HOW BANK MARKET CONCENTRATION, REGULATION, AND INSTITUTIONS SHAPE THE REAL EFFECTS OF BANKING CRISES

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How Bank Market Concentration, Regulation, and Institutions Shape the Real Effects of Banking Crises

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Abstract

This paper studies the influence of bank market concentration, regulation, and institutions on the real effects of 68 systemic banking crises in 54 countries over the 1980-2000 period. We find that less stringent restrictions on non-traditional bank activities and on the mixing of banking and commerce have a negative effect on economic growth during normal periods but mitigate the negative effects of banking crises on economic growth. This changing influence between crisis and non-crisis periods is reinforced by market concentration. We also find that explicit deposit insurance and better-quality accounting standards mitigate the negative real effects of systemic banking crises and interact positively with bank concentration to minimize the reduction of economic growth during crisis episodes. These results are evidence of the greater benefits that long-term relationships and the mixing of banking and commerce may provide during banking crises.

Keywords: banking crises, bank concentration, economic growth, institutions, regulation

JEL Codes: E44, G21, O16

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1. Introduction

One of the main concerns in the current economic crisis is how to reduce the negative effects of banking crises on economic growth. This debate is not a transient one, as banking crises appear to have become more common and more far-reaching in the 1990s and 2000s in comparison with earlier periods (Bordo *et al.*, 2001). In this context, this paper uses a sample of 68 systemic banking crises in 54 countries to analyze how the real effects of banking crises depend on the country's bank market concentration, regulation, and institutions. We also analyze interactions between these variables to find the mechanisms by which banking crises reduce economic growth through the lending channel.

The law and finance literature provides substantial and recent empirical evidence indicating that financial development helps firms to grow faster by supplying more external funds and that a country's financial development is related to its legal and institutional framework (La Porta *et al.* 1997, 1998; Levine 1997, 2005; Rajan and Zingales, 1998). The natural extension of the above evidence to banking crisis periods suggests that there will be a more contractionary impact on sectors in which growth is dependent on funds provided by banks when a sudden negative shock obliges them to reduce their credit supply.

Empirical evidence confirms the above hypothesis. Bordo *et al.* (2001), Boyd *et al.* (2005), and Hutchison and Noy (2005) show that the magnitude of output losses associated with banking crises varies substantially across crisis episodes. Hoggarth *et al.* (2002) find that output losses incurred during crises in developed countries are higher on average than those in emerging economies. Dell'Ariccia *et al.* (2008) and Krozsner *et al.* (2007) confirm that the negative real effects remain after carefully controlling for reverse causality between economic downturns and banking crises. They find that more financially dependent industries perform significantly worse during banking crises than industries that are not so dependent on external funds. This indicates causality running from banking crises to recessions, stemming at least in part from a reduction in the credit supply, and not simply from recessions to banking crises. Krozsner *et al.* (2007), moreover, show that the negative effect of banking crises on growth is greater in countries with more developed financial systems. Their finding is the natural extension for banking crisis periods of the evidence provided by Rajan and Zingales (1998) for non-crisis periods. The interpretation is that operating in an environment where financial markets are well developed is an advantage for more financially dependent industries in good times, but a disadvantage in times of banking crises. They also find a differential impact of banking crises on growth for industries dominated by young firms and for industries with high levels of intangible assets.

Little is known, however, about whether the real effects of banking crises depend on other country characteristics apart from financial development. Our paper attempts to help fill this gap by linking the literature on the impact of bank market concentration, regulation, and institutions on economic growth with the literature analyzing the real effects of banking crises. The paper makes several contributions.

First, we analyze how bank concentration influences the real effects of banking crises. Previous research has suggested two opposite effects for bank concentration on economic growth. In perfect markets, bank concentration may imply more market power for banks, involving higher interest rates and lower availability of funds. Bank concentration might thus reduce economic growth. In markets with asymmetric information, however, higher bank market concentration may increase banks' incentives to invest in the acquisition of soft information by establishing close relationships with borrowers over time (relationship banking), facilitating the availability of credit and thereby reducing firms' financial constraints (Petersen and Rajan, 1994, 1995; Boot, 2000; Dell'Ariccia and Marquez, 2004). Bank concentration might thus foster economic growth. Cetorelli and Gambera (2001) empirically find that the effect of bank concentration on economic growth varies across sectors. While bank concentration has a general negative effect on growth, it also promotes growth of industrial sectors that are more in need of external finance by facilitating credit access for younger firms. The argument is that banking market concentration facilitates the creation of close lending relationships between banks and this type of firm, leading to an enhancing effect on firms' growth.

There is, however, no empirical evidence on the influence of bank concentration on the negative real effects of banking crises. A priori, there is no clear forecast. On the one hand, a more concentrated banking market that favors lending relationships might reduce the negative effects of banking crises on the credit channel. The better the information banks have about the quality of firms' investment opportunities, the more the lower credit supply might be turned to more profitable investments. In such cases, bank concentration might reduce the negative real effects of banking crises. On the other hand, close lending relationships between banks and firms originate switching costs for borrowers in changing lenders. If the relationship bank goes bankrupt, some of its borrowers might be obliged to borrow from non-relationship banks. These borrowers would face an adverse selection problem as non-informed banks will prefer to allocate their funds to the better known, but less profitable, projects of relationship firms (Detragiache *et al*. 2000). The consequence is that the projects financed are not the best in the economy. In such cases, bank concentration might increase the negative real effects of a banking crisis. As the theory predicts both effects, we do not make an a priori forecast as to how bank concentration influences the real effects of banking crises, and treat it rather as an empirical issue.

Second, our research provides empirical evidence on which regulatory and institutional country characteristics minimize the negative real effects of banking crises. We study two aspects: 1) whether bank regulation and institutions have an additional influence to that found for bank concentration and financial development and, 2) whether bank regulation and institutions interact with bank concentration, i.e., if the effect of bank concentration on the real effects of banking crises varies across countries depending on regulation and institutions. As bank concentration, regulation, and institutions may be affected by endogeneity problems leading to correlations among them, we focus on the exogenous component of each one using instrumental variables.

As regulatory variables we specifically consider the influence of restrictions on non-traditional bank activities, restrictions on the mixing of banking with commerce, and the presence of explicit deposit insurance. Empirical evidence provided for non-crisis periods shows that more strictly regulated banking markets are less developed, less stable, and less competitive (Barth *et al.*, 2004; Claessens and Laeven, 2004). The effects of bank regulation might, however, be different in crisis and non-crisis periods. This is the case of bank equity holdings of industrial firms. As conflicts of interest and information asymmetries become more relevant to firms in financial distress, even restrictive legislations such as those of the US and Britain have allowed banks to temporarily take equity in industrial firms to prevent viable firms from being liquidated (Gilson *et al*., 1990; James, 1995; Franks and Nyborg, 1996). There is no evidence, however, on the role of the mixing between banking and commerce during periods of banking crises even though, during such periods, agency costs and information asymmetries may become more important as banks have to select the borrowers to whom they will not be renewing loans. The traditional benefits associated with the affiliation between banking and commerce might thus increase banks' efficiency in the more restrictive lending policy that forces a lower credit supply.

Similarly, it has long been suggested that while deposit insurance exists to prevent bank runs in solvent banks during systemic crises (Diamond and Dybvig, 1983), more generous deposit insurance has costs in the long run, weakening market discipline enforced by depositors (Merton, 1977; Demirgüç-Kunt and Detragiache, 2002). The empirical literature on the effects of deposit insurance coverage during banking crises is, however, inconclusive. Claessens *et al.* (2003) find that generous support for banking systems does not reduce the output cost of banking crises. Angkinand (2008) find the opposite result. Neither of the two papers controls for reverse causality problems between economic downturn and the real effects of banking crises. Dell'Ariccia *et al.* (2008) address the reverse causality problems and do not find a statistically significant relation between blanket depositor protection and the real cost of crises. None of the above works analyze how the interaction with bank concentration of deposit insurance, restrictions on non-traditional bank activities, and the mixing of banking and commerce may mitigate the negative real effects of banking crises.

As institutional variables potentially influencing the real effects of banking crises we include the control of corruption and the quality of disclosure of firms' annual reports. As the law and finance literature has proved that financial development is positively related to institutional quality, the role of institutions on the real effects of banking crisis would have been partially captured by Kroszner *et al.* (2007) when they find a greater reduction of economic growth in countries with deeper financial systems. A different influence to the negative one associated with financial development might, however, stem from the positive effect of institutional quality on the resolution policies usually adopted during banking crises or through interactions with bank concentration. Claessens *et al.* (2004) suggest that a better institutional framework lowers fiscal outlays for crisis resolution. Fernández *et al.* (2010) find that bank concentration is more beneficial for solving adverse selection and moral hazard problems between firms and banks in less developed markets that have poor institutional infrastructure. The difficulty of developing markets in such environments may make long-term relationships between banks and debtors helpful in solving the problem (La Porta *et al.,* 1997, 1998). Bank concentration in such markets may favor these relationships and thereby have a greater positive effect on economic growth.

There is, however, no empirical evidence on whether a high-quality institutional environment complements or substitutes bank concentration to promote long-term relationships with borrowers during banking crises. We use different measures of institutional quality to find which of the aspects that are positively related to financial development are most important during banking crises for mitigating negative effects on economic growth. We focus on the exogenous component of each institutional variable to avoid correlated results.

Finally, we analyze more countries than previous studies. We include a sample of 68 systemic banking crisis in 54 developed and developing countries over the 1980-2000 period using data on 28 industries in each country. Also using industrial data, Kroszner *et al.* (2007) analyze data from 38 countries, and Dell'Ariccia *et al.* (2008) from 41 countries. We can thus provide information on a greater range of country differences to give us a better understanding of how the real effects of banking crises depend on bank market concentration, regulation, and institutions.

Our results indicate that bank regulation and institutions interact with market concentration to mitigate the negative real effects of systemic banking crises. We find that less stringent restrictions on non-traditional bank activities and on the mixing of banking and commerce have a negative effect on economic growth during normal periods but mitigate the negative effects of banking crises on economic growth. We also find that, in periods of stability, concentration only has a positive effect on the economic growth of more financial dependent sectors when there are restrictions on banking activities and on the extent to which banks may own and control non-financial firms. In crisis periods, however, bank concentration has a positive effect on economic growth only when bank activities and the mixing of banking and commerce are unrestricted.

These results suggest that legal restrictions on non-traditional banking activities and bank ownership of non-financial firms prevent a more efficient risk assessment that might promote economic growth during banking crises. They also indicate that legal restrictions on bank activities are more important than market structure in reducing the negative real effects of systemic banking crises. These results are evidence of the greater benefits that long-term relationships and the mixing of banking and commerce may provide during banking crises.

We also find that explicit deposit insurance and better-quality accounting standards mitigate the negative real effects of systemic banking crises and interact positively with bank concentration to minimize the reduction of economic growth during banking crisis periods.

The remainder of the paper is organized as follows. Section 2 discusses the econometric methodology. Section 3 discusses the data. Section 4 presents the results, and Section 5 concludes.

2. Methodology

We extend the method in Kroszner *et al.* (2007) to analyze the influence of bank concentration, regulation, and institutions on the real effects of banking crises. We apply the following model in countries with systemic banking crises and for three separated sub-periods, namely, before, during, and after the crisis:

$$
\begin{aligned}
&\textit{Growth}_{i\,j} = \textit{Constant} + \beta_1 * \textit{Industry Share of Value Added}_{ij} \\
&+ \beta_2 * \textit{Financial Development}_i * \textit{External Dependence}_j \\
&+ \beta_3 * \textit{Bank Concentration}_i * \textit{External Dependence}_j \\
&+ \beta_4 * \textit{Regulation and Institutions}_i * \textit{External Dependence}_j \\
&+ \beta_5 * \textit{Industry Dummies}_j \\
&+ \beta_6 * \textit{Country Dummies}_i \\
&+ \textit{Error}_{i,\,j} \qquad [1]
\end{aligned}
$$

Growth_{ij} is the real growth in value added[1] of sector j in country i. The industrial share on value added controls for the potential convergence effects among industries, i.e., the tendency of larger industries to experience slower growth. Following previous literature, we include an interaction term between financial development and external dependence to control for the influence of financial development. The interaction with external dependence aims to avoid the usual reverse causality problems for the relationship between economic growth and financial development. The premise of this approach is that, if industries that depend more on external finance are hurt more severely after a banking crisis, then a banking crisis is likely to have an independent negative effect on real economic activity. The coefficient β_2 of this interaction term is expected to be positive in pre-crisis periods and negative in crisis periods.[2]

We extend previous analyses by including two additional interaction terms. One is between the level of external financial dependence and bank concentration. This interaction analyzes in three separate subperiods (pre-crisis, crisis, and post crisis period) whether sectors that are more in need of external finance grow disproportionately slower or faster if they are in a country with high bank concentration. Following the arguments explained in the previous section, the sign of β_3 in the pre-crisis period is ambiguous depending on the dominance of the negative effect of banking market power or of the positive effect on the incentives for (monopolistic) banks to establish lending relationships. Cetorelli and Gambera (2001) find a positive coefficient for this interaction for normal periods in a sample of 41

[1] For robustness, we check that basic results do not change when we use gross capital formation, employment, and number of establishments as the dependent variables instead of value added.

[2] This approach was initially applied by Rajan and Zingales (1998) and subsequently used by Cetorelli and Gambera (2001), Claessens and Laeven (2003), Fisman and Love (2003), and Braun and Larrain (2005) to investigate the effects of bank concentration, trade credit usage, property rights, and recessions, respectively, on sectoral growth. Kroszner *et al.* (2007) and Dell'Ariccia *et al.* (2008) have also applied this approach to specifically study the real effects of banking crises.

countries. The change of the sign of β_3 over the pre-crisis, crisis, and post-crisis period is also an empirical question.

Finally, we include an interaction term between the level of external dependence of industry j and a set of regulatory and institutional variables in country i. These interactions capture whether regulatory and institutional characteristics influence the real effects of banking crises via other mechanisms apart from those included in financial development and bank market concentration. These interaction terms are incorporated sequentially rather than both together to avoid possible correlation problems.

We use industry and country dummies to control for all unobservable sources of value added growth specific to each country and each industry. Inclusion of these fixed effects avoids the need for financial development, bank concentration, and regulatory and institutional variables to enter the regression on their own. It allows us to focus only on the terms of their interaction.

We follow Krozsner *et al*. (2007) and Dell' Ariccia *et al*. (2008) for classifying the sub-period around banking crises. We use [t, $t+2$] as the crisis period, where t is the first year of the crisis period as reported by Caprio *et al.* (2003). We separate the pre-crisis period from the crisis period by three years, that is, we define the pre-crisis period as [t_1, t-3], where t_1 is the first year of the sample period (1980 or first year available). Similarly, we define the post-crisis period as [t+3, T], where t is the crisis inception year and T is the end of the sample period (generally, 2000).[3]

A small number of countries experience multiple crises during our sample period. In these cases and if the corresponding data on real value added are available, we account for multiple crises within a country as in Krozsner *et al.* (2007). Because periods between crises may not be regarded as normal times, the pre-crisis variables are based only on the period after the last crisis in the sample. The "during-crisis" variables are calculated as an average of each during-crisis episode for that country. We therefore include only one crisis observation in the basic regressions for countries that have experienced multiple crises. We perform the same robustness checks as Kroszner *et al.* (2007) to verify that results do not vary with the treatment of multiple crises.[4]

We define an additional specification to analyze the difference in real growth in value added between the crisis period and the pre-crisis period. In this specification, we use the difference in real growth value added between the crisis period and the pre-crisis period as the dependent variable, that is,

$$\Delta Growth_{ij} = Constant + \beta_1 * Industry\ Share\ of\ Value\ Added_{ij}$$

$$+ \beta_2 * Financial\ Development_i * External\ Dependence_j$$

$$+ \beta_3 * Bank\ Concentration_i * External\ Dependence_j$$

$$+ \beta_4 * Regulation\ and\ Institutions_i * External\ Dependence_j$$

$$+ \beta_5 * Industry\ Dummies_j$$

[3] We check that results do not vary when we use alternative definitions of the crisis periods, such as (t-3, t+3) and (t-5, t+5).
[4] In particular, the results do not change when we allow each crisis episode in a country to be a different observation, including more than one crisis per country, when we add an indicator for countries with multiple crises, or when we drop countries with multiple crises altogether.

$$+ \beta_6 * \textit{Country Dummies}_i$$

$$+ \textit{Error}_{i,j} \qquad [2]$$

where $\Delta Growth_{ij}$ is $Growth_{ij,CRISIS}$ - $Growth_{ij,\ PRE\text{-}CRISIS}$, where $Growth_{ij,\ CRISIS}$ is the real growth in value added of sector j in country i during the crisis period and $Growth_{ij,\ PRE\text{-}CRISIS}$ is the real growth in value added of sector j in country i during the pre-crisis period.

Finally, we analyze if the impact of bank concentration on economic growth during crisis and non-crisis periods depends on bank regulation and institutional quality. We sequentially incorporate an interaction term between bank concentration, external financial dependence and each variable proxying for the regulatory and institutional environment. The inclusion of industry and country dummies allows us to focus only on the interaction terms. The model specification is as follows:

$$\begin{aligned}
\textit{Growth}_{ij} = \textit{Constant} &+ \beta_1 * \textit{Industry Share of Value Added}_{ij} \\
&+ \beta_2 * \textit{Financial Development}_i * \textit{External Dependence}_j \\
&+ \beta_3 * \textit{Bank Concentration}_i * \textit{Regulation and Institutions}_i * \textit{External Dependence}_j \\
&+ \beta_4 * \textit{Industry Dummies}_j \\
&+ \beta_5 * \textit{Country Dummies}_i \\
&+ \textit{Error}_{i,j} \qquad [3]
\end{aligned}$$

The regressions are estimated using ordinary least squares (OLS). In all estimations we try to identify the exogenous component of each country variable and control for potential simultaneity bias among financial development, bank concentration, regulation, and institutions. A major stumbling block when empirical analysis includes regulation and institutions is separating out the effects and the correlated outcomes. Such interrelations and the potential endogeneity of country-level variables make it difficult to tease out the specific effect of each variable and to know which of them plays the major role in economic growth. We select much the same set of instruments as other authors for the legal and institutional variables. Following Krozsner *et al*. (2007), we consider the five binary variables indicating the legal origin and a measure of rule of law in each country as instruments for bank concentration, and legal and institutional variables.[5] This methodology allows us to focus on the influence of the exogenous component of bank market concentration, regulation, and the quality of institutions on industrial economic growth during both stability periods and banking crises. To test the suitability of using an Instrumental Variables (IV) estimator, we perform the Durbin-Wu-Hausman test which

[5] Results are robust to alternative definitions of the set of instruments. For instance, we check that results do not vary when we use as instruments only the country's legal origin as in La Porta *et al*. (1998), Beck *et al*. (2000), and Levine *et al*. (2000), when we use the legal origin, the rule of law, the total GDP, and the country's population as in Cetorelli and Gambera (2001) or when we use the legal origin, the latitudinal distance from the equator, and the religious composition of the population in each country as in Barth *et al.* (2004).

verifies the null hypothesis that the introduction of IVs has no effect on estimates of the regression's coefficients. We report IV estimations when the test is rejected at the 10 percent level or less. Otherwise, OLS estimates are reported.

3. Data

We use industry-specific and country-specific data from a variety of sources. We take the information on banking crises from Caprio *et al.* (2003). Our database contains information on 113 banking crises in 93 countries since the 1970s. Due to data constraints, a number of countries are dropped. First, we drop countries for which we do not have data on industrial value added. Following Krozsner *et al*. (2007) we also exclude countries for which we do not have sectoral value added for at least five sectors during any of the sub-periods. Missing data on the ratio of private credit to GDP reduce our final sample to 68 systemic banking crises in 54 countries over the 1980-2000 period. The basic estimation uses an unbalanced sample of 927 country-industry observations for the pre-crisis period, 909 country-industry observations for the crisis period, and 805 country-industry observations for the post-crisis period. Table 1 reports the crisis inception dates included in our sample.

We calculate the industrial real growth in value added and the industry's share in total value added in the country using the UNIDO Industrial Statistic Database (2006). This database contains information on 28 industrial sectors at 3-digit ISIC disaggregation level. To deflate the industrial value added, we use the Consumer Price Index (CPI) from International Financial Statistics (IFS). Table 1 reports the average growth rate of real value added for each country's pre, during, and post-crisis periods.

We follow Rajan and Zingales (1998), Beck et al., (2000) or Krozsner et al., (2007), among others, and we measure financial development as the ratio of private credit of deposit money banks to GDP taken from the IFS. The industry's share in total value added and financial development are calculated for the first year in our sample, 1980, or first year available, to control for the potential endogeneity of these variables.

We use in our main specification the index calculated in Rajan and Zingales (1998) as the measure of external dependence. This index is defined as the fraction of capital expenditures not financed with cash-flow from operations constructed at industry-level for a sample of US firms.[6] As in Cetorelli and Gambera (1998), we focus on the external financial needs of younger firms (those less than 10 years old). We also check that results do not change when we use alternative proxies for external finance. Following Dell'Ariccia *et al.* (2008) we use the average establishment or plant size and export orientation, and following Raddatz (2006) we use the ratio of total inventories over annual sales for US firms in the same industry in 1980.

[6] Rajan and Zingales (1998) argue that the financial structure of US industries is an appropriate benchmark because the relatively open, sophisticated, and developed US financial markets should allow US firms to face fewer obstacles to achieving their desired financial structure than firms in other countries. This approach offers a valid and exogenous way of identifying the extent of an industry's external dependence anywhere in the world. An important assumption underlying it is that external dependence reflects technological characteristics of the industry that are relatively stable across space and time.

We approximate the level of bank concentration by the fraction of bank assets held by the three largest commercial banks in a country. This measure is used, among others, by Cetorelli and Gambera (2001), Demirgüç-Kunt *et al.* (2004), Beck *et al*. (2006). This variable is averaged over the sample period and comes from the Beck *et al*. (2000) database. Table 1 shows that bank concentration ranges from 39% for India to 100% for Cape Verde and Finland, indicating that high levels of bank concentration is not only a developing country characteristic. We check that the main results do not change when we use alternative measures of bank market concentration such us the sum (measured in total assets) of markets shares of the five largest banks; the rank of bank concentration and the Herfindalh index of market concentration.

We include three regulatory variables widely used in previous papers (Barth et al., 2004; Beck et al., 2006). The first is whether banks are allowed to take part in activities that generate non-interest income. This variable indicates whether bank activities in the securities, insurance, and real estate markets and bank ownership and control of non-financial firms are: (1) unrestricted, (2) permitted, (3) restricted, or (4) prohibited. This indicator can range from 4 to 16, where higher values indicate more restrictions on bank activities and non-financial ownership and control. We also separate in a single variable the restrictions on bank ownership and control of non-financial firms to specifically analyze the influence of the mixing of banking and commerce. This variable ranges from 1 to 4. Information on both variables comes from the World Bank's bank regulation database.

The third regulatory variable is the presence of explicit deposit insurance in a country. We use a dummy variable (INS) that takes a value of 1 if there is explicit deposit insurance and 0 otherwise. Deposit insurance data come from Demirgüç-Kunt and Sobaci (2001).

Finally, we use two different variables to measure the quality of the institutional environment: the index of control of corruption from the ICRG (International Country Risk Guide), and the index of the quality of disclosure of firms' annual reports from La Porta *et al*. (1998). The index of control of corruption ranges from the minimum 1.01 presented by Bangladesh to the maximum 8.9 in the case of South Africa. The quality of accounting standards varies in our sample from 2.4 (Egypt) to 8.3 (Sweden).

4. Empirical Results

4.1 Financial Development and Banking Crises

We initially replicate the Kroszner *et al*. (2007)' estimations to see if their results remain in our database. We find (see Table 2) similar results to those reported in Kroszner *et al*. (2007). We obtain a positive and significant coefficient for the interaction term between financial development and the index of external financial dependence in the pre-crisis period. This means that during non-crisis periods, industries with higher levels of financial dependence tend to grow faster in countries with

Table 1
Economic Growth and Banking Crises

This table shows country averages of the industry-level real growth in value added for the pre-crisis, crisis and post-crisis periods. The sample consists only of systemic banking crisis countries. Data are for the period 1980-2000. Following Krozsner *et al.,* (2007), the pre-crisis period is [t_1, t-3], where t_1 is the first year of the sample period (1980 or earliest available) and t is the crisis year. The crisis period is defined as [t, t+2], where t is the first year of the crisis period reported on Caprio and Klingebiel (2002) or on the World Bank Database of Banking Crises (2003). The post-crisis period is [t+3, T], where t is the crisis inception date and T is the end of the sample period (generally, 2000). We also report the ratio of private credit to GDP in 1980 (or the first year available), and the average bank concentration for the whole period, 1980-2000. Due to missing data on private credit and bank concentration the final sample consists in 70 systemic banking crises in 57 countries. Data on value added are from UNIDO. Data on private credit come from IFS. Finally, data on bank concentration come from the Beck *et al.,* (2000), database.

Country	Banking Crises Date	Real Growth in Value Added			Number of Sectors			Private Credit to GDP	Bank Concentration
		Pre-Crisis	Crisis	Post-Crisis	Pre-Crisis	Crisis	Post-Crisis		
Algeria	1990	0.026	-0.054	-0.186	28	8	7	0.399	0.885
Argentina	1980, 1989, 1995	n.a.	0.010, 0.034, 0.031	-0.010	0	16, 19, 19	28	0.119	0.493
Bangladesh	1987	0.002	-0.015	-0.021	27	28	28	0.151	0.632
Bolivia	1986, 1994	-0.065	0.036, -0.009	-0.021	26	27, 26	27	0.144	0.616
Burkina-Faso	1988	-0.062	n.a.	n.a.	23	0	0	0.220	0.870
Burundi	1994	-0.041	n.a.	n.a.	17	0	0	0.068	0.927
Cameroon	1987, 1995	-0.050	n.a., -0.008	-0.058	25	0, 20	20	0.285	0.873
Cape Verde	1993	0.037	n.a.	n.a.	9	0	0	0.019	1
Central African Rep.	1988	-0.060	0.033	-0.009	13	13	5	0.113	n.a.
Chile	1981	n.a.	-0.055	-0.051	0	28	28	0.308	0.574
Colombia	1982	n.a.	-0.019	-0.138	0	28	28	0.252	0.462
Congo	1992	0.009	n.a.	n.a.	12	0	0	0.158	0.976
Costa Rica	1994	-0.133	-0.021	-0.027	27	28	27	0.264	0.885
Côte d'Ivoire	1988	-0.041	0.077	-0.109	19	10	25	0.402	0.885
Czech Republic	1989	n.a.	n.a.	-0.005	0	0	24	n.a.	0.844
Ecuador	1980, 1996, 1998	n.a.	0.020, 0.050, 0.011	n.a.	0	15, 14, 14	0	0.169	0.499
Egypt	1991	0.044	-0.032	0.009	28	28	28	0.178	0.613
El Salvador	1989	-0.045	n.a.	0.017	27	0	28	0.243	0.920
Finland	1991	-0.007	-0.021	0.006	28	28	26	0.430	1
Ghana	1982	n.a.	-0.165	-0.092	0	26	27	0.021	0.809
Hungary	1991	-0.051	-0.031	-0.035	27	23	27	0.260	0.757
India	1993	-0.007	0.007	-0.001	28	28	28	0.233	0.396
Indonesia	1992, 1997	0.027	0.005, -0.029	0.001	25	27, 24	24	0.078	0.662
Jamaica	1994, 1996	-0.121	0.005, -0.025	n.a.	14	20, 20	0	0.180	n.a.
Japan	1992	0.035	0.007	-0.004	28	28	28	1.173	0.483
Jordan	1989	0.015	-0.008	0.038	26	27	27	0.475	0.8880
Kenya	1985, 1993	-0.018	0.000, 0.017	0.032	26	26, 25	25	0.317	0.647
Korea, Rep. of	1997	0.069	-0.019	0.005	28	28	28	0.483	0.541
Kuwait	1986	-0.013	0.030	-0.028	23	22	24	0.337	0.681
Madagascar	1988	-0.096	n.a.	n.a.	20	0	0	0.203	0.931
Malaysia	1985, 1997	-0.004	0.004, -0.029	0.021	28	28, 28	27	0.435	0.502
Mexico	1981, 1994	n.a.	-0.076, -0.050	-0.008	0	18, 28	28	0.167	0.740
Morocco	1980	n.a.	n.a.	0.018	0	0	26	0.237	0.724
Nepal	1988	n.a.	0.071	-0.027	0	19	19	0.104	0.812
Nicaragua	1989	n.a.	n.a.	n.a.	0	0	0	0.417	0.625

Niger	1983	n.a.	n.a.	-0.058	0	0	11	0.156	0.971
Nigeria	1991	-0.051	-0.091	-0.027	25	20	21	0.109	0.616
Norway	1990	-0.028	-0.007	-0.000	28	26	26	0.75	0.915
Panama	1988	-0.001	0.016	-0.052	26	24	20	0.479	0.490
Paraguay	1995	-0.044	n.a.	n.a.	26	0	0	0.106	0.627
Peru	1983	n.a.	n.a.	-0.445	0	0	28	0.094	0.780
Philippines	1983, 1998	n.a.	-0.060, n.a.	n.a.	0	28, 0	0	0.384	0.742
Poland	1992	-0.149	-0.005	n.a.	28	28	28	0.106	0.716
Senegal	1988	-0.061	0.827	-0.036	20	3	23	0.405	0.805
South Africa	1989	-0.058	-0.003	-0.053	28	28	25	0.382	0.939
Sri Lanka	1989	-0.017	0.005	0.006	28	27	27	0.183	0.770
Swaziland	1995	-0.071	n.a.	n.a.	16	0	0	0.218	0.973
Sweden	1991	-0.019	-0.022	-0.006	28	28	28	0.834	0.996
Tanzania	1982	-0.101	-0.018	-0.137	24	23	21	n.a.	0.770
Tunisia	1991	-0.011	0.046	-0.019	27	22	22	0.487	0.575
Thailand	1983	n.a.	-0.044	0.098	0	2	28	0.291	0.917
Togo	1993	-0.080	n.a.	n.a.	16	0	0	0.253	0.522
Turkey	1982, 1994, 2000	n.a.	-0.033, -0.057, -0.036	n.a.	0	28, 28, 23	0	0.163	0.861
Uruguay	1981	n.a.	-0.070	-0.327	0	28	28	0.291	0.879
Venezuela	1994	-0.128	-0.050	0.114	28	28	9	0.503	0.643
Zambia	1995	-0.169	n.a.	n.a.	27	0	0	n.a.	0.824
Zimbabwe	1995	-0.096	0.003	n.a.	28	26	0	0.286	0.785
Average/Total		-0.037	-0.012	-0.037	985	101	1234	0.287	0.750

more developed financial systems. This result is also consistent with Rajan and Zingales (1998). During crisis periods, we obtain the opposite relation, i.e., industries that are more dependent on external sources of funds tend to grow disproportionately more slowly in more developed financial systems. Results for the post-crisis period in column (3) show that the coefficient on the interaction term between bank development and external dependence is not statistically significant.

The negative and significant coefficient of column (4) indicates that the different influence of financial development on growth during the pre-crisis and the crisis period is economically and statistically significant. We do not, however, obtain a statistically significant coefficient on the interaction term when we compare the post-crisis period with the crisis period (Column 5) and the pre-crisis period (Column 6).

Columns (7) and (8) show that basic results in columns (1) and (2) do not vary when we use a balanced panel by dropping those sectors for which we only have data on one sub-period. Finally, in column (9) we show the results allowing for multiple crisis observations. The dependent variable is the difference in growth between the crisis and pre-crisis period. Our database therefore confirms the results found by Krozsner *et al.* (2007).

4.2. Bank Market Concentration and Banking Crises

We now incorporate the role of the exogenous component of bank concentration on economic growth during banking crises. We first add bank concentration in country i to examine its global impact on the real effects of banking crises. The results are reported in Table 3. As we include country dummies in all regressions, we now just isolate the specific effect of the exogenous component of bank concentration that in the previous regressions is captured by the country dummies. It is therefore not surprising that the coefficients of the interaction between financial development and the index of external financial dependence keep the signs shown in Table 2.

We obtain a negative and significant coefficient for bank concentration during the pre-crisis period. This result is consistent with Cetorelli and Gambera (2001) and supports the idea that greater banking market concentration imposes a deadweight loss in the credit market that affects the whole economy. During the crisis period we do not observe any statistically significant effect of bank concentration, but it again becomes negative in the post-crisis period. We obtain a positive coefficient for bank concentration when we analyze in column (4) the difference in growth between the crisis and the pre-crisis period. This result reflects the disappearance during the crisis period of the negative effects caused by bank concentration during the pre-crisis period.

In column (5) we present the results of estimations using the difference in growth during the post-crisis and the crisis periods. We obtain a negative and significant effect for bank concentration, suggesting that during the post-crisis period the negative effect of bank concentration on economic growth

Table 2
Financial Development and Banking Crises

This table shows the results of regressions analyzing the influence of financial development on the real effects of banking crises. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable is the growth rate of real value added during each of pre-crisis, crisis and post-crisis periods. In column (4) the dependent variable is the difference in the growth rate of real value added between the crisis and pre-crisis periods. In column (5) the dependent variable is the difference in the growth rate of real value added between the post-crisis and crisis periods. In column (6) the dependent variable is the difference in the growth rate of real value added between the post-crisis and pre-crisis periods. We include the industrial share of value added for each industry in 1980. Bank financial development is measured as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. We use the index of industrial external financial dependence calculated in Rajan and Zingales (1998). In columns (7) y (8) we use balanced panel data of countries in the sample with data for both pre-crisis and crisis periods. In column (9) we allow each crisis episode in a country to be a distinct crisis observation, thereby including more than one crisis for countries with multiples crisis over the time period. Country and industry dummies are included but are not reported. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Balanced Panel		Multiple Crises Observations
Explanatory Variables	Pre-crisis	Crisis	Post-crisis	Crisis vs. pre-crisis	Post-crisis vs. Crisis	Post-crisis vs. Pre-crisis	Pre-crisis	Crisis	Crisis vs. pre-crisis
Industrial Share of	-0.0953***	0.0884	0.0547	0.1420*	-0.0469	0.1399**	-0.0981***	0.0439	0.0998
Value Added	(-2.66)	(1.28)	(1.21)	(1.87)	(-0.53)	(2.46)	(-2.97)	(0.65)	(1.36)
Financial Development *	0.0507**	-0.0280**	0.0082	-0.0812***	0.0364	-0.0351	0.0534***	-0.0278*	-0.0618*
External Dependence	(2.51)	(-1.97)	(0.31)	(-3.14)	(1.13)	(-1.06)	(2.93)	(-1.72)	(-1.91)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.4863	0.5475	0.4962	0.5505	0.5090	0.3459	0.6692	0.4963	0.6451
# Observations	927	909	805	692	739	663	692	692	870

Table 3

Bank Concentration and Banking Crises

This table shows the results of regressions analyzing the influence of bank concentration on the real effects of banking crises. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable is the growth rate of real value added during each of pre-crisis, crisis and post-crisis periods. In column (4) the dependent variable is the difference in the growth rate of real value added between the crisis and pre-crisis periods. In column (5) the dependent variable is the difference in the growth rate of real value added between the post-crisis and crisis periods. In column (6) the dependent variable is the difference in the growth rate of real value added between the post-crisis and pre-crisis periods. In columns (7) y (8) we use balanced panel data of countries in the sample with data for both pre-crisis and crisis periods. In column (9) we allow each crisis episode in a country to be a distinct crisis observation, thereby including more than one crisis for countries with multiples crisis over the time period. We include the industrial share of value added for each industry in 1980. Bank financial development is measured as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. We use the index of industrial external financial dependence calculated in Rajan and Zingales (1998). Bank market concentration is calculated as the averaged value of the ratio assets from the three largest banks to total assets of banking sector in each country. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for bank concentration does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration are: legal origin and rule of law. Country and industry dummy variables are included but are not reported. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Balanced Panel		Multiple Crises Observations
Explanatory Variables	**Pre-crisis**	**Crisis**	**Post-crisis**	**Crisis vs. pre-crisis**	**Post-crisis vs. Crisis**	**Post-crisis vs. Pre-crisis**	**Pre-crisis**	**Crisis**	**Crisis vs. pre-crisis**
Industrial Share of Value Added	-0.0870**	0.0832	0.0479	0.1419*	-0.0493	0.1463**	-0.1105***	0.0313	0.0960
	(-2.13)	(1.13)	(1.04)	(1.79)	(-0.54)	(2.45)	(-3.73)	(0.44)	(1.27)
Financial Development * External Dependence	0.0514***	-0.0277*	-0.0014	-0.0717***	0.0261	-0.0448	0.0447**	-0.0270	-0.0601*
	(2.72)	(-1.86)	(-0.05)	(-2.72)	(0.82)	(-1.33)	(2.49)	(-1.57)	(-1.84)
Bank Concentration	-0.1760***	-0.0091	-0.2563**	0.1521***	-1.187***	0.3628***	-0.1650***	-0.0113	0.1023***
	(-9.96)	(-0.50)	(-4.57)	(6.71)	(-6.16)	(3.79)	(-14.83)	(-0.60)	(2.69)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.6281	0.5679	0.5387	0.5681	0.5172	0.3562	0.7281	0.4990	0.6727
# Observations	859	883	800	666	734	658	666	666	857
Durbin-Wu-Hausman Test	99.11***	0.25	20.91***	45.02***	37.93***	14.38***	220.03***	0.36	7.26***

reappears. The positive coefficient of bank concentration in column (6) indicates that the negative effect diminishes in the post-crisis period compared to the pre-crisis period. Results do not vary when in columns (7) and (8) we use a balanced panel data set or when in column (9) we allow each crisis episode in a country to be a separate observation.

The approach outlined above enables us to identify the difference in terms of the global effect of bank concentration on economic growth between crisis and non-crisis periods.

We go on to try to determine whether the impact of banking market concentration on industry growth, during crises and non-crisis periods, might vary among industries depending on the level of external financial dependence. In Table 4, we report estimations adding the interaction term between bank concentration and the index of external financial dependence. This model specification allows us to break down the total effect of the exogenous component of bank concentration in, first, an economy-wide effect and, second, a sector-specific effect.

Consistent with Cetorelli and Gambera (2001), we obtain a positive and significant coefficient for the interaction term between bank concentration and the index of external financial dependence in pre-crisis periods. This result indicates that bank concentration promotes economic growth of the industrial sectors that are most in need of external financing by facilitating credit access for younger firms. Cetorelli and Gambera (2001) suggest that, with information asymmetries, higher levels of bank concentration may increase banks' incentives to invest in the acquisition of soft information by establishing close lending relationships with borrowers over time. These credit relationships facilitate the availability of funds for the sectors that are most in need of such relationships (Petersen and Rajan, 1994, 1995; Boot, 2000; Dell'Ariccia and Marquez, 2004).

The results reported in column (2) show a different pattern during banking crises. We do not find a significant impact of bank concentration on economic growth during banking crises in more financially dependent industries. We thus obtain a negative and significant coefficient for the interaction term between bank concentration and the index of financial dependence in column (4) when the dependent variable is the difference in real growth rate between the crisis and the pre-crisis period. This negative coefficient indicates that the disappearance during the crisis period of the positive effect of bank concentration for the growth of sectors that are more dependent on external finance is statistically significant.

We also obtain a negative and significant coefficient for the interaction term of bank concentration and external financing dependence, in column (6), when the dependent variable is the difference in real growth rate between the post-crisis and the pre-crisis period. This result implies that the positive effect in normal periods of bank concentration on economic growth of industries with higher levels of external financial dependence disappears not only during the crisis period but also subsequent to it. It suggests that the benefits of bank concentration to solve adverse selection and moral hazard problems between banks and firms in more financially dependent firms are reduced after a financial crisis. The results

Table 4
Bank Concentration, External Dependence, and Banking Crises

This table shows the results of regressions analyzing the influence of bank concentration on the real effects of banking crises in more financially dependence industries. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable is the growth rate of real value added during each of pre-crisis, crisis and post-crisis periods. In column (4) the dependent variable is the difference in the growth rate of real value added between the crisis and pre-crisis periods. In column (5) the dependent variable is the difference in the growth rate of real value added between the post-crisis and crisis periods. In column (6) the dependent variable is the difference in the growth rate of real value added between the post-crisis and pre-crisis periods. In columns (7) y (8) we use balanced panel data of countries in the sample with data for both pre-crisis and crisis periods. In column (9) we allow each crisis episode in a country to be a distinct crisis observation, thereby including more than one crisis for countries with multiples crisis over the time period. We include the industrial share of value added for each industry in 1980. Bank financial development is measured as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. We use the index of industrial external financial dependence calculated in Rajan and Zingales (1998). Bank market concentration is calculated as the averaged value of the ratio assets from the three largest banks to total assets of banking sector in each country. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for bank concentration does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration are: legal origin and rule of law. Country and industry dummy variables are included but are not reported. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
							Balanced Panel		Multiple Crises Observations
Explanatory Variables	Pre-crisis	Crisis	Post-crisis	Crisis vs. pre-crisis	Post-crisis vs. Crisis	Post-crisis vs. Pre-crisis	Pre-crisis	Crisis	Crisis vs. pre-crisis
Industrial Share of Value Added	-0.0761*	0.0763	0.0343	0.1258	-0.0508	0.1242**	-0.1009***	0.0246	0.0711
	(-1.85)	(0.98)	(0.77)	(1.52)	(-0.52)	(2.21)	(-3.64)	(0.32)	(0.91)
Financial Development * External Dependence	0.0267*	-0.0046	0.0013	-0.0335*	0.0116	-0.0277	0.0269*	-0.0063	-0.0044
	(1.77)	(-0.48)	(0.07)	(-1.77)	(0.60)	(-1.00)	(1.94)	(-0.57)	(-0.18)
Bank Concentration * External Dependence	0.0706**	-0.0027	-0.0502	-0.0555*	-0.0459	-0.1181*	0.0540**	-0.0072	0.0605
	(2.59)	(-0.20)	(-1.07)	(-1.71)	(-0.92)	(-1.89)	(1.96)	(-0.45)	(1.42)
Bank Concentration	-0.1970***	-0.0154	-0.1713***	0.1636***	-1.167***	-0.2177***	-0.1812***	-0.0132	0.0902*
	(-9.80)	(-0.75)	(-5.81)	(6.21)	(-6.00)	(-3.74)	(-12.86)	(-0.62)	(1.92)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.6315	0.6082	0.5645	0.5885	0.5422	0.3530	0.7097	0.5479	0.6975
# Observations	769	793	719	599	662	592	599	599	767
Durbin-Wu-Hausman Test	53.14***	0.29	30.13***	19.82***	19.09***	12.94***	115.69***	0.31	7.53***

found using a balanced panel dataset and allowing for multiple crisis observations yield very similar results.

The coefficients of bank concentration indicate that the general depressant effect on growth in less financially dependent sectors associated with a concentrated banking industry in normal periods is not found during crisis periods but re-appears after the banking crisis.

4.3. Regulation, Institutions, and Banking Crises

We now analyze if the impact of bank concentration on the real effects of banking crises persists after controlling for the characteristics of bank regulation and institutions in the country. We add sequentially an interaction term of the exogenous component of each legal and institutional variable with the index of external financial dependence.

Table 5 reports the results for the exogenous component of regulatory variables. The interaction coefficients of financial development and concentration with external dependence do not vary after including regulatory variables. Regulatory variables, however, have additional effects to those of bank concentration and financial development. Both variables, restrictions on non-traditional activities and on the mixing of banking and commerce, in normal periods promote the growth of financially dependent sectors. Their influence, however, becomes negative again during crisis periods, indicating that less stringent restrictions on non-traditional bank activities and on the mixing of banking and commerce have a positive effect during crisis periods. The negative and significant coefficients of the interactions of two regulatory variables in columns (5) and (6) indicate that the change in the influence between the pre-crisis and the crisis period is statistically significant. The change in the influence from the pre-crisis to the crisis period is consistent with the greater benefits that long-term relationships and the mixing between banking and commerce may provide during banking crises. This result suggests that legal restrictions prohibiting banks from investing in other banking activities prevents them from drawing up a more efficient risk assessment to promote economic growth during financial crises. It also suggests that regulations preventing banks from holding equity stakes in non-financial firms lead to higher economic costs during banking crises. Relaxing restrictions on the mixing of banking and commerce and/or lowering weights in the risk-weighted capital requirement for bank equity investments in relationship firms may help reduce the negative real effects of banking crises. This should, however, be only a temporary measure as more stringent restrictions have positive effects in normal periods.

Explicit deposit insurance does not have a significant effect on growth in normal periods but does promote the growth of more financial dependent sectors during the crisis period. The coefficient of the interaction between the presence of explicit deposit insurance and external financial dependence in column 9 indicates that the change in the influence between the pre-crisis and the crisis period is

Table 5
Bank Regulation and Banking Crises

This table shows the results of regressions analyzing the influence of bank regulation on the real effects of banking crises. We present the results for the pre-crisis, crisis and the difference in growth between the crisis and pre-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1) and (2) the dependent variable is the growth rate of real value added during pre-crisis period; in columns (3) and (4), the dependent variable is the growth rate of real valued added during banking crises; and in columns (5) and (6), the dependent variable is the difference in growth between the crisis and the pre-crisis periods. Bank market concentration is measured as the ratio assets from the three largest banks to total assets of banking industry in each country. We use the indicator of the degree to which banks' activities are restricted outside the credit and deposit business. Separately we use the indicator of the extent to which banks may own and control non-financial firms. Country and industry dummy variables are included on estimations, but are not reported. Country and industry dummy variables are included on estimations, but are not reported. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration and for the regulatory variables are: legal origin and rule of law. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	Pre-Crisis			Crisis			Crisis vs. Pre-crisis		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Industrial Share of Value Added	-0.0749*	-0.0744*	-0.0761*	0.0752	0.0755	0.0758	0.1224	0.1237	0.1253
	(-1.84)	(-1.82)	(-1.85)	(0.96)	(0.97)	(0.97)	(1.50)	(1.49)	(1.52)
Financial Development * External Dependence	0.0468***	0.0310**	0.0271*	-0.0100	-0.0084	-0.0115	-0.0571**	-0.385**	-0.0440*
	(2.78)	(2.09)	(1.75)	(-0.99)	(-0.82)	(-0.98)	(-2.51)	(-2.02)	(-2.18)
Bank Concentration * External Dependence	0.1436***	0.1131***	0.016**	-0.0105	-0.0351	0.0029	-0.1555***	-0.1231***	-0.0642**
	(3.05)	(3.51)	(2.24)	(-0.64)	(-1.04)	(0.21)	(-3.04)	(-2.96)	(-1.97)
Restrictions on Non-Traditional Banking Activities * External Dependence	0.0165**			-0.0034*			-0.0214**		
	(2.38)			(-1.85)			(-2.59)		
Restrictions on the Ownership of Non-Financial Firms * External Dependence		0.0518***			-0.0325**			-0.0674***	
		(3.52)			(-2.43)			(-3.25)	
Deposit Insurance * External Dependence			-0.0014			0.0094			0.0154*
			(-0.06)			(1.32)			(1.71)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.5654	0.5596	0.5547	0.5898	0.5903	0.5891	0.5760	0.5752	0.5719
# Observations	769	769	769	793	793	793	599	599	599
Durbin-Wu-Hausman Test	4.67***	7.68***	3.35**	1.87	3.07**	1.03	4.65***	5.80***	3.89***

statistically significant. This evidence is consistent with Angkinand (2008) who find that countries that provide comprehensive deposit insurance coverage experience a smaller output cost of crises.

Table 6 reports the results after controlling for the exogenous component of institutional variables. Results for the influence of financial development and bank concentration are unchanged from those reported previously. The influence of the exogenous component of the quality of accounting standards changes in crisis periods. During stability periods, the interaction between the quality of accounting standards and external dependence does not have a statistically significant coefficient. It indicates that industries that are more dependent on external financing grow faster in more financially developed countries and in more concentrated banking systems but accounting standards do not have an additional effect to that incorporated in the country's financial development. During crisis periods, however, we found in column (4) that the quality of accounting standards plays a specific positive role. The coefficient of this interaction term in column (6) indicates that the change of the influence of accounting standards during the crisis period is statistically significant. It suggests the importance of better accounting disclosure to solve information asymmetry problems during banking crises.

We do not, however, obtain an additional influence during crisis periods for the exogenous component of control of corruption to that captured by the country's financial development.

4.4. Interactions between Bank Concentration, Regulation, and Institutions

We now analyze whether the exogenous component of bank regulation and institutions modify the impact of bank concentration on economic growth during banking crises. In this extended specification, we include a triple interaction term between each legal and institutional variable with bank concentration and external dependence.

Table 7 reports the results for the regulatory variables. Columns (1) and (2) show that interaction terms between bank concentration, external financial dependence and the two proxies for regulatory restrictions have positive coefficients during the pre-crisis period. Also, the interaction term between concentration and external dependence no longer has the positive coefficients observed in previous tables. It even has a negative and statistically significant coefficient in column (2) when we include the interaction with the restrictions on the mixing of banking and commerce. These findings indicate that concentration only has a positive effect on the economic growth of more financially dependent sectors in normal periods when there are restrictions on banking activities and on the extent to which banks may own and control non-financial firms.

The positive interaction between bank concentration and legal restrictions on bank activities during normal periods is consistent with Fernández *et al*. (2010) and may have several origins. The need to focus on deposits and loans favors specialization of bank activities and may make it more helpful for banks to establish lending relationships with firms. In this case, bank concentration may provide a

Table 6
Institutions and Banking Crises

This table shows the results of regressions analyzing the influence of institutions on the real effects of banking crises. We present the results for the pre-crisis, crisis and the difference in growth between the crisis and pre-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1) and (2) the dependent variable is the growth rate of real value added during pre-crisis period; in columns (3) and (4), the dependent variable is the growth rate of real valued added during banking crises; and in columns (5) and (6), the dependent variable is the difference in growth between the crisis and the pre-crisis periods. Bank market concentration is measured as the ratio assets from the three largest banks to total assets of banking industry in each country. The institutional variables are: the index of control of corruption from ICRG; and the index of accounting standards calculated in La Porta *et al*., (1998). Country and industry dummy variables are included on estimations, but are not reported. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration and for the institutional variables are: legal origin and rule of law. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	Pre-Crisis		Crisis		Crisis vs. Pre-Crisis	
	(1)	(2)	(3)	(4)	(5)	(6)
Industrial Share of Value Added	-0.0754* (-1.83)	-0.0868* (-1.82)	0.0765 (0.98)	0.2866* (1.67)	0.1238 (1.50)	0.4767* (1.84)
Financial Development * External Dependence	0.0337** (2.14)	0.0335** (2.42)	-0.0018 (-0.15)	-0.0243* (-1.79)	-0.0497** (-2.59)	-0.0615** (-2.47)
Bank Concentration * External Dependence	0.1019** (2.14)	0.0235 (1.17)	0.0058 (0.32)	-0.0127 (-0.93)	-0.1316** (-2.10)	-0.0425* (-1.78)
Control of Corruption * External Dependence	-0.0026 (-0.98)		-0.0005 (-0.27)		0.0064 (1.56)	
Accounting Standards * External Dependence		-0.0005 (-1.49)		0.0006** (2.42)		0.0013*** (2.74)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.5550	0.8133	0.5889	0.3719	0.5722	0.4668
# Observations	769	273	793	411	599	269
Durbin-Wu-Hausman Test	3.37**	0.73	1.25	1.83	2.34**	2.27

higher marginal benefit to promote lending relationships. Stricter restrictions on the mixing of banking and commerce may increase the marginal benefit of bank concentration as a substitute for solving the conflicts of interest and information asymmetries between banks and debtors through the promotion of long-term relationships. Moreover, stricter restrictions regarding the mixing of banking and commerce may mitigate hold-up problems, as a bank that is only a lender will have less power than a bank that is both a shareholder and a lender to a firm.

In the crisis period, however, regulatory restrictions interact differently with bank concentration. In columns (4) and (5), the interaction term of bank concentration and external dependence has positive coefficients but the coefficients of the interactions with the two proxies of regulatory restrictions are negative. That is, we find a positive effect of bank concentration on economic growth when bank activities and the mixing of banking and commerce are unrestricted. Both types of legal restrictions, however, diminish the positive influence of bank concentration on the economic growth of more financially dependent industries during banking crises. This result suggests that banking freedom and bank concentration complement each other in solving the greater adverse selection and moral hazard problems that the economic downturn and the lower credit supply cause in the crisis period.

We also find that the interaction between bank concentration, deposit insurance, and external dependence has a positive, but not statistically significant, coefficient during the crisis period. The coefficient of the interaction term is positive and statistically significant in column (9) when we compare growth between the crisis and the pre-crisis period. It indicates that bank concentration and deposit insurance are complements that help mitigate the negative real effects associated with systemic banking crises.

In Table 8 we analyze the interaction between our two proxies for the institutional environment and bank concentration for the sectors that are more financially dependent. Results in columns (1) show a negative coefficient on the interaction term between bank concentration, external dependence, and financial development. This result is consistent with the higher value of close relationships between banks and firms, during stability periods, in countries where the poor quality of the institutional environment does not favor the development of markets. Bank concentration in underdeveloped markets may thus substitute strong institutions for reducing information asymmetries and agency costs between banks and debtors, by increasing the benefits for banks of establishing close lending relationships.

The interaction between bank concentration and institutions changes during the crisis period. Good-quality accounting standards are seen to be necessary if bank concentration is to play a positive role during banking crises. The interaction between bank concentration, accounting standards, and external dependence has a positive and statistically significant coefficient in column (6). Moreover, the coefficient for the interaction between bank concentration and external dependence becomes negative. This indicates that bank concentration, even in more financially dependent sectors, requires

Table 7
Bank Concentration, Regulation, and Banking Crises

This table shows the results of regressions analyzing the influence of the interaction between regulation and bank concentration on the real effects of banking crises. We present the results for the pre-crisis, crisis and the difference in growth between the crisis and pre-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1) and (2) the dependent variable is the growth rate of real value added during pre-crisis period; in columns (3) and (4), the dependent variable is the growth rate of real valued added during banking crises; and in columns (5) and (6), the dependent variable is the difference in growth between the crisis and the pre-crisis periods. Bank market concentration is measured as the ratio assets from the three largest banks to total assets of banking industry in each country. We use the indicator of the degree to which banks' activities are restricted outside the credit and deposit business. Separately we use the indicator of the extent to which banks may own and control non-financial firms. Country and industry dummy variables are included on estimations, but are not reported. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration and for the regulatory variables are: legal origin and rule of law. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	**Pre-Crisis**			**Crisis**			**Crisis vs. Pre-crisis**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Industrial Share of Value Added	-0.0775*	-0.0742*	-0.0760*	0.0775	0.0755	0.0760	0.1278	0.1234	0.1254
	(-1.89)	(-1.82)	(-1.84)	(0.99)	(0.97)	(0.97)	(1.54)	(1.49)	(1.52)
Financial Development * External Dependence	0.0448***	0.0337**	0.0304*	-0.0158	-0.0100	-0.0109	-0.0587***	-0.0418**	-0.0431**
	(2.75)	(2.24)	(1.96)	(-1.45)	(-0.94)	(-0.99)	(-2.80)	(-2.16)	(-2.21)
Bank Concentration * External Dependence	-0.0281	-0.0812*	0.0827**	0.0532*	0.0881**	-0.0014	0.0771	0.1331**	-0.0749**
	(-0.72)	(-1.92)	(2.16)	(1.83)	(2.25)	(-0.11)	(1.57)	(2.37)	(-2.20)
Bank Concentration * Restrictions on Non-Traditional Banking Activities * External Dependence	0.0166***			-0.0099**			-0.0238***		
	(2.92)			(-2.40)			(-3.37)		
Bank Concentration * Restrictions on the Ownership of Non-Financial Firms * External Dependence		0.0719***			-0.0444**			-0.0959***	
		(3.62)			(-2.44)			(-3.38)	
Bank Concentration * Deposit Insurance * External Dependence			-0.0143			0.0131			0.0221*
			(-0.48)			(1.52)			(1.89)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.5572	0.5598	0.5548	0.5897	0.5903	0.5892	0.5739	0.5755	0.5720
# Observations	769	769	769	793	793	793	599	599	599
Durbin-Wu-Hausman Test	6.28***	7.85***	3.40**	3.06**	3.15**	1.23	6.93***	6.14***	3.15**

Table 8
Bank Concentration, Institutions, and Banking Crises

This table shows the results of regressions analyzing the influence of the interaction between institutions and bank concentration on the real effects of banking crises. We present the results for the pre-crisis, crisis and the difference in growth between the crisis and pre-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1) and (2) the dependent variable is the growth rate of real value added during pre-crisis period; in columns (3) and (4), the dependent variable is the growth rate of real valued added during banking crises; and in columns (5) and (6), the dependent variable is the difference in growth between the crisis and the pre-crisis periods. Bank market concentration is measured as the ratio assets from the three largest banks to total assets of banking industry in each country. The institutional variables are: the index of control of corruption from ICRG; and the index of accounting standards calculated in La Porta *et al*., (1998). Country and industry dummy variables are included on estimations, but are not reported. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments does not change the estimation outcome. We report IV estimates when the test is rejected at the one percent level. Instruments for bank concentration and for the institutional variables are: legal origin and rule of law. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	Pre-Crisis			Crisis			Crisis vs. Pre-crisis		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Industrial Share of Value Added	-00761*	-0.0750*	-0.0869*	0.0764	0.0764	0.2871*	0.1259	0.1233	0.4777*
	(-1.86)	(-1.82)	(-1.82)	(0.98)	(0.98)	(1.67)	(1.52)	(1.49)	(1.85)
Financial Development * External Dependence	0.1751***	0.0360**	0.0326**	-0.0074	-0.0034	-0.0221*	-0.1659**	-0.0514***	-0.0638**
	(2.75)	(2.27)	(2.34)	(-0.27)	(-0.28)	(-1.67)	(-2.18)	(-2.64)	(-2.48)
Bank Concentration * External Dependence	0.1911***	0.1419**	0.0768	0.0008	0.0060	-0.0622**	-0.1693**	-0.2016**	-0.1814**
	(2.68)	(2.06)	(1.38)	(0.03)	(0.20)	(-2.04)	(-1.98)	(-2.12)	(-2.26)
Bank Concentration * Financial Development * External Dependence	-0.2156**			0.0041			0.1950*		
	(-2.22)			(0.10)			(1.66)		
Bank Concentration * Control of Corruption * External Dependence		-0.0043			-0.0003			0.0088*	
		(-1.31)			(-0.13)			(1.77)	
Bank Concentration * Accounting Standards * External Dependence			-0.0007			0.0008**			0.0016**
			(-1.39)			(2.38)			(2.60)
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.5557	0.5552	0.8128	0.5889	0.5889	0.3709	0.5719	0.5724	0.4660
# Observations	769	769	273	793	793	411	599	599	269
Durbin-Wu-Hausman Test	3.95**	3.43**	0.68	0.45	1.31	1.84	2.75*	2.52*	3.39***

a minimum quality in accounting standards if it is to help mitigate the reduction in growth during banking crises.

5. Conclusions

We analyze the role of bank market concentration, regulation, and institutions on the real effects of banking crises using industrial data for a sample of 68 systemic banking crises in 54 developed and developing countries over the 1980-2000 period. We find that regulation and institutions modify across countries the negative effects of a banking crisis on economic growth associated with the reduction in the credit supply. Less stringent restrictions on non-traditional banking activities and on bank ownership of non-financial firms lead to a lower reduction in economic growth during crisis periods. This effect differs from the negative influence on growth that we observe for less stringent restrictions on non-traditional bank activities during non-crisis periods.

We also find that the effect of bank market concentration on economic growth depends on bank regulation and institutions, and varies from crisis to non-crisis periods. In stability periods, concentration has a positive effect on economic growth only in the case of more financially dependent sectors and when there are restrictions on banking activities and on the extent to which banks may own and control non-financial firms. In the crisis period, however, bank concentration has a positive effect on economic growth only when bank activities and the mixing of banking and commerce are unrestricted. These results suggest that legal restrictions on non-traditional bank activities and owning non-financial firms prevents them from drawing up a more efficient risk assessment that might promote economic growth during banking crises. These results afford evidence of the greater benefits that long-term relationships and the mixing of banking and commerce may provide during banking crisis. They also indicate that legal restrictions on banking activities are more important than bank concentration for reducing the negative real effects of systemic banking crisis.

We also find that explicit deposit insurance and better-quality accounting standards mitigate the negative real effects of systemic banking crises and interact positively with bank concentration to minimize the reduction of economic growth during a banking crisis.

Our analysis has two basic policy implications. First, regulation and institutions are relevant for mitigating the real effects of banking crisis and suggest that optimal regulations for stability periods may become inefficient for crisis periods. The negative consequences on economic growth of relaxing restrictions on bank activities and on the mixing of banking and commerce during normal periods become positive during periods of banking crises. Second, as the effect of bank concentration depends on the individual country’s regulation and quality of institutions, antitrust enforcement is not equally beneficial in every country. Antitrust enforcement should consider the benefits that a more concentrated bank market may provide during banking crises depending on the country’s regulatory and institutional framework.

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