



# IMF Working Paper

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## Basel Capital Requirements and Credit Crunch in the MENA Region

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**IMF Working Paper**

Middle East and Central Asia Department

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**Abstract**

The 1988 Basel I Accord set the common requirements of bank capital to promote the soundness and stability of the international banking system. The agreement required banks to hold capital in proportion to their perceived credit risks, and this requirement may have caused a “credit crunch,” a significant reduction in the supply of credit. We investigate the direct link between the implementation of the Basel I Accord and lending activities, using a data set spanning annual observations covering 1989–2004 for banks in Egypt, Jordan, Lebanon, Morocco, and Tunisia. The results provide clear support for a significant increase in credit growth following the implementation of capital regulations, in general. Despite higher capital adequacy ratios, banks expanded credit and asset growth. Credit growth appears to be driven by demand fluctuations attributed to real growth, cost of borrowing, and exchange rate risk. Overall, the effects of macroeconomic variables, in contrast to capital adequacy, appear to be more dominant in determining credit growth, regardless of the capital adequacy ratio, and regardless of variation across banks by nationality, ownership, and listing.

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## I. INTRODUCTION

In 1988, an agreement was reached in Basel to set the common requirements of bank capital in 12 industrial countries. This agreement became known as the Basel Accord (Basel I), and its intent was to promote the soundness and stability of the international banking system in response to increased risk after the deregulation and globalization of financial systems, and in response to the accumulation of bad loans in developing countries.

As a consequence of the international agreement reached in Basel to standardize capital regulations, bank regulators have increasingly scrutinized the adequacy of bank capital, mandating that international banks operating in the major industrialized countries hold capital in proportion to their perceived credit risk. Risk-based capital may be viewed as a regulatory tax that is higher on assets in categories that are assigned higher risk weights. Therefore, it is expected that the implementation of the capital adequacy ratio imposed by the Basel Accord would encourage substitution out of high-risk assets, such as commercial loans, into less risky assets, such as government securities. Having to hold more capital against a specific asset increases the cost for a bank to hold this asset class. Thus, risk-based capital adequacy may have caused a “credit crunch,” resulting in a significant reduction in the supply of credit available to borrowers. The allocation of credit away from commercial loans may cause a significant reduction in macroeconomic activity, given limited alternatives for credit availability in the non-banking financial system. However, it is possible that more competitive banks may resort to additional lending and charge borrowers a higher interest rate to compensate for the additional cost of having to hold more capital, provided that demand is inelastic to higher lending rates. The analysis will identify the net effect of both channels on credit growth after the imposition of a higher capital requirement for more risky assets in banks’ portfolios.

However, supply and demand factors do affect credit growth. The introduction of Basel I may have resulted in a shortage of regulatory capital for banks, which could have, in turn, led to a decrease in the supply of credit, i.e., lending. However, there are other constraints on credit growth which could originate on the supply side of lending institutions or on the demand side of credit. Factors that affect the willingness or capacity of banks to lend may include liquidity constraints, in response to monetary policy instruments that affect available lendable funds; or collateral requirements; or a shift in lending strategy to improve prudential indicators in response to high nonperforming loans (NPLs). These requirements, along with macroeconomic indicators that determine demand for credit, could play an important role in determining credit availability, consequently, banks’ investment strategy and portfolio allocation. For example, borrowers may choose not to demand credit because they see few sound investment opportunities; or because they face balance sheet problems that constrain their appetite for leverage and credit demand. Indeed, self-financing is prevalent in many developing countries in light of constraints on credit availability, particularly for small and medium-sized enterprises (SMEs), forcing many businesses to rely on retained earnings for financing. Increased risk aversion or changes in investors’ confidence and business sentiment may affect the demand and supply for credit. The analysis will address these factors, data permitting, in an effort to isolate the effect of capital adequacy requirements on credit growth.

Given concerns about the possibility of a credit crunch (reduction in loan supply) following the implementation of the Basel I Accord, a survey by the Basel Committee on Banking Supervision (Bank for International Settlements (BIS), 1999) studied the evidence for the Group of 10 (G-10) countries. Other studies (see, e.g., Pazarbasioglu (1997) on Finland; Ghosh and Ghosh (1999) on East Asia; Woo (1999) on Japan; Chiuri et al. (2002) on 16 emerging countries; Dionne and Harchaoui (2003) on Canada; Van Roy (2003) on G-10 countries; Konishi and Yasuda (2004) on Japan; Barajas, Steiner, and Cosimano. (2005) on Latin America; Berger and Udell (1994) and Peek and Rosengren (1995 a,b, 1997, 2000) on the United States) investigated the link between capital regulations and credit availability. Despite extensive research, there is still much debate on the impact of capital requirements on the supply of credit and on the effects of supply- and demand-driven fluctuations on credit expansion.

We aim to investigate the impact of the adoption and implementation of the Basel I Accord on credit availability using a sample of countries in the Middle East and North Africa (MENA) region. While Basel I was originally negotiated among the developed countries, it has become a major component of banking regulations throughout the world, setting uniform rules for regulating the amount of capital a bank must hold and defining risk-based minimum capital requirements.

The topic is very timely in the context of the MENA region. Notwithstanding the slowdown attributed to the recent uprisings, the region had been registering growth rates that are among the highest in the world, having benefited from the wealth effect attributed to the surge in oil price. The spillover effect of the oil boom has resulted in a surge in capital inflows and excess liquidity that demands careful attention to the role of financial intermediation. The policy debate has recently focused on the role of monetary policy in managing liquidity, including defining appropriate anchors and maximizing the channels for policy effectiveness.

The transmission channel of monetary policy is highly dependent on the structure of the financial system and the effectiveness of its intermediation function. The latter is dependent on demand-driven factors, which could be influenced by monetary policy and supply-side factors that are dependent on bank-specific portfolio and regulatory requirements. To the extent that there is a bank lending channel of monetary policy, reduction in bank credit brought about by capital requirements can constrain real investment opportunities and slow down real growth. Such potential macroeconomic effects would transmit bank capital requirements to macroeconomic performance and stability, hampering the effectiveness of monetary policy to stimulate growth and revive investment.

Many MENA countries have adopted the Basel I Accord, imposing minimum risk-based capital requirements on their banks. We have compiled a cross-country database on Basel I adoption and aim to study the impact of capital regulation or risk-weighted capital ratio. Our sample includes Egypt, Jordan, Lebanon, Morocco, and Tunisia. The sample includes a diversified sample of

MENA countries that have taken serious steps towards implementing Basel I and undertaking financial and banking reforms.<sup>2</sup>

An increase in the risk-weighted capital ratio may lead banks to raise more capital, decrease total assets, or shift the composition of assets towards less risk. In light of the high cost of raising capital, the latter two options may be unavoidable. Accordingly, the implementation of Basel I may establish a direct link between regulatory capital ratios, credit supply, and, in turn, economic activity.

Excessive regulations may have adverse effects. On the positive side, they serve as prudential measures that mitigate the effects of economic and financial crises on the stability of the banking system and subsequent macroeconomic results. Nonetheless, as banks become more constrained, their ability to expand credit and contribute to economic growth will be hampered during normal times. Amidst heightening concerns about the extent of the global slowdown in the wake of the recent financial meltdown, more calls have emerged to tighten financial regulations and the oversight authority in the banking system. As many would agree on the need to impose tighter prudential measures, our investigation will focus on the potential adverse effects on credit expansion.

While most analysts would argue for the need to enforce tighter prudential regulations to mitigate risk in the financial system, the question remains: What is the right benchmark to enforce regulations without jeopardizing the ability of banks to service the economy? To properly address this question, it has become necessary to thoroughly analyze the effect of capital regulations, namely the capital adequacy ratio, on credit growth.

The literature on this subject is growing, but its scope has been limited by data availability and methodological issues. The present study combines the data set regarding the adoption of the Basel I Accord, in addition to a data set spanning 1989-2004, drawn from banks in Egypt, Jordan, Lebanon, Morocco, and Tunisia, we examine the link between capital regulations and lending activity.<sup>3</sup> We test for the impact of the capital adequacy ratio, independently and interactively with Basel regulations, on credit expansion in the selected MENA countries. The methodology follows the framework by Berger and Udell (1994) to test for a structural break regarding banks' loan supply following the adoption of Basel. In addition, we resort to the alternative framework by Peek and Rosengren (1995 a,b) to test the short-run impact of capital regulations.

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<sup>2</sup> We exclude oil-producing countries because their asset growth is likely to be driven by fluctuations in the oil price and oil production. In addition, Islamic banks predominate in these countries, and they differ from commercial banks in terms of capital financing. Other countries in the MENA region are excluded due to data constraints.

<sup>3</sup> The investigation stops at 2004 to examine the effects of Basel I. The Basel I guidelines were published in 1988. The implementation at banks in the Middle East varied by country. However, we test the impact of publishing the guidelines, as banks are likely to have geared their strategy to comply with the proposed guidelines towards implementation. Hence, the implications are likely to be captured in credit growth over a stretched time span that followed the publication of the guidelines, captured in our sample period.

Our results, consistent with the bulk of previous studies, indicate that the implementation of Basel did not, in general, slow credit expansion. The capital adequacy ratio has not made a difference in banks' ability to expand credit. The effect of Basel I on credit expansion does not vary with the initial capital ratio at banks. More importantly, and as is consistent with previous studies, the capital adequacy ratio and enforcement of regulations increased equity along with credit and asset expansion in the countries under investigation. The effects of macroeconomic variables—real growth, the interest rate, and exchange rate depreciation—may have offset the adverse effects of capital regulations on credit supply, although the evidence appears to be mixed across countries.

The combined evidence indicates the importance of demand-side determinants to credit expansion in the countries under investigation. Monetary policy should be geared towards managing liquidity so as to influence economic conditions that stimulate credit growth. Given strong demand for credit, policy priorities should focus on enhancing regulations and prudential measures that would streamline the supply of credit and reinforce the contribution of financial intermediation to economic growth.

Section 2 of this paper summarizes the existing literature on the relationship between capital constraints and credit availability. Section 3 provides some background on the banking sector in the countries under investigation. Section 4 describes the data set and methodology. In Section 5, we report the empirical results. Section 6 concludes and offers policy implications.

## I. LITERATURE REVIEW

There are two strands of the literature: theoretical and empirical. In 1999 the Bank for International Settlements (BIS) carried out a survey of evidence on the effectiveness of the 1988 Basel Accord within the G-10 countries (BIS 1999). The first question was on the implementation of bank capital requirements, i.e., whether banks fulfill the capital requirements by increasing capital or by altering the risk-weighted assets. Shrieves and Dahl (1992), using several periods of cross-section data on commercial banks in the United States, report that the risk-based capital standard is effective. Using a sample of U.S. banks in the periods 1984–93 and 1990–91, the evidence of Calem and Rob (1996) and Jacques and Nigro (1997) confirm the effectiveness of the Basel I Accord on risk allocation in banks' portfolios. Aggarwal and Jacques (1998), employing a cross-sectional sample of U.S. banks in 1991, 1992, and 1993, examine the impact of the 1991 banking legislation on bank behavior and conclude that undercapitalized banks increased their capital target ratios more quickly than other banks.

Another group of studies analyzed the impact of capital requirements using a sample of banks in other industrial countries. Ediz et al. (1998) find that the regulation is effective in the United Kingdom. Rime (2001) confirms this finding using data for Swiss banks. Montgomery (2001), using a panel of Japanese bank balance sheets, for fiscal years 1982–99, finds that neither international nor domestic asset portfolios are strongly affected by the total regulatory capital ratio. In contrast, Koehn and Santomero (1980) and Kim and Santomero (1988) show that capital requirements result in changes in the composition of the risky part of the bank's portfolio in such a way that risk is increased and the probability of failure may be higher. The implication, as emphasized by Blum (1999), is that capital regulation does not prohibit banks from undertaking

a higher degree of risk, as is consistent with a moral hazard problem. As further analyzed in Marshall and Prescott (2000) and Vlaar (2000), efficient banks may seek more opportunities to maximize profitability in light of higher capital requirements.

The second strand of the literature tests the impact of capital requirements on credit expansion. Some papers have considered the theoretical underpinnings of capital regulation and its potential effects on credit expansion. The theoretical underpinnings for this argument are articulated in Bernanke and Gertler (1995). If banks are unable to comply with the higher capital requirement, they opt to shrink credit supply (see, e.g., Myers and Majluf (1984)).

Empirical analysis has tested the relationship between capital regulations and credit expansion. Holmstrom and Tirole (1997) demonstrate that the capital ratio behaves pro-cyclically, increasing during expansion and decreasing during contraction. There is a strong relationship between banks' assets and liabilities (see, e.g., Diamond and Rajan (2000)): deposits increase during expansion, along with banks' credit expansion, resulting in an increase in the capital adequacy ratio.

Using U.S. data, Bernanke and Lown (1991) demonstrate, among other things, that loan growth at individual banks during the recession of 1991–92 is positively linked to initial capital ratios. Berger and Udell (1994), using data for the United States, take a close look at micro-bank level data to examine how bank portfolios changed in the early 1990s from the 1980s and to see how these changes are related to risk-based capital ratios and other key variables. Almost all of the lending and securities categories declined substantially in the early 1990s owing to macro/regional effects.

In contrast, Peek and Rosengren (1995a, b) conclude that there is considerable evidence, at least for New England, that lower loan demand and a capital-crunch-induced decline in loan supply *together* brought about a decline in lending. Brinkmann and Horvitz (1995) also find evidence of significant loan supply responses to the Basel I capital requirements.

Furlong (1992), Haurbrich and Wachtel (1993), and Lown and Peristiani (1996) also conclude that capital regulation contributed to a decrease in lending that helped fuel a post-capital-requirements U.S. credit crunch. Wagster (1999) reaches the same conclusion for Canada and the United Kingdom. Using U.S. data, Furfine (2000) shows a robust correlation between the shocks to bank capital and a fall in lending. Furfine (2001) concludes that while capital regulation does matter, toughened supervisory scrutiny had a larger influence on banks' balance-sheet choices during the U.S. credit crunch in the early 1990s.

Similarly, Kim and Moreno (1994) find that the regulatory environment forced banks in Japan to pay more attention to their capital positions, resulting in a slowdown in the growth of lending. Ito and Sasaki (1998) provide evidence that individual Japanese banks with lower capital ratios had a tendency to reduce lending. Using Japanese banking data, Woo (1999) finds evidence that supports the effect of a capital crunch on lending growth during the early 1990s. Honda (2002) finds that international capital standards reduced credit expansion in Japan slightly more than domestic regulations did.



Watanabe (2004) analyzes the impact of prudential regulation in slowing down credit expansion and concludes that the capital crunch is, by definition, driven by regulation. Specific emerging country studies include Ghosh and Ghosh (1999) who find that as the banking system crisis deepened in Indonesia, the supply of real credit declined. Agung et al. (2001) shows the existence of a credit crunch after the crisis in Indonesia, 1997–99. Using a sample of 16 emerging countries, Chiuri et al. (2002) find evidence that the introduction of higher minimum bank capital requirements may well induce an aggregate slowdown of bank credit. Barajas and Steiner (2002) looked at eight Latin American cases and report that banks followed several options post-Basel I: increase capital, decrease total assets, or shift the composition of assets towards those that are less risky. Chiuri et al. (2002) examine a panel of data for 572 banks in 15 developing countries and find consistent evidence that the imposition of capital regulation induced a reduction in loan supply and, hence, in total lending.

Not all researchers agree that capital regulation has had significant effects on bank lending. BIS (1999) reviews a number of prior studies investigating how capital adequacy regulations influence actual capital ratios—such as Peltzman (1970), Mingo (1975), Dietrich and James (1983), Shrieves and Dahl (1992), Keeley (1988), Jacques and Nigro (1997), Aggarwal and Jacques (1997), Rime (2001), and Wall and Peterson (1987, 1995)—and conclude that in the near term banks mainly respond to toughened capital requirements by reducing lending and that there is little conclusive evidence that capital regulation has induced banks to maintain higher capital-to-asset ratios than they otherwise would choose if unregulated. Likewise, Ashcraft (2001) finds little evidence that capital regulation during the 1980s materially influenced bank capital ratios. Flannery and Rangan (2005) find some influence of capital regulation on actual bank capital ratios.

Barrios and Blanco (2003), using data for Spanish commercial banks between 1985 and 1991, find that banks were unconstrained by capital regulation during the period of study. Beatty and Gron (2001) find similar results using data for 438 publicly traded U.S. holding companies between 1986 and 1995. Barajas, Chami, and Cosimano (2005) analyze the impact of Basel I on the credit slowdown in Latin America and find little evidence that either the loan-asset ratio or the average growth rates of loans declined after Basel I adoption.

In the MENA region, a decade of sound macroeconomic policies and reforms allowed many countries in the region to weather the global financial crisis in a relatively stronger position than many other emerging economies. Indeed, the banking sector in a number of MENA countries was subject to several waves of reforms prior to the financial crisis. For example, the Turkish banking sector went through major consolidation during 1999–2003. Similarly, the Egyptian banking sector went through a massive wave of consolidation during the period 2003–06, as per the requirements of increased banking capitalization that were enforced under the Egyptian Banking Law of 2003.

Several studies were undertaken on reforms and their implications on financial intermediation in the MENA region. Murinde and Yaseen (2004) considered the impact of Basel regulations on bank capital and risk behavior using data for banks in the Middle East and North Africa. Nasr (2009) raised the question about the role of banks in Egypt as a catalyst for economic development and found that although significant progress has been made in the implementation

of financial sector reforms in Egypt since mid-2004, challenges still remain. Moreover, various financial indicators put the Egyptian financial system at a low level in terms of financial intermediation over the period 2000-2008, as compared to other developing and developed countries, and that finance has been mainly going to the privileged enterprises, while small and medium-sized enterprises, as well as start-ups, have limited access to finance.

Ben Naceur and Kandil (2009) studied the impact of capital requirements on banks' cost of intermediation and performance in Egypt. The results of the study supported Egypt's Central Bank efforts to enforce capital regulations starting in 1991 to improve the performance of the banking system in Egypt.

Reda and Isik (2006) measured the change in efficiency and productivity of Egyptian commercial banks during the period 1995–2003. They recommended that the government adopt policies that would foster competition. Abdel-Baki (2010) assessed the effectiveness of the banking reform on the performance of Egyptian banks by analyzing the efficiency of 26 banks over the period 2004–09. The research culminated in the preparation of guidelines to steer the banking sector towards enhanced efficiency.

Poshakwale and Qian (2009) investigated whether financial reforms introduced in Egypt have had a significant impact on improving the financial sector's competitiveness and efficiency. More specifically, they found that the financial sector reforms appear to have a positive significant impact on competition and efficiency.

Similarly, several studies were undertaken on the Turkish banking sector. Steinherr, Tukel, and Ucer (2004) reviewed the health of the sector and the obstacles that hinder its growth. They concluded that in 2004 the Turkish banking sector compared well with those of new members of the European Union. However, the job was not finished yet regarding the challenge of introducing risk-management Basel II and upgrading the capital market to EU standards.

Sayilgan and Yildirim (2009) examined the determinants of profitability in the Turkish banking sector during the period 2002–07 and Isik and Darrat (2008) assessed the effect of the macroeconomic environment on productive performance in the Turkish banks over 30 years. The results indicate that illiquidity, determined mainly by macroeconomic conditions, was the major cause of banks' failures, indicating the heavy burden of policy mistakes.

Few studies compared banking performance in the MENA region. Hakim and Neaime (2005a) compared performance and credit risk in the banking sector in Egypt and Lebanon. Hakim and Neaime (2005b) assessed the exposure of 36 large commercial banks across eight MENA countries and analyzed the effectiveness of their risk management policy between 2000 and 2005. The results revealed that hedging practices vary considerably in Egypt, Lebanon, Kuwait, and the United Arab Emirates, while the risk mitigation policies seem more uniform in Jordan, Bahrain, Saudi Arabia, and Turkey.

Our paper builds on the efforts to test the effect of capital regulations on credit expansion across a sample of MENA countries. More specifically, the methodology is based on the work of

Berger and Udell (1994) who test for a structural break regarding banks' loan supply following the adoption of Basel I, and on the alternative framework of Peek and Rosengren (1995 a,b). who test the short-run impact of capital regulations. The aim is to uncover evidence that provides answers to the following questions: (i) Is there any evidence of an increase in banks' capitalization in the wake of enforcing the requirements of the Basel I Accord, and (ii) what are the effects on equity assets and the composition of risk in the asset portfolio?

### **III. BANKING SECTOR DEVELOPMENTS AND REGULATIONS**

This section provides an overview of major highlights characterizing the banking sector in the five MENA countries under investigation. Table 1 provides an overview of major banking indicators across countries. Lebanon stands out as having the largest number of banks in the sample, although the average size of each bank is than in Morocco, Jordan, or Egypt. Jordan has a higher proportion of international banks, relative to domestic banks, compared to other countries in the region, where the number of international banks lags behind the number of domestic banks. Most banks in the region are listed and privately owned, a trend that has increased over time, as described below. In addition, we clarify specific developments that followed the introduction of Basel I, that motivated us to undertake this study and help explain the evidence.

#### **A. Egypt**

The Egyptian banking sector expanded markedly in the mid-1970s (for details, see El-Shazly (2006)), spurred by the shift in economic management towards an open-door policy. This policy aimed at outward-looking growth with an active role for the private sector in economic management. To achieve these objectives, a banking law was enacted in 1975 (Law 120/1975) defining the nature and mode of operations for all banks. In the 1990s, the Egyptian authorities undertook major banking reforms towards a more liberal system. This included the strengthening of bank supervision and regulations on the basis of internationally accepted standards to deal with the risk inherent in the new policy environment. As the banking sector is a major component of the Egyptian financial sector, the Central Bank of Egypt (CBE) viewed the soundness of such sector to be of paramount importance in ensuring full utilization of the sector's resources in reviving economic activity and sustaining high-level growth.

The rapid growth of the banking sector during the 1990s, together with the liberalization of the whole economy, placed an extra burden on the Central Bank of Egypt (CBE) as the sole regulator of the banking industry. In order to reduce market concentration and increase competition, the authorities adopted a banking reform program which had as one of its pillars the restructuring and privatization of public banks. Accordingly, one of the four public banks was privatized,<sup>4</sup> and public banks were mandated to divest their shares in the joint venture banks, reducing their ownership stake to a maximum of 20 percent.

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<sup>4</sup> Bank of Alexandria was acquired by the Italian San Paolo Bank in 2006.

Banks are supervised by the Banking Control Department of the CBE and, in practice, supervision is strong. The CBE has made considerable progress in developing its supervisory framework and staff, using materials, procedures, and techniques obtained from other countries' supervisory systems. According to the IMF's Financial Sector Assessment Program (FSAP) report of 2002,<sup>5</sup> the CBE complied with most of the Basel Core Principles for Effective Banking Supervision. In 2003, the government, together with the CBE, drafted a new Central Bank and Banking Sector Law to increase the independence of the CBE in maintaining price stability, to reinforce to supervisory role, and to increase banks' efficiency and competitiveness.

Since the end of the first FSAP in June 2002, several pieces of legislation targeted additional reforms. A new law was enacted in July 2003 to establish the independence of the CBE. In line with the recommendations of the FSAP report, modifications and amendments of the CBE rules and regulations have been introduced. All banking supervision arrangements were comprehensively documented in the second half of 2002. New regulations respecting connected and related party lending have been enforced since November 2002. By the end of March 2003, the majority of banks had complied with the new minimum capital adequacy ratio of 10 percent and an additional capital injection to all state-owned banks had been implemented. Provisioning levels for classified loans are monitored very closely. Other supervision and prudential regulations include: increasing the minimum paid-up capital of banks, increasing the efficiency of the offsite supervision of the CBE Supervision Department and preparing banks for the introduction of the Basel II new regulations.

The unified banking law of 2003 raised the minimum required paid-up capital of national banks from LE 100 million to LE 500 million. Also, the capital adequacy ratio requirement was increased to 10 percent as opposed to 8 percent for the risk-weighted assets. As a result over the period 2004–06, the Egyptian banking sector witnessed a major wave of consolidation. Small banks and poor performers were targeted for acquisition, as they could not abide by the modified regulations. In contrast, foreign banks were involved in acquisition actions, in an attempt to enter the Egyptian banking sector, especially after the government refrained from offering new banking licenses.<sup>6</sup> Foreign interest was illustrated by the participation of foreign players in the bids that took place to acquire stakes in Egyptian banks. These banks include BNP Paribas, Barclays, Piraeus, Credit Agricole, Societe Generale, BLOM, and Audi, among others. Table (A1) portrays the structure of the banking sector during the last decade. Noteworthy is the reduction in the total number of banks from 62 in 2000 to 39 in 2010.

## **B. Jordan**

Macroeconomic conditions have been conducive to financial stability, with external developments partially posing the greatest potential risk to financial stability.<sup>7</sup> Jordan's financial

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<sup>5</sup> IMF, Financial Sector Stability Assessment, Egypt, December 2002.

<sup>6</sup> Banking licensing is subject to economic needs, but in reality no new licenses were offered over the past two decades.

<sup>7</sup> For details, see Jordan, IMF Staff Report for the 2005 Article IV Consultation.

system is dominated by the banking system, which has provided a high level of intermediation. Most banks are well capitalized, liquid, profitable, and can withstand considerable shock, but NPLs are generally high, and there is higher concentration in bank deposits and loans.

The 2003 Financial Sector Stability Assessment (FSSA) reports that the banking system generally shows high capital ratios, liquidity, and profitability. There are four undercapitalized banks, after the restructuring of one bank. Plans have been in development to restructure the four undercapitalized banks. Banking supervision has been strengthened and most prudential standards are in line with international best practice. The FSSA also highlighted that the Jordanian banking system is vulnerable to geopolitical shocks.

### **C. Lebanon**

The financial sector is bank-focused and generally acknowledged to be exceptionally large and relatively stable.<sup>8</sup> As of February 2004, the sector consisted of 53 commercial banks and 10 specialized medium- and long-term credit banks, 28 financial institutions, eight financial, and three leasing companies; foreign banks were also well represented. The financial intermediation level, equivalent to around 240–250 percent of GDP, reflects the large size of the banking sector.

Banks' profitability fell with the reduction in banks' holdings of Treasury bills. Non-performing loans are also of concern in light of relatively low provisioning levels. Identified weaknesses in banking prudential supervision have been remedied through an overhaul of prudential regulation. Tighter controls on money laundering were implemented. The Central Bank supervises and regulates the banking system. The Banking Control Commission performs its supervisory functions as an independent body, with a separate budget. The Higher Banking Council (HBC) assumes the role of a supreme banking court whose decisions and rulings are final, including the imposition of sanctions on banks and financial institutions that violate banking regulations.

Starting in March 1995, commercial banks were required to meet a minimum capital adequacy ratio of 8 percent in line with Basel I. Banks' capital has increased substantially: by the end of 2001, the average capital adequacy ratio of commercial banks was approximately 16.8 percent. Banks are obliged to draw up financial statements and auditors must publish a consolidated and checked annual statement of bank accounts.

### **D. Morocco**

The country's credit institutions comprise 21 banks (12 commercial banks, four specialized banks, four subsidiaries, and one branch of a foreign bank) and 70 finance companies.<sup>9</sup> The commercial banks account for 78 percent of the non-consolidated assets of the banking system, while the specialized banks have 22 percent. The credit institutions are governed by the Banking

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<sup>8</sup> For details, see Commission Staff Working Paper (2005)

<sup>9</sup> For details, see World Bank (2000).

Law of July 1993, which eliminated the distinction between commercial banks and specialized financial agencies. That law also unified the legal framework and supervisory regime for all credit institutions. Foreign capital plays a significant role in Moroccan banks, approximately 21 percent of banking sector assets. As in many countries, the banking sector in Morocco dominates the financial system. Nonetheless, the size of the banking system and its market penetration remain relatively modest by regional and international standards.

Recent banking activity in Morocco has been marked by a gradual but sustained liberalization. Liberalization has been accompanied by new prudential regulations in line with international standards. As the state's presence in the banking sector decreased to 30 percent of total bank assets, credit to the private sector expanded significantly, approximately from 25 to 48 percent.

Over the past ten years, the Moroccan Government, with the assistance of the World Bank, has supported the development of Morocco's financial system through a series of operations covering the banking system. The main reforms implemented during this period include elimination of credit ceilings, interest rate liberalization, adoption of a new banking law in 1993, gradual elimination of monetary holdings of government securities, and strengthening of prudential regulations of banks in accordance with international standards. As a result of these reforms, the financial sector is increasingly operating in accordance with market rules, and financial intermediation activity has intensified.

Overall, the financial situation of commercial banks is healthy and has clearly improved since 1993. Net earnings of the country's banking system are well above international levels and returns on assets and equity compare very favorably with these of banks elsewhere. Specialized banks represent the weakest segment of the banking sector, accounting for 50 percent of total loans in arrears, and have failed to keep pace with the sector as a whole in terms of earnings and asset quality. The banks' foreign exchange risk exposure is currently limited and well below potential limit. Overall, the quality of the loan portfolio, net of provision, does not currently threaten the capital adequacy of commercial banks. The banking system has a relatively adequate capital base, consisting of Tier 1 capital and yielding an average capital adequacy ratio of 12 percent.

## **E. Tunisia**

The 2006 FSSA for Tunisia indicates that the existing number of NPLs does not constitute a significant threat to macroeconomic stability.<sup>10</sup> However, it represents a source of inefficiency and distortion in the banking system, which needs to be addressed. Public banks hold more than half of all NPLs and continue to weigh disproportionately on the system. Provisioning is low because of over-reliance on collateral, although realization of collateral is difficult. Tunisia has made progress in implementing the FSAP recommendations, particularly in the area of banking sector restructuring.

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<sup>10</sup> For details, see Tunisia, Staff Report for the 2005 Article IV Consultation, IMF.

Banking sector performance has strengthened under the impetus of public bank restructuring and tighter prudential controls and supervision. All major indicators of bank soundness have improved. The capital asset ratio for the commercial banking sector as a whole rose to 10.1 percent in 1999, with only one small bank still failing to reach the minimum 8 percent ratio, and the level of unprovisioned bad loans was brought down to 14.1 percent of net liabilities, from 18.4 percent in 1997. This ratio declined over time as a result of tighter supervision and the measures taken to facilitate provisioning, write-offs and the establishment of loan recovery agencies.

The credit culture will have to be strengthened more if the risks of accumulating new bad loans are to be contained. While strong growth prospects should reduce credit risk, the restructuring of resource allocation associated with trade liberalization could generate new pressures on banks' loan portfolios. Given the large role still played by public banks (60 percent of total banking sector assets) and the need to upgrade banks' risk, reforms of bank practices are urgently needed to meet the requirements of a more open economy.

#### IV. METHODOLOGY

Previous research has investigated the link between bank capital regulation, the loss of bank capital, and bank shrinkage, commonly referred to as capital crunch (Bernanke and Lown, 1991; Furlong, 1992; Bizer, 1993; Cantor and Wenninger, 1993; Haurbrich and Wachtel, 1993; Baer and McElravey, 1994; Berger and Udell, 1994; Hancock, Laing, and James, 1995). Most studies have attributed the capital crunch to large losses in bank capital, in combination with the adoption of new capital standards.

To establish whether regulatory enforcement actions have contributed to a credit crunch, we constructed a pooled annual time-series and cross-section panel of banks' balance sheets in five MENA countries: Egypt, Jordan, Lebanon, Morocco, and Tunisia. Most previous studies of credit crunches have focused on gross changes in bank assets and banks loans (for example, Bernanke and Lown, 1991, and Peek and Rosengren 1994). Our analysis will employ three measures of banks' indicators: real change in total assets, net loans over total assets and banks' holdings of government securities over total assets.

The empirical analysis proceeds by investigating the determinants of the differences in the asset portfolio behavior of banks. We do not assume that the credit crunch occurred but allow that a crunch may have occurred during an interval that includes most of the phase-in period for risk-based capital according to Basel regulations. Our data comprise the sample period 1989-2003. The date of implementation of the capital adequacy requirement varied across countries as follows: Egypt (1997), Jordan (1992), Lebanon (1995), Morocco (1996), and Tunisia (1999).<sup>11</sup>

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<sup>11</sup> The sample of countries includes the most advanced countries in financial reforms and bank regulation. Algeria, Mauritania and Libya are excluded because there is no sufficient number of banks (less than five banks in the data base). For the GCC countries, mainstream banks are islamic and the economy is undiversified outside the oil sector, which would bias the results regarding credit expansion.

To test for secular lending patterns and to better distinguish between the effect of the Basel I introduction from other demand and supply factors that could affect credit growth, it is necessary to have a control period because a credit crunch is defined as a decline in credit availability or a leftward shift in the supply curve for loans, relative to normal times. Our relatively long control period allows us to test for secular lending patterns. In addition, we test the impact of fluctuations in the demand for credit on lending patterns. By controlling for important determinants of credit growth on the demand side, we address the identification problem that relates to the measurement of credit volume that has been effectively granted, in response to a host of determinants on the supply and demand side, including that attributed to the change in the capital adequacy ratio. Hence, we include macrovariables, such as GDP or interest rates that affect credit supply and demand, independently of the requirement for capital adequacy. For example, higher GDP growth would increase investor confidence, stimulating higher demand and supply of credit.

We define a crunch as a decrease in loan supply relative to a benchmark. Much of the prior research showed that during the credit crunch periods banks with low-leverage capital ratios tended to lend less than banks with high capital ratios. Nonetheless, a test of “credit crunch” would require a significant reduction in credit supply.

The dependent variables in our analysis are the real growth rates of several banking indicators or end-of-year ratio indicators. We use real growth rates of the asset stocks as proxies for flows of new investments. In addition, we are interested in the growth rates of loans, which may be indicative of a credit crunch. An increase (decrease) in loans is likely to be highly correlated with banks’ deposits, as the latter provides the pool of resources for loan supply. Further, we study the impact of the capital adequacy ratio on banks’ management of risk in their portfolios, in light of regulatory requirements and the degree of risk they face. To verify, we examine the change in banks’ holdings of government securities as a result of the implementation of Basel regulations.

We test for a significant reduction in lending and total assets, or a change in the composition of assets following the implementation of the Basel I Accord, and/or an increase of equity. If the voluntary risk-retrenchment hypothesis is correct and banks chose to reduce their risks, then they would likely cut back loan growth in favor of more holdings of government securities. Many bank loans to small businesses require the comparative advantage and/or scale economies of a bank associated with information production (see Diamond, 1984). If banks reduce the supply of credit, many small borrowers may be unable to obtain financing because of the loss of information obtained through the bank-borrower relationship. Moreover, according to the “lending view” of the transmission channel of monetary policy, a reduction in credit allocation through bank loans, for example, would exacerbate an economic slowdown and reduce the effectiveness of monetary policy (see, e.g., Bernanke and Blinder (1988, 1992); Romer and Romer (1990); Gertler and Gilchrist (1991, 1993)).

The analysis proceeds systematically by exploring how and why bank lending and capital characteristics differ between the credit crunch and control periods. We first see if in fact change in means between the pre- and post-Basel periods was experienced by bank lending and capital using the simple regression:



$$D_{ijt} = \alpha_0 + \alpha_1 \text{Post-Basel-R.P.}_{jt} + \alpha_2 X_t + \varepsilon_{jt} \quad (1)$$

$D$  in Model (1) represents each of the dependent variables: the real growth of total assets (*RGTA*), the ratio of government securities over total assets (*GOVSEC*), total capital ratio (*TCAPR*) and the loan-asset ratio (*LAR*);<sup>12</sup> *Post-Basel-RP* is a dummy variable that equals 1 for each year after the implementation of the Basel I Accord in the specific bank  $j$  and 0 before that;<sup>13</sup> the  $X$  variables in equation (1) include macroeconomic variables to account for the demand-side hypothesis. More specifically, they include macroeconomic variables that could influence bank lending behavior. Our analysis incorporates three such variables: real GDP growth per capita (*Growth in GDP*), differential between loan and deposit interest rates (*Interest rate*), and the exchange rate (*Loc. Cur/USD*), measured by the price of the U.S. dollar in terms of domestic currency. Credit growth is likely to pick up during periods of economic boom that are consistent with higher real growth. In contrast, exchange rate depreciation may slow down credit expansion; depreciation of the exchange rate would increase the risk to lending in domestic currency, given outstanding foreign liabilities; and  $\varepsilon_{j,t}$  is a mean-zero random error, which is serially uncorrelated and orthogonal to information available at time  $t-1$ .

In order to test whether loan supply contracted as a result of the Basel I Accord, we used the Berger and Udell (1994) approach with some adjustment, specifically tailored to the composition of our sample.<sup>14</sup> The analysis proceeds by exploring how and why bank loan growth rates differ between the pre- and post-Basel period. Bank loans are assumed to react to lagged measures of perceived risks; banks with a high level of risk (for instance, low total capital ratio) would have a lower level of loans on average than less capitalized banks. This is related to the “risk retrenchment hypothesis,” as defined by Berger and Udell.

$$\begin{aligned} \text{LAR}_{ijt} = & \alpha_0 + \alpha_1 \text{Post-Basel-R.P.}_{jt} + \alpha_2 \text{TCAPR}_{jt} + \alpha_3 \text{Post-Basel-R.P.}_{jt} \cdot \text{TCAPR}_{jt} \\ & + \alpha_2 X_t + \varepsilon_{jt} \end{aligned} \quad (2)$$

The dependent variable *LAR* is the loan-asset ratio. *TCAPR* is total capital ratio and we include three macroeconomic variables - real GDP growth per capita, differential between loan and deposit interest rates and the exchange rate - to capture changes in loan demand.

A negative  $\alpha_1$  coefficient would indicate that banks decreased their loans after Basel I regardless of their risk. If bank loans react negatively to a prior increase in risk (a decrease of total capital ratio), we expect the coefficient on the risk factor  $\alpha_2$  to be positive. The effect of Basel I on risk sensitivity will be assessed by the coefficient  $\alpha_3$  on the interaction term between *Post-Basel RP*

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<sup>12</sup> This ratio account for the reserves for loan losses since net loans is used instead of gross loans.

<sup>13</sup> The dummy is bank specific as the implementation date varies across banks in various countries in the panel, depending on the adoption date in each country.

<sup>14</sup> A major difference between the paper’s approach and that of Berger and Udell (1994) includes: (i) employing annual data, (ii) credit crunch is defined as a decline in credit availability, (iii) lagged variables are not included in equation (2), and (iv) we use one sample of banks within countries, absent data for further disaggregation.

and the *TCAPR* variables. If banks experienced risk retrenchment as a result of Basel I Accord, then  $\alpha_3$  should be positive. That is, banks with higher capital adequacy ratio were in a better position to expand loans in response to the higher standards imposed by Basel I.

To establish robustness, we utilize the Peek and Rosengren (1995b) approach, but with some adjustments specifically tailored to our case. We do take into account explicitly the international and inter-temporal dimensions of our sample by using panel analysis and by introducing control variables to account for macroeconomic effects. Peek and Rosenberg do not include any macroeconomic variables because the sample collected only covers New England banks. Following Peek and Rosenberg, we estimate the following equation:

$$RGLoans_{ijt} = \alpha_0 + \alpha_1 TCAPR_{jt-1} + (\alpha_2 + \alpha_3 TCAPR_{jt-1}) \Delta TCAPR_{jt} + \alpha_4 \log A_{jt} + \alpha_5 X_t + \varepsilon_{jt} \quad (3)$$

The dependent variable of equation (3), *RGLoans*, is the change in real net loans normalized by the ratio of capital to total assets at the beginning of the year, to reduce potential heteroscedasticity problems with the error term. Banks with capital-to-assets ratios below the required minimum are expected to have more sluggish growth in lending than better-capitalized banks.<sup>15</sup> To test this effect, equation (3) includes the lagged total capital ratio ( $TCAPR_{t-1}$ ), with  $\alpha_1$  and  $\alpha_2$  expected to be positive. The  $\alpha_2$  coefficient captures the effects of changes in bank lending on changes in equity, and is predicted to be positive in support of the capital crunch hypothesis. According to Peek and Rosengren (1995b) and Chiuri et al. (2002), we would anticipate the effect of the change in capital to be smaller for banks that have higher capitalization. The “risk retrenchment hypothesis” focuses on the effect of the change in capital on banks’ lending practices and their drive to avoid risk. To reinforce the evidence, we test variation based on the initial (beginning of the year) total capital stock. Hence, the evidence focuses on possible variation in banks’ risk appetite with the initial conditions across banks. We expect the estimates of the  $\alpha_3$  parameter to be negative, proving that the effect of change in capital ( $\Delta TCAPR$ ) is smaller when the total capital ratio at the beginning of the year is high. Potential demand-side shocks are controlled by the logarithm of total assets ( $\log A$ ) and the vector of macro-variables  $X$ .

## V. EMPIRICAL EVIDENCE AND ANALYSIS

Before we estimate the empirical models (1) and (2), we provide a diagnostic analysis of the series under consideration. Relevant statistics are summarized in Tables 2 and 3. The MENA region shows different patterns in the growth rates of credit following the introduction of Basel I. Although Jordan, Tunisia and Morocco have not experienced a slowdown in net loans, Egypt and Lebanon have.

Across all five countries, the average real growth of loans was higher in the pre-Basel period. Despite the capital adequacy regulation, the rate of growth of equity was higher, on average, pre-

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<sup>15</sup> The risk retrenchment hypothesis advocates lower levels of intermediation for banks with very low levels of capital. As long as banks want to stay financially viable, they restrain their lending practices under very low capitalization. The normal practice is that banks want to avoid high risk, particularly if they have limited access to capital and opt to maintain prudent standards to stay financially viable.

Basel I. Higher growth of equity contributed to faster growth in loans and banks' holdings of government securities, on average.<sup>16</sup> Nonetheless, the average growth of total assets was slightly higher post-Basel I, implying a higher degree of diversification in banks' portfolio. The qualitative evidence remains, in general, robust using banks' data from Egypt and Lebanon. In Jordan, there was a significant increase in equity growth post-Basel I. Banks' total assets grew, on average, at a higher rate post-Basel I, and this growth appears to be directly driven by higher growth of banks' holdings of government securities. Despite a reduction in the average growth of equity across banks of Morocco and Tunisia, banks experienced a surge in average real growth of total assets, particularly holdings of government securities.

Overall, descriptive statistics provide mixed evidence concerning the impact of capital regulations on the growth of equity, banks' assets, and their composition across the countries under investigation. Using end-of-period ratios, the evidence appears stronger regarding the effect of the higher capital adequacy ratio in accelerating the growth of banks' equity and their holdings of government securities, relative to total assets. The evidence, suggests, in general, higher loans-to-assets ratio post Basel I, in most countries.

Our approach to the empirical investigation relies on descriptive analysis and econometric estimation to establish robustness. Descriptive statistics are informative, but may not be conclusive. Hence, we test for structural breaks in a formal econometric model using dummy variables.

Table 4 presents the results of estimating the empirical model in (1). The positive and significant coefficient of the dummy variable indicates significant growth in banks' total assets post-Basel I in Egypt and Morocco and in a sample of all countries. The effects of macroeconomic variables are evident, having contributed to growth of assets. The positive and significant coefficients indicate the dominant effect of the demand channel in accelerating credit growth. This evidence is robust in Egypt, Lebanon, Morocco, Tunisia, and a sample of all countries. Currency depreciation slows down credit expansion in Lebanon, Morocco, and a sample of all countries.<sup>17</sup> Depreciation increases the cost of lending in domestic currency and the cost of borrowing in foreign currency. In contrast, currency depreciation stimulates export growth and demand for credit in Tunisia. A higher cost of lending depresses demand for credit and slows down assets expansion in Lebanon. In contrast, the differential margin between lending and deposit rates usually widens with a credit boom and, therefore, coincides with significant expansion in banks' assets in Jordan.

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<sup>16</sup> As banks were forced to comply with higher prudential regulations, they opted to increase the capital adequacy ratio to stem the risk of inadequate liquidity given existing leverage. Where banks have managed to increase capital, it is natural to have proceeded with more credit growth, where macroeconomic conditions proved to be conducive to private sector growth. However, in cases where credit risk prevailed, higher capital ratio may have forced banks to follow a more conservative lending strategy to avoid higher risk, given the difficulty of raising capital.

<sup>17</sup> Despite adherence to a pegged exchange rate in Lebanon, there were significant devaluations of the local currency with respect to the U.S. dollar over the time span under investigation. As Lebanon is dependent on financial inflows to the banking system from Lebanese living abroad, depreciation risk may slow down such inflows, shrinking liquidity in the banking system and, therefore, credit expansion.

Table 5 illustrates the results of estimating the empirical model in (1) using data for the ratio of banks' equity to total assets as the dependent variable. This ratio increased significantly post-Basel I in Lebanon, Morocco, Tunisia, and a sample of all countries. The effects of demand-side factors appear less robust, as the evidence is mixed. Higher real growth stimulates demand for credit and, in turn, a higher capital adequacy ratio in Morocco. In contrast, higher interest rate and currency depreciation depress demand for credit and decrease the capital adequacy ratio.

Table 6 illustrates the results of estimating the empirical model in (1) using data for banks' holdings of government securities as the dependent variable. The evidence is not robust regarding the effect of Basel I on banks' holdings of government securities. The evidence in Jordan and a sample of all countries indicates significant reduction in banks' holdings of government securities post-Basel I. By contrast, these holdings increased in Lebanon post-Basel I, which may be specific to the high government debt and to the excess liquidity in the banking system that is driven by migrants' flows. Currency depreciation increases the risk of investment in domestic currency, decreasing banks' holdings of government securities. This evidence is robust in Jordan, Lebanon, and a sample of all countries. In contrast, a widening margin between the lending and deposit interest rates decreases demand for loans and increases banks' holdings of government securities. This evidence is significant in Egypt and Jordan. The combined evidence supports, in general, a significant increase in equity that resulted in significant increases in banks' total assets and holdings of government securities post- Basel I.

Table 7 presents the results of estimating the empirical model in (2) using the net loans to total assets ratio as the dependent variable. The positive and significant coefficient on the dummy variable for Basel I indicates an increase in this ratio post-Basel I in Lebanon, Morocco, Tunisia, and a sample of all countries, independently of the level of risk at banks. The interactive dummy tests variation in net loans to assets ratio post-Basel I based on the level of risks at banks. The negative and significant coefficient indicates a reduction in net loans ratio the higher the initial capital relative to assets in Morocco, Tunisia, and all countries. Banks with lower capital ratio post-Basel I were able to expand net loans, in contrast to the risk retrenchment hypothesis. The positive and significant effect of real growth on the net loans to assets ratio is evident for Egypt only. In contrast, real growth decreases net loans to assets ratio in Lebanon, Tunisia and a sample of all countries. In these cases, higher growth provides better opportunities to diversify banks' portfolios, e.g., investing in sovereign bonds and equity, and decreases the net loan to assets ratio in the banking system. A widening differential between the lending and borrowing rates has a negative and significant effect, decreasing the net loans to assets ratio in Egypt and Jordan. A higher cost of borrowing has a negative effect on the demand for credit and, therefore, shrinks the loans to assets ratio.

Table 8 presents the results of estimating the empirical model in (3) using the growth rate of net loans in the banking system as the dependent variable. The positive and significant coefficient on the lagged capital adequacy ratio supports a significant increase in net loan growth with equity in Egypt, Lebanon, Morocco, and a sample of all countries. The coefficient on the change in equity provides mixed evidence. Higher growth of equity contributes to a higher growth of net loans in Egypt and Lebanon. In contrast, the growth in net loans decreases, despite higher equity growth, in Jordan. In the latter case, demand-side factors may have had a more dominant effect on the growth of net loans. The coefficient on the interactive term captures variation in the growth of loans with the capital adequacy ratio, conditional on the rate of growth in equity across banks.

The coefficient is positive and significant in Jordan and in a sample of all countries. In contrast to the risk retrenchment hypothesis, the effect of the change in capital on the growth of net loans is high, despite a high initial capital ratio across banks.

The results are grouped by nationality (Table 9), status of quotation (listed or not listed) (Table 10), and by ownership (Table 11).<sup>18</sup> In Table 9, the evidence supports significant increase in total assets, equity, and net loans post-Basel I for both national and international banks. It also, however, provides a sharp contrast regarding holdings of government securities: while national banks opted to increase their holdings post-Basel I, international banks decreased these holdings. The difference indicates that international banks have more options for diversifying their portfolios and reducing risk.

In Table 10, the impact of Basel I Accord is positive and significant on the growth of total assets, equity, and net loans, regardless of the status of quotation (listed or unlisted). In contrast, both types of banks held less government securities post-Basel I. The evidence discounts the importance of capital regulations on banks' decisions to hold less risky assets in their portfolio.

In Table 11, the evidence is robust regarding the effect of Basel I in stimulating the growth of banks' total assets, equity, and net loans, regardless of ownership. Both private and state-owned banks opted to hold less government securities, calling into question claims Basel I induced more risk-averse investment strategy.

## VI. CONCLUSION

This paper has considered the effect of enforcing the capital adequacy requirement on credit expansion across a sample of MENA countries that includes Egypt, Jordan, Lebanon, Morocco, and Tunisia. Three banking indicators are under consideration: total assets, net loans, and holdings of government securities. Enforcing more stringent capital regulations may have forced banks to shrink credit expansion in order to abide by the necessary requirement, absent measures to increase capital in the short term.

We study the effects of enforcing capital requirements using three empirical models. The first model measures the effect of capital regulation on the growth in total assets, loans, and equity. The second model combines capital regulations with risk measures, i.e., the capital adequacy ratio, to study their independent effects as well as their interactive effect on credit expansion. Moreover, the model controls for the effect of macroeconomic variables, namely real GDP growth, the interest rate differential between lending and deposit ratios, and the exchange rate relative to the dollar. The demand for credit is likely to increase with real GDP growth, indicating a boost in economic activity. A higher interest rate differential increases the cost of

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<sup>18</sup> Data constraints did not allow us to investigate the effect of banks' size. It is expected, however, that small banks are more conservative in their lending practices in the face of tougher capital regulations. Small banks have smaller capital, face more difficulty to raise capital and have less leeway to withstand risk.

investment, slowing down credit growth. Exchange rate depreciation increases banks' risk of lending in domestic currency, given their outstanding foreign obligations.

The results, across the sample of MENA countries under investigation, support an increase in growth of banks' equity post- Basel I. Nonetheless, the evidence does not support the effect of the capital adequacy regulation in slowing down credit expansion. Except in Lebanon, the growth of banks' assets increased post- Basel I. Further, the evidence, data permitting, does not support a deliberate effort to increase banks' holdings of government securities to mitigate risk and abide by capital regulations.

The evidence, although mixed, provides stronger support for demand-side determinants of credit expansion than for supply-side factors in the sample of MENA countries under consideration. This evidence illustrates that credit expansion in MENA countries is highly dependent on macroeconomic fundamentals and less dependent on micro foundations and supply constraints in the financial system. Credit expansion warrants a careful assessment of prudential regulations to reduce the risk of imbalances in the banking system. A thorough evaluation of the determinants of banking performance and credit supply is necessary. Prudential measures should be established to hedge against risk and increase the resilience of the banking system in the face of macro and micro shocks.

Credit expansion is a key ingredient of the transmission channel of monetary policy. Absent prudential regulations, rapid growth of credit could exacerbate the adverse effects of negative shocks in the banking system and the spillover effects on the economy. The paper's findings discount the evidence of a credit crunch on account of stricter potential regulations, and they support calls to monitor banks' performance to strengthen the intermediation function and reduce the risk of financial vulnerability. Absent these regulations, financial risk could have devastating effects on the stability of the banking system and these effects could propagate into an economy-wide financial crisis, as recent experiences have demonstrated.

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**Table 1: Variable Definitions and Sources**

<b>Variables</b>	<b>Definition</b>	<b>Sources</b>
<i>RGTA</i>	This variable is measured by the real growth of total assets	Bankscope
<i>GOVSEC</i>	This variable is the ratio of government securities over total assets	Bankscope
<i>TCAPR</i>	This variable is defined as total equity over total assets	Bankscope
<i>LAR</i>	This variable is measured by net loans over total assets	Bankscope
<i>LogA</i>	This variables is the logarithm of total assets	Bankscope
<i>Post-Basel-RP</i>	This is a dummy variable that equals 1 for each year after the implementation of the Basel I Accord in the specific bank <i>j</i> and 0 before that	Central bank web sites
<i>Growth in GDP</i>	This variable is measured by the real GDP growth per capita	International Financial Statistics (IFS)
Interest rate	This variable is computed as the differential between loan and deposit interest rates	International Financial Statistics (IFS)
<i>Loc. Cur/USD).</i>	This variable is defined as the exchange rate measured by the price of the U.S. dollar in terms of domestic currency	International Financial Statistics (IFS)

Table 2: Sample Period and Number of Observations per country<sup>19</sup>

Country	Sample period	Basel 1 implementation date	No. of banks	Sample representation ratio (%)	Average size in billion of USD	No. of banks per nationality		No. of banks by listing status		No. of banks by type of ownership	
						Inter.	Dom.	Non listed	Listed	Private	State-owned
Egypt	1989-2004	1997	28	97%	2.778	13	15	10	18	14	14
Jordan	1989-2004	1992	9	90%	3.167	6	3	0	9	9	0
Lebanon	1992-2003	1995	45	90%	0.589	-	-	-	-	-	-
Morocco	1989-2004	1996	9	82%	3.417	4	5	4	5	5	4
Tunisia	1989-2004	1996	12	86%	1.207	2	10	3	9	7	5

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<sup>19</sup> The data for Lebanon related to nationality, listing and bank ownership are not available.

Table 3: Descriptive Statistics

Measures of bank's behaviour	Average real growth				End of period ratios		
	Total Assets	Net Loans	Equity	Government Securities	Net Loans/Total Assets	Equity/Total Assets	Government Securities/Total Assets
<b>Panel A: Behaviour Pre-Basel 1</b>							
All countries	10.43%	21.44%	83.54%	41.85%	9.57%	6.74%	31.36%
Egypt (1989-1996)	5.93%	32.41%	14.09%	65.51%	40.53%	7.77%	42.85%
Jordan (1989-1991)	6.47%	-8.02%	-9.38%	28.77%	44.65%	6.97%	9.46%
Lebanon (1989-1994)	26.11%	26.22%	293%	37.40%	29.94%	4.61%	24.93%
Morocco (1989-1995)	4.79%	9.98%	12.86%	11.95%	39.61%	7.75%	29.46%
Tunisia (1989-1998)	3.7%	3.58%	16.32%	-	61.76%	7.56%	-
<b>Panel B: Behaviour Post-Basel 1</b>							
All countries	11.54%	9.58%	73.39%	26.51%	13.92%	10.21%	24.71%
Egypt (1998-2004)	8.71%	5.02%	8.06%	34.27%	48.39%	9.26%	20.77%
Jordan (1993-2004)	12.21%	1.12%	13.53%	47.54%	42.83%	10.38%	5.21%
Lebanon (1996-2004)	14.94%	14.71%	149.54%	19.45%	29.98%	10.94%	28.54%
Morocco (1997-2004)	7.25%	9.28%	7.06%	19%	48.42%	9.06%	38.66%
Tunisia (2000-2004)	5.02%	7.72%	10.10%	-	67.85%	10.02%	-

**Table 4: The Effects of Capital Adequacy Adoption on Bank's Real Total Asset**

	All countries	Egypt	Jordan	Lebanon	Morocco	Tunisia
Constant	6.747*** (40.31)	6.541*** (26.61)	2.843 (1.50)	13.888*** (14.18)	7.794*** (22.80)	5.941*** (17.16)
Post-Basel-R.P.	0.337*** (13.95)	0.386*** (7.67)	0.168 (0.66)	-0.561*** (-5.89)	0.519*** (9.01)	0.001 (0.03)
Growth in GDP	2.596*** (6.61)	4.234*** (2.95)	-0.888 (-0.63)	4.716*** (3.38)	2.216*** (5.66)	2.514*** (2.87)
Loc. Cur./(US\$)	-5.675*** (-41.55)	-0.004 (-0.25)	3.857 (1.34)	-0.009*** (-15.98)	-0.049* (-1.61)	0.581*** (3.29)
Interest rate	- -	-0.027* (-1.66)	0.227*** (4.91)	-0.017*** (-2.68)	- -	- -
F-statistic	-	-	-	-	-	-
F-test <sup>a</sup>	-	-	-	-	-	-
$\chi^2$ -Wald <sup>b</sup>	2718***	250.24***	55.80***	1332***	164.83***	55.48***
Hausman test <sup>c</sup>	3.34	0.14	0.54	0.63	0.09	0.34
No. of Banks	105	28	9	47	9	12
No. of Obs	1244	378	113	498	111	149

This table reports panel regression of eqs. (1) for the impact of Basel I Accord on bank's real total asset

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*, \*\* and \*\*\* respectively.

a Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

b The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

c asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.



**Table 5: The Effects of Capital Adequacy Adoption on Bank's Equity**

	All countries	Egypt	Jordan	Lebanon	Morocco	Tunisia
Constant	0.242*** (12.13)	0.125*** (9.31)	0.032 (0.11)	0.172 (1.34)	0.037** (2.46)	0.032 (1.25)
Post-Basel-R.P	0.018*** (5.42)	0.004 (0.90)	0.007 (0.18)	0.039*** (3.13)	0.011*** (3.70)	0.016* (1.83)
Growth in GDP	0.016 (0.32)	0.051 (0.36)	-0.163 (-0.71)	-0.316* (-1.69)	0.067*** (3.14)	0.112 (0.97)
Loc. Cur./(US\$)	-0.259*** (-8.75)	-0.002* (-1.68)	0.018 (0.04)	0.054 (0.499)	0.004** (2.49)	0.036 (1.57)
Interest rate	- -	-0.005*** (3.44)	0.013* (1.71)	-0.002** (-2.06)	- -	- -
F-statistic	79.22***	-	-	-	-	-
F-test <sup>a</sup>	13.63***	-	-	-	-	-
$\chi^2$ -Wald <sup>b</sup>	-	40.49***	3.79	170.50***	72.24***	49.47***
Hausman test <sup>c</sup>	72.73***	1.51	0.43	1.61	0.87	0.90
No. of Banks	105	28	9	47	9	12
No. of Obs	1244	373	113	498	111	149

This table reports panel regression of eqs. (1) for the impact of Basel I Accord on bank's Equity/Total Assets ratio.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*, \*\* and \*\*\* respectively.

a Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

b The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

c Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 6: The Effects of Capital Adequacy Adoption on Bank's Government Securities**

	All countries	Egypt	Jordan	Lebanon	Morocco
Constant	0.779*** (6.37)	0.221 (0.98)	0.309*** (2.69)	-0.055 (-0.29)	0.384** (2.51)
Post-Basel-R.P	-0.093*** (-4.95)	-0.051 (-0.67)	-0.045*** (-2.76)	0.041** (3.13)	-0.017 (-0.63)
Growth in GDP	0.131 (0.58)	-2.468 (-1.11)	0.142 (1.57)	-0.906*** (-1.69)	0.232 (1.21)
Loc. Cur./(US\$)	-0.576*** (-3.92)	-0.042 (-1.50)	-0.335 (-1.90)*	0.214* (-0.68)	0.012 (0.86)
Interest rate	-	0.062** (2.15)	0.004* (1.69)	-0.002 (-1.39)	-
F-statistic	8.82***	-	-	-	-
F-test <sup>a</sup>	49.38***	-	-	-	-
$\chi^2$ -Wald <sup>b</sup>	-	24.01***	26.39***	25.08***	2.43
Hausman test <sup>c</sup>	13.69***	0.05	0.60	6.40	0.10
No. of Banks	87	23	8	47	9
No. of Obs	921	255	99	456	111

This table reports panel regression of eqs. (1) for the impact of Basel I Accord on bank's Government Securities/Total Assets ratio.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*, \*\*, and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 7: The effects of Capital Adequacy Adoption on Bank's Net Loans Ratio (Berger et Udell, 1994 approach)**

	<b>All countries</b>	<b>Egypt</b>	<b>Jordan</b>	<b>Lebanon</b>	<b>Morocco</b>	<b>Tunisia</b>
Constant	6.543*** (2.78)	0.6843*** (15.53)	0.234 (0.25)	-26.793 (-1.35)	0.289*** (3.85)	0.553*** (7.60)
Post-Basel-R.P	1.725*** (2.98)	0.028 (1.17)	0.021 (0.836)	6.806*** (3.75)	0.187*** (3.63)	0.156*** (3.21)
Lag Eq/Ta	5.603 (0.86)	-0.291 (-1.51)	-0.375 (-0.34)	-1.407 (-0.08)	2.061*** (3.91)	0.905*** (3.21)
Lag Eq/Ta* Post-Basel-R.P	-12.016* (-1.87)	0.0362 (0.18)	0.283 (0.26)	-12.321 (-0.69)	-1.876*** (-3.05)	-1.381*** (-3.74)
Growth in GDP	-16.731*** (-2.86)	1.184*** (0.006)	-0.205 (-0.68)	-97.343*** (-4.10)	0.081 (0.76)	-0.459 (-1.30)
Loc. Cur./(US\$)	8.227** (2.48)	-0.018*** (-3.28)	0.407 (0.29)	33.953*** (2.63)	0.001 (0.06)	0.018 (0.25)
Interest rate	- -	-0.034*** (-6.83)	-0.022*** (-2.95)	0.175 (0.66)	- -	- -
F-statistic	3.92***	-	3.59***	-	-	6.89***
F-test <sup>a</sup>	26.10***	-	5.71***	-	-	27.90***
$\chi^2$ -Wald <sup>b</sup>	-	217.55***	-	38***	54.76***	-
Hausman test <sup>c</sup>	10.63**	2.14	50.01***	0.99	0.06	24***
No. of Banks	105	28	9	47	9	12
No. of Obs	1139	345	104	451	102	127

This table reports panel regression of eqs. (2) for the impact of Basel I Accord on bank's Net loans/Total Assets ratio.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*\*, \* and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 8: The Effects of Capital Adequacy Adoption on Bank's Real Growth of Net Loans (Chiuri et al., 2002 approach)**

	All countries	Egypt	Jordan	Lebanon	Morocco	Tunisia
Constant	0.717* (1.72)	0.091 (0.71)	4.691 (0.24)	-0.908*** (-4.01)	-0.138 (-0.80)	-0.155* (-1.74)
Lag Eq/Ta	2.974*** (3.89)	0.535*** (3.46)	-10.2914 (-1.12)	0.641*** (6.36)	1.347** (2.07)	-0.438** (-2.35)
Diffeq	-0.082 (-0.08)	2.301*** (3.99)	-73.701*** (-3.40)	0.695*** (7.27)	1.223 (0.90)	0.92 (1.46)
Lag Eq/Ta* diffeq	13.38** (2.24)	-10.657*** (-2.18)	980.111*** (7.24)	-0.688 (-1.28)	-3.342 (-0.25)	2.593 (0.58)
LogA	-0.128** (-2.36)	-0.009 (-0.57)	-0.147 (-0.84)	0.003 (0.26)	0.036 (1.54)	0.005 (0.73)
Growth in GDP	3.505** (2.45)	0.753* (1.82)	11.869* (1.74)	-0.385 (-1.36)	-0.155 (-1.13)	0.258 (0.78)
Loc. Cur./(US\$)	-0.007** (-2.47)	-0.011** (-2.14)	-5.278 (-0.18)	0.625*** (3.97)	-0.024*** (-3.14)	0.117*** (3.302)
Interest rate	-	-0.005 (-1.25)	0.160 (0.58)	-0.007* (-1.83)	-	-
F-statistic	-	10.13***	-	21.12***	3.31***	-
F-test <sup>a</sup>	-	2.08***	-	2.50***	1.60	-
$\chi^2$ -Wald <sup>b</sup>	47.13***	-	159.65***	-	-	43.58***
Hausman test <sup>c</sup>	9.59	29.27***	9.47	101.11***	16.25***	4.75
No. of Banks	105	28	9	47	9	12
No. of Obs	1138	345	103	451	102	137

This table reports panel regression of eqs. (3) for the impact of Basel I Accord on bank's real growth of net loans.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*\*, \* and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 9: The Effects of Capital Adequacy Adoption on Bank's Behaviour: Discrimination by the Nationality of the Bank**

	Real total asset		Government securities		Equity		Net loans	
	International	Domestic	International	Domestic	International	Domestic	International	Domestic
Constant	6.265*** (26.39)	6.801*** (9.21)	-0.444** (2.37)	0.166* (1.76)	0.089*** (10.71)	0.087*** (8.28)	0.477*** (16.03)	0.573*** (16.50)
Post-Basel-R.P	0.441*** (10.81)	0.373*** (9.21)	-0.205*** (-3.49)	-0.062*** (5.98)	0.018*** (5.04)	0.019*** (3.55)	0.203*** (6.86)	0.075*** (4.99)
Lag Eq/Ta	-	-	-	-	-	-	1.065*** (4.44)	-0.355** (-2.05)
Lag Eq/Ta* Post-Basel-R.P	-	-	-	-	-	-	-1.476*** (-5.42)	0.312* (1.77)
Growth in GDP	2.384*** (4.96)	2.011*** (3.47)	0.515 (0.83)	0.195* (1.74)	0.069 (1.49)	-0.025 (-0.31)	-0.218 (-1.20)	0.074 (0.50)
Loc. Cur./(US\$)	0.004 (0.24)	-0.012 (-0.61)	0.004 (0.16)	0.019*** (4.02)	-0.001 (-1.06)	-0.003* (-1.68)	-0.041*** (-6.53)	-0.018*** (-4.01)
F-statistic	-	-	-	-	-	-	14.81***	-
F-test <sup>a</sup>	-	-	-	-	-	-	16.75***	-
$\chi^2$ -Wald <sup>b</sup>	230.01***	139.74***	14.27***	37.65***	35.37***	12.98***	-	145.84***
Hausman test <sup>c</sup>	1.79	5.45	0.47	2.54	3.77	2.65	35.46***	0.40
No. of Banks	25	33	20	20	25	33	25	33
No. of Obs	326	417	236	229	329	417	304	384

This table reports panel regression of eqs. (1&2) for the impact of Basel I Accord on bank's behaviour subdivided by international and domestic banks.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*\*, \* and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 10: The effects of Capital Adequacy Adoption on Bank's Behaviour: Discrimination by the Status of Quotation**

	Real total asset		Government securities		Equity		Net loans	
	Listed	Non Listed	Listed	Non Listed	Listed	Non Listed	Listed	Non Listed
Constant	6.384*** (36.47)	7.153*** (15.96)	0.309*** (2.60)	0.285 (1.38)	0.086*** (11.20)	0.081*** (5.27)	0.517*** (19.27)	0.547*** (9.47)
Post-Basel-R.P	0.443*** (12.17)	0.281*** (8.70)	-0.151*** (-3.90)	-0.078*** (-3.79)	0.022*** (5.16)	0.006* (1.71)	0.104*** (5.69)	0.141*** (5.88)
Lag Eq/Ta	-	-	-	-	-	-	0.197 (0.99)	-0.061 (-0.23)
Lag Eq/Ta* Post-Basel-R.P	-	-	-	-	-	-	-0.262 (-1.25)	-0.948*** (-4.22)
Growth in GDP	2.041*** (4.38)	2.771*** (6.06)	0.376 (0.37)	0.314 (1.40)	0.006 (0.11)	0.082 (1.47)	-0.039 (-0.28)	0.201 (0.83)
Loc. Cur./(US\$)	0.005 (0.29)	-0.033** (2.10)	0.001 (0.37)	0.026*** (2.86)	-0.003* (-1.80)	0.001 (0.27)	-0.026*** (-6.42)	-0.014** (-2.18)
F-statistic	-	-	-	-	-	-	-	-
F-test <sup>a</sup>	-	-	-	-	-	-	-	-
$\chi^2$ -Wald <sup>b</sup>	265.26***	143.59***	17.15***	16.56***	29.03***	7.85***	108.96***	38.56***
Hausman test <sup>c</sup>	2.33	2.01	0.52	1.36	6.22	0.20	0.81	1.33
No. of Banks	43	15	31	9	43	15	43	15
No. of Obs	568	178	364	101	568	178	525	163

This table reports panel regression of eqs. (1&2) for the impact of Basel I Accord on bank's behaviour depending on the listing or not of the bank.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*\*, \* and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.

**Table 11: The Effects of Capital Adequacy Adoption on Bank's Behaviour: Discrimination by the Type of Ownership**

	Real total asset		Government securities		Equity		Net loans	
	Private	State-owned	Private	State-owned	Private	State-owned	Private	State-owned
Constant	6.197*** (32.49)	7.121*** (8.74)	0.381*** (2.72)	0.184 (1.51)	0.021*** (9.58)	0.086*** (8.47)	0.506*** (20.41)	0.552*** (11.44)
Post-Basel-R.P	0.481*** (11.49)	0.279*** (8.74)	-0.177*** (-3.90)	-0.066*** (-4.74)	0.021*** (4.07)	0.014*** (4.86)	0.164*** (7.61)	0.093*** (5.24)
Lag Eq/Ta	-	-	-	-	-	-	0.799*** (3.80)	-0.356* (-1.72)
Lag Eq/Ta* Post-Basel-R.P	-	-	-	-	-	-	-0.918*** (-4.17)	-0.105 (-0.53)
Growth in GDP	2.042*** (4.28)	2.035*** (3.41)	0.511 (1.16)	0.224 (1.08)	0.015 (0.25)	0.047 (0.82)	-0.172 (-1.16)	0.421** (2.02)
Loc. Cur./(US\$)	0.009 (0.45)	-0.017 (-1.12)	0.004 (0.20)	0.022*** (3.65)	-0.002 (-1.20)	-0.002** (-2.10)	-0.037*** (6.32)	-0.018*** (-3.72)
F-statistic	-	-	-	-	-	-	18.56***	(-3.72)
F-test <sup>a</sup>	-	-	-	-	-	-	19.43***	-
$\chi^2$ -Wald <sup>b</sup>	246.71***	114.63***	17.13***	24.65***	18.84***	26.56***	-	-
Hausman test <sup>c</sup>	5.48	0.40	1.27	3.57	1.27	1.04	23.47***	91.29***
No. of Banks	35	23	26	14	35	23	35	0.89
No. of Obs	471	275	312	153	471	275	436	23
								252

This table reports panel regression of eqs. (1&2) for the impact of Basel I Accord on bank's behaviour depending on whether the bank is privately or state-owned.

Note: t-statistics are in parentheses. Significance at the 10%, 5%, and 1% level is noted by \*\*, \* and \*\*\* respectively.

<sup>a</sup> Fischer's test under the null hypothesis that the coefficients specific to each bank are all equal and constant.

<sup>b</sup> The  $\chi^2$  is for the Wald test whether the explanatory variables in the random coefficient models are jointly significant.

<sup>c</sup> Asymptotically distributed as  $\chi^2$  under the null hypothesis that the explanatory variables are not correlated with the error terms.