injection Program	2.9		
	Asset purchase	Impaired assets and liquidity	2.0		
		<b>Total fiscal outlays</b>	<b>4.9</b>		
	Asset guarantee	Asset guarantee program	0.6		
Belgium	Recapitalization	Ethias, Fortis, KBC, and Dexia	5.8		
	Other	Capital for Fortis SPV	0.2		
		<b>Total fiscal outlays</b>	<b>6.0</b>		
	Asset guarantee	Asset relief facility	6.0		
		Fortis SPV	1.3		
Fortis portfolio		0.4			
	<b>Total asset guarantees</b>	<b>7.7</b>			
Denmark	Recapitalization	Capital Assistance Program	2.7		
		Capital injection in Fionia Bank	0.1		
	Other	Loan to Fionia Bank	0.3		
		<b>Total fiscal outlays</b>	<b>3.1</b>		
France	Recapitalization	SPPE acquisition of subordinated bonds	0.5		
		Second stage recapitalization (BNP, SG, Dexia)	0.5		
		<b>Total fiscal outlays</b>	<b>1.0</b>		
	Asset guarantee	Financial Security Assurance Inc.	0.3		
Germany	Recapitalization	Federal and state recapitalizations and guarantees for capital support	1.7		
		Norddeutsche Landesbank Girozentrale	0.1		
		<b>Total fiscal outlays</b>	<b>1.8</b>		
	Asset purchase	Asset purchase program	11.1		
	Asset guarantee	Bad Bank Act 3/	6.1		
Greece	Recapitalization	Capital injection package I	1.7		
		Agricultural Bank of Greece	0.2		
		Capital Injection package II	0.5		
		2012 Capital Injection package III (IMF estimate)	23.0		
	Other	Liquidity	1.9		
		<b>Total fiscal outlays</b>	<b>27.3</b>		
Hungary	Recapitalization	Capital injection in FHB (mortgage lender)	0.1		
	Other	FX loans to large banks	2.6		
		<b>Total fiscal outlays</b>	<b>2.7</b>	<b>1.6</b>	<b>1.1</b>
Iceland	Recapitalization	Securities lending	6.2		
		Commercial banks recapitalizations	14.7		
		Recapitalization of the House Financing Fund	2.1		
		“Savings banks”	1.3		
	Other	Central bank recapitalization	18.1		
		Called guarantees of the State Guarantee Fund	1.8		
	<b>Total fiscal outlays</b>	<b>44.2</b>	<b>23.7</b>	<b>20.5</b>	
Ireland	Recapitalization	Bol, AIB, Anglo Irish, EBS, INBS	29.5		
		Capital injections to meet PCAR stress test results	11.2		
		<b>Total fiscal outlays</b>	<b>40.7</b>		
	Asset purchase	Assets purchased by NAMA	20.3		
	Asset guarantee	NAMA	19.1		
Italy	Recapitalization	Recapitalization scheme	0.3		
Kazakhstan	Recapitalization	BTA, Halyk, Alliance, and KKB	2.4		
	Other	Liquidity through deposits of the development agency	1.3		
		<b>Total fiscal outlays</b>	<b>3.7</b>		

Country	Type of outlay	Specific fiscal outlay	Gross outlays 1/	Recoveries 2/	Net outlays
Latvia	Recapitalization	Parex and MLBN	3.1	0.8	2.3
	Other	Liquidity	2.5		
		<b>Total fiscal outlays</b>	<b>5.6</b>	<b>0.8</b>	<b>4.8</b>
Luxembourg	Recapitalization	Fortis and Dexia	7.7		
Mongolia	Recapitalization	Recapitalization and restructuring costs	4.2		
Netherlands	Recapitalization	Fortis, ING, SNS, and AEGON	6.6		
	Other	Loans to Icesave and Icelandic deposit Insurance	0.2		
		Loan to Fortis	5.9		
		<b>Total fiscal outlays</b>	<b>12.7</b>	<b>7.1</b>	<b>5.6</b>
	Asset guarantee	ABN AMRO/Fortis Mortgage portfolio	6.0		
	ING Alt-A RMBS portfolio	4.8			
		<b>Total asset guarantees</b>	<b>10.8</b>		
Nigeria	Recapitalization	Recapitalizations and purchase of bad assets	11.8		
Russia	Recapitalization	State Mortgage Agency, VTB, Rosselhozbank, Rosagroleasing, VEB	1.0		
		Subordinated loans from VEB	0.9		
		Liquidity through government deposits in commercial banks	0.4		
		<b>Total fiscal outlays</b>	<b>2.3</b>		
Slovenia	Recapitalization	NLB and NKBM	0.8		
	Liquidity	Public sector deposits in banks (proceed from bond issue)	2.8		
		<b>Total fiscal outlays</b>	<b>3.6</b>		
Spain	Recapitalization	Recapitalization of cajas and other banks 4/	2.0		
	Asset purchase	Purchase of high-quality securities from credit institutions	1.8		
		<b>Total fiscal outlays</b>	<b>3.8</b>		
	Asset guarantee	Asset protection scheme for BBK (takeover of Cajasol)	0.0		
Sweden	Recapitalization	Recapitalization package	0.2		
	Other	Initial contribution to stabilization fund	0.5		
		<b>Total fiscal outlays</b>	<b>0.7</b>		
Switzerland	Recapitalization	Mandatory convertible notes UBS	1.1	1.5	-0.4
Ukraine	Recapitalization	Public recapitalization program	4.5		
United Kingdom	Recapitalization	RBS, Lloyds, LBG, and Northern Rock	5.0		
	Other	Dunfermline Building Society takeover	0.1		
		Deposit compensation	1.8		
		Loans to Northern Rock and Bradford & Bingley	1.9		
		<b>Total fiscal outlays</b>	<b>8.8</b>	<b>2.2</b>	<b>6.6</b>
	Asset guarantee	Pool of RBS assets and CoCos	14.5		
United States	Recapitalization	Capital Purchase Program (CPP)	1.5	1.5	0
		AIG	0.5	0.1	0.4
		Targeted Investment Program	0.3	0.3	0
		Support to GMAC	0.1	0	0.1
		Support to Fannie Mae and Freddie Mac	1.2	0.2	1.0
	Other	Automotive Industry Financial program	0.5	0.3	0.2
	Asset purchase	MBS purchase	0.3	0	0.3
		Public-Private Investment Program	0.1	0	0.1
		<b>Total fiscal outlays</b>	<b>4.5</b>	<b>2.4</b>	<b>2.1</b>
	Asset guarantee	Citigroup asset guarantee	small		

Sources: IMF staff reports and official websites.

1/ Gross fiscal costs and recoveries differ somewhat from those in the IMF's Fiscal Monitor (February 2012, Table 7, p. 23), partly reflecting the different time periods used. For Germany, the Fiscal Monitor figures include financial sector support measures taken by subnational governments. And for Greece, the Fiscal Monitor figures do not include the Spring 2012 capital injection package.

2/ Includes repayments up to end-2011 of capital support as well as interest and fees generated from loans and guarantee programs for the cases where the data was available.

3/ Includes guarantees issued by the Stabilization Fund (items related to the Bad Bank Act and debt issued by financial institutions).

4/ Recapitalized banks include Catalunya Caixa, Unnim, Espana-Duero, Nova Caixa Galicia, Banco Financiero y de Ahorros, Banco Mare Nostrum, Banca Civica, Caja del Mediterraneo, and Banco de Valencia.

Table A3. Systemic Banking Crises Policy Responses, 2007–2011

<b>Country</b>	<b>Liquidity Support</b>	<b>Gross Restructuring Costs</b>	<b>Asset Purchases and Guarantees</b>	<b>Guarantees on Bank Liabilities</b>	<b>Significant nationalizations</b>
	(percentage points increase in central bank claims on financial institutions over deposits and foreign liabilities) 3/	(recapitalization and other restructuring costs, excluding liquidity support, in percent of GDP)	(funded by treasury and central bank, in percent of GDP)	(significant guarantees on bank liabilities in addition to increasing deposit insurance ceilings)	(state takes control over institutions; year of nationalization between brackets)
<b>Austria</b>	8	4.9	Guarantees: 0.6	Unlimited coverage to depositors Bank and non-bank bond issues	Hypo Group Alpe Adria, Kommunalkredit (2009)
<b>Belgium</b>	14.1	6.0	Guarantees: 7.7	DI raised from €20,000 to €100,000 Deposit-like insurance instruments Interbank loans and short-term debt Specific guarantees on Dexia	Fortis (2008), Dexia Bank Belgium (2011)
<b>Denmark</b>	11.4	2.8		Deposits and unsecured claims of PCA banks	Fionia Bank (2009)
<b>France</b>	7.4	1.0	Guarantees: 0.3	DI already higher than EU new limit €360 billion in guarantees for refinancing credit institutions Guarantee on €55 billion of Dexia's debt	
<b>Germany</b>	3.5	1.8	Guarantees: 6.1 Purchases: 11.1	Unlimited coverage of household deposits Interbank loans and bank debt (capped at €400 bn)	Hypo Real Estate (2009)
<b>Greece 1/</b>	42.3	25.4		DI raised from €20,000 to €100,000 Funding guarantees up to €15 billion, expanded to €15 billion in 2011	
<b>Hungary</b>	1.3	0.1		Unlimited protection to depositors of small banks	
<b>Iceland</b>	16.8	44.2		Unlimited coverage to domestic deposits	Kaupthing, Landsbanki, Glitnir, Straumur-Burdaras, SPRON and Sparisjóðabankinn (all 2008)
<b>Ireland</b>	16.3	40.7	Guarantees: 19.1 Purchases: 20.3	Unlimited coverage to most liabilities of 10 banks	Anglo Irish Bank (2009), EBS limited and Irish Nationwide Building Society (2010), Irish Life and Permanent (2011)
<b>Italy</b>	5.7	0.3		DI already higher than the EU limit State guarantee for new bank liabilities	

<b>Country</b>	<b>Liquidity Support</b>	<b>Gross Restructuring Costs</b>	<b>Asset Purchases and Guarantees</b>	<b>Guarantees on Bank Liabilities</b>	<b>Significant nationalizations</b>
	(percentage points increase in central bank claims on financial institutions over deposits and foreign liabilities) 3/	(recapitalization and other restructuring costs, excluding liquidity support, in percent of GDP)	(funded by treasury and central bank, in percent of GDP)	(significant guarantees on bank liabilities in addition to increasing deposit insurance ceilings)	(state takes control over institutions; year of nationalization between brackets)
<b>Kazakhstan</b>	5	2.4		DI raised from T0.7 million to T5 million	Bank Turan Alem, Alliance Bank (2009)
<b>Latvia</b>	3.4	3.1		DI raised to €50,000 Guarantee on Parex syndicated loans	Parex Bank (2008)
<b>Luxembourg</b>	4.1	7.7		DI raised from €20,000 to €100,000 €4.5 billion guarantee on Dexia's debt	Fortis and Dexia's subsidiaries (2008)
<b>Mongolia</b>	9.4	4.2		Unlimited coverage to all deposits	Zoos Bank (2009)
<b>Netherlands</b>	3.7	6.6	Guarantees: 3.3	DI raised to €100,000 Interbank loans of solvent banks Fortis bonds (€5 bn) and ING bonds (€10 bn)	ABN-AMRO/Fortis (2008)
<b>Nigeria</b>	11.7	11.8	Purchases: 9.3	Guaranteed on all interbank transactions, foreign credit lines, and pension deposits	Afribank Plc, Bank PHB Plc, Spring Bank Plc (2011)
<b>Portugal 2/</b>	16.7	0		DI raised from €25,000 to €100,000 Debt securities issued by credit institutions (20% of GDP)	
<b>Russia</b>	23.9	1.9		DI raised from R400,000 to R700,000 Interbank lending for qualifying banks	
<b>Slovenia</b>	9.6	0.8		Unlimited protection for all deposits by individuals and small enterprises until end-2010, and capped at €100,000 thereafter New debt issued by financial institutions until end-2010	
<b>Spain</b>	3.5	3.8	Purchases: 1.8	DI raised from €20,000 to €100,000 Guarantees on new debt issued by financial institutions until end-2010 (capped at €200 billion)	
<b>Sweden</b>	13	0.7		DI raised from SEK 250,000 to SEK 500,000 Medium-term debt of banks and mortgage institutions (up to SEK 1.5 trillion)	

<b>Country</b>	<b>Liquidity Support</b>	<b>Gross Restructuring Costs</b>	<b>Asset Purchases and Guarantees</b>	<b>Guarantees on Bank Liabilities</b>	<b>Significant nationalizations</b>
	(percentage points increase in central bank claims on financial institutions over deposits and foreign liabilities) 3/	(recapitalization and other restructuring costs, excluding liquidity support, in percent of GDP)	(funded by treasury and central bank, in percent of GDP)	(significant guarantees on bank liabilities in addition to increasing deposit insurance ceilings)	(state takes control over institutions; year of nationalization between brackets)
<b>Switzerland</b>	0.7	1.1	Purchases: 6.7	DI raised from SFr 30,000 to SFr 100,000	
<b>Ukraine</b>	9.2	4.5		DI raised from UAH 50,000 to 150,000	Prominvest (2008), Nadra, Inprom, Volodimrski, Dialog, Rodovid, Kiev, Ukgaz (all 2009)
<b>United Kingdom</b>	5.6	6.9	Purchases: 16.3 Guarantees: 14.5	DI raised from £35,000 to 50,000 Guarantee on short- to medium-term debt (capped at £250 billion) Blanket guarantee on Northern Rock and Bradford & Bingley wholesale deposits	Northern Rock (2008); RBS (2008).
<b>United States</b>	4.7	4.5	Purchases: 13.0	DI raised from \$100,000 to \$250,000 Money market funds (capped at \$50 billion) Full guarantee on transaction deposits Newly issued senior unsecured debt	Fannie Mae, Freddie Mac, AIG (all 2008).

Sources: IMF staff reports, official websites, and authors' calculations.

1/ Greece's fiscal cost includes the bank recapitalization funds for 23 percent of GDP included in the 2012 program. Since these funds will cover losses triggered by the debt exchange, we include them although they were not fully used as of May 2012.

2/ For Portugal, the funds allocated for bank restructuring purposes are not included because they have not been used yet and it is unclear how much and when they will be used.

3/ Includes liquidity support from the Treasury in the case of Austria, Denmark, Greece, Hungary, Kazakhstan, Latvia, the Netherlands, Russia, Slovenia, and the United Kingdom.

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