

# Prudential Regulation and Supervision of the Banking Sector and Banking Crises: A Cross Country Empirical Investigation

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## Abstract

The main purpose in this study is to see empirically whether there really exists a clear association between weaknesses in the regulation and supervision of the banking sector and banking crises. Test results indicate that capital regulations are a major factor in the prevention of crises, giving important support to the propositions towards ensuring higher capital requirements. However, tighter capital regulations do not seem to mitigate the negative impact of moral hazard problem generated by generous deposit insurance system. While inflation has a significant role in the generation of crisis, its significance weakens to a major extent, when accompanied with regulatory and supervisory factors. Hence, the significance of regulatory and supervisory framework of the banking system is once more justified.

**Keywords:** *Banking Regulation and Supervision, Banking Crisis.*

**JEL Classification:** *G18, G21, G28*

## Özet - Bankacılık Sektörü Düzenlemesi ve Denetlemesi ile Bankacılık Krizleri: Ülke Bazında Ampirik Sınama

Bu çalışmanın temel amacı bankacılık sektörünün düzenlenmesi ve denetlenmesindeki zayıflıklar ile bankacılık krizleri arasında net bir ilişki olup olmadığını ampirik olarak sınamaktır. Ampirik bulgulara göre sermaye düzenlemeleri krizlerin önlenmesinde önemli bir unsur olup, sermaye yeterliliklerinin yükseltilmesine yönelik önerileri destekler niteliktedir. Diğer taraftan, daha sıkı sermaye düzenlemeleri mevduat güvencesi tarafından oluşturulan "ahlaki çöküntü" probleminin olumsuz etkisini azaltacak nitelikte değildir. Enflasyon, krizlerin çıkmasında önemli rolü olan bir değişken iken, düzenleme ve denetlemeye ilişkin başka değişkenlerle birlikte test edildiğinde önemi azalmaktadır. Bu durum, bankacılık sektörünün düzenlemesi ve denetlemesinin önemini bir kez daha desteklemektedir.

**Anahtar Kelimeler:** *Bankacılık Sektörünün Düzenlemesi ve Denetlenmesi, Bankacılık Krizi.*

**JEL Sınıflaması:** *G18, G21, G28*

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*The views expressed in this paper are solely of the author, and do not necessarily reflect the views of the Central Bank of the Republic of Turkey*

## 1. Introduction

Weakness of the regulation and supervision of the financial system is viewed as a major factor, contributing to the emergence of bank failures (Fischer and Reisen, 1992:103; Noy, 2004:341; Mishkin, 2001:8) and financial crisis. It is argued that if financial liberalization is accompanied with weak prudential supervision of the banking sector, then it will result in excessive risk taking by financial intermediaries and a subsequent crisis (Demirgüç-Kunt and Detradiache, 1998; Edwards, 2000; Rossi, 1999; Mehrez and Kaufmann, 2000).

Analogous to these arguments, weak regulation and supervision has been held at least partly responsible for leading to crises in countries ranging from the United States and Japan, to Korea and Mexico, Chile, Thailand on the one hand, to India, Russia, Ghana and Hungary, on the other (Barth et al., 1999a:1). The most striking and strong arguments in this context have been raised for the Asian crisis. It is asserted that it would have been possible to avoid the Asian crisis, if banks had been supervised well (Williamson, 1999:10; Intal et al. 2001:43). Mishkin (2001:8) provides support for this thesis by arguing that the non-crisis countries in East Asia, which are Singapore, Hong Kong and Taiwan, had very strong prudential supervision. Corbett, Irwin and Vines (1999:193) claim that vulnerability to crisis in Asia was created by “liberalization of both trade and financial markets in the presence of an un-reformed financial system”<sup>(1)</sup>. Then, more recently, economic crises experienced by Turkey in 2000 and 2001 have drawn attention to the strong correspondence between weak regulation and supervision of the banking system and the outbreak of crises. In the case of Turkey, it is argued that weaknesses in the regulation of both public and private banks contributed significantly to the emergence of crises<sup>(2)</sup>.

Furthermore, a cross-country comparison<sup>(3)</sup> conducted by Williamson and Mahar (1998) concludes that prudential regulation and supervision was stronger in countries experiencing less severe financial crisis as compared to those experiencing a

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(1) *“The key mistake, which led to the vulnerability of the financial system in Asia, is believed to be that the old-style financial system continued into the new era of liberalization” (Corbett, Irwin and Vines, 1999:194).*

(2) *Alper and Öniş (2002:2) argue that private commercial banks were instrumental in the outbreak of November 2000 crisis, while it was public banks that were the chief culprits in the subsequent crisis of February 2001.*

(3) *They constructed an index of the level of prudential regulation and supervision in thirty-three countries. Average level of prudential regulation and supervision in all the countries that experiences financial crises is examined regardless of whether the crisis occurred before or after liberalization.*

more severe crisis. Besides, average level of prudential regulation and supervision in the five-year period preceding a crisis is found not to be independent from the occurrence of a banking crisis.

While weakness of the banking sector, of course, is not the only element that generates vulnerability to economic crisis, banking regulation and supervision emerges as a major component of vulnerability to crisis. It is argued that as capital account liberalization intensifies capital mobility, this imposes a greater burden on a country to assure that its financial system is well supervised and regulated (Dornbusch, 1998:20). It is asserted that strong banking systems can better handle reversals in capital flows, while weak and inefficient banking systems are less able to cope with volatile capital flows, therefore, are more vulnerable to contagion (Johnston, 1998:5; Johnston et al., 1997:7). This means that they are more likely to propagate and magnify the effects of financial crises on other economies. Furthermore, it is claimed that concerns about banking solvency or inadequate regulatory frameworks may encourage capital flight.

While an extensive literature is devoted to explain reasons and consequences of financial, mostly banking, crises, reforms proposed to help preventing crises mostly include changes in existing financial regulations and supervisory standards. There exists a long list of “best practices” for the regulation and supervision of banks, which is proposed by the Bank for International Settlements (BIS) and further extended by the IMF and the World Bank. The underlying phenomenon is the belief that if only policymakers in countries around the world would implement particular regulatory and supervisory practices, then banks would be sound and strong, which would prevent banking crises to great extent.

Hence, almost all international financial institutions, but especially the World Bank and the IMF have begun to urge countries to adopt and implement appropriate regulations and supervisory practices for their financial systems. For instance, Barth et al. (1999b:1) emphasize that the World Bank stresses the importance of prudential regulation and supervision more than ever in its all financial sector reviews and projects. It is believed that improvements in the existing financial systems will reduce the likelihood of financial instability and crisis<sup>(4)</sup>.

The validity of these assertions and beliefs should be questioned, as there is relatively very little empirical evidence that supports the advice for regulatory and supervisory reforms. For instance, there exist only a few studies that question whether the so-called “best practices” currently being advocated by international agenci-

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<sup>(4)</sup> See Neyaptı and Dinçer (2005b) for a discussion about the hypothesis that experience of financial crises results in the lesson of adopting higher quality of regulatory and supervisory environment.

es are the best ones for promoting well-functioning banks and whether successful practices in the United States succeed in countries with different institutional and political environments (Barth et al., 2002:1).

The reason for the absence of adequate empirical evidence in the literature is the lack of detailed cross-country comparisons of financial and regulatory systems for developing countries and the difficulty of obtaining adequate measures to describe the regulatory and supervisory structure. It was only very recently, in 1999, that data on the practices of various financial regulatory and supervisory authorities for a wide range of countries began to be assembled and analyzed. Hence, the push to reforming financial regulation and supervision by international institutions has begun without even the knowledge as to whether or under what circumstances these efforts will be successful (Barth et al., 1999a:3). Furthermore, advice for banking reforms to prevent banking crises began without sufficient information about the extent to which these regulatory and supervisory reforms increase or decrease the likelihood of a banking crisis. In addition, there is very little knowledge about the appropriate way to reform financial sector regulation and supervision in many countries. In view of the fact that capital requirements and regulatory standards recommended by the Basel Committee are designed for industrial countries, their appropriateness for emerging market countries have been rightly questioned in recent years especially in the face of severe banking crises<sup>(5)</sup>.

There exist mainly two approaches to measure the quality of banking regulation and supervision: 1) evaluation of the letter of the law and 2) surveys<sup>(6)</sup>. Among the survey-based approach to collect information related to bank regulations and supervisory activities, the first extensive effort on a worldwide scale has been designed and implemented by Barth et al. in 1999, through a questionnaire sent to more than 107 countries<sup>(7)</sup>. Then, they used this data to assess the relationship between spe-

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(5) *This argument is mainly raised and discussed by Rojas Suarez (2001).*

(6) *Neyaptı and Dincer (2005a) discuss the advantages and disadvantages of both approaches.*

(7) *This survey was funded by the World Bank. The data were based upon surveys sent to national bank regulatory and supervisory authorities: The contact individuals at national regulatory and supervisory agencies were provided by the Basel Committee on Banking Supervision. Furthermore, participants to the World Bank seminars for bank supervision from emerging market countries were also asked to complete the survey. Furthermore, the World Bank personnel traveling to countries that had not yet responded to the survey delivered the survey to the appropriate officials. The data is available at the following website:*

*[http://www.worldbank.org/research/projects/bank\\_regulation.htm](http://www.worldbank.org/research/projects/bank_regulation.htm)*

*<http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html>*

cific regulatory and supervisory practices and banking sector development and fragility in a series of studies (Barth et al., 1999a; 1999b; 2002). Previously, again through a survey based approach, information was collected by Claessens (1996) for a rather limited group of countries, twenty-five transition countries and six comparator countries. The alternative approach, that is, measurement based on various legal attributes, has been carried out by Dincer and Neyapti (2005) to evaluate the quality of the legal aspects of bank regulation and supervision for twenty-three transition countries.

Our purpose in this study, first of all, is to see whether there really exists a clear association between weaknesses in the regulation and supervision of the banking sector and financial crises through an empirical analysis. We specifically ask the following questions: Is the weak banking sector supervision and regulation a major contributor to banking crisis? What is the relative role of macroeconomic deterioration in the generation of the crisis, especially when examined together with variables related to the supervisory and regulatory framework.

Our analysis differs from that of Barth<sup>(8)</sup> et al. (2002) in that we incorporate various macroeconomic indicators into the analysis. Empirical results in this study point to the robust significance of deposit insurance and capital requirements in leading to crises. Our test results indicate that capital regulations is a major factor in the prevention of crises, which give important support to the propositions led by international agencies towards ensuring higher capital requirements. On the other hand, tighter capital regulations do not seem to mitigate the negative impact of moral hazard problem generated by generous deposit insurance system, which is a striking message against propositions raised by international financial institutions towards stressing more stringent capital requirements as a remedy for generous deposit insurance system. While inflation is a major macroeconomic indicator, with a significant role in the generation of crisis, its significance weakens to a major extent, when accompanied with regulatory and supervisory factors. Hence, the significance of regulatory and supervisory framework of the banking system is once more justified.

This paper is organized as follows: The reasons for the need for a strong regulatory and supervisory framework of the banking system are explored in section 2.

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<sup>(8)</sup> *Inflation was the only macroeconomic indicator they have used in their banking crises regressions.*

Section 3 discusses previous studies. Section 4 is devoted to our empirical analysis. Section 5 concludes.

## **2. Excessive Risk Taking by Banks and the Need for Prudential Regulation and Supervision**

Banks generally have an incentive to engage in excessive risk-taking and speculative activities as long as they guarantee that their failure will not threaten their shareholders and managers. This guarantee is provided by deposit insurance, implicit or explicit guarantees for bail-out by the government and through easy access to the lender-of-last resort facility (Akyüz, 1993:16).

Deposit insurance, which is a scheme particularly observed in developing countries and designed to protect depositors and attract funds to the banks, provides a kind of guarantee that financial institutions would not be allowed to go broke and/or government bail-outs would protect them. Then, banks having this guarantee, being obliged to pay very little for the insurance coverage, may have all the incentives to channel funds into high-return, high-risk and speculative projects and be illiquid (Akyüz, 1993:16). These incentives provided by deposit insurance system stimulate excessive risk-taking by banks in the presence of weak prudential regulation and poor supervision, either in design or enforcement or both, such that the levels of bank capital and provisions for loan losses become inadequate. McKinnon (1998:56) calls this situation as the “overborrowing syndrome”, which refers to excessive bank lending.

The threat for the economy emerges when banks expand their risky activities at rates that far exceed their capacity to manage them prudently. For instance, the main reason behind the collapse of the domestic financial system in Latin America in the early 1980s was the belief among depositors and financial intermediaries that the government would step in crisis times to protect depositors’ savings and prevent closure of financial firms. Even if there was no explicitly stated guarantee by the government, the fact that there was no credible threat of bankruptcy and a belief of full guarantee among domestic depositors and foreign lenders resulted in moral hazard problems. These problems were further aggravated by inadequate supervisory and prudential regulation system.

According to Corbett et al. (1999:209), the Asian crisis was the “consequence of insufficient institutional development in the region during the miracle boom period”. It is argued that implicit guarantees in the financial system were one of the ma-

major flaws during the period of liberalization. Therefore, one of the factors that created vulnerability in Asia was the presence of a bank-based financial regime in which “there was implicit promises of a government bailout of the financial system in the event of bad out-turns” (Corbett et al., 1999: 191).

Consequently, strengthening prudential regulation and supervision is necessary to deal effectively with the banking sector risks, particularly in the context of capital account liberalization. Moreover, strong regulatory and supervisory policies are important to minimize moral hazard (including corruption, fraud and excessive risk taking) in the banking system. Moreover, the existence of systemic risk provides strong arguments for regulation<sup>(9)</sup>. Since each bank is an integral part of the payment system, failure of a bank can generate a domino effect on the other solvent and profitable banks. Therefore, risk of a system failure forms the basis of the argument of insuring banks against liquidity shocks. The Asian crisis of 1997 is an example for the problem of systemic risk. Another reason for bank regulation is the existence of asymmetric information problem and the inability of small depositors to monitor banks. Concerning the inability of small depositors to monitor banks, it is argued that there is a need for the regulatory authority agent to act as a public representative of depositors (Alper and Öniş, 2002:5-6).

Alper and Öniş (2002:5) assert that effective regulation is particularly important for what they call “transitional financial systems” to describe a system where market liberalization proceeds rapidly in the absence of an effective legal and institutional infrastructure. These intermediate regimes are observed in emerging market economies such as Turkey, Mexico and Argentina. It is argued that there is a clear need to develop a strong banking regulatory framework for such transitional financial systems in terms of both preventing crises and achieving long-term economic growth.

Ultimate objective of prudential regulation and supervision of the banking sector is, therefore, stabilizing the financial system and obtaining public confidence in its stability, as well as being able to manage systemic risk and protect clients. Hence, supervision and prudential standards should be improved so as to ensure that banks meet capital requirements, make adequate provision for bad loans, limit connected lending, and publish informative financial information, and that insolvent institutions are dealt with rapidly (Fischer, 1998:4; Mathieson and Rojas-Suarez, 1994:343).

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<sup>(9)</sup> See Alper and Öniş (2002) and Santos (2000:5-6) for a detailed discussion.

### 3. Previous Studies

The question that we aim to answer in this study, i.e. the issue whether the weak banking sector regulation and supervision is closely associated with financial crisis, has been explored empirically in a few studies.

Demirgüç-Kunt and Detragiache (2000) found that presence of an explicit deposit insurance scheme tends to increase the probability of systemic banking problems. For the period (1981-1997) that they examined, they have concluded that moral hazard played a significant role in leading to systemic banking problems, especially since countries with deposit insurance schemes did not control successfully the negative effects of moral hazard through appropriate prudential regulation and supervision.

One of the studies that examine the links between capital account liberalization, prudential regulation and supervision and financial crises is an IMF Working Paper by Rossi (1999). The difficulty of comparing regulatory practices for a range of countries is overcome in this study through developing an index that accounts for differences of the regulatory and supervisory practices of different countries in terms of internationally accepted guidelines. One of the results of the study is that lax prudential practices and higher depositors' safety seem to exacerbate financial fragility. Rossi (1999:15) concludes that banking crises are more likely in the presence of controls on outflows, of laxer prudential regulation and high depositors' safety. The striking conclusion of this paper is that capital account liberalization is found not to have contributed to the banking crises, as one would expect from a study carried out by an IMF staff member. Furthermore, a less repressed financial system is found to allow countries to achieve financial stability and higher economic activity over the business cycle.

Noy (2004) searches for empirical evidence to the hypothesis that if liberalization is accompanied by insufficient prudential supervision of the banking sector, then it will result in financial crisis. He concludes that insufficiency of the prudential regulation and supervision presents only a medium term threat to the banking sector. However, he complains about the weaknesses of supervision variables he used in regressions. Furthermore, he (2004:356) adds that "the onset of banking crisis is a process that embodies a lot of institutional and political details that have been, until now, beyond the reach of econometric research". On the other side, he found almost all macroeconomic and financial variables he included –inflation, M2/reserves ratio, GDP growth rate, real exchange rate and foreign interest rates- as significant contributors to the likelihood of a banking crisis.



Barth et al. (1999b) questioned whether countries with more restrictive regulatory systems have a lower probability of suffering a banking crisis. They (1999b:12) found that restricting bank activities tends to increase the likelihood of suffering a major crisis. Particularly, in countries in which securities activities are restricted, the likelihood of a banking crisis is greater. This finding is quite opposite to those, which claim that stricter restrictions on the allowable activities of banks constraints excessive risk taking behavior. Furthermore, Barth et al. (2002:15) found no evidence for the proposition that strict capital adequacy regulations ameliorate the risk taking incentives produced by generous deposit insurance. They (2002:15) argue that while these results do not imply that capital is unimportant for bank fragility, “they suggest that there is not a strong relationship between the stringency of official capital requirements and the likelihood of a crisis after controlling for other features of the regulator and supervisory regime”. Furthermore, they accept that “this finding contradicts conventional wisdom and the current focus of the policy advice being advanced by international agencies” (Barth et al., 2002:15).

## 4. Empirical Analysis

### 4.1. Data

In this study, the main challenge of finding regulatory and supervisory data on cross country basis has been recovered by using the database that is compiled by Barth, Caprio and Levine by conducting a survey<sup>(10)</sup> on the different financial regulatory and supervisory environments that exist in 107 countries throughout the world. These survey results give information about the extent to which various regulatory and supervisory practices in different countries accommodate international best practices.

The regulatory and supervisory data are measured over the 1998-2000 period<sup>(11)</sup>. Since most of the crises occurred throughout the 1990s and a time-series database on the full range of bank regulatory and supervisory policies is not available, a careful examination of the regression results is needed. Due to unavailability of a time series database on the range of bank regulatory and supervisory data used in this paper, the study by Barth et al.(2001) which showed that restrictions on bank

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<sup>(10)</sup> Barth, Caprio and Levine designed and implemented a survey funded by the World Bank to collect information on bank regulations and supervisory practices.

<sup>(11)</sup> Barth et al. (2002:16) mentions that of the 107 responses received, 13 responses were received in November 1998, 65 were received in 1999, and 29 in early 2000. Data is available at the following website: [www.worldbank.org/research/interest/intrstweb.htm](http://www.worldbank.org/research/interest/intrstweb.htm)

activities have not changed much over the last two decades removes the doubt to some extent.

Furthermore, it should be reminded that since surveys focus on practice, subjective judgments of evaluators might undermine the quality of data. On the other hand, the alternative method of measurement of bank regulatory and supervisory framework based on evaluation of the letter of law<sup>(12)</sup> has the disadvantage of not reflecting practice, while minimizing the subjective evaluations. Hence, being aware of the fact that both surveys and evaluation of legal attributes have their own advantages and disadvantages, we choose to use survey results<sup>(13)</sup>, leaving the analysis based on legal attributes and comparison of the two methodologies to another study.

Indices used in the empirical analysis were provided by Barth, Caprio and Levine on our request. Basically, these aggregate indices are obtained by incorporating the answers to many questions<sup>(14)</sup>. Table 1 provides information about all variables by name, definition, sources and the time period that the data covered. The entire database embraces 4 qualitative and 7 quantitative variables. Qualitative variables are systemic banking crises, capital regulatory index, restrictions on bank activities and moral hazard index and. Quantitative variables are bank development data as well as control variables<sup>(15)</sup>, which are inflation, current account balance as a percentage of GDP, GDP per capita growth, real interest rate, domestic credit provided by banking sector as a percentage of GDP, gross private capital flows as a percentage of GDP as the macroeconomic factors likely to lead to a crisis.

The sample covers both developing and developed countries. The 40 countries included in the sample are as follows: Developing countries are Argentina, Brazil, Chile, China, Czech Republic, Greece, Hungary, Indonesia, India, Korea, Malaysia, Mexico, Philippines, Poland, Portugal, Romania, Russia, Singapore, Thailand, Turkey and Venezuela. Developed countries are Austria, Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Israel, Italy, Japan, Spain, Switzerland, Sweden, Netherlands, New Zealand, United Kingdom and United States.

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<sup>(12)</sup> *Neyaptı and Dincer (2005a) use the database based on evaluations of legal attributes of banking regulation and supervision.*

<sup>(13)</sup> *For more information about advantages and disadvantages of both approaches, see Neyaptı and Dincer (2005a)*

<sup>(14)</sup> *For more information about specific survey questions used to construct indices, see Barth et al. (2002:21)*

<sup>(15)</sup> *Debt/GDP ratio and exchange rate regime can also be considered as control variables, which is planned to be included in another study.*

**Table 1: Data Base**

Name	Definition	Source
<b>Qualitative Variables</b>		
<b>Systemic Banking Crisis</b>	Whether a country suffered a major banking crisis according to Caprio-Klingebiel (2003) during the 1990s or late 1980s. Dummy, where 1 indicates a crisis.	Database requested from Barth, Caprio and Levine
<b>Capital Regulatory Index</b>	It measures both the extent of regulatory requirements regarding the amount of capital that banks must have relative to specific guidelines and the extent to which the source of funds that count as regulatory capital that can include assets other than cash or government securities, borrowed funds, and whether the sources of capital are verified by the regulatory or supervisory authorities. It ranges in value from 0 to 9, with a higher value indicating greater stringency.  (Barth, Caprio and Levine, 2002:17)	Database requested from Barth, Caprio and Levine
<b>Restrictions on Bank Activities</b>	It includes restrictions on securities, insurance and real estate activities plus restrictions on the ability of banks to own and control non-financial firms.  (Barth, Caprio and Levine, 2002:16)	Database requested from Barth, Caprio and Levine
<b>Moral Hazard Index</b>	This index is taken from Barth, Caprio and Levine (2002:19) who adopted from Demirgüç-Kunt and Detragiache (2000). Demirgüç-Kunt and Detragiache (2000) used principal components to capture the presence and design features of explicit deposit insurance systems with the latter including: no coinsurance, foreign exchange deposits covered, interbank deposits covered, type of funding, source of funding, management, membership and the level of explicit coverage. The higher the value, the greater is moral hazard. (Barth, Caprio and Levine, 2002:20)	Database requested from Barth, Caprio and Levine
<b>Quantitative Variables</b>		
<b>Inflation</b>	Average inflation rate during the five years prior to the crisis in countries that experienced a banking crisis. In countries that did not experience a crisis, the average inflation rate during the five years prior to the survey, 1993-97 is used. (Barth, Caprio and Levine, 2002:29)	Database requested from Barth, Caprio and Levine
<b>Current account balance (% of GDP)</b>	For the countries that experienced a crisis, current account balance as percent of GDP is taken prior to crisis year. In countries that did not experience a crisis, current account balance as percent of GDP in 1999 is used.	World Development Indicators (WDI) online database, World Bank
<b>GDP per capita growth (annual %)</b>	For the countries that experienced a crisis, GDP per capita growth is taken prior to crisis year. In countries that did not experience a crisis, GDP per capita in 1999 is used.	World Development Indicators (WDI) online database, World Bank
<b>Real interest rate (%)</b>	For the countries that experienced a crisis, real interest rate is taken prior to crisis year. In countries that did not experience a crisis, real interest rate in 1999 is used.	World Development Indicators (WDI) online database, World Bank
<b>Domestic credit provided by banking sector (% of GDP)</b>	For the countries that experienced a crisis, domestic credit provided by banking sector as a percent of GDP is taken prior to crisis year. In countries that did not experience a crisis, data in 1999 is used.	World Development Indicators (WDI) online database, World Bank
<b>Gross private capital flows (% of GDP)</b>	For the countries that experienced a crisis, gross private capital flows as a percent of GDP is taken prior to crisis year. In countries that did not experience a crisis, data in 1999 is used.	World Development Indicators (WDI) online database, World Bank
<b>Bank Development</b>	It equals claims on the private sector by deposit money banks and as a share of GDP and is the average value over the 1997-99 period to smooth any business cycle fluctuations. (Barth, Caprio and Levine, 2002:21)	Database requested from Barth, Caprio and Levine

## **4.2. Descriptive Statistics and Regression Results**

The relationship between banking crises and regulatory and supervisory environment are examined using both simple correlations and logit regressions. We first present the simple correlations between the three measures of the regulatory environment<sup>(16)</sup> -capital regulatory index, moral hazard index and restrictions on bank activities index-, which are found to be significant in the empirical analysis, and banking crises. Then, regression results are presented, where we control for inflation and current account balance to GDP ratio. Although all quantitative variables are involved in these regressions, only the results related to inflation and current account balance to GDP ratio will be reported. This arises from the fact that other quantitative variables have been found insignificant. It is important to control for these variables, i.e., macroeconomic indicators in evaluating the relationship between the regulatory/supervisory environment and banking crises.

### **4.2.1. Correlations**

In this section, only the variables, which are found to be significant in the empirical analysis, are involved in the analysis for correlations among variables. On the basis of correlations between banking crisis and regulatory environment as well as macroeconomic indicators, we found positive correlation between banking sector crisis and generosity of the deposit insurance regime (high values of the Moral Hazard Index), inflation as well as regulatory restrictions on bank activities (see Table A.1 in the Appendix). In other words, increases in the rate of inflation, more generous deposit guarantee and restrictions on bank activities raise the likelihood of suffering a banking crisis. There is a negative correlation between banking sector crisis and capital regulatory index and current account balance to GDP ratio. Signs of these correlations are as expected. Signs of all correlation coefficients are as expected.

### **4.2.2. Estimation Methodology and Regression Results**

In the empirical analysis, the dependent variable is a dummy variable called CRISIS, where CRISIS equals 1 if a country suffered a banking crisis and CRISIS equals 0 otherwise. A country is considered to have a crisis if the estimated losses to the government due to bank failures are greater than five percent of GDP (Barth et al., 1999b:14).

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<sup>(16)</sup> *There exist many variables provided by Barth et al. related to regulatory environment and they are involved in the estimation regressions, but only these three regulatory variables have been found significant in these estimations. Hence, only those variables are reported in the data set and regression results.*

**Table 2: Banking Crises Regressions**

Equation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-1.7109** (0.832) (0.039)	-0.8066 (0.922) (0.3821)	-1.97** (0.978) (0.0440)	-0.8627 (0.967) (0.3724)	-1.834 (1.777) (0.3022)	-0.0053 (2.619) (0.9984)	-0.7679 (1.462) (0.5996)	1.3614 (0.939) (0.1473)
Restrictions on Bank Activities				1.1821** (0.589) (0.0448)		1.371 (1.342) (0.3072)	2.0310** (0.907) (0.0252)	1.8399*** (1.094) (0.0929)
Capital Regulatory Index		1.0898*** (0.590) (0.0651)			-3.9793* (1.624) (0.0143)	-3.7381** (1.7847) (0.0362)		-3.7836** (1.756) (0.0313)
Moral Hazard Index			0.5278** (0.258) (0.0411)		1.5308** (0.670) (0.0225)	1.5622** (0.767) (0.0417)	1.0998** (0.522) (0.0352)	1.5323** (0.708) (0.0306)
Current Account to GDP ratio	-0.03189 (0.101) (0.7543)	-0.0181 (0.111) (0.8706)	-0.1721 (0.151) (0.2549)	-0.0582 (0.112) (0.6038)			0.4858*** (0.273) (0.0762)	
Inflation	0.2835** (0.142) (0.0461)	0.1956 (0.135) (0.1498)	0.2689 (0.168) (0.111)	0.2403 (0.154) (0.1199)	0.3963 (0.288) (0.1693)	0.1961 (0.366) (0.5922)	0.1299 (0.20) (0.5170)	

Note: Each column gives complete logit results. Standard errors are in the first parenthesis. P-values are in the second parenthesis. Capital regulatory index, moral hazard index and restrictions on bank activities are principal component versions.

\* 1 percent significance level  
 \*\* 5 percent significance level  
 \*\*\* 10 percent significance level

Table 2 presents logit regressions on the relationship between the likelihood of experiencing a banking crisis and each bank regulation and supervision indicator<sup>(17)</sup>, while controlling for macroeconomic instability indicators such as inflation and current account balance to GDP ratio, which are generally accepted as important determinants of banking crises.

The overall empirical test results based on logit regressions state that moral hazard and the capital regulations emerge as the most important variables that affect the probability of a banking crisis. The results suggest that there is a robust relationship between capital regulations, i.e. stringency of official capital requirements and the likelihood of a banking crisis after controlling for other characteristics of the regulatory and supervisory environment and macroeconomic instability indicators (equations 2, 5, 6)<sup>(18)</sup>. This finding is contrary to the one reached by Barth et al. (2002:33). On the other hand, this result is quite consistent with the current policy advices of the international institutions.

<sup>(17)</sup> Neyaptı and Dinçer (2005b) show that prevailing financial crises positively affect bank regulation and supervision and hence, its quality may increase with the lessons derived from crises.

<sup>(18)</sup> Capital requirements are expected to provide a buffer against unexpected losses for ensuring safety and soundness of the banking system. That is to say, accumulation of capital in banks' balance sheets is expected to act as buffer against adverse shocks they face in order to minimize the likelihood of severe financial disturbances. As capital absorbs possible losses, it is the ultimate determinant of a banks' lending capacity. It is asserted that even in the absence of deposit insurance, capital requirements are needed to minimize the outbreak of a systemic banking crisis (Rojas-Suarez, 2001:3). It is argued that requirement of sufficient capital not only helps to minimize the occurrence of crisis, but minimizes the total social cost of crisis resolution if a crisis occurs. Therefore, capital requirements are not just linked to individual bank's assets but also to the risk of systemic failures. The Basle I Accord published in 1988 by the Basel Committee on Banking Supervision has been the central guide for regulating bank capital requirements.

Results also support the association established in the literature between the generosity of the deposit insurance system and the likelihood of a banking crisis<sup>(19)</sup>. This positive relationship is quite robust to alterations in the control variables<sup>(20)</sup>. Furthermore, tighter capital regulations do not seem to mitigate the negative impact of moral hazard problem generated by generous deposit insurance system, which is a striking message against propositions raised by international financial institutions towards stressing more stringent capital requirements as a remedy to generous deposit insurance system. Hence, while an increase in the moral hazard increases the probability of a banking crisis, an increase in the capital regulatory index decreases the probability of such a crisis.

A third seemingly important variable is the restrictions on bank activity. When we control for macroeconomic indicators (equation 4), countries with more restrictions on bank activities have significantly high probabilities of suffering a banking crisis. Positive link between the likelihood of a crisis and greater restrictions on bank activities are explained by Barth et al. (2002:31) by arguing that diversification of income sources through nontraditional bank activities –allowing banks to engage in an assortment of activities- tends to be positively associated with bank stability, especially in economies with active non-bank financial markets.

Most importantly, the regression results suggest that the macroeconomic dynamics such as inflation and the current account deficit, turn out to be insignificant when the structural variables are added to the regressor set. When these structural variables such as the moral hazard index and capital regulatory index are accounted for, the impact of these macroeconomic variables become negligible.

## 5. Conclusion

If financial liberalization is undertaken in the presence of weak prudential regulation and supervision of the banking sector, financial liberalization motivates and enables excessive risk taking by financial institutions and creates distortions in the allocation of credit. It further increases the vulnerability of banks to shocks and subsequent crisis. On the other hand, presence of efficient supervision and regulation is viewed as a guarantee that prevents excessive risk taking, hence, it is argued that financial liberalization is unlikely to have adverse effect on the stability of the banking sector.

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<sup>(19)</sup> Demirgüç-Kunt and Detragiache (2000) reached the conclusion that deposit insurance generosity predicts future banking crises. Barth et al. (2002:34) also find a strong relationship between these two variables.

<sup>(20)</sup> For instance, in regressions involving the variables of GDP per capita growth, real interest rate, domestic credit provided by the banking sector as a percentage of GDP.

Inherent micro-economic imperfections facing the banking industry such as adverse selection, moral hazard, principal-agent issues and other micro-imperfections due to informational asymmetries and uncertainties lay the basis of the difficulties of designing appropriate framework for banking sector regulations and of preventing excessive risk taking activity by banking sector. Excessive risk taking, in turn, results in deterioration of financial sector balance sheets, which can, by itself, be sufficient to lead to financial or economic crises. Thus, it seems that regulatory improvements should discourage excessive risk-taking by financial institutions.

The issue of the appropriateness of proposed regulations for developing countries is not considered in the present study. Instead, we consider the role of regulatory and supervisory framework in the context of banking crises. In particular, we ask whether weak regulatory and supervisory framework is sufficient for creating a suitable environment for banking crisis. Empirical results point to the robust significance of deposit insurance and capital requirements in leading to crises. While moral hazard arising from deposit insurance was found as a major factor in leading to crises before by other studies, capital regulatory index was found insignificant by Barth et al.(2002). Our test results indicate that capital regulations is a major factor in the prevention of crises, which give important support to the propositions led by international agencies towards ensuring higher capital requirements. On the other hand, tighter capital regulations do not seem to mitigate the negative impact of moral hazard problem generated by generous deposit insurance system, which is a striking message against propositions raised by international financial institutions towards stressing more stringent capital requirements as a remedy for generous deposit insurance system.

While inflation is a major macroeconomic indicator, with a significant role in the generation of crisis, its significance weakens to a major extent, when accompanied with regulatory and supervisory factors. Hence, the significance of regulatory and supervisory framework of the banking system is once more justified.

As suggested by the empirical findings in this study that the nature of the banking crises is closely associated with the institutional structure of the financial system rather than macroeconomic conditions of the economy. It can be concluded that once a solid institutional structure of the banking system is established, worsening macroeconomic conditions need not lead to a banking crisis. Thus, in order to prevent banking crises, the policymakers should focus more on the institutional factors, such as moral hazard problem, capital regulations and restrictions on bank ac-

tivities. On the other hand, if these conditions are not met, then worsening macro-economic conditions most probably lead to a banking crisis.

While this conclusion supports the view that weakness of the banking system has played a major role in leading to 2000 and 2001 crises in Turkey, the issue that whether it would have been possible to prevent crises in Turkey through proper implementation of prudential banking regulation and supervision can be a research question of another study.



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## APPENDIX

**Table A.1: Correlations Among Selected Variables**

	Major Banking Crisis	Capital Regulatory Index	Moral Hazard Index	Restrictions on Bank Activities	Current account balance (% of GDP)	Inflation
Major Banking Crisis	1					
Capital Regulatory Index	-0.52	1				
Moral Hazard Index	0.41	0.18	1			
Restrictions on Bank Activities	0.53	-0.37	0.009	1		
Current account balance (% of GDP)	-0.32	0.19	0.14	-0.16	1	
Inflation	0.39	-0.42	0.28	0.37	-0.25	1