The Consequences of Banking Crises for Public Debt

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ABSTRACT/RESUMÉ

The Consequences of Banking Crises for Public Debt

The aim of this paper is to assess the consequences of banking crises for public debt. Using an unbalanced panel of 154 countries from 1980 to 2006, the paper shows that banking crises are associated with a significant and long-lasting increase in government debt. The effect is a function of the severity of the crisis. In particular, for severe crises, comparable to the most recent one in terms of output losses, banking crises are followed by a medium-term increase of about 37 percentage points in the government gross debt-to-GDP ratio. Measuring the increase in debt in this manner seems more appropriate than some of the measures used in the literature that have provided off-quoted and very large numbers for the run-up in debt. In addition, the debt ratio increased more in countries with a higher initial gross debt-to-GDP ratio and with a higher initial foreign debt-to-GDP ratio.

JEL classification codes: G1; E6
Keywords: Banking crises; financial crises; public debt.

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Les Conséquences des Crises Bancaires pour la Dette Publique

L'objectif de ce document est de déterminer l'impact des crises bancaires sur la dette publique. Les résultats obtenus utilisant un panel non-cylindré de 154 pays sur la période 1980-2006 montrent que les crises bancaires provoquent une augmentation significative et persistante de la dette publique. Cet effet dépend de la sévérité de la crise. Plus précisément, les crises dont la sévérité est comparable à la crise la plus récente en termes de pertes de PIB augmentent la dette publique brute par rapport PIB d'environ 37 points de pourcentage à moyen terme. Cette approche semble être plus appropriée par rapport à celles utilisées dans la littérature qui centrées sur la dette publique elle-même rapportent l'impact beaucoup plus important des crises bancaires. De plus, l'impact des crises bancaires croît en fonction du niveau initial de la dette public et de la dette extérieur par rapport au PIB.

Classification JEL : G1 ; E6
Mots clés : crises bancaires ; crises financière; dette publique.

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THE CONSEQUENCES OF BANKING CRISES FOR PUBLIC DEBT

By
Davide Furceri and Aleksandra Zdzienicka[1]

1. Introduction

1. Financial crises are not only typically associated with sharp economic downturns,[2] but also with a substantial deterioration of fiscal positions. Declining revenues due to weaker economic conditions, higher expenditures associated with bailout costs and demand stimuli have historically led to a rapid deterioration of fiscal balances and increase of public debt.[3]

2. Analysing a panel of developed and developing economies, Reinhart and Rogoff (2009) estimate that in the three years after the occurrence of a banking crisis the real value of government debt rose on average by 86%. However, arguably measuring the change in debt this way can be misleading because the relative increase in government debt depends on the initial level of the debt. Alternatively, if the rise in debt is measured in terms of the change in the ratio of debt-to-GDP, the figures becomes considerably smaller; using similar episodes to those chosen by Reinhart and Rogoff (2009), but focusing on the *percentage point* increase of the debt-to-GDP ratio, the historical average cumulative increase in the debt-GDP ratio three years after the occurrence of a banking crisis is typically about 9 *percentage points* of GDP (Figure 1). The effect varies considerably across the episodes presented in the figure, ranging from an almost insignificant increase in the case of Thailand in 1997 to an increase of more than 35 percentage points for Finland in 1991. In addition, countries differ not only in terms of the magnitude of the impact in the three years following the crisis, but also in terms of the dynamic of the response and in terms of medium-term effects. For example, three years after financial crises in Japan and Finland the effect on debt is very similar, however the medium-term evolution beyond three years is very different (Figure 2).

3. The current financial crisis is exceptional not only for its severity and its synchronicity across countries, but also for the macroeconomic policy response: monetary policy rates have been slashed, central bank balance sheets expanded, and most governments have taken expansive fiscal measures to counter the economic downturn. For many countries debt levels are projected to increase substantially compared with the pre-crisis situation. For example, for the OECD as a whole, the gross government debt-

2. See, for example, Aziz *et al.* (2000), Barro (2001), Hutchinson and Ilan (2005), Boyd et al. (2005), Cerra and Saxena (2008), Furceri and Mourougane (2009a,b) Furceri and Zdzienicka (2010a,b).

3. See, for example, Caprio and Klingebiel (1997), Honohan and Klingebiel (2000), Laeven and Valencia (2008a), Reinhart and Rogoff (2008), Furceri and Mourougane (2009a), OECD (2009).

to-GDP ratio is projected to increase by more than 20 percentage points by 2011 (Figure 3), and for some countries (Iceland, Ireland, Japan, and the United Kingdom) by more than 30 percentage points (OECD, 2010). Focusing on a longer time horizon (Figure 4), debt levels may increase by even more (*OECD*, 2010). Based on the assumption that government consolidation measures are only gradual but sufficient to stabilise debt-to-GDP ratios over the long term, the OECD area-wide debt-GDP ratio may still increase by about 30 percentage points by 2025 compared with pre-crisis levels.[4]

4.   In the context of the aftermath of the recent financial crisis this paper considers past historical episodes to examine what has happened to public debt over the medium and long term, The paper provides estimates of the dynamic impact that banking crises episodes have typically had on the gross debt-to-GDP ratio, and of the role that structural and policy variables have had in shaping this response. The analysis complements previous work analysing the fiscal costs associated with banking crises in several respects by:

- Focusing on gross public debt as a dependent variable. Several papers in the literature have instead focused on trying to estimate only the bailout costs associated with banking crises.[5] However, there are two main problems with this approach. First, estimates of fiscal bailouts depend markedly on the methodology used. As a result, the difference in the estimates across studies focusing on the same episodes is large (Frydl, 1999 and Vale, 2006). Second, bailout costs are only a part of the fiscal cost associated with banking crises, which also result from the reduced revenues associated with output losses, the increase in spending due to automatic stabilisers and from discretionary increases in the public deficit.

- The focus is on the debt-to-GDP ratio rather than the percentage change in debt levels. This is important for two reasons. First, the debt-to-GDP ratio is a better measure to assess fiscal sustainability. Second, analysing the percentage increase of debt levels in the aftermath of banking crises could lead to possible misinterpretations since the *percentage* increase crucially depends on the initial level of the debt before the occurrence of the crisis. For example, consider two crises episodes: Sweden (1991) and Colombia (1998). Following Reinhart and Rogoff (2009), the increase in the gross public debt in the three years following the banking crisis as in Colombia implies that public debt increased by about 175% while in Sweden it increased by about 60%. However, when the *percentage point* increase in the debt-to-GDP ratio is considered, as in Figure 1, the result leads to a spectacular reversal of this ranking: fiscal positions deteriorated significantly more in Sweden (27 *percentage points* of GDP) than in Colombia (13 *percentage points* of GDP).

- Presenting *inferential* empirical evidence on the increase of the debt-to-GDP ratio in the aftermath of banking crises. The only work, to our knowledge, that tries to assess the increase in public debt (not as ratio to GDP, as discussed previously) is Reinhart and Rogoff (2009). However, in their paper, the authors present only *descriptive* evidence of the increase in the gross government debt three years after the occurrence of banking crises, without controlling for country characteristics and other factors that could explain the increase in public debt in the short term and different responses across countries.

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4.   In particular, it is assumed that the underlying primary fiscal balance improves by ½ per cent of GDP until it is sufficient to ensure that the debt-to-GDP ratio is stable. See Chapter 4 of the *OECD Economic Outlook* 87 (2010) for more details.

5.   See among others Caprio *et al.* (2005), and Sanhueza (2001).

- Estimating the effect of banking crises on the debt-to-GDP ratio both in the short and in the long run,[6] in particular to assess whether fiscal costs associated with the crises have been permanent or if they have tended to dissipate in the long term.

- Analysing the heterogeneity of responses among different countries and episodes.

5. Using an unbalanced panel of 154 countries from 1970 to 2006, the main finding of the paper is that banking crises are associated with a significant and long-lasting increase in the government debt-to-GDP ratio, with the magnitude of the effect being a function of the severity of the crisis. In particular, we find that following a severe crisis, comparable to the most recent one in terms of output loss, there is a medium-term increase of about 37 percentage points in the government gross debt-to-GDP ratio. We also find that larger increases in debt tended to occur in those countries with the highest initial debt-to-GDP ratios and with the highest share of foreign public debt to GDP. Finally, the effect is not statically different between OECD and non-OECD countries.

6. The rest of the paper is organised as follows: the next section describes the data and the empirical methodology used to examine the effects of a financial crisis on debt; section three describes the results; and finally, section four concludes with the main findings.

2. Data and empirical methodology

2.1 Data

7. Data for the real gross debt-to-GDP ratio are taken from the IMF World Economic Outlook (2009). Data for the share of gross foreign public debt over total public debt are taken from Panizza (2008), where public foreign debt is defined as issued in foreign countries and under the jurisdiction of a foreign court. Data for banking crises episodes are taken from Laeven and Valencia (2008a). In the latter paper the authors provide detailed information on the starting date of several banking, currency and debt crises. The dataset is constructed by combining quantitative indicators measuring banking sector distress, such as a sharp increase in non-performing loans and bank runs, with a subjective assessment of the situation. In particular, the database extends and builds on the database of Caprio, *et al.* (2005) and covers 124 systemic banking crises over the period 1970-2007.[7]

2.2 Empirical methodology

8. In order to estimate the dynamic impact of banking crises episodes on the debt-to-GDP ratio the paper follows the approach proposed by Jorda (2005) and Teulings and Zubanov (2009) which consists of estimating impulse response functions (IRFs) directly from local projections. In detail, for each future period k the following equation has been estimated on annual data:

$$b_{i,t+k} - b_{i,t} = \alpha_i^k + \sum_{j=1}^{l} \gamma_j^k \Delta b_{i,t-j} + \beta_k D_{i,t} + \varepsilon_{i,t}^k \tag{1}$$

with $k= 1,..8$. Where b indicates the government gross debt-to-GDP ratio, D is a dummy that takes the value equal to 1 for the occurrence of a banking crisis and zero otherwise, α_i represent country fixed effects, γ_j captures the persistence in changes of the debt ratio, and β_k measures the impact of banking crises on the change of the debt ratio for each future period k. The number of lags (l) has been tested, and

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6. Previous works generally focus on a time horizon of three years.

7. See Tables A1 for a detailed description of crises episodes.

the results suggest that inclusion of two lags produce the best specification.[8] Corrections for heteroskedasticity, when appropriate, are applied using White robust standard errors, while the problem of autocorrelation in the errors is addressed using two lags of the explanatory variable as regressors.[9] Impulse response functions (IRFs) are then obtained by plotting the estimated coefficients β_k for $k= 1,..8$.

9.   An alternative way of estimating the dynamic impact of banking crises on output is to estimate an ARDL equation of debt-to-GDP ratio and crises dummies and to compute IRFs from the estimated coefficients.[10] However, the IRFs derived using this approach are sensitive to the choice of the number of lags, and the inclusion of interaction terms in the equation often leads to problems of multicollinearity, thus making the IRFs unstable. In addition, the significance of long–lasting effects on the debt ratio with ARDL models can be simply driven by the use of one-type shock models (Cai and Den Haan, 2009).

10.   In contrast, the approach used in this paper does not suffer from these problems because the lags of the change in the debt ratio enter only as control variables and are not used to derive the IRFs. Finally, the confidence bands associated with the estimated IRFs are easily computed using the standard deviations of the estimated coefficients β_k, and Monte-Carlo simulations are not required.

3.   Estimation results

3.1   Baseline

11.   The results from estimating the impact of banking crises on the gross government debt-to-GDP ratio using equation (1) imply a significant and long-lasting increase in public debt (Figure 5). [11] In particular, banking crises have typically increased the government gross debt-to-GDP ratio by about 12 percentage points in the short term (one year after the occurrence of the crisis), and by about 10 percentage points in the medium term (eight years after). In addition, the largest increase in the debt ratio (17 percentage points) has typically occurred around three years following the occurrence of a banking crisis.

12.   To check the robustness of the results, equation (1) is re-estimated by alternatively including: *1)* time fixed effects; *2)* a common time trend; *3)* a country-specific time trend. Time-fixed effects are included to control for specific time shocks, such as those affecting world interest rates. A time trend is used to control for common trends in the developments of debt-to-GDP ratios. Finally, a country-specific time trend is included to allow trends in the debt-to-GDP ratio to differ across countries. The results using these different controls remain statistically significant and broadly unchanged (Figures 6a-6c).

13.   As an additional robustness test the estimation sample is restricted to those countries for which data for $b_{i,t+k}$ are available for each period k. The reason for doing so is to control for a possible composition bias deriving from estimating $b_{i,t+k}$ over an unbalanced set of countries. The results for the restricted sample (displayed in Figure 6d) suggest that the short and the medium term effects are almost identical to those estimated for the unbalanced baseline sample.

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8.   The results are extremely robust to the number of lags included in the specification.

9.   Tests for autocorrelation of the residuals have been carried out and have rejected the hypothesis of serial correlation.

10.   This approach was initially proposed by Romer and Romer (1989) and then recently applied by Cerra and Saxena (2008), Furceri and Mourougane (2009a,b) and Furceri and Zdzienicka (2010b) to assess the impact of financial crises on economic activity.

11.   See Table A2 for more detailed information regarding the estimated parameters in equation (1).

14.   Finally, to also test whether the effect is similar between advanced and less developed economies, equation (1) is augmented by including a dummy for OECD countries as a control and as interaction term with the crisis dummy, as follows:

$$b_{i,t+k} - b_{i,t} = \alpha_i^k + \sum_{j=1}^{t} \gamma_j^k \, by_{i,t-j} + \beta_k D_{i,t} + \vartheta^k OECD_{i,t} + \delta^k OECD_{i,t} D_{i,t} + \varepsilon_{i,t}^k \qquad (2)$$

15.   The coefficient associated with the interaction term is statistically insignificant, suggesting that the effect of banking crises on public debt is not statistically different between the two groups of countries. The unconditional effect is still positive, statistically significant and of the same order of magnitude as the one estimated in the baseline specification (Table A2).

3.2   *Sensitivity to severity of the crisis*

16.   The results presented so far have shown that on *average* banking crises have had significant and persistent effects on the government debt-to-GDP ratio. However, it is reasonable to think that fiscal policy responses, both in terms of size of fiscal stimulus packages to counter the crisis and in terms of the increase in the deficit due to automatic stabilisers, may be a function of the output losses and therefore vary with the severity of the crisis. This would imply that the baseline estimates tend to over-estimate the impact on government debt for "moderate" banking crises and to under-estimate the impact for "severe" crises.

17.   To test for this hypothesis equation (1) is re-estimated distinguishing between "severe" and other crises, where severity is judged according to the associated output loss. Specifically the cumulative output loss is computed as the deviation of the annual growth rate from the average trend and if this exceeds 4% the crisis is considered to be severe.[12] Based on this definition most OECD countries would have experienced a "severe" crisis during the recent episode. The results suggest a clear distinction between moderate and severe crises on the debt-to-GDP ratio (Figure 7), both in the short and in the medium term. In particular, for moderate crises (Panel A) the maximum effect is about 15 percentage points after four years and it becomes insignificant in the medium term (after eight years). For severe crises (Panel B-C), the peak effect is about 50 percentage points (three times bigger than the average effect presented in the baseline scenario) and the medium-term effect is about 37 percentage points.

18.   The results for severe crises are in line with the recent IMF (2009) and OECD Economic Outlook (2010) medium-term projections for the debt-to-GDP ratio following the most recent financial crisis. In particular, while according to the IMF (2010) projections the debt-to-GDP ratio in 2014 is estimated to be almost 37 percentage points above the 2007 level, according to the OECD Economic Outlook (2010) the increase during the period 2007-2014 is estimated to be around 35 percentage points.[13]

3.3   *Initial debt*

19.   The rise in public debt in the aftermath of a banking crisis may be more important for countries that had at the time of the crisis a higher initial debt-to-GDP ratio. This hypothesis can be explained by the fact that a higher initial level of debt affects the debt accumulation through debt service.[14] In times of

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12.   Output losses are computed as the deviation of the annual growth rate compared to the trend (approximated by the average of annual growth rates over time). The results are qualitatively unchanged for reasonable changes in the threshold value. This is conceptually similar to the cumulative (negative) output gap following a downturn.

13.   In particular, it is assumed that the underlying primary fiscal balance improves by ½ per cent of GDP until it is sufficient to ensure that the debt-to-GDP ratio is stable. See Chapter 4 of the *OECD Economic Outlook* 87 (2010) for more details.

14.   See Figures A1 for the estimated impact of banking crises on government debt service.

crisis, debt service burdens increase due to reduced government revenues and increased risk premia. This last factor tends to be generally more important for countries with a higher initial level of public debt.[15]

20.		To assess the impact of the initial debt-to-GDP ratio on shaping the dynamic response of the government debt-to GDP ratio to banking crises, equation (1) is augmented by including the initial debt-ratio as a control variable and as an interaction term with the crisis dummy:

$$b_{i,t+k} - b_{i,t} = \alpha_i^k + \sum_{j=1}^t \gamma_j^k \, by_{i,t-j} + \beta_k D_{i,t} + \vartheta^k X_{i,t} + \delta^k (b_{i,t} - \bar{b}) D_{i,t} + \varepsilon_{i,t}^k \qquad (2)$$

21.		The interaction term $(b_{i,t} - \bar{b}) D_{i,t}$ is centred on the (over-time and cross-country) mean to make the interpretation of unconditional effects easier. Based on equation (2), for each period k, the impact of banking crises on the debt-to-GDP ratio is measured by $\beta_k + \delta^k (b_{i,t} - \bar{b})$. This implies that the effect will increase as a function of the initial debt ratio if $\delta^k > 0$.

22.		The results reported in Figure 8 tend to confirm the hypothesis that in countries with a higher initial debt-to-GDP ratio (corresponding to the third quartile of the distribution, *i.e.* above 76%) the increase in the debt-to-GDP ratio, both in the short (one and two years after) and in the medium term (eight years after), is about 15 percentage points higher than in countries with a lower initial debt ratio (the first quartile, *i.e.* below 20%).

### 3.4		*Foreign public debt*

23.		Another factor that may affect the pattern of the public debt-to-GDP ratio in the aftermath of banking crises is the share of public foreign debt (to GDP and/or to total public debt). First, countries with a high share of foreign public debt may face higher interest payments on debt coming due as capital markets become unwilling to continue rolling debt over. Second, when foreign exposure is heavy, expectations that debt service and repayment may be made difficult by currency depreciation may lead to a self-fulfilling public debt default. Third, in countries with a high foreign public debt ratio currency depreciation may lead to a substantial increase in the debt burden because of the *original sin* and lead to debt crises (Flandreau, 2003; Bordo, 2006; Bordo and Meisser, 2006). Fourth, a high level of foreign public debt may lead to significant output losses, especially in emerging economies, since sudden stops or reversals in capital inflows are more likely.[16]

24.		An approach to test whether countries with a higher foreign public debt ratio have been characterised by an higher rise in the debt-to-GDP ratio in the aftermath of banking crises is to re-estimate equation (2) using the initial level of the foreign public debt-to-GDP ratio as control and interaction term with the banking crises dummy. However, a problem with this approach in this case is that the probability of banking crises is endogenous to the share of foreign public debt.[17]

25.		A way to mitigate this problem is to estimate our baseline equation for different levels of the foreign public debt ratio (defined as the ratio of foreign public debt to GDP[18]). For simplicity, and

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15.		See for example Haugh *et al.* (2009), Schuknecht *et al.* (2009), Codogno *et al.* (2003), Gale and Orzag (2003), Gomez-Puig (2006), Manganelli and Wolswijk (2007).

16.		See, for example, Calvo *et al.* (2004), Bordo *et al.* (2008).

17.		Bordo and Meisser (2006) find that, especially if mismanaged, foreign debt can significantly increase the probability of financial crises.

18.		Similar results are obtained using the ratio of foreign public debt to total public debt as a measure of the foreign public debt ratio (Figure A2).

homogeneity with the rest of the results presented, equation (1) is estimated for three groups of countries: *i)* those with a foreign debt ratio lower than the first quartile of the distribution, *i.e.* below 13% (*low foreign debt ratio*); *ii)* those with a foreign debt ratio higher than the third quartile of the distribution, *i.e.* above 57% (*high foreign debt ratio*); *iii)* those with a foreign debt between the first and the third quartile (*average foreign debt ratio*). The IRFs corresponding to the three groups are displayed in Figure 9. The results suggest that the public debt-to-GDP ratio increased more in those countries with a higher share of foreign debt to GDP. In particular, in countries with a low foreign debt ratio the increase in the debt ratio is not statically significant different from zero, or negative (decrease in public debt). In countries with average foreign debt ratio, the results point to a long-term increase of the debt ratio of about 8 percentage points (which is similar to the baseline effect presented in Figure 5). Finally, in countries with high foreign debt ratio the peak effect is close to 30 percentage points, while the long-term effect is about 23 percentage points.[19]

4. Conclusions

26.   Financial crises are typically associated with sharp economic downturns but also with a substantial deterioration of fiscal positions. Declining revenues due to weaker economic conditions, higher expenditures associated with bailout costs and demand stimuli have historically led to a rapid deterioration of fiscal balances and increase of public debt. Focusing on the debt-to-GDP ratio and several episodes of banking crises from 1980 to 2006 this paper aims to quantify the evolution of the government gross debt-to-GDP ratio in the aftermath of banking crises. In particular, using a sample of 154 countries the paper estimates impulse response functions of public debt to banking crises.

27.   The results of this exercise suggest that banking crises have produced a significant and long-lasting increase in the government debt-to-GDP ratio, with the effect being a function of the severity of the crisis. In particular, for severe crises, comparable to the current one in terms of output losses, the government debt-to-GDP ratio is found to increase by up to 50 percentage points at the peak, and by 37 percentage points in the medium term (eight years after the crises onset). The effect is considerably lower for moderate crises.

28.   The increase in public debt in the aftermath of banking crises depends not only on the severity of the crises but also on country-specific characteristics. In particular, analysing a set of structural and policy variables larger increases in debt are found to occur in countries with higher initial debt-to-GDP ratios and with a larger share of foreign debt.

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19.   The results obtained by estimating equation (2), using the initial level of the foreign debt ratio as control and interaction term with the banking crises dummy, broadly confirm these results.

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FIGURES

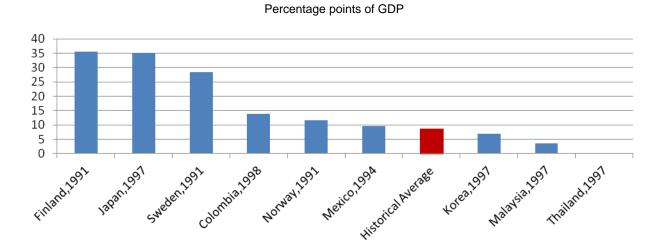**Figure 1. Cumulative increase in the debt-to-GDP ratio in the three years following the banking crises**

Percentage points of GDP

Figure 2. Evolution of the debt-to-GDP ratio following banking crises in Finland and Japan
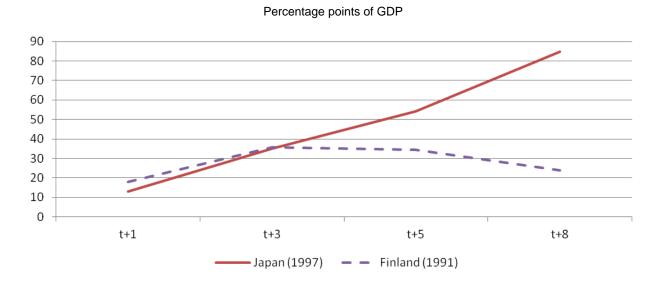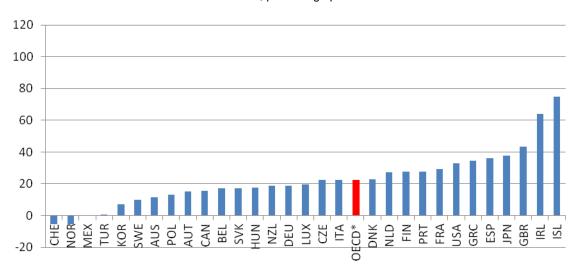
Percentage points of GDP

Figure 3. Projected increase in the government debt-to-GDP ratio

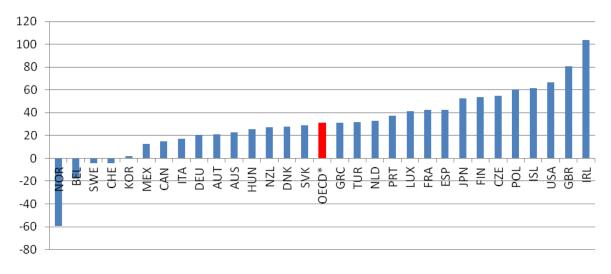Period 2007-11, percentage points of GDP

Note: * unweighted average of OECD countries excluding Mexico and Turkey.

Source: OECD Economic Outlook 87 Database (2010).

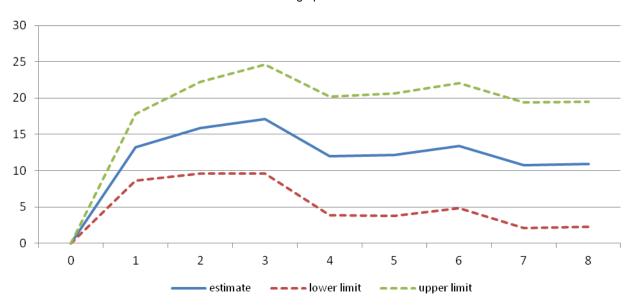**Figure 4. Projected increase in the government debt-to-GDP ratio**

Period 2008-25, percentage points of GDP

Note: * unweighted average of OECD countries excluding Mexico and Turkey. Projections are based on the assumption that government debt-to-GDP will stabilise by 2025 as a result of gradual consolidation measures. See the *OECD Economic Outlook* 87 (2010) for more details.
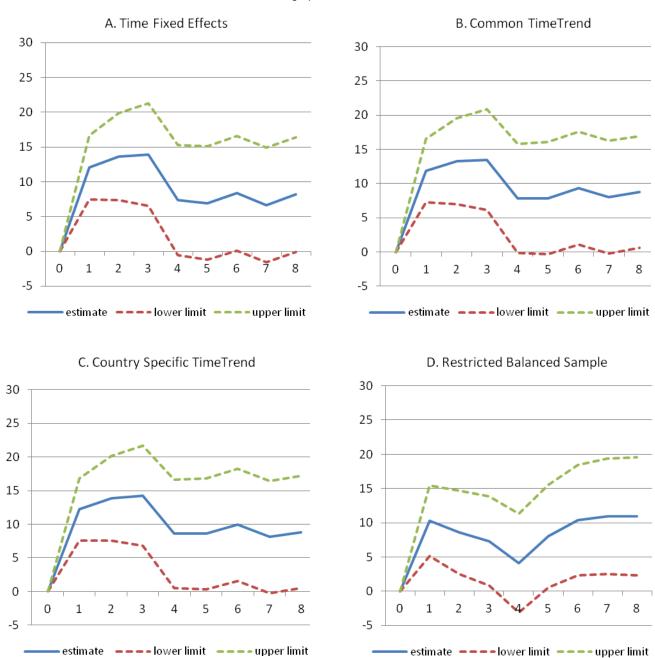
Source: OECD Economic Outlook 87 Database (2010).

Figure 5. The effect of banking crises on the debt-to-GDP ratio

Percentage points of GDP

Note: Dotted lines represent 90% confidence bands.

Figure 6. Robustness tests

Percentage points of GDP

A. Time Fixed Effects

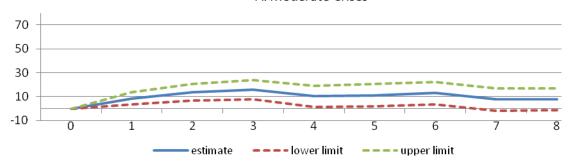B. Common TimeTrend

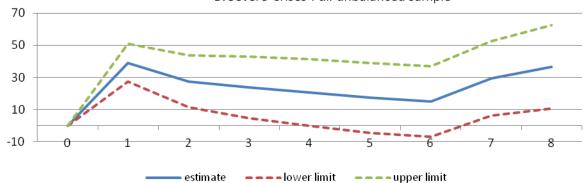C. Country Specific TimeTrend

D. Restricted Balanced Sample

Note: dotted lines represent 90% confidence bands.

Figure 7. The effect of moderate and severe banking crises on the debt-to-GDP ratio

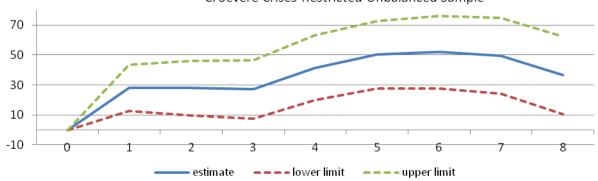Percentage points of GDP

A. Moderate Crises

B. Severe Crises-Full unbalanced sample

C. Severe Crises-Restricted Unbalanced Sample

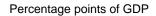*Note*: dotted lines represent 90% confidence bands.

Figure 8. The effect of banking crises on debt-to-GDP ratio controlling for the initial debt ratio

Percentage points of GDP

Note: Large and small identify the first and the third quartile of the initial debt-to-GDP ratio distribution. Dotted lines differ from the average response only when the interaction term is statistically significant.

Figure 9. The effect of banking crises on the debt-to-GDP ratio for different level of foreign debt ratio (foreign public debt over GDP)

Percentage points of GDP

A. Low ratio

B. Average ratio

C. High ratio

Note: Dotted lines represent 90% confidence bands. Low ratio corresponds to a level of the foreign debt ratio lower than 13 pp (1st quartile of the distribution); Average ratio corresponds to a level of foreign debt ratio higher than 13 pp and lower than 57 pp; High ratio corresponds to a level of foreign debt ratio higher than 57 pp. (3rd quartile of the distribution).

Figure A1. The effect of banking crises on debt service

Interest expenditure over Total Revenue(%)

Interest expenditure over GDP (%)

Note: Dotted lines represent 90% confidence bands.

Figure A2. The effect of banking crises on the debt-to-GDP ratio for different level of foreign debt ratio (foreign public debt over total public debt)
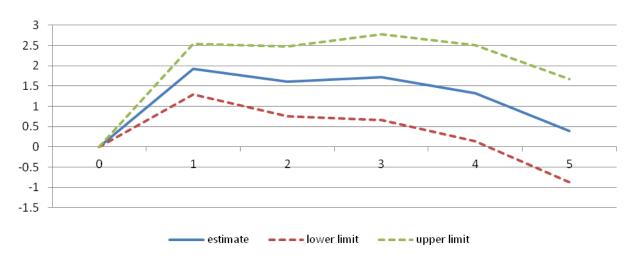
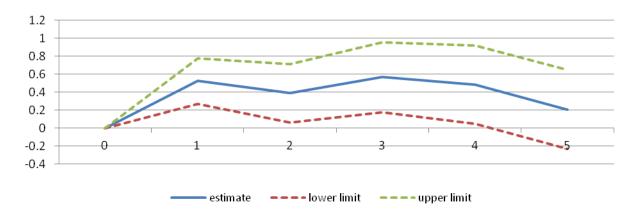Percentage points of GDP

Note: Dotted lines represent 90% confidence bands. Low ratio corresponds to a level of the foreign debt ratio lower than 34 pp (1st quartile of the distribution); Average ratio corresponds to a level of foreign debt ratio higher than 32 pp and lower than 83 pp; High ratio corresponds to a level of foreign debt ratio higher than 83 pp. (3rd quartile of the distribution).

TABLES

Table A1. Banking crises episodes

Country	Time	Country	Time	Country	Time
Albania	1994	Ecuador	1998	Norway	1991
Algeria	1990	Egypt,	1980	Panama	1988
Argentina	1980	El Salvador	1989	Paraguay	1995
Argentina	1989	Equatorial Guinea	1983	Peru	1983
Argentina	1995	Eritrea	1993	Philippines	1983
Argentina	2001	Estonia	1992	Philippines	1997
Armenia	1994	Finland	1991	Poland	1992
Azerbaijan	1995	Georgia	1991	Romania	1990
Bangladesh	1987	Ghana	1982	Russian Federation	1998
Belarus	1995	Guinea	1985	Sao Tome and Principe	1992
Benin	1988	Guinea	1993	Senegal	1988
Bolivia	1986	Guinea-Bissau	1995	Sierra Leone	1990
Bolivia	1994	Guyana	1993	Slovak Republic	1998
Bosnia and Herzegovina	1992	Haiti	1994	Slovenia	1992
Brazil	1990	Hungary	1991	Spain	1977
Brazil	1994	India	1993	Sri Lanka	1989
Bulgaria	1996	Indonesia	1997	Swaziland	1995
Burkina Faso	1990	Israel	1977	Sweden	1991
Burundi	1994	Jamaica	1996	Tanzania	1987
Cameroon	1987	Japan	1997	Thailand	1983
Cameroon	1995	Jordan	1989	Thailand	1997
Cape Verde	1993	Kenya	1985	Togo	1993
Central African Rep.	1976	Kenya	1992	Tunisia	1991
Central African Rep.	1995	Korea, Rep.	1997	Turkey	1982
Chad	1983	Kuwait	1982	Turkey	2000
Chad	1992	Kyrgyz Rep.	1995	Uganda	1994
Chile	1976	Latvia	1995	Ukraine	1998
Chile	1981	Lebanon	1990	United Kingdom	2007
China	1998	Liberia	1991	United States	1988
Colombia	1982	Lithuania	1995	United States	2007
Colombia	1998	Macedonia, FYR	1993	Uruguay	1981
Congo, Dem. Rep.	1983	Madagascar	1988	Uruguay	2002
Congo, Dem. Rep.	1991	Malaysia	1997	Venezuela,	1994
Congo, Dem. Rep.	1994	Mali	1987	Vietnam	1997
Congo, Rep.	1992	Mauritania	1984	Yemen,	1996
Costa Rica	1987	Mexico	1981	Zambia	1995
Costa Rica	1994	Mexico	1994	Zimbabwe	1995
Cote d'Ivoire	1988	Morocco	1980		
Croatia	1998	Mozambique	1987		
Czech Rep.	1996	Nepal	1988		
Djibouti	1991	Nicaragua	1990		
Dominican, Rep.	2003	Nicaragua	2000		
Ecuador	1982	Niger	1983		
Ecuador	1998	Nigeria	1991		

Source: Laeven and Valencia (2008a).

Table A2. Estimates (1)

K	Baseline	Time FE	Time trend	Country time trend	Severe	Moderate	OECD
1	13.226	12.065	11.908	12.206	39.078	8.447	15.176
	(4.72)***	(4.30)***	(4.25)***	(4.35)***	(5.51)***	(2.77)***	(4.69)***
2	15.893	13.657	13.291	13.869	27.563	13.694	17.372
	(4.13)***	(3.58)***	(3.48)***	(3.61)***	(2.81)***	(3.27)***	(3.98)***
3	17.084	13.903	13.500	14.246	23.746	15.795	19.808
	(3.75)***	(3.12)***	(3.00)***	(3.15)***	(2.04)**	(3.19)***	(3.76)***
4	12.002	7.351	7.832	8.602	20.470	10.410	13.445
	(2.42)**	(1.53)	(1.61)*	(1.76)*	(1.62)*	(1.93)**	(2.34)**
5	12.206	6.937	7.872	8.581	17.220	11.246	13.706
	(2.37)**	(1.4)	(1.58)*	(1.71)*	(1.31)	(2.02)**	(2.30)**
6	13.441	8.365	9.331	9.928	15.012	13.102	16.109
	(2.57)**	(1.67)*	(1.86)*	(1.96)**	(1.12)	(2.31)**	(2.66)***
7	10.747	6.671	8.050	8.116	29.299	7.684	13.233
	(2.05)**	(1.33)	(1.61)*	(1.60)*	(2.09)**	(1.36)	(2.12)**
8	10.910	8.191	8.783	8.856	36.526	7.681	13.499
	(2.08)**	(1.63)*	(1.77)*	(1.75)*	(2.32)**	(1.38)	(2.14)**

Note: t-statistics in parenthesis. ***,**,* denote significance at 1%, 5%, and 10%, respectively.

Table A2. Estimates (2)

K	Severe	Moderate	Small foreign debt	Average foreign debt	Large foreign Debt	Debt
1	39.078	8.447	2.749	24.590	8.618	12.794
	(5.51)***	(2.77)***	(1.35)	(8.59)***	(1.70)*	(4.84)***
2	27.563	13.694	-1.022	13.042	24.161	9.706
	(2.81)***	(3.27)***	(-0.34)	(3.09)***	(3.11)***	(2.99)***
3	23.746	15.795	-4.081	11.504	26.732	9.348
	(2.04)**	(3.19)***	(-1.15)	(2.41)**	(2.92)***	(2.60)***
4	20.470	10.410	-5.847	4.019	20.827	3.575
	(1.62)*	(1.93)**	(-1.44)	(0.78)	(2.13)**	(0.96)
5	17.220	11.246	-8.570	4.377	25.323	4.407
	(1.31)	(2.02)**	(-2.01)**	(0.80)	(2.51)**	(1.18)
6	15.012	13.102	-4.605	5.223	29.401	5.765
	(1.12)	(2.31)**	(-1.07)	(0.94)	(2.81)***	(1.53)
7	29.299	7.684	-8.423**	7.232	23.499	6.309
	(2.09)**	(1.36)	(-2.01)	(1.31)	(2.25)**	(1.65)*
8	36.526	7.681	-8.181	8.276	23.016	6.883
	(2.32)**	(1.38)	(-2.01)*	(1.70)*	(2.08)**	(1.79)*

Note: t-statistics in parenthesis. ***,**,* denote significance at 1%, 5%, and 10%, respectively.

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