Serial Banking Crises and Capital Investment

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ABSTRACT: We find that banking crises have a sizable, multiyear cumulative negative effect on investment in capital. Moreover, in countries that have experienced several banking crises over the years, each additional crisis lowers the ratio of investment to gross domestic product by more than the previous crisis. In addition, the recovery of investment following a banking crisis is conditional on earlier crises in the same country. The recovery is slower in countries that have experienced crises in the past. The results are obtained using data for seventy-five countries for the period 1976–2005.

KEY WORDS: banking crises, investment.

Recent research shows that banking crises can have a prolonged effect on economic activity. For example, Cerra and Saxena (2008) find that output remains 7 percent below its precrisis trend even ten years after a banking crisis. World Economic Outlook (2009) reports that the persistent fall in output in the medium term arises from reductions in both employment and capital. Rioja et al. (2014) present evidence that banking crises can reduce capital investment for as long as seven years. We contribute to that literature by focusing on the effect of serial banking crises. That is, we study the effects of a banking crisis in countries that have had repeated bouts of such crises. As Reinhart and Rogoff (2008) describe, defaults and financial instability are not one-time phenomena. They find that "serial defaults" are common across countries and time. Specifically, we ask the following two questions: (1) Is there a cumulative negative effect of banking crises? That is, does each additional crisis lower investment by more than the previous crises? (2) Does investment recover more slowly after a banking crisis in countries that have experienced crises in the past?

We are interested in the effects of the repeated occurrence of banking crises since these could signal deep institutional problems in the financial sector or reduced confidence and may depress investment for many years by creating uncertainty and anticipation of future new crises.[1] The literature, however, has not explored the effect of serial banking crises but has focused exclusively on the effects of one crisis at a time. Table 1 provides some additional motivation. According to our data set (described in detail in the next section), countries that experienced a first banking crisis within the time span of our sample had an average investment decline of 2.3 percent in the three years after the crisis. In countries that experienced a second banking crisis, investment declined by 6.2 percent in the three years after the crisis as Table 1 shows. Countries that experienced a third banking crisis

Table 1. Multiple crises and investment

Crisis occurrence	Cumulative change in investment year *t* to *t* + 3
First	−2.3
Second	−6.2
Third	−11.0
Fourth and Fifth	−11.2

Note: Cumulative change is the sum of the change in investment (as percent of GDP) in the three years after a banking crisis.

had an average drop in investment of over 11 percent in the three years after. The data in Table 1 then provide motivation to study whether in fact investment is more adversely affected by a current crisis if the country has experienced more banking crises in the past. Indeed, we find evidence in our estimations that the effect of a banking crisis on investment is conditional on the number of previous crises.

We use data for seventy-five countries for the period 1976–2005, including the well-known Reinhart and Rogoff (2008) event data on banking crises episodes. Our results confirm that banking crises have long-term consequences. We find that crises reduce investment even after controlling for the availability of credit and other sources of financing, the feedback effects from growth to investment, the magnitude of the crisis, and a number of other factors. In fact, the ratio of investment to gross domestic product (GDP) ratio is on average about 2 percent lower during *each* of the seven to eight years following a banking crisis. Moreover, our results show that experiencing multiple crises over time reduces investment and partly accounts for the persistence of the effect.

Our focus on serial crises is based on recent literature showing that dramatic economic events such as banking crises can influence expectations and behavior many years into the future. Malmendier and Nagel (2009) show that people who have lived through a period of high inflation have persistently higher levels of expected inflation. Giuliano and Spilimbergo (2009) find that people who have grown up during recessions favor more income redistribution and have less trust in government. Malmendier and Nagel (2011) show that people who have lived through periods of low stock market returns are less likely to take financial risk and are less likely to participate in the stock market. Furthermore, the effects of such dramatic economic events can persist for decades. Mudd, Pashev, and Valev (2010) find that people who have experienced a loss during a banking crisis are more likely to expect another banking crisis even a decade after the crisis. While our paper focuses on banking crises, Calvo's (1986) paper on a related type of crisis, currency crisis, shows that economic agents do not expect stabilizations to be permanent in countries with a history of currency crises.[2] Studying the Great Depression, Cagan (1965) models the expectations of the future rate of loss on deposits as depending on some average of the past experience of losses. In summary, (1) financial instability is a recurrent problem in some countries, and (2) it could have a lasting effect on economic agents.

Our paper extends the literature on the medium- and long-term effects of crises by Cerra and Saxena (2008) and the World Economic Outlook (2009) with a specific focus on investment and the effect of multiple crises. We also contribute to a long-standing body of literature showing that uncertainty adversely affects capital investment and

economic growth (e.g., Aizenman and Marion 1993, 1999; Brunetti and Weder 1998; Lensink et al. 1999).[3] We provide supporting evidence by investigating the role of serial banking crises.

Data and Methodology

We use the well-known Reinhart and Rogoff (2008) data set to identify banking crises. Episodes of banking crises are identified as "periods when bank runs lead to the closure, merging or takeover of financial institutions or, if there are no runs, the closure, merging, takeover or large program assistance from the public sector to an important financial institution [which] led to similar distress in other financial institutions" (Reinhart and Rogoff 2008, p. 58). Using this definition, Reinhart and Rogoff (2008) identify 156 banking crises in 110 countries from 1963 to 2007.[4] Regarding the frequency of banking crises, 35 percent of all crises occurred in the 1980s and 45 percent in the first half of the 1990s. This trend declined in the latter years of the sample as only 16 percent of the crises happened after 1995. The data also show that different regions have been affected differently by banking crises. Latin American economies have experienced a high number of banking crises. For example, Argentina suffered four banking crises in our period of study, while Brazil suffered two crises. Many countries in sub-Saharan Africa, Central Asia, and Eastern Europe have also suffered from multiple banking crises. Only a quarter of the countries in these three regions have not experienced a banking crisis, while thirteen countries have experienced two crises.

Since we are interested in the effect of banking crises on long-run capital formation, our dependent variable is *Investment,* which is defined as real gross capital formation as share of GDP. These data come from the Penn World Tables (Heston et al. 2006). As the summary statistics in Table 2 show, investment is on average 18 percent of gross domestic product (GDP). To investigate how long a banking crisis may affect investment, we construct a dummy variable *Crisis* that takes the value one for the year when a banking crisis started, and zero otherwise. We then construct lagged values of the *Crisis* variable for each country in the sample and enter up to ten lags in the following benchmark empirical specification:

$$Investment_{i,t} = \alpha + \sum_{k=1}^{10} \theta_k crisis_{i,t-k} + \gamma X_{i,t} + \lambda_i + e_{i,t}. \qquad (1)$$

This specification allows us to estimate the effect of a crisis on investment up to ten years after the onset of the crisis. We are interested in the magnitude and statistical significance of the estimated parameters θ at different lags k. For example, $\hat{\theta}_6 < 0$ would indicate that a banking crisis reduces investment in the sixth year after the crisis began. The vector of control variables is denoted X and its components are explained below. The unobserved country-specific effect is denoted by λ_i. The idiosyncratic is **e** and α is the constant term.

To investigate the effect of multiple crises, we add the variable *Multiple Crises*$_{i,t}$, which equals the number of crises that country i has experienced through year t. For example, in 1996, Argentina had experienced four banking crises within our sample period (1980, 1985, 1989, and 1995), while Indonesia had experienced one banking crisis (1992). Hence, the variable *Multiple Crises* in the year 1996 would take a value of four for Argentina and a value of one for Indonesia. We are interested in testing whether the number of crises experienced affects investment, so we estimate the following equation:

$$Investment_{i,t} = \alpha + \sum_{k=1}^{10} \theta_k crisis_{i,t-k} + \sigma Multiple\ Crises_{i,t} + \gamma X_{i,t} + \lambda_i + e_{i,t}. \quad (2)$$

Our hypothesis is that the occurrence of multiple crises would reduce investment as they are a strong indicator of recurrent instability. *Multiple Crises* may reduce long-run confidence in economic stability and would tend to lower investment over the years, so we would expect that $\sigma < 0$. In addition, the inclusion of *Multiple Crises* in the estimation allows us to observe what happens to the coefficients on the crisis dummies (θs). It is possible that a new banking crisis is a reminder that crises are a recurrent problem in a particular country. If so, the estimated θs may be smaller once one adds *Multiple Crises.* This would indicate that a potential reason for the decline in investment after a banking crisis is that confidence in economic stability is reduced for a number of years. The estimated value of the coefficient σ and the change in the θs when we include *Multiple Crises* are central to our investigation as they address directly the two questions posed in the introduction of the paper. The coefficient σ measures the long-run cumulative effect of banking crises on investment, while the θ coefficients measure the adverse effect from individual crises and, hence, how fast investment recovers.

There are a couple of specification-related issues that need to be discussed. First, we acknowledge that there could be a potential endogeneity issue. That is, both the banking crisis and investment could depend on an omitted variable. We try to partially address this issue by using one to ten lags of the crises variable (a predetermined variable with respect to time *t* investment). We try to also ameliorate this potential problem by including an array of control variables in the estimations. We also use lags of the control variables due to the same concern of potential endogeneity with investment. Second, in contrast to Cerra and Saxena's (2008) time series approach, we use fixed effects panel estimation. Cerra and Saxena (2008) run estimates with lags of the crisis dummies (as we do) as well as with a contemporaneous crisis dummy in addition to the lags. They find that their results are robust to both specifications. We proceed similarly, choosing to report the lags-only estimates. However, we also run estimations with a contemporaneous crisis dummy and find similar results.[5]

The set of control variables, *X*, that may affect investment is drawn from the literature. One key determinant of investment is the amount of credit issued to the private sector. We use *Private Credit* defined as the amount of credit issued by banks to the private sector as a share of GDP.[6] This measure has been widely used in the finance and growth literature (Levine 2005).[7] Another key determinant of investment is the well-known "accelerator effect." When output in an economy has been growing fast, business profits and cash flows increase, which leads firms to increase investment. Hence, we use the average GDP growth over the previous five years to control for this investment accelerator effect.

The other variables that comprise our baseline control set are *GDP per capita*, *Inflation*, *Government Spending* (as a share of GDP), and *Trade Openness* (as a share of GDP). We include these control variables for the following reasons. As in standard growth models, we would expect countries with high *GDP per capita* to also have high investment rates. We expect *Inflation* to have a negative effect as it affects potential future returns (Aizenman and Marion 1999). *Trade Openness* is likely to have a positive effect on investment. The government spending share of GDP is typically found to have a negative effect on economic growth; hence, a negative effect on investment would be expected. We also control for stock market activity, which can be an alternative source of funds for investment. We use *Value Traded*, which measures the value of the traded shares in the domestic stock market as percent of GDP. In some specifications, we also use the *Real Interest Rate* for robustness to account for the cost of borrowed funds. Finally, we use an *Institutions*

Table 2. Summary statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Investment ratio	18.54	8.15	2.84	44.65
Crisis	0.04	0.19	0	1
Main controls				
GDP per capita	12,494	9,250	750	45,694
Average five-year GDP growth	2.25	2.62	–8.34	13.83
Inflation	20.23	251.86	–1.29	7,481.66
Government Spending	19.68	7.58	4.08	55.05
Private Credit	0.58	0.44	0.03	3.45
Openness	76.60	53.35	12.84	446.06
Capital Openness	0.78	1.54	–1.83	2.50
Value Traded	0.22	0.40	0.00	3.26
Real Interest Rate	0.07	0.09	–0.63	0.58
Legal System and Property Rights	0.40	0.90	–5.15	1.67

index, which is a first principal component of two variables: *Legal System and Property Rights* from Gwartney and Lawson (2012) and the *Polity IV measure* of political stability (Polity IV Project, 2012). We expect that countries with weaker institutions would have lower investment rates. Adding *Institutions* to the equation is important as banking crises might be a symptom of underdeveloped institutions and, therefore, the effect of crises on investment that we detect could be a proxy for the role of institutions. Appendix A shows the definitions of the variables and the sources of the data; Tables 2 and 3 present the summary statistics.

Results

We first perform fixed effects estimations of our benchmark Equation (1) regressing investment as a share of GDP on lags of the banking crisis dummy and our baseline control set. The results in Table 4 show that investment can be adversely affected by banking crises for as long as eight years. The crisis dummies are negative and significant through year eight in regressions (1) through (4).[8] The coefficient estimates for the crises dummies indicate the percent of GDP by which investment is affected. Therefore, this adverse effect is also economically large as investment is on average about 2 percent of GDP lower following a banking crisis. The largest effect is found in years three and four postcrisis. For instance, in regression (1), the coefficient in year three is –2.835, which means that a banking crisis reduces investment by 2.835 percent of GDP in the third year after the crisis. The negative effect diminishes over time to about 1.5 percent of GDP by the eighth year and is insignificant thereafter. The control variables *GDP per capita*, *Government Spending*, and *Real Interest Rate* are statistically significant and have the expected sign in the four regressions reported. In summary, the effects of the banking crisis on investment remain significant for eight years after accounting for a wide variety of determinants of investment.

We now turn our attention to the effect of multiple crises by estimating Equation (2); results are presented in Table 5. Regression (1) is a baseline regression without *Multiple*

Table 3. Correlations

	Investment ratio	Crisis	GDP per capita	Average five-year GDP growth	Inflation	Government spending
Investment Ratio	1					
Crisis	-0.036	1				
GDP per capita	0.520	-0.077	1			
Average five-year GDP growth	0.328	0.007	0.106	1		
Inflation	-0.037	-0.007	-0.061	-0.100	1	
Government Spending	-0.216	0.000	-0.246	-0.036	-0.018	1
Private Credit	0.483	-0.034	0.666	0.080	-0.071	-0.214
Openness	0.282	-0.063	0.205	0.173	-0.051	-0.030
Capital Openness	0.325	-0.026	0.589	0.089	-0.078	-0.138
Value Traded	0.382	-0.047	0.547	0.117	-0.036	-0.215
Real Interest Rate	-0.121	0.077	-0.124	-0.073	-0.217	0.126
Legal System and Property Rights	0.418	-0.029	0.663	0.142	-0.066	-0.051

	Private credit	Openness	Capital Openness	Value Traded	Real interest rate	Legal System and Property Rights
Private Credit	1					
Openness	0.192	1				
Capital Openness	0.383	0.251	1			
Value Traded	0.594	0.165	0.312	1		
Real Interest Rate	-0.103	-0.065	0.085	-0.125	1	
Legal System and Property Rights	0.499	0.108	0.436	0.323	0.001	1

Table 4. The effect of banking crisis on investment

Variables	(1)	(2)	(3)	(4)
L1.crisis	−2.280***	−2.026***	−2.232***	−1.993***
	(0.525)	(0.519)	(0.520)	(0.515)
L2.crisis	−2.566***	−2.390***	−2.581***	−2.410***
	(0.582)	(0.604)	(0.587)	(0.609)
L3.crisis	−2.835***	−2.691***	−2.815***	−2.679***
	(0.579)	(0.589)	(0.575)	(0.585)
L4.crisis	−2.764***	−2.774***	−2.817***	−2.821***
	(0.589)	(0.596)	(0.580)	(0.588)
L5.crisis	−2.629***	−2.694***	−2.643***	−2.704***
	(0.545)	(0.547)	(0.529)	(0.535)
L6.crisis	−2.599***	−2.630***	−2.612***	−2.640***
	(0.580)	(0.554)	(0.574)	(0.550)
L7.crisis	−1.935***	−2.006***	−1.926***	−1.995***
	(0.482)	(0.481)	(0.477)	(0.477)
L8.crisis	−1.482**	−1.506**	−1.468**	−1.492**
	(0.582)	(0.581)	(0.580)	(0.579)
L9.crisis	−0.774	−0.722	−0.759	−0.711
	(0.542)	(0.541)	(0.540)	(0.540)
L10.crisis	0.336	0.339	0.339	0.342
	(0.571)	(0.563)	(0.572)	(0.564)
GDP per capita	5.544***	5.370***	5.659***	5.479***
	(1.772)	(1.764)	(1.759)	(1.753)
Inflation	−0.652	−1.463	−0.653	−1.433
	(0.678)	(0.887)	(0.676)	(0.877)
Government Spending	−0.210**	−0.192**	−0.212**	−0.195**
	(0.0849)	(0.0837)	(0.0839)	(0.0828)
Openness	−0.0258	−0.0258	−0.0257	−0.0257
	(0.0201)	(0.0197)	(0.0201)	(0.0198)
Average GDP growth	0.246	0.233	0.248	0.236
	(0.150)	(0.150)	(0.150)	(0.149)
Private Credit	−0.815	−0.754	−0.728	−0.679
	(1.000)	(0.979)	(0.976)	(0.960)
Capital Openness	0.405	0.444	0.403	0.441
	(0.284)	(0.279)	(0.284)	(0.280)
Value Traded	0.290	0.280	0.266	0.259
	(0.822)	(0.822)	(0.823)	(0.823)
Real Interest Rate		−5.118**		−4.922**
		(1.991)		(1.915)
Legal System and Property Rights			−0.411*	−0.367*
			(0.240)	(0.218)
Constant	−25.00	−23.39	−25.89*	−24.24
	(15.61)	(15.50)	(15.51)	(15.43)
Observations	1,056	1,056	1,056	1,056
Number of countries	75	75	75	75
R^2 overall	0.260	0.267	0.262	0.269

Notes: Investment as a share of GDP is the dependent variable. Results shown are from fixed effects regressions. *Lj.crisis* is a dummy variable for a banking crisis that occurred *j* years ago. Robust standard errors are in parentheses. * Significance at the 10 percent; ** significance at the 5 percent level; *** significance at the 1 percent level.

Crises, which we use for comparison. The new specifications including the *Multiple Crises* variable are presented in regressions (2), (3), (4), and (5). The estimated coefficients for *Multiple Crises* are negative and statistically significant indicating that investment is lower in countries that have suffered several crises. For instance, in regression (2), the coefficient of –1.176 on *Multiple Crises* indicates that, for every additional crisis, investment is about 1.2 percentage points of GDP lower. In a country that has experienced two, three, or more crises, this effect would be compounded accordingly. These estimates are then consistent with the data that were presented in Table 1, which showed investment decreasing by larger amounts after each additional crisis.

How does accounting for *Multiple Crises* affect the banking crisis dummies? One can compare the size of the coefficients on the banking crises lags in regressions with and without *Multiple Crises.* As Table 5 shows, the size of the effect of the banking crisis dummies is lower by about 0.5 percent of GDP once we account for *Multiple Crises.* For example, the estimated coefficient for lag four of the crisis is –2.204 (regression (2)) versus –2.764 (regression (1)). In the same manner, the coefficients on the banking crisis dummies of every regression in Table 5 can be compared to their counterparts in Table 4. The coefficients are in all cases smaller once *Multiple Crisis* is accounted for. These results suggest that experiencing repeated crises explains part of the long–lived adverse effects on investment found in Table 4.[9]

We next explore a series of robustness tests to find how they may affect the results described above.[10] Table 6 presents the results of the robustness tests. First, policy volatility in a country could be a source of uncertainty that affects investment and should be controlled for. Hence, we use the variability of inflation as a proxy for policy volatility and include it in regression (2) in Table 6. The estimated coefficient on the variability of inflation volatility is not statistically significant, while the estimated coefficient on *Multiple Crises* remains negative and statistically significant. Second, another potential source of uncertainty in a country could come from institutional instability. Brunetti and Weder (1998) and Lensink et al. (1999) have found that institutional instability can reduce investment and growth. To proxy for institutional instability, we compute the variability of our *Institutions* index over a window of five years prior to the crisis and include it as a control variable in regression (3). The coefficient on institutional stability is positive though not significant at the 5 percent level. However, *Multiple Crises* remains negative and significant after controlling for this institutional stability. We also run a random effects estimation reported in regression (4). Random effects results are similar to the baseline fixed effects counterparts. In particular, the lags of banking crisis and the *Multiple Crises* variable results are unchanged.

In our next robustness test, we consider an alternative measure of multiple crises: we use a set of dummy variables for countries that have had one, two, or three or more crises. Hence, we create the following dummy variables: *Crisis1* = 1 if the country had one crisis at time *t* in the sample period; *Crisis2* = 1 if the country had two crises at time *t* in the sample period; *Crisis3* = 1 if the country had three or more crises at time *t* in the sample period. We use these variables in regression (5). The coefficient on *Crisis2* is negative and statistically significant, while the coefficients on *Crisis1* and *Crisis3* are not significant. Hence, countries that have had two banking crises have a lower investment share of GDP. We may have expected that *Crisis3* would also be negative and significant, but while the sign is negative, the coefficient is not statistically significant at the 5 percent level. This may be because there are few countries in our sample that have had three or more banking crises. Our final robustness check includes *Public Debt*, the ratio of debt to GDP**,**

Table 5. The effect of multiple crises on investment

Variables	(1)	(2)	(3)	(4)	(5)
L1.crisis	−2.280***	−1.699***	−1.386**	−1.655***	−1.358**
	(0.525)	(0.587)	(0.552)	(0.571)	(0.540)
L2.crisis	−2.566***	−2.012***	−1.784***	−2.031***	−1.808***
	(0.582)	(0.558)	(0.560)	(0.560)	(0.563)
L3.crisis	−2.835***	−2.292***	−2.099***	−2.276***	−2.091***
	(0.579)	(0.578)	(0.568)	(0.574)	(0.563)
L4.crisis	−2.764***	−2.204***	−2.173***	−2.261***	−2.224***
	(0.589)	(0.580)	(0.586)	(0.570)	(0.576)
L5.crisis	−2.629***	−2.113***	−2.144***	−2.131***	−2.159***
	(0.545)	(0.533)	(0.540)	(0.518)	(0.527)
L6.crisis	−2.599***	−2.122***	−2.120***	−2.138***	−2.134***
	(0.580)	(0.583)	(0.559)	(0.580)	(0.558)
L7.crisis	−1.935***	−1.460***	−1.499***	−1.454***	−1.492***
	(0.482)	(0.486)	(0.483)	(0.481)	(0.480)
L8.crisis	−1.482**	−1.087*	−1.083*	−1.076*	−1.073*
	(0.582)	(0.568)	(0.569)	(0.568)	(0.569)
L9.crisis	−0.774	−0.468	−0.391	−0.456	−0.382
	(0.542)	(0.550)	(0.550)	(0.549)	(0.550)
L10.crisis	0.336	0.594	0.617	0.595	0.617
	(0.571)	(0.550)	(0.543)	(0.552)	(0.544)
Multiple Crises		−1.176**	−1.264**	−1.168**	−1.254**
		(0.565)	(0.565)	(0.568)	(0.568)
GDP per capita	5.544***	6.366***	6.242***	6.474***	6.342***
	(1.772)	(1.574)	(1.571)	(1.568)	(1.570)
Inflation	−0.652	−0.851	−1.728*	−0.850	−1.697*
	(0.678)	(0.675)	(0.876)	(0.674)	(0.866)
Government Spending	−0.210**	−0.218**	−0.199**	−0.220***	−0.202**
	(0.0849)	(0.0834)	(0.0818)	(0.0824)	(0.0810)
Openness	−0.0258	−0.0212	−0.0208	−0.0211	−0.0208
	(0.0201)	(0.0217)	(0.0215)	(0.0218)	(0.0215)
Average GDP growth	0.246	0.221	0.205	0.223	0.208
	(0.150)	(0.149)	(0.148)	(0.149)	(0.148)
Private Credit	−0.815	−0.809	−0.743	−0.723	−0.670
	(1.000)	(0.969)	(0.944)	(0.943)	(0.924)
Capital Openness	0.405	0.439	0.483*	0.437	0.480*
	(0.284)	(0.281)	(0.275)	(0.281)	(0.276)
Value Traded	0.290	0.298	0.287	0.275	0.267
	(0.822)	(0.825)	(0.825)	(0.826)	(0.826)
Real Interest Rate			−5.442***		−5.249***
			(1.933)		(1.860)
Legal System and Property Rights				−0.405*	−0.357
				(0.243)	(0.220)
Constant	−25.00	−31.61**	−30.39**	−32.44**	−31.17**
	(15.61)	(14.05)	(13.96)	(13.99)	(13.95)
Observations	1,056	1,056	1,056	1,056	1,056
Number of countries	75	75	75	75	75
R^2 overall	0.260	0.266	0.274	0.268	0.276

Notes: Investment as a share of GDP is the dependent variable. Results shown are from fixed effects regressions. *Lj.crisis* is a dummy variable for a banking crisis that occurred *j* years ago. Robust standard errors are in parenthesis. * Significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

Table 6. The effect of multiple crises on investment: Robustness

Variables	(1)	(2)	(3)	(4)	(5)	(6)
L1.crisis	-1.358**	-1.260**	-1.436**	-1.754***	-1.400***	-0.800
	(0.540)	(0.568)	(0.621)	(0.610)	(0.525)	(0.665)
L2.crisis	-1.808***	-1.649***	-1.994***	-2.212***	-1.931***	-1.026
	(0.563)	(0.577)	(0.604)	(0.594)	(0.621)	(0.822)
L3.crisis	-2.091***	-1.957***	-2.312***	-2.488***	-2.172***	-1.636**
	(0.563)	(0.575)	(0.622)	(0.610)	(0.616)	(0.718)
L4.crisis	-2.224***	-2.017***	-2.221***	-2.370***	-2.328***	-1.887***
	(0.576)	(0.594)	(0.613)	(0.603)	(0.627)	(0.675)
L5.crisis	-2.159***	-1.971***	-2.206***	-2.312***	-2.175***	-2.077**
	(0.527)	(0.509)	(0.608)	(0.591)	(0.555)	(0.777)
L6.crisis	-2.134***	-1.965***	-1.831***	-1.954***	-2.193***	-2.480***
	(0.558)	(0.522)	(0.535)	(0.529)	(0.572)	(0.879)
L7.crisis	-1.492***	-1.364***	-1.394***	-1.504***	-1.582***	-1.761**
	(0.480)	(0.463)	(0.524)	(0.542)	(0.495)	(0.712)
L8.crisis	-1.073*	-1.021*	-1.434**	-1.498**	-1.169**	-1.449**
	(0.569)	(0.555)	(0.663)	(0.659)	(0.576)	(0.690)
L9.crisis	-0.382	-0.348	-0.839	-0.876	-0.509	-0.668
	(0.550)	(0.545)	(0.692)	(0.708)	(0.565)	(0.705)
L10.crisis	0.617	0.626	0.279	0.237	0.479	1.309*
	(0.544)	(0.524)	(0.637)	(0.620)	(0.524)	(0.739)
Multiple Crises	-1.254**	-1.400**	-1.532***	-0.929**		-1.435**
	(0.568)	(0.566)	(0.520)	(0.439)		(0.584)

	(1)	(2)	(3)	(4)	(5)	(6)
Inflation Volatility		−0.414*				
		(0.240)				
Institution Volatility			0.323*	0.299*		
			(0.183)	(0.170)		
One crisis					0.0473	
					(0.891)	
Two crises					−3.280***	
					(1.234)	
Three or more crises					−2.946	
					(2.253)	
Public Debt						−0.0186
						(0.0189)
Constant	−31.17**	−27.17*	−35.67**	−20.38**	−32.07**	−29.05*
	(13.95)	(14.03)	(14.76)	(8.540)	(13.09)	(16.35)
Observations	1,056	1,054	893	893	1,056	547
Number of countries	75	75	75	75	75	41
R^2 overall	0.276	0.282	0.269	0.264	0.293	0.296

Notes: Investment as a share of GDP is the dependent variable. Results shown are from fixed effects regressions. *Lj.crisis* is a dummy variable for a banking crisis that occurred *j* years ago. Regressions include GDP per capita, Inflation, Government Spending, Openness, Average GDP growth, Private Credit, Capital Openness, Value Traded, Real Interest Rate, and Legal Systems and Property Rights. Robust standard errors are in parentheses. * Significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

as a control variable. Data for debt to GDP for our sample period is only available for forty-eight of the seventy-five countries in our sample. The estimated coefficient on debt to *Public Debt* is negative but not statistically significant. Nevertheless, the coefficient on *Multiple Crises* is still negative and significant after controlling for debt. In summary, *Multiple Crises* remains negative and significant in a battery of robustness tests.

It is interesting to next explore the effect of multiple crises further to see how it might vary across countries of different income levels. We split countries into two groups according to their World Bank classification and denote the groups Higher Income and Lower Income. Our Higher Income group includes the World Bank–defined categories High-Income OECD (Organisation for Economic Co-operation and Development) and High-Income non-OECD. Our Lower Income group includes Upper Middle Income countries, Lower Middle Income and Low Income countries. We split all the countries in our sample into two broad groups to maximize the number of countries and observations.[11] Table 7 reports the results for the two country groups. Two regressions are reported for each country group. The explanatory variables in the first regression are the crisis dummies and the baseline control set (coefficients for the control variables are not reported for the sake of brevity). The second regression adds *Multiple Crises* as an explanatory variable. This is done to test whether multiple crises make a difference and to compare how the coefficients on the crisis dummies vary once we account for multiple crises.

As Table 7 shows, banking crises appear more damaging to investment in the Lower Income group, having adverse effects of up to eight years and reducing investment by as much as 3 percent of GDP. Conversely, in the Higher Income group, the adverse effects are statistically significant for only three of the lags of crises at the 5 percent level (six lags are significant at the 10 percent level). Further, the size of the adverse effect is smaller in the Higher Income group. Once *Multiple Crises* is included, the coefficient is statistically significant in the Lower Income group only. Further, coefficient *Multiple Crises* is larger than the one obtained from using the whole sample reported in Table 5. These findings lead to the conclusion that the adverse effects of banking crises are particularly bad for middle- and low-income countries (our Lower Income group). It must also be acknowledged that this group of countries has suffered a higher incidence of banking crises than the higher income countries. Hence, the effects are more easily observed in lower- and middle-income countries.

Conclusions

We find that banking crises can decrease investment for seven to eight years by about 2 percent of GDP. This is a fairly persistent and sizable negative effect. In view of the worldwide financial crises of 2007–2009 (which in many cases involved the banking sector), these findings may partly explain why the recovery has been slow in many countries. Within the economics literature, these results extend the contribution of Cerra and Saxena (2008), who find a persistent effect of banking crises on GDP.

We explore the issue further by studying the role of repeated or serial banking crises. We find that investment is more adversely affected in countries that have experienced previous banking crises. This may be explained by a decline in confidence or in the general health of the banking system due to previous crises. In a parallel paper (Rioja et al. 2014), we find that the size and duration of the adverse effect of banking crises on investment varies according to the level of financial development of a country. The largest and longer-lasting decrease in investment is found in countries in a middle region of financial

Table 7. The effect of multiple crises on investment in different income groups

Variables	Higher income	Higher income	Lower income	Lower income
L1.crisis	–2.041***	–1.289**	–0.906*	–0.630
	(0.619)	(0.635)	(0.502)	(0.561)
L2.crisis	–2.402***	–1.695**	–1.182	–0.937
	(0.667)	(0.720)	(0.764)	(0.763)
L3.crisis	–2.856***	–2.149***	–0.969	–0.738
	(0.650)	(0.702)	(0.618)	(0.665)
L4.crisis	–3.034***	–2.346***	–1.390*	–1.110
	(0.702)	(0.711)	(0.732)	(0.812)
L5.crisis	–2.994***	–2.307***	–1.522**	–1.351**
	(0.711)	(0.731)	(0.580)	(0.579)
L6.crisis	–3.097***	–2.443***	–1.069**	–0.911
	(0.755)	(0.783)	(0.515)	(0.541)
L7.crisis	–2.366***	–1.756**	–0.886	–0.678
	(0.653)	(0.682)	(0.649)	(0.702)
L8.crisis	–1.594**	–1.101	–1.202**	–1.021*
	(0.773)	(0.772)	(0.555)	(0.541)
L9.crisis	–0.717	–0.342	–1.033*	–0.858
	(0.766)	(0.781)	(0.557)	(0.536)
L10.crisis	0.705	1.000	–0.881	–0.723
	(0.772)	(0.737)	(0.537)	(0.521)
Multiple Crises		–1.415**		–0.698
		(0.535)		(0.914)
Constant	–28.17	–35.46**	–84.12**	–87.04***
	(18.10)	(16.64)	(31.87)	(30.91)
Observations	656	656	400	400
Number of countries	50	50	25	25
R^2 overall	0.283	0.291	0.499	0.501

Notes: Investment as a share of GDP is the dependent variable. Results shown are from fixed effects regressions. *Lj.crisis* is a dummy variable for a banking crisis that occurred *j* years ago. Regressions include GDP per capita, Inflation, Government Spending, Openness, Average GDP growth, Private Credit, Capital Openness, Value Traded, Real Interest Rate, and Legal Systems and Property Rights. Robust standard errors are in parenthesis. * Significance at the 10 percent level; ** significance at the 5 percent level; *** significance at the 1 percent level.

development, where finance plays its most important role according to theory. That result, which echoes the findings of Kalemli-Ozcan et al. (2010), increases our understanding of how crises affect investment—that is, through the availability of credit—but a more thorough investigation into alternative channels is left for future research.

Notes

1. Related theoretical literature on the effects of uncertainty on investment includes the effects of uncertain tax policy (e.g., Hassett and Metcalf 1999) and the effects of output price uncertainty (e.g., Abel 1983; Pindyck 1982). Peltonen et al. (2011) find that investment adjusts very sluggishly to shocks in emerging countries.

2. The hysteresis of currency substitution has also been explained by persistent expectations of renewed instability (Clements and Schwartz 1992; Melvin and Fenske 1992).

3. Rancière et al. (2008) study how taking on systemic risk can reduce financial constraints and lead to growth despite occasionally causing crises along the way. Conversely, our paper focuses on how the level of investment is affected in the years after a banking crisis.

4. We use a subsample of countries for which we have data on all variables needed for the analysis, which is for the period 1976–2005. This provides an unbalanced panel of 1,056 observations across seventy-five countries and twenty-nine years.

5. These estimations are available from the authors upon request.

6. The *Private Credit* measure unfortunately does not include trade credit, which according to Sheng et al. (2013) can be used as a substitute, especially during financial crisis.

7. Credit typically dries out during and after banking crises, which affects investment. An exception may be government-owned banks, which may actually increase the credit they issue during crises according to Shen et al. (2012).

8. Regression (2) adds the real interest rate to the set of control variables. Regression (3) adds the *Institutions* index, while regression (4) adds both the real interest rate and *Institutions*.

9. In the main estimations, we use the set of seventy-five countries for which we have data for all variables used in the regressions. The sample of countries can be expanded for some regressions that do not use the interest rate or institutions as controls. These robustness tests are available from the authors upon request.

10. We are grateful to two anonymous referees for suggesting some of these robustness tests. Due to data availability, the samples for some robustness specifications become smaller than that in the preferred specification.

11. The number of crises by World Bank income group is presented in Appendix B. The list of countries for each group is not presented due to space constraints but is available from the authors.

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Appendix A: Sources of Information

Variable	Definition	Source
Crisis	Dummy variable that assumes the value of 1 for the year when a banking crisis begins	Reinhart and Rogoff (2008)
Multiple Crises	Number of crises the country has experienced through year *t*.	Reinhart and Rogoff (2008)
Investment	Investment share of real GDP per capita	Heston et al. (2006)
GDP per capita	Real GDP per capita (Constant Prices: Chain series) in prices 2005	Heston et al. (2006)
Average five-year GDP growth	Average annual growth of GDP per capita of the last five years	Heston et al. (2006)
Inflation	Inflation, consumer prices (annual percent)	World Development Indicators
Government Spending	Government share of real GDP per capita	Heston et al. (2006)
Private Credit	Private credit by deposit money banks to GDP	Beck et al. (2009)
Value Traded	Ratio of the value of total shares traded in domestic stock markets to GDP	Beck et al. (2009)
Openness	Exports plus imports as a percentage of real GDP	Heston et al. (2006)
Capital Openness	Index of capital account openness.	Chinn and Ito (2008)
Real Interest Rate	Real interest rate (percent)	World Development Indicators
Institutions Index	First principal component of (1) Legal System and Property Rights (an index of measures of rule of law, security of property rights, an independent judiciary, and an impartial court system) and (2) Polity (IV)	Gwartney et al. (2012), Polity IV Project (2012)

Appendix B: Number of Countries with Multiple Crises by Income Group

Income group	Zero crises	One crisis	Two crises	Three or more crises
Higher income group				
High-income OECD	11	8	1	0
High-income non-OECD	1	4	0	0
Upper middle income	6	9	2	2
Lower income group				
Low middle income	9	13	3	0
Low income	7	6	0	0