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BANKING CRISES, BANKING MARKET STRUCTURE AND GROWTH: INTERNATIONAL EVIDENCE FROM INDUSTRY DATA

Ana I. Fernández-Álvarez
Francisco González-Rodríguez
Nuria Suárez-Suárez[*]

University of Oviedo

Abstract

This paper analyzes the role of banking market structure, institutions and regulation on the effects of banking crises on real economy. Our empirical analysis relies on 70 systemic banking crises in 57 countries over the 1980-2000 period. Results show that more concentrated banking markets tend on average to imply a lower contraction of industrial value added during banking crises. However, this finding varies across sectors depending on the external financial dependence. Sectors that are highly dependent on external finance tend to experience a substantially greater contraction of value added during banking crises in countries with more concentrated banking systems. Our results also show the greater importance of market discipline to promote a less negative effect of bank concentration on economic growth during episodes of banking distress. Moreover, we find that during banking crises bank concentration has a less positive effect on economic growth in countries with more restrictions on non-traditional banking activities.

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

JEL Codes: E44, G21, O16

* Corresponding author: Nuria Suárez Suárez, Department of Business Administration, University of Oviedo. Avenida del Cristo s/n, 33071. Oviedo. (Spain) Tel.: +34.985.10.28.20. Fax: +34.985.10.37.08. E-mail: suareznuria@uniovi.es

1. INTRODUCTION

There is a large literature showing the empirical relevance of financial development and banking market structure for economic growth. In this paper, we study the role of bank market structure, institutional environment, bank regulation and supervision on the impact of financial crises on economic growth during the 1980-2000 period.

It is agreed that financial development helps firms to grow faster by supplying more external funds. Rajan and Zingales, (1998), demonstrate this effect being particularly strong among firms or industries that typically need more external funds to finance their investments. The literature also points out the importance of finance in the propagation of the business cycles. This idea is called the credit channel of the business cycle.

Previous works argue two lines of research. The first one focuses on the credit-worthiness of firms and is usually called the balance sheet channel. A negative wealth shock damages the firm's balance sheet and reduces the amount of credit that firms can get, multiplying the effect of the primitive shock on firms' spending (Bernanke and Gertler, 1989; 1990; Kiyotaki and Moore, 1997). The connection between the strength of the balance sheet and the borrowing capacity of a firm can be explained by moral hazard, asymmetric information or the lack of collateral. The second line of research studies the more specific role of banks, the bank lending channel. In this case a negative shock affects the ability of banks to provide funds and therefore reduces real activity (Bernanke and Blinder, 1998; Stein, 1998).

If financial conditions play an important role in aggregated cyclical behaviour, one expects the response to negative shocks to depend on the agent's reliance on financial markets. Since capital markets are imperfect, recessions should have a larger impact on industries with higher external dependence. In this line, Dell'Ariccia *et al.,* (2008), find that those sectors that are highly dependent on external finance tend to experience a substantially greater contraction of value added during a banking crisis. Krozsner *et al.,* (2007), go further and show that those industries with higher levels of external financing dependence perform worst during banking crises and this effect is particularly greater for external financial dependent industries from countries with deeper financial systems.

If that is the case, banking market structure might have an important role on the effects of banking crises over economic growth. Cetorelli and Gambera, (2001) find a general depressing effect on growth associated with a concentrated banking industry. However, this general effect varies across sectors because bank concentration promotes economic growth of those industrial sectors that are more in need of external finance, by facilitating credit access to younger firms. The argument is that banking market concentration facilitates the creation of close lending

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relationships between banks and firms, which have, in turn, an enhancing effect on firms' growth.

There have also been a number of recent cross-country studies that have highlighted the importance of bank regulation and supervision on the functioning and development of banking systems. Barth *et al.,* (2004), analyze the relationship between specific regulatory and supervisory practices and banking-sector development. They show the more beneficial effects of policies that force accurate information disclosure and foster incentives for private agents to exert corporate control in promoting bank development. They also show that policies that rely excessively on direct government supervision and regulation of bank activities are worse for financial development and stability. Beck *et al*., (2006), examine the channels through which bank concentration, regulation and supervision impact financial stability.

This research extends this evidence analyzing the role of bank market structure in the effect of a financial crisis on economic growth in different legal and institutional environments. Specifically, we investigate whether the impact of a banking crisis on those sectors that are more dependent on external financing varies depending on banking market structure, bank regulation and supervision on each country.

Our results show that more concentrated banking markets tend on average to imply a lower contraction of value added during banking crises. However, this finding varies across sectors depending on the external financing dependence. Those industrial sectors that are highly dependent on external finance tend to experience a substantially greater contraction of value added during a banking crisis in countries with more concentrated banking systems. Our results also show the greater importance of market discipline to promote a less negative effect of bank concentration on economic growth, during banking crises. Moreover, we find that during episodes of banking crises, bank concentration has a less positive effect on economic growth in countries with more restrictions on non-traditional banking activities.

The rest of the paper is organized as follows. Section 2 presents in more detail the theory behind our empirical study. Section 3 describes the methodology, sample and variables. Section 4 presents the main results and robustness checks and, finally, Section 5 concludes.

2. THEORETICAL BACKGROUND

Financial literature has focused on the relation between financial development and economic growth. Many authors have established that development of both banking and stock markets is

positively associated with higher real per capita growth.[1] Specifically, Rajan and Zingales, (1998), analyze the mechanisms through which financial development impacts on industrial economic growth. They show that industries that heavily depend on external finance develop disproportionately faster in countries with more-developed financial markets. They argue that a deep financial system appears to relax credit constraints permitting financially dependent sectors to grow faster during normal periods.

Little empirical work investigates the mechanisms through which financial crises generate problems in the real sector. Kroszner *et al.,* (2007), investigate the link between external financial dependence and industrial growth during financial crises. They analyze whether the impact of a financial crisis on those sectors that are more dependent on external financing varies with financial development. If the banking system is the key institution allowing credit constraints to be relaxed, a sudden negative shock to these intermediaries, in a system in which such intermediaries are important, should have a disproportionately contractionary impact on the sectors whose growth is dependent on the services provided by banks. This result is the natural extension for financial crises of the evidence provided by Rajan and Zingales, (1998), for non-crisis periods. The main result in Krozsner *et al.,* (2007), is that externally dependent sectors tend to experience a greater contraction of value added during banking crises in well developed financial systems than in countries with shallower financial systems. They find a differential impact of banking crises on growth for industries dominated by young firms and for industries with high levels of intangible assets. They also find this effect to be larger in countries with poor accounting standards. Their finding is that the differential effect found by Rajan and Zingales, (1998), is present in pre-crisis periods, but becomes insignificant during crises. 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.

Dell'Ariccia *et al.,* (2008), analyze if those industrial sectors that are more in need on external financing are shocked disproportionately during a banking crisis, than those industries that are not so dependent on external funds. They show that banking crises have real effects on the

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[1] Evidence demonstrating that well-functioning banks promote growth is provided using country-level data by King and Levine, (1993) and Levine and Zervos, (1998), and using industry-level data by Rajan and Zingales, (1998), Beck and Levine, (2002), and Claessens and Laeven, (2003). Demirgüç-Kunt and Maksimovic, (1998, 1999, 2002), and Levine *et al.,* (2000) also provide evidence using firm-level data that companies in countries with a large banking sector grow faster than predicted by individual firm characteristics.

economies because more financially dependent industries perform significantly worse during banking crises.

Braun and Larrain, (2005), found that those industries more dependent on external finance experienced a stronger negative output contraction during episodes of economic distress. The results are supportive of the joint hypothesis that banking crises have real effects, and at least part of this effect is through the lending channel.

There has also been cross-country research on the effects of banking market structure and regulation on financial-sector stability, access to financing, and growth[2]. For example, Demirgüc-Kunt *et al*., (2004), investigate the effects of banking regulations, market structure, and institutions on the cost of financial intermediation.

Cetorelli and Gambera, (2001), extend the basic model in Rajan and Zingales, (1998) to analyze the relevance of bank concentration for economic growth. While bank concentration has an overall negative effect on growth, it in fact promotes economic growth of industrial sectors that are more in need on external financing by facilitating credit access for younger firms.

Beck *et al.,* (2006), find that crises are less likely in economies with more concentrated banking systems, even after controlling for differences in bank regulation, national institutions affecting competition, macroeconomic conditions and shocks to the economy. The data indicate that regulatory policies and institutions that thwart competition are associated with greater banking system fragility. Regarding on bank regulation and supervision, Barth *et al.*, (2004), analyze the relationship between specific regulatory and supervisory practices and banking-sector development in 107 countries. Their findings suggest that policies that rely on guidelines that force accurate information disclosure and foster incentives for private agents to exert corporate control work best to promote bank development than policies that rely excessively on direct government supervision and regulation of bank activities.

In this paper we interconnect the previous literature on the impact of banking market structure and regulation on economic growth with the effects of banking crises in countries with different levels of financial development. We analyze whether the impact of bank concentration on industrial economic growth varies during banking crises depending on different levels of financial dependence, banking regulation, supervision and institutions. In particular, this study examines whether a strong banking regulatory and supervisory framework can effectively reduce the output cost of banking crises through a more beneficial effect of bank concentration on economic growth.

This paper contributes to the literature in three ways. First, using data from 70 systemic banking crises from 57 countries during the last quarter century, we analyze whether sectors that are

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[2] See Berger *et al.,* (2004), for a review.

highly dependent on external finance tend to experience a substantially greater contraction of value added during a banking crisis in countries with deeper financial systems than in countries with shallower ones. Second, the paper investigates if banking market structure and, specifically, banking market concentration, explains the effects of banking crises on economic growth across countries. And third, we study if the growth impact of a systemic banking crisis is different among countries depending on the features of bank regulation, supervision and institutions.

3. METHODOLOGY AND DATA

3.1 Method

We extend the model in Kroszner *et al.*, (2007), following Cetorelli and Gambera, (2001), to investigate the link between bank concentration and industrial growth during financial crises. We examine if the impact of bank concentration on economic growth varies during banking crises depending on the features of institutions, banking regulation and supervision.

Specifically, we estimate the following model:

$$GROWTH_{i,j} = \beta_1 * SHARE_{i,j} + \beta_2 * FD_i + \beta_3 * FD_i * ED_j + \beta_4 * CONC_i * ED_j + \\ + \beta_5 * CONC_i * ED_j * REGINST_i + \alpha_i + \eta_j + \varepsilon_{i,j}$$

where GROWTH is the growth rate in real value added of sector j in country i. SHARE is the share of sector j in the total value added of country i. FD is the development of the financial system of country i. ED is the external dependence ratio of sector j, following Rajan and Zingales (1998). CONC is the bank market concentration in country i. REGINST is a set of proxy variables for the institutional environment, bank regulation and supervision in a country. Finally, α_i and η_j are the fixed country and industry effects, respectively.

Following previous works by Rajan and Zingales (1998), Cetorelli and Gambera, (2001) and Krozsner *et al.,* (2007), we include the interaction term between financial development and external financial dependence FD * ED. We use this interaction term to analyze the impact of financial development on industrial economic growth during banking crises.

We include the level of bank concentration in each country (CONC), to analyze the global impact of bank concentration on economic growth during systemic banking crises. In addition, we study if the global effect of bank concentration on economic growth is the same depending on the level of industrial dependence on external source of financing. As in Cetorelli and Gambera, (2001), we include the interaction term between bank concentration and the index of

external financial dependence CONC * ED. This interaction term provides a more detailed analysis on the impact of bank concentration on industry economic growth taking into account the level of external financing needs of each industry.

Finally, to analyze if the role of bank concentration on economic growth varies depending on the features of institutional environment, bank regulation and supervision, we sequentially incorporate the interaction term between bank concentration and each variable proxying for the institutional, legal, and supervisory environment (CONC*ED*REGINST). The limited number of instruments, the extensive number of country variables, and the need to use interaction terms with the concentration variable all support incorporation of the coefficients separately rather than at the same time[3].

Following Krozsner *et al,.* (2007), we estimate the model for three subperiods, namely, before, during, and after a systemic banking crisis. Since it is difficult to identify a crisis period precisely, in particular the end of the crisis period, we use [t, $t+2$] as the crisis period, 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), published by the World Bank. We separate the pre-crisis period from the crisis period by three years, that is, we define the pre-crisis period to be [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. Similarly, we define the post-crisis period as [$t+3$, T], where t is the crisis inception date and T is the end of the sample period (generally, 2000).

A small number of countries experienced multiple crises during our sample period[4]. 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. The results are unchanged when we allow each crisis episode in a country to be a different observation.

3.2 Sample Description and Variables

The dependent variable is the growth rate on real industrial value added (GROWTH). The information on industrial value added comes from UNIDO, Industrial Statistic Database, (2006). This database contains information on 28 industrial sectors at 3-digit ISIC

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[3] Barth *et al.* (2004) use a similar sequential procedure to analyze the influence of regulatory and supervisory practices on bank development.
[4] See Table 1.

disaggregation level. To deflate the industrial value added, we consider a Consumer Price Index (CPI) from the International Monetary Fund. Following Rajan and Zingales, (1998), we calculate the industrial share on value added to control for the potential convergence effects among industries in our sample.

To approximate the level of financial development (FD) in each country, we consider the ratio private credit to deposit money banks to GDP. This variable also comes from the International Monetary Fund.

We use the measure of financial dependence (ED) calculated in Rajan and Zingales, (1998). This variable is defined as the fraction of capital expenditures not financed with cash-flow from operations. Rajan and Zinagales, (1998), construct their index of external dependence at the industry level for a sample of US firms. They 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 to identify the extent of an industry's external dependence anywhere in the world. Under the assumption that for technological and economic reasons some industries depend more on external finance than others, and these differences persist across countries, this index is valid for any industry in any country of the world.

As in Cetorelli and Gambera, (2001) and Beck *et al.,* (2006), among others, the level of bank concentration (CONC) is approximated by the ratio "assets from the three largest banks to total assets of banking industry in each country". This variable comes from the Beck *et al.,* (2000) database.

REGINST is the set of proxy variables of institutions, bank regulation and supervision in a country. These variables are ANTI, CORRUP, STANDARDS, RESTRICT, RESTOWN, OFFICIAL, MONITOR, ACCOUNT, and INS.

We use three indicators of the quality of a country's institutional environment: the anti-director rights (ANTI) defined as a measure of shareholder's protection and constructed by La Porta *et al.,* (2008); an index indicating the level of control of corruption in a country (CORRUP), from the International Country Risk Guide (ICRG); and an index reflecting the quality of disclosure of firms' annual reports (STANDARDS) from La Porta *et al.,* (1998).

Table 1

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 [t₁, t-3], where t₁ 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 averaged value for bank concentration on each country during 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

Country	Year								
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	1990	-0.037	-0.012	-0.037	985	101	1234	0.287	0.750

The proxies for the regulatory and supervisory variables come from the World Bank "Bank Regulation and Supervision Database" initially developed by Barth *et al.,* (2004). The measure of restrictions on bank activities (RESTRICT) indicate 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.

As indicator of the restrictiveness between the mixing of banking and commerce we split the latter variables and only consider whether bank ownership and control of non-financial firms is: (1) unrestricted, (2) permitted, (3) restricted or (4) prohibited, (RESTOWN).

A country's official supervisory power (OFFICIAL) is measured by adding a value of 1 for each affirmative answer to 14 questions intended to gauge the power of supervisors to undertake prompt corrective action, to restructure and reorganize troubled banks and to declare a deeply troubled bank insolvent. Higher values indicate more official supervisory power.

We use three indicators of private supervision. First, we measure private supervision using the private monitoring index of Barth *et al.*, (2004) (MONITOR). Higher values on this variable indicate more private oversight. Second, we also use the accounting and information disclosure requirements in the country (ACCOUNT). This variable ranges from 0 to 6, with higher values indicating more information disclosure requirements.

The third alternative measure of private monitoring is the presence of explicit deposit insurance in a country. It has long been suggested that while deposit insurance is established with the purpose of increasing depositors' confidence in the safety of their deposits and thus preventing bank runs (Diamond and Dybvig, 1983), more generous deposit insurance weakens the market discipline enforced by depositors, and encourages banks to take greater risk (Merton, 1977). Recent empirical evidence confirms this effect, showing that deposit insurance increases the likelihood of banking crises (Demirgüc-Kunt and Detragiache, 2002). To capture whether there is deposit insurance in the banking system, we use a dummy variable (INS) that takes a value of 1 if there is explicit deposit insurance and 0 otherwise.

To analyze the different impact of bank concentration on economic growth during banking crises in comparison to non-crisis periods in different legal and institutional environments, we sequentially incorporate an interaction term between bank concentration and each institutional, regulatory or supervisory variable from the vector REGINST (CONC*DEP*REGINST).

In all estimations we control for the potential endogeneity problem of bank concentration, institutions, bank regulation and supervision. We select much the same set of instruments as other authors for the legal and institutional variables. Following Barth *et al.*, (2004), we use as instruments five binary variables to describe the origin of the national legal code (English common law, French civil law, German civil law, Scandinavian civil law, and the

socialist/communist code); the latitudinal distance from the equator; and the religious composition of the population in each country (Catholic, Protestant, Muslim, other). We also check to see 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) or when we add the legal origin, the rule of law, the total GDP, and the country's population, as in Cetorelli and Gambera, (2001).

Our empirical analysis uses the legal origin of each country and a measure of the rule of law as instruments for the observed values of bank concentration[5].

We try to identify the exogenous component of each variable and control for potential simultaneity bias. This methodology allows us to focus on the influence of the exogenous component of banking market concentration, the quality of institutions, bank regulation and supervision on industrial economic growth during banking crises. To test the suitability of using an Instrumental Variables (IV) estimator we perform the Durbin-Wu-Hausman test. The test verifies the null hypothesis that the introduction of IVs has no effect on the 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.

We consider a higher number of countries and crises than previous studies do[6]. We analyze a sample of 70 systemic banking crises on 57 countries over the 1980-2000 period. We get the information on banking crises from the Caprio and Klingebiel, (2002) database and from the World Bank Database of Banking Crises (2003), published by the World Bank[7].

Due to data constraints, we drop a large number of countries. First, we drop crisis 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 private credit to GDP and on bank concentration reduces the sample to 70 banking crises from 57 countries. This final sample consists of 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 in our basic estimations.

Table 1 presents the final list of crisis countries and the crises inception dates following Caprio and Klingebiel, (2002) database and the World Bank Database of Banking Crises, (2003). For

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[5] Krozsner *et al.,* (2007) use the same instruments for the observed values of financial development on their robustness checks.
[6] Krozsner *et al.,* (2007), analyzes 45 banking crises in 45 countries during 1980-2000. Dell'Ariccia *et al.*, (2008) use data of 48 banking crises from 41 countries.
[7] The Caprio and Klingebiel, (2002) database contains information on 113 banking crises of 93 countries since the 70s. The World Bank Database of Banking Crises, (2003) reports information of 166 banking crises in 126 countries since the 80s to 2002.

each country's pre, during, and post-crisis periods we also present the average growth rate of real value added, the level of financial development on 1980, or first year available, and the averaged level of banking market concentration for each country.

4. EMPIRICAL RESULTS

4.1 Financial Development, External Dependence and Banking Crises

In this section we present the results of estimations testing whether sectors that are highly dependent on external finance tend to experience a substantially greater contraction of value added during banking crises in countries with deeper financial systems. The results are presented in Table 2. In the first and second columns, the dependent variable is the growth rate of real value added during the pre-crisis and crisis period, respectively. Consistent with the findings in Rajan and Zingales, (1998) and in Krozsner *et al.,* (2007), we obtain a positive and significant coefficient for the interaction term between financial development and the index of external financing dependence. This means that during non-crisis periods, industries with higher levels of financial dependence tend to grow faster in countries with more developed financial systems.

During crisis periods, we obtain the opposite relation. Industries more dependent on external sources of funds tend to growth disproportionately slower during systemic banking crises.In column (3) we present the results for the post-crisis period. As in Krozsner *et al.,* (2007), we do not obtain coefficients statistically significant for the interaction term between bank development and external dependence.

Having demonstrated that the growth impact of a banking crisis is different among industries depending on their reliance on external finance and on the financial development level, we are interested in analyze if the difference in growth between the crisis and the pre-crisis periods is economically and significantly important. In column (4) we present the results when we consider the difference in growth between the crisis and the pre-crisis periods. As expected, the reduction in the real growth rate of value added from the pre-crisis to the crisis period is greater for more financially dependent industries in countries with more developed financial systems.

In column (5) we estimate the difference in growth between the post-crisis and the crisis period; although positive, suggesting that highly financially dependent sectors grow faster during post-crisis periods than during crisis periods, the coefficient is not statistically significant. In column (6) we consider the difference in growth between the post-crisis and the pre-crisis period. We obtain a negative coefficient for the interaction term between financial development and external dependence. This negative coefficient might suggest the presence of long-term effects

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Table 2

This table shows the results of regressions analyzing the growth impact of a banking crisis on economic growth of sectors with different level of external dependence. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable (GROWTH) 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. SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED is 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.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7) Balanced Panel	(8)	(9) Multiple Crises Observations
	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
SHARE	-0.0953***	0.0884	0.0547	0.1420*	-0.0469	0.1399**	-0.0981***	0.0439	0.0998
	(-2.66)	(1.28)	(1.21)	(1.87)	(-0.53)	(2.46)	(-2.97)	(0.65)	(1.36)
ED * FD	0.0507**	-0.0280**	0.0082	-0.0812***	0.0364	-0.0351	0.0534***	-0.0278*	-0.0618*
	(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
F- test (p-value)	45.18	22.72	36.19	85.51	23.51	10.07	55.36	69.84	191.10
# Observations	927	909	805	692	739	663	692	692	870

of a banking crisis for industries more financially dependent. However, this coefficient is not statistically significant.

Following Krozsner *et al.,* (2007), in columns (7) and (8) we present the results using a balanced panel consisting of the same observations in both the pre-crisis and the crisis periods by dropping those sectors for which we only have data on one sub-period. This method allows us to consider the same number of observations during the pre-crisis and the crisis periods.[8] The results are very similar to those reported in columns (1) and (2). 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. Again the results are very similar to those commented above.

Summing up, we have corroborated the results obtained in Krozsner *et al*., (2007) over a greater sample of banking crises countries during consisting in 70 systemic banking crises in 57 countries over the 1980-2000 period. According to Rajan and Zingales, (1998), during normal times, industries highly dependent of external finance grow faster in countries with higher level of financial development. However, during banking crises, the higher dependence on external sources of funds, the higher value added contraction, in countries more financially developed.

4.2 Bank Concentration and Banking Crises

In this section we analyze the global impact of bank concentration on economic growth during banking crises. The results on the global impact of bank concentration on economic growth are presented on Table 3. From columns (1) to (3) we use the growth rate in real value added during pre-crisis, crisis and post-crisis periods as the dependent variable.

The coefficient of the interaction term between financial development and the index of external financing dependence remains positive and significant during pre-crisis periods. During crisis periods, the coefficient becomes negative and statistically significant, pointing out a more contracting effect of banking crises on industries highly dependent on external finance, according to previous results.

Following the traditional argument from banking literature that supports that in a market without information asymmetries, market power results in a higher price for credit and less credit availability, we obtain a negative and significant coefficient for bank concentration on economic growth during pre-crisis periods.

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[8] Note that the number of observations on columns (7) and (8) is the same than in columns (4), where the dependent variable is the difference in growth between the crisis and the pre-crisis period.

This result is consistent with previous works that deal with the idea that more banking market concentration implies an efficiency loss that involves the whole economy.

In column (2) we present the results using the growth rate in value added during the crisis period as dependent variable. In this case, we do not observe any statistically significant effect of bank concentration on industrial economic growth. Results for the post-crisis period are presented in column (3). In this case, the coefficient of the level of concentration of banking systems is again negative and significant, according to a more global negative effect of bank concentration on economic growth during stability periods. If we consider the difference in growth between the crisis and the pre-crisis period, we find that bank concentration has a positive and statistically significant coefficient. Although during pre-crisis period bank concentration has a general depressing effect on economic growth, we cannot confirm that this effect remains during banking crises. We can say that the level of concentration of banking systems does not affect more negatively during banking crises than during stability periods.

In column (5) we present the results of estimations using the difference on growth during the post-crisis and the crisis periods. As it was expected, we obtain a negative and significant effect for bank concentration suggesting that the negative effect of bank concentration on economic growth is stronger during the post-crisis period than during crisis periods. In column (6) we show the results with the difference in real growth rate of value added between the post-crisis and pre-crisis periods. The results confirm that while bank concentration has a global negative effect on economic growth during both pre-crisis and post-crisis periods, the negative impact is stronger during pre-crisis periods. This result may suggest the less negative effect of bank concentration after banking crises to promote the revitalization of the economies.

As in previous section, we estimate economic growth during pre-crisis and crisis periods using a balanced panel dataset. The results are closely similar to those reported in columns (1) and (2), respectively. Finally, in column (9) we allow for multiple crises observations for those countries that have experienced more than one crisis episode during the sample period. We obtain a positive and significant coefficient for the difference in growth between the crisis and pre-crisis period that confirm the more negative effect of bank concentration on economic growth during normal times.

In sum, we have analyzed the differences in the global impact of bank concentration on economic growth between stability and instability periods. We confirm previous results in Cetorelli and Gambera (2001), on the more negative effect of a concentrated banking system on industrial economic growth during stability periods.

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Table 3

This table shows the results of regressions analyzing the influence of bank concentration for economic growth during pre-crisis, crisis and post-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable (GROWTH) 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. SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED is the index of industrial external financial dependence calculated in Rajan and Zingales (1998). CONC is bank market concentration 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 CONC 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.

Explanatory Variables	(1) Pre-crisis	(2) Crisis	(3) Post-crisis	(4) Crisis vs. pre-crisis	(5) Post-crisis vs. Crisis	(6) Post-crisis vs. Pre-crisis	(7) Balanced Panel Pre-crisis	(8) Balanced Panel Crisis	(9) Multiple Crises Observations Crisis vs. pre-crisis
SHARE	-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)
ED * FD	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)
CONC	-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
F- test (p-value)	82.55	38.09	39.76	65.78	23.55	10.20	87.55	67.74	158.74
# 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***

4.3 Bank Concentration, Financial Dependence and Banking Crises

The approach outlined above enables us to identify the difference in terms of the economy-wide effect of bank concentration on economic growth between crisis and non-crisis periods. In this section we try to determine if the impact of banking market concentration on industry growth during banking crises may vary among industries depending on the level of external financial dependence. Results are presented in Table 4.

Following Cetorelli and Gambera, (2001), we add the interaction term between bank concentration and the index of external financial dependence to analyze if the global effect of bank concentration on economic growth is homogeneous among industries during stability and instability periods.

In the first column of Table 4 we present the results for industrial economic growth during pre-crisis periods. As expected, we obtain a positive and significant coefficient for the interaction term between bank concentration and the index of external financial dependence. According to Cetorelli and Gambera (2001), bank concentration promotes economic growth of industrial sectors that are more in need of external financing by facilitating credit access for younger firms. The argument is 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 (relationship banking). These credit relationships facilitate the availability of funds, thereby reducing firms' financial constraints (Petersen and Rajan, 1994, 1995; Boot, 2000; Dell'Ariccia and Marquez, 2004).

In column (2) we report the results for the crisis period. Again, while we confirm the more positive effect of bank concentration on economic growth of those industries more financially dependent during stability periods, we do not find a significant impact of bank concentration on economic growth during banking crises. However, if we look at the results presented in column (4), where the dependent variable is the difference in growth between crisis and pre-crisis periods, we obtain a negative and significant coefficient for the interaction term between bank concentration and the index of financial dependence. This means that bank concentration has a more negative effect on economic growth of industries with higher levels of financial dependence during crisis periods in comparison to pre-crisis periods.

In column (5) we present the results using the difference in growth rate of real value added between post-crisis and crisis period. We do not obtain significant coefficients for the interaction term CONC * ED. In column (6) the dependent variable is the difference in real growth rate of value added between the post-crisis and the pre-crisis period. In this case, we find

a negative and significant coefficient for the interaction term of bank concentration and external financing dependence.This result implies that the effect of bank concentration on economic growth of industries with higher levels of external financial dependence is more positive during pre-crisis periods. It might suggest that the benefits of bank concentration to solve adverse selection and moral hazard problems between banks and firms are reduced after a financial crisis.

This outcome again puts forward the more negative effect of bank concentration on economic growth in industries with higher levels of financial needs during banking crises. This result also indicates the long-term growth effects of systemic banking crises.

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

In Table 5 we add individually bank concentration (CONC) to control for the global effect of bank concentration on economic growth. Basically, results do not differ for those presented in Table 4 and described above.

4.4 Controlling for the Legal and Institutional Environment

To further investigate the different growth impact of bank concentration during banking crises during stability periods, we now consider other country-level characteristics that may be related to the impact of bank concentration on real economic growth. Results are presented in Table 6.

Specifically, we include sequentially an interaction term between financial dependence and each of the variables measuring the institutional, regulatory and supervisory features in each country. In columns (1) to (3) we control for the quality of institutions by including the interaction term between financial dependence and the anti-director rights index (ANTI), control of corruption index (CORRUP) and the measure of the quality of firms' accounting standards (STANDARDS).

In columns (4) and (5) we control for the restrictions on non-traditional banking activities (RESTRICT) and the restrictions on banking control of non-financial firms (RESTOWN). Finally, in the last four columns we enter our basic regressions adding the interaction terms between financial dependence and official supervision (OFFICIAL), private monitoring (MONITOR), disclosure information (ACCOUNT) and the existence of explicit deposit insurance (INS). The results on the impact of bank concentration on economic growth during banking crises are unchanged.

Table 4

This table shows the results of regressions analyzing the influence of bank concentration for economic growth in industries with different levels of external financial dependence, during pre-crisis, crisis and post-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable (GROWTH) 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. SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration 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 CONC 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
SHARE	-0.0761**	0.0763	0.0345	0.1258	-0.0502	0.1242**	-0.1009***	0.0246	0.0717
	(-1.85)	(0.98)	(0.78)	(1.52)	(-0.52)	(2.21)	(-3.64)	(0.32)	(0.92)
ED * FD	0.0265*	-0.0046	0.0000	-0.0335*	0.0101	-0.0277	0.0269*	-0.0063	-0.0036
	(1.77)	(-0.48)	(0.00)	(-1.77)	(0.51)	(-1.00)	(1.94)	(-0.57)	(-0.15)
CONC * ED	0.0706**	-0.0027	-0.0145	-0.0555*	-0.0070	-0.1181*	0.0540**	-0.0072	-0.0103
	(2.59)	(-0.20)	(-0.36)	(-1.70)	(-0.24)	(-1.89)	(1.96)	(-0.45)	(-0.38)
Industry Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES	YES	YES	YES	YES	YES
R-Squared	0.5547	0.5889	0.5252	0.5715	0.5355	0.3397	0.6633	0.5464	0.6729
F- test (p-value)	60.07	22.32	37.93	72.85	25.68	15.57	70.89	77.81	206.41
# Observations	769	793	719	599	662	592	599	599	767
Durbin-Wu-Hausman Test	6.71***	0.05	1.14	2.92*	0.84	3.57*	3.86**	0.00	2.46

Table 5

This table shows the results of regressions analyzing the influence of bank concentration for economic growth in industries with different levels of external financial dependence, during pre-crisis, crisis and post-crisis periods. Regressions are estimated using OLS estimators for cross-country data. In columns (1), (2) and (3), the dependent variable (GROWTH) 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. SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration 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 CONC 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.

Explanatory Variables	(1) Pre-crisis	(2) Crisis	(3) Post-crisis	(4) Crisis vs. pre-crisis	(5) Post-crisis vs. Crisis	(6) Post-crisis vs. Pre-crisis	(7) Balanced Panel Pre-crisis	(8) Balanced Panel Crisis	(9) Multiple Crises Observations Crisis vs. pre-crisis
SHARE	-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)
ED * FD	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)
CONC*ED	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)
CONC	-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
F- test (*p*-value)	93.39	38.44	41.33	76.84	25.22	15.98	110.02	77.66	231.97
# 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***

The coefficient for the interaction CONC*ED remains negative and significant in most regressions indicating that bank concentration has a less positive effect on economic growth during banking crises for those sectors more dependent on external financing. The institutional variables (ANTI, CORRUP and STANDARDS) present positive coefficients indicating that, during banking crises, the level of institutional development of a country has a positive effect on economic growth of industries that rely more on external finance.

Regulatory and supervisory variables in Table 6 also present individual significant effects on the difference in growth between crisis and pre-crisis periods. RESTRICT and RESTOWN have a more negative influence on economic growth during banking crises. At the same time, the presence of an explicit deposit insurance system during banking crises has positive and significant effect on industrial economic growth.

These results guide us to analyze empirically if the influence of bank concentration on economic growth may be different depending on the quality of institutions, the restrictiveness of banking regulations and the powerfulness of bank official and private supervision in each country. We covered this aim on next section.

4.5 Legal and Institutional Environment, Concentration and Banking Crises

In this section we study the effect of bank concentration on the difference in growth between stability and instability periods depending on the characteristics of institutions, regulation and supervision.

The Quality of Institutions

For a market to function well, firms must be able to rely on the enforceability of contracts. Weak legal systems and poor institutional infrastructure impede market development (La Porta *et al.,* 1998; Demirgüc-Kunt and Maksimovic, 2002). The difficulty of developing markets in these environments may make long-term relationships between banks and debtors helpful in solving the problem (La Porta *et al.,* 1998). During stability periods, bank concentration in poor developed markets may favor these relationships and thereby have a positive effect on economic growth. Bank concentration in underdeveloped markets may thus substitute for strong legal protection of creditors and property, and work in the absence of strong institutions to reduce information asymmetries and agency costs between banks and firm owners.

Table 6

This table shows the results of regressions analyzing the influence of bank regulation on non-traditional banking activities on the role of bank concentration for economic growth. Regressions are estimated using OLS estimators for cross-country data. In all regressions the dependent variable is the difference in growth rate of real value added between the crisis and the pre-crisis periods (GROWTH). SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration. ANTI is the anti-director rights index calculated in La Porta *et al.,* (2008). CORRUP is the index of control of corruption from ICRG. STANDARDS is the accounting standards calculated in La Porta *et al.,* (1998) reflecting the quality of disclosure of firm's annual reports. RESTRICT is an indicator of the degree to which banks' activities are restricted outside the credit and deposit business. RESTOWN is an indicator of the extent to which banks may own and control non-financial firms. OFFICIAL measures official supervisory power. MONITOR measures market monitoring. ACCOUNT is an index of accounting and information disclosure requirements. INS is a dummy variable that takes a value of 1 if the country has an explicit deposit insurance scheme and 0 otherwise. 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 for CONC, ANTI, CORRUP, STANDARDS, RESTRICT, RESTOWN, OFFICIAL, MONITOR, ACCOOUNT and INS 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. Instruments for supervisory variables are: legal origin, latitudinal distance from the equator, and religious composition of the population in each country. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
SHARE	0.1567	0.1238	0.4767*	0.1280	0.1237	0.1230	0.1252	0.1260	O.1253
	(1.22)	(1.50)	(1.84)	(1.55)	(1.49)	(1.49)	(1.51)	(1.53)	(1.52)
ED * FD	-0.0417**	-0.0497**	-0.0615**	-0.0572***	-0.0385**	-0.0486***	-0.0448**	-0.0313*	-0.0440**
	(-2.40)	(-2.59)	(-2.47)	(-2.71)	(-2.02)	(-2.64)	(-2.29)	(-1.79)	(-2.18)
CONC * ED	0.0180	-0.1316**	-0.0425*	-0.1547***	-0.1231***	-0.1069**	-0.0093	-0.0576*	-0.0642**
	(0.61)	(-2.10)	(-1.78)	(-3.45)	(-2.96)	(-2.31)	(-0.41)	(-1.70)	(-1.97)
ANTI*ED	0.0220***								
	(2.79)								
CORRUP*ED		0.0064							
		(1.56)							
STANDARDS*ED			0.0013***						
			(2.74)						
RESTRICT*ED				-0.0179***					
				(-3.10)					
RESTOWN*ED					-0.0674***				
					(-3.25)				
OFFICIAL*ED						-0.0098			
						(-1.65)			
MONITOR*ED							0.0034		
							(0.60)		
ACCOUNT*ED								-0.0032	
								(-0.39)	
INS*ED									0.0154*
									(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	0.4050	0.5722	0.4668	0.5737	0.5752	0.5726	0.5715	0.5717	0.5719
F- test (*p*-value)	21.56	72.45	14.72	70.97	72.77	72.95	71.73	71.32	71.61
# Observations	472	599	269	599	599	599	599	599	599
Durbin-Wu-Hausman Test	4.05**	2.34**	2.27	6.38***	5.80***	2.67*	2.18	2.89*	3.89**

The estimations on the analysis of the impact of bank concentration on economic growth during banking crises in different institutional environments are presented in Table 7. To asses if the impact of bank concentration on economic growth during banking crises varies depending on institutional quality, we add sequentially an interaction term between bank concentration, financial dependence and each of the institutional variables.

In all estimations the interaction term between bank concentration, financial dependence and each of the institutional variables has a positive and significant coefficient. This means that although bank concentration has a positive effect on economic growth in countries with poor institutional environments during non-crisis periods, this effect disappears when a banking crisis occurs in these countries. Bank concentration does not help during banking crises in countries with poor development of institutions. This result indicates the needing of well-functioning and developed institutions to promote economic growth and help long-term consequences of a banking crisis disappear.

Table 7

This table shows the results of regressions analyzing the influence of institutional quality on the role of bank concentration for economic growth. Regressions are estimated using OLS estimators for cross-country data. In all regressions the dependent variable is the difference in growth rate of real value added between the crisis and the pre-crisis periods (GROWTH). SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration. ANTI is the index calculated in La Porta *et al.,* (2008). CORRUP is the index of control of corruption from ICRG. STANDARDS is the accounting standards calculated in La Porta *et al.,* (1998) reflecting the quality of disclosure of firm's annual reports 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 for CONC, ANTI, CORRUP and STANDARDS 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. Instruments for institutional variables are: legal origin, latitudinal distance from the equator, and the religious composition of the population in each country. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	(1)	(2)	(3)
SHARE	0.1564	0.1233	0.4777*
	(1.21)	(1.49)	(1.85)
ED * FD	-0.0408**	-0.0514***	-0.0638**
	(-2.37)	(-2.64)	(-2.48)
CONC * ED	-0.0901**	-0.2016**	-0.1814**
	(-2.39)	(-2.12)	(-2.26)
CONC * ED * ANTI	0.0316***		
	(3.83)		
CONC * ED * CORRUP		0.0088*	
		(1.77)	
CONC * ED * STANDARDS			0.0016**
			(2.60)
Industry Dummies	YES	YES	YES
Country Dummies	YES	YES	YES
R-Squared	0.4052	0.5724	0.4660
F- test (*p*-value)	21.59	72.71	14.42
# Observations	472	599	269
Durbin-Wu-Hausman Test	4.15**	2.52*	3.39**

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Bank Regulation, Concentration and Banking Crises

We next examine whether regulatory restrictions on non-traditional bank activities affect the impact of bank concentration on the difference in growth between crisis and pre-crisis periods. Results in Table 8 show negative and statistically significant coefficients for the interaction terms of CONC x RESTRICT and CONC x RESTOWN.

This result indicates that tighter restrictions on both bank activities in the securities, insurance, and real estate markets and on bank ownership and control of non-financial firms have a more positive effect of bank concentration on economic growth during stability periods than during crisis periods. 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 play a crucial role in promoting lending relationships. That is, bank concentration facilitates the exploitation of economies of scale and scope, and thus may have a more positive (less negative) influence on economic growth. Limiting bank ownership and control of non-financial firms may also reduce the market power of banks associated with a given bank concentration, thus reducing the hold-up problem in the lending relationship. Higher restrictions on bank ownership of non-financial firms may also increase the marginal benefit of bank concentration to solve the conflicts of interests that cannot be reduced when banks are not allowed to hold equity in their debtors.

However, during banking crises, results may indicate that restrictions on non-traditional banking activities do not increase the benefits of bank concentration to foster economic growth through the creation of close lending relations between banks and firms. This result indicates that during financial crises, the legal obligation for banks to focus on traditional lending and deposit activities impedes banks to invest on other banking activities and get a more efficient risk assessment.

Bank Supervision, Concentration and Banking Crises

In this section we analyze if the impact of bank concentration on economic growth differs from non-crisis to crisis periods depending on the characteristics of official and private bank supervision in a country. Results are presented in Table 9.

In column (1) we present the results analyzing the influence of official supervision on the effect of bank concentration on the difference in growth between crisis and pre-crisis periods. We find a negative and significant coefficient for the interaction CONC*ED*OFFICIAL. This result indicates that, during non-crisis periods, the more positive effect of bank concentration on economic growth occurs in countries with relatively more powerful official supervision.

Table 8

This table shows the results of regressions analyzing the influence of bank regulation on non-traditional banking activities on the role of bank concentration for economic growth. Regressions are estimated using OLS estimators for cross-country data. In all regressions the dependent variable is the difference in growth rate of real value added between the crisis and the pre-crisis periods (GROWTH). SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration. RESTRICT is an indicator of the degree to which banks' activities are restricted outside the credit and deposit business. RESTOWN is an 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 for CONC, RESTRICT and RESTOWN 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. Instruments for regulatory variables are: legal origin, latitudinal distance from the equator, and the religious composition of the population in each country. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	(1)	(2)
SHARE	0.1278 (1.54)	0.1234 (1.49)
ED * FD	-0.0587*** (-2.80)	-0.0418** (-2.16)
CONC * ED	0.0771 (1.57)	0.1331** (2.37)
CONC * ED * RESTRICT	-0.0238*** (-3.37)	
CONC * ED * RESTOWN		-0.0959*** (-3.38)
Industry Dummies	YES	YES
Country Dummies	YES	YES
R-Squared	0.5739	0.5755
F- test (*p*-value)	71.02	73.00
# Observations	599	599
Durbin-Wu-Hausman Test	6.93***	6.14***

During stability periods, more official supervision may substitute market discipline in these countries and increase the benefits of bank concentration on economic growth by promoting close lending relationships between banks and the more financially dependent firms. The negative coefficient of this interaction term points out to a less positive effect of bank concentration on economic growth during banking crises.

In column (2) we analyze the influence of bank concentration on economic growth in countries with stronger market discipline. The positive coefficient of CONC*ED*MONITOR indicates that during non-crisis periods, bank concentration has a more positive effect on economic growth in countries with less private monitoring of banks. In this case, the weaker market discipline increases the benefits of bank concentration in solving information problems between banks and firms through the establishment of close lending relationships. The positive coefficient of this interaction term, points out a reduction in the benefits of bank concentration on economic growth in countries with poor market discipline during banking crises. This less positive influence of bank market concentration during pre-crisis periods is also observed in countries with explicit deposit insurance, as the interaction term CONC*DEP*INS has a positive coefficient. During crisis periods, explicit deposit insurance systems makes possible that bank concentration has a less negative effect on economic growth.

Although we do not find statistical evidence for the indicator of accounting and information disclosure requirements (ACCOUNT), results in columns (1), (2) and (4) indicate the greater importance of market discipline to promote a less negative effect of bank concentration on economic growth during episodes of banking distress.

Table 9

This table shows the results of regressions analyzing the influence of bank supervision on the role of bank concentration for economic growth. Regressions are estimated using OLS estimators for cross-country data. In all regressions the dependent variable is the difference in growth rate of real value added between the crisis and the pre-crisis periods (GROWTH). SHARE is the industrial share of value added for each industry in 1980. BANK measures bank financial development as the value of private credits by deposit money banks and other financial institutions to the private sector divided by GDP. ED refers to the index of borrowing needs of firms less than 10 years old calculated in Rajan and Zingales (1998). CONC is bank market concentration. OFFICIAL measures official supervisory power. MONITOR measures market monitoring. ACCOUNT is an index of accounting and information disclosure requirements. INS is a dummy variable that takes a value of 1 if the country has an explicit deposit insurance scheme and 0 otherwise. Country dummies, industry dummies and year dummy variables are included on estimations, but are not reported. The Durbin-Wu-Hausman statistic tests the null hypothesis that the use of instruments for CONC, OFFICIAL, MONITOR, ACCOUNT and INS 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. Instruments for supervisory variables are: legal origin, latitudinal distance from the equator, and the religious composition of the population in each country. T-statistics are between parentheses. ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Explanatory Variables	(1)	(2)	(3)	(4)
SHARE	0.1224	0.1226	0.1265	0.1254
	(1.48)	(1.48)	(1.53)	(1.52)
ED * FD	-0.0498***	-0.0453**	-0.0356**	-0.0431**
	(-2.69)	(-2.25)	(-1.98)	(-2.21)
CONC * ED	0.0257	-0.1598**	0.0026	-0.0749**
	(0.49)	(-2.12)	(0.05)	(-2.20)
CONC * ED * OFFICIAL	-0.0140*			
	(-1.80)			
CONC * ED * MONITOR		0.0134*		
		(1.79)		
CONC * ED * ACCOUNT			-0.0025	
			(-0.22)	
CONC * ED * INSURANCE				0.0221*
				(1.89)
Industry Dummies	YES	YES	YES	YES
Country Dummies	YES	YES	YES	YES
R-Squared	0.5727	0.5725	0.5713	0.5720
F- test (*p*-value)	73.28	73.08	71.02	71.50
# Observations	599	599	599	599
Durbin-Wu-Hausman Test	2.79*	2.34*	1.44	3.15**

4.6 Robustness Checks

In further analysis we check the robustness of the results. First, we consider alternative measures of bank market concentration: 1) the fraction of deposits held by the five largest commercial banks in total banking system deposits, from the World Bank's Bank Regulation Supervision Database developed by Barth *et al*., (2004), and 2) the Herfindahl Index averaged over the 1980-1997 period, from Beck *et al.,* (2006). Results are similar to those previously reported.

Second, we also check to see that results do not vary when we use as instruments for bank concentration only the country's legal origin as in La Porta *et al.,* (1998), Beck *et al.,* (2000),

and Levine *et al.,* (2000), or when we add the legal origin, the rule of law, the total GDP, and the country's population, as in Cetorelli and Gambera, (2001).

5. CONCLUSIONS

We have studied the role of banking market structure over the real effects of banking crises, considering different institutional, regulatory and supervisory environments. Over a sample of 70 systemic banking crises in 57 developed and developing countries in the 1980-2000 period, our first result shows that more concentrated banking markets tend on average to experience a lower contraction of value added during banking crises. However, this finding varies across sectors depending on the external financial dependence. Those sectors that are highly dependent on external finance tend to experience a substantially greater contraction of value added during a banking crisis in countries with more concentrated banking systems.

We have analyzed if the quality of institutions affects the influence of bank concentration on economic growth differently during banking crises. Our empirical evidence shows that, during stability periods, bank concentration presents a more positive effect on economic growth in countries with poor developed institutions. This effect is less positive during banking crises episodes. Results indicate a greater importance of well-functioning institutions to promote economic growth during banking crises, either in concentrated and non-concentrated banking markets.

When we analyze the features of bank regulation, we find that tighter restrictions on non-traditional banking activities and on bank ownership of non-financial firms lead to a lower reduction on economic growth during crisis periods than pre-crisis periods. If we interact the effects of bank regulation with the effects of bank concentration on economic growth, the results show that, during banking crises, bank concentration has a less positive effect on economic growth of more financially dependent industries in countries with more restrictions on non-traditional banking activities. These results point out the more negative effect of bank concentration on industries with higher levels of financial needs during banking crises, either on highly restricted and non-restricted banking systems. Our evidence supports the fact that during stability periods, the need for banks to focus on traditional lending and deposit activities makes possible that banks have incentives to invest in close lending relationships with firms through which solve adverse selection and moral hazard problems. Thus, we find that bank concentration has a more positive impact on industrial value added on these environments.

Finally, we have analyzed the role of bank supervision on economic growth. The results show that more market discipline is associated with a lower positive influence of bank concentration on economic growth during non-crisis periods. This result is consistent with the belief that in

countries with weaker market discipline, bank concentration substitute financial markets for solving information problems between banks and firms. In these cases, bank concentration may stimulate economic growth through lending relationships. Nevertheless, during banking crises, we find an opposite effect of bank concentration on economic growth. This result may indicate the greater importance of stronger market discipline in promoting a less negative effect of bank concentration on economic growth during episodes of banking distress.

6. REFERENCES

BARTH, J.R., CAPRIO, G., and LEVINE, R., (2004), «Bank regulation and supervision: What works best?», *Journal of Financial Intermediation*, 13, 205-248.

BECK, T., DEMIRGÜC-KUNT, A., and LEVINE, R., (2006), «Bank concentration, competition, and crisis: First results», *Journal of Banking and Finance*, 30, 1581-1603.

BECK, T., and LEVINE, R., (2002), «Industry growth and capital allocation: Does having a market or bank system matter?», *Journal of Financial Economics,* 64, 147-180.

BECK, T., LEVINE, R., and LOAYZA, N. (2000), «Finance and the sources of growth», *Journal of Financial Economics,* 58, 261-300.

BERGER, A., DEMIRGÜC-KUNT, A., LEVINE, R., and HAUBRICH, G., (2004), «Bank concentration and competition: An evolution in the making», *Journal of Money, Credit and Banking*, 36, 433-451.

BOOT, A.W.A., (2000), «Relationship banking: What do we know?», *Journal of Financial Intermediation*, 9, 7-25.

CAPRIO, G., and KLINGEBIEL, D., (2002): «Episodes of systemic and borderline financial crises», In Klingebiel, D., Laeve, L. (Eds.), *Managing the Real and Fiscal Effects of Banking Crises*, World Bank Discussion Paper No. 428, Washington, DC, 31-49.

CETORELLI, N., and GAMBERA, M., (2001), «Banking market structure, financial dependence and growth: international evidence from industry data», *The Journal of Finance*, 56, 617-648.

CLAESSENS, S., and LAEVEN, L., (2003), «Financial development, property rights, and growth», *The Journal of Finance*, 58, 2401-2436.

DELL'ARICCIA, G., and MARQUEZ, R., (2004), «Information and bank credit allocation», *Journal of Financial Economics,* 72, 185-214.

DELL'ARICCIA, G., DETRAGIACHE, E., and RAJAN. R., (2008), «The real effect of banking crises», *Journal of Financial Intermediation*, 7, 89-112.

DEMIRGÜC-KUNT, A., and DETRAGIACHE, E., (2002), «Does deposit insurance increase banking system stability? An empirical investigation», *Journal of Monetary Economic,* 49, 1373-1406.

DEMIRGÜC-KUNT, A., and MAKSIMOVIC, V., (1998), «Law, finance and firm growth», *The Journal of Finance,* 53, 2107-2137.

DEMIRGÜC-KUNT, A., and MAKSIMOVIC, V., (1999), «Institutions, financial markets, and firm debt maturity», *Journal of Financial Economics,* 65, 337-363.

DEMIRGÜC-KUNT, A., and MAKSIMOVIC, V., (2002), «Funding growth in bank-based and market-based financial systems: Evidence from firm-level data», *Journal of Financial Economics*, 69, 191-226.

DIAMOND, D. W., and DYBVIG, P. H., (1983), «Bank runs, deposit insurance, and liquidity», *Journal of Political Economy*, 91, 401-19.

DJANKOV, S., R. LA PORTA, F. LÓPEZ-DE-SILANES and A. SHLEIFER (2008), «The law and economics of self-dealing», *Journal of Financial Economics*, 3, 430-465.

KING G., R., and LEVINE, R, (1993), «Finance and growth: Schumpeter might be right», *Quarterly Journal of Economics*, 108, 717-737.

KROZSNER, R.S., LAEVEN, L. and KLINGEBIEL, D., (2007), «Banking crises, financial dependence and growth», *Journal of Financial Economics,* 84, 187-228.

LA PORTA, R., LOPEZ-DE-SILANES, F., and SHLEIFER, A., (1997), «Legal determinants of external finance», *The Journal of Finance*, 52, 1131-1150.

LA PORTA, R., LOPEZ-DE-SILANES, F., and SHLEIFER, A., (1998), «Law and Finance», *Journal of Political Economy*, 106, 1113-1155.

LEVINE, R., and ZERVOS, S., (1998), «Stock markets and economic growth», *American Economic Review*, 88, 537-558.

MERTON, R. C., (1977), «An analytic derivation of the cost of deposit insurance and loan guarantees: An application of modern option pricing theory», *Journal of Banking and Finance*, 1, 3-11.

PETERSEN, M. A., and RAJAN, R. G., (1994), «The benefits of lending relationships: Evidence from small business data», *The Journal of Finance*, 49, 1367-1400.

PETERSEN, M. A., and RAJAN, R. G., (1995), «The effect of credit market competition on lending relationships», *The Quarterly Journal of Economics,* 110, 407-443.

RAJAN, R.G., (1992), «Insiders and outsiders: the choice between informed and arms length debt», *The Journal of Finance*, 47, 1367-1400.

RAJAN, R. G., and ZINGALES, L., (1998), «Financial dependence and growth». *The American Economic Review*, 88, 559-586.