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THE MACROECONOMIC IMPACT OF BANK CAPITAL REQUIREMENTS IN EMERGING ECONOMIES: PAST EVIDENCE TO ASSESS THE FUTURE

The Macroeconomic Impact Of Bank Capital Requirements In Emerging Economies: Past Evidence To Assess The Future

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ABSTRACT

We test for emerging economies the hypothesis — previously verified for G-10 countries only — that the enforcement of bank capital asset requirements (CARs) exerts a detrimental effect on the supply of credit. The econometric analysis on individual bank data suggests three main results. First, CAR enforcement — according to the 1988 Basel standard — significantly curtailed credit supply, particularly at less-well capitalized banks. Second, such negative impact was larger for countries enforcing CARs in the aftermath of a currency/financial crisis. Third, the adverse impact of CARs on the credit supply was significantly smaller for foreign-owned banks, suggesting that opening up to foreign investors may be an effective way to partly shield the domestic banking sector from negative shocks. Overall, CAR enforcement — by inducing banks to reduce their lending — may well have induced an aggregate credit slowdown or contraction in the examined emerging countries. This paper is relevant to the ongoing debate on the impact of the revision of bank CARs, as contemplated by the 1999 Basel proposal. Our results suggest that in several emerging economies the revision of bank CARs could well induce a credit supply retrenchment, which should not be underestimated.

JEL classification numbers: G18, G21, G28

Keywords: bank capital asset requirements, capital crunch

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1. Introduction

During the last decade an increasing number of emerging countries adopted stiffer rules for bank minimum capital requirements following the spirit, if not the letter, of the 1988 Capital Accord proposed by the Basel Committee on Banking Supervision for "internationally active" banks of G-10 countries. As a result, the Accord, initially designed to provide a level playing field for internationally active banks, has become a model for capital regulation of national banking system in both developed and emerging countries.

Following the early phases of implementation of the Accord in developed countries, a widespread concern emerged about the possible negative impact that higher capital requirements could exert on the level of economic activity, especially during economic downturns. The intense debate led to a number of empirical analyses, which identified several cases in which binding capital requirements led to a sudden contraction of bank lending.[1] On the occasion, Mr. Richard Syron, president of the Federal Reserve Bank of Boston, coined the expression "capital crunch" to characterize the simultaneous shortage of capital and the limited banks' ability to grant new loans that occurred during the 1990-91 recession in the United States.[2]

More recently, following the widespread adoption of Basel-like minimum banks' capital requirements, similar concerns have been expressed for emerging economies. Several authors have claimed that the tightening of capital requirements — or their more stringent enforcement — contributed to the depth and length of the financial crisis of East Asian economies. The issue seems even more relevant for emerging economies than it might have been for G-10 economies given the larger role that banking systems usually play in the former countries.

This paper provides new evidence on the effects that the introduction of Basel-like capital requirements in emerging countries had on bank lending policies. Our purpose is twofold. First, we want to assess whether the different institutional setup prevailing in emerging economies with respect to G-10 countries affects the banks' reaction to the introduction of otherwise similar capital regulations in the former countries vis-à-vis the latter ones. Second, our aim is to use any evidence of systematic effects associated with the implementation of capital requirements in emerging countries' banking systems to provide guidance both on the definition of the new Capital Accord and on its phasing-in prescriptions.

In order to offer preliminary evidence on these issues the paper extends previous empirical analyses in several directions. In the first place, we expand previous studies — focusing on single countries — to a larger set of emerging countries.[3] Secondly, rather than looking at individual countries in isolation, we group a relatively large number of emerging countries — which have adopted and enforced capital regulation in the last decade — and look at the statistical regularities arising from their joint analysis. Thirdly, rather than relying on aggregate data, we analyze the behavior of individual banks active in each selected country, thus being better able to identify supply-driven credit

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[1] For an exhaustive and updated survey of the literature on the impact of capital requirements on the level of economic activity, see BIS (1999).
[2] Remark reported in Woo (1999), p.1.
[3] Previous empirical work on the impact of capital requirements on bank lending in developing countries includes Ferri and Kang (1999) and Ito (2000).

restrictions. Finally, our framework encompasses both shocks to bank capital arising from external sources — such as business cycle related losses — and shocks originating from regulatory sources — such as in the case of an increase in capital ratios.

The evidence gathered in the paper points out three major results. First, the enforcement of capital adequacy requirements negatively affects the supply of bank loans over a multiyear horizon and the effect tends to be stronger for initially less capitalized banks. Second, the impact of higher capital requirements is larger for those countries implementing enforcement practices in the aftermath of financial crises. Third, the adverse impact of more stringent minimum capital regulations on the credit supply is significantly smaller for foreign-owned banks, suggesting that opening domestic banking to foreign ownership or to the entry of foreign institutions may be an effective way of shielding the domestic banking sector from negative shocks. Overall, higher capital requirements seem to exert a rather general and negative effect on bank lending in emerging economies, whether affected by a crisis or not.

Accordingly, our analysis suggests using caution in enforcing — more than introducing — minimum capital requirements in emerging economies, where financing channels alternative to the banking system are generally weaker. Under these circumstances, the curtailing of bank loans could cause a depletion of organizational capacity in emerging economies' corporate sectors with potential long-lasting detrimental consequences for these economies' prospects (Greenwald and Stiglitz, 1993). Adequate phasing in procedures should, therefore, be considered for those economies which may face new and higher capital requirements as a result of the revised Capital Accord. By the same token, local supervisory authorities considering the opportunity of introducing higher than the Basel suggested minimum capital ratios or enforce sounder provisioning policies, need to carefully consider these effects as well.

More generally, our analysis is consistent with the view that risk-based capital requirements can exert effective and positive discipline only in those countries securing a minimum set of preconditions — e.g. adequate accounting standards, a proper definition of regulatory capital, and sound provisioning practices. Where, instead, those preconditions are lacking and the whole burden falls on higher capital ratios, the restrictive impact on bank lending may have large negative effects on the economy.

In the following we start surveying the considerable literature — mostly referred to developed countries — empirically assessing the impact of the enforcement of the 1988 Basel CARs (Section 2). Section 3 outlines our methodological framework — building on the seminal contribution of Peek and Rosengren (1995) — to identify the impact of the enforcement of the 1988 Basel CARs in emerging economies. Specifically, we single out crisis countries — in which the enforcement likely took place under externalpressures— from the others. Section 4 describes the procedure adopted to select the sample of emerging economies and exposes our testing strategy. We present the econometric results in Section 5, while Section 6 concludes.

2. The impact of CARs on bank behavior: previous contributions and open issues

It is a well-known tenet that capital adequacy rules have an impact on bank behavior.[4] Specifically, the literature has focused on two aspects. First, it is believed that the introduction of capital adequacy rules will normally strengthen bank capital and, thus, improve the resilience of banks to negative shocks. The second main affected area is banks' risk taking. If, as it happens, capital adequacy rules establish higher standards for loans to the private sector than for credits vis-à-vis the public sector (e.g. Treasury securities), introducing these rules, might cause a shift in banks' balance sheets from the former to the latter assets.

Put in other words, the first question is whether banks fulfill the CARs by increasing capital (the numerator) or by reducing risk-weighted assets (the denominator). The second question, instead, asks whether the stiffening of capital adequacy can lead to a contraction in banks' supply of loans. Although the two issues are indeed related to each other — i.e. the contraction in loan supply can be the most effective way of reducing risk-weighted assets — they have been addressed using different methodologies.

The two questions just outlined appear even more relevant for emerging economies. Regarding the first, in fact, banks might be more likely forced to reduce risk-weighted assets when their ability to raise capital is impaired by shallow domestic capital markets, i.e. the typical situation in emerging economies. Regarding the second, bank lending represents a larger share in the corporate sector's external finance in emerging economies, thus making them more prone to suffer from the ensuing restriction in bank lending.

Regarding the first question, some authors provide evidence that banks change the composition of their assets away from high risk-weighted assets when capital requirements are binding for them. Studies on this issue have mostly focused on US banks: e.g. Dahl and Shrieves (1990), Aggarwal and Jacques (1997), and Jacques and Nigro (1997) all offer evidence for US banks only. Some other contributions have tried to assess whether negative shocks to capital induced Japanese banks to restrict lending. Considering that a large part of Japanese banks' Tier 2 capital consists of unrealized capital gains on equity investments, Kim and Moreno (1994) — on aggregate data — and Ito and Sasaki (1998) — on individual bank data — provide evidence that negative shocks to capital stemming from stock market plunges lead to significant declines in lending. Peek and Rosengren (1997) show that negative shocks to capital resulting from declines in the Tokyo stock market translate into curtailing loans in the US by Japanese banks and subsidiaries.

The second issue — whether the stiffening of capital adequacy can lead to a contraction in banks' supply of loans — has been debated at length in trying to explain the early 1990s US recession. By historical standard such recession was rather mild and yet recovery was extremely slow. Various authors have suggested that the reason for such extremely slow recovery has to be found in the capital crunch, a particular type of credit crunch — i.e. a retrenchment in banks' loan supply — precipitated by the inception in the US of the Basel Committee capital adequacy standards. The consequent failure of the banking system to play its normal role in the transmission of the monetary policy stimulus would have prevented the economy from responding to sizable interest rate cuts.

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[4] For general discussion, see Dewatripont and Tirole (1994); Freixas and Rochet (1997).

According to the definition proposed by the Council of Economic Advisors (1991), a credit crunch is "a situation in which the supply of credit is restricted below the range usually identified with prevailing market interest rates and the profitability of investment projects". Various reasons —surveyed in Bernanke and Gertler (1995) and Hubbard (1995) — account for banks' desire to retrench their loan supply following a monetary tightening or some other negative shock to the economy. It is argued that the introduction of the Basel Committee capital standards, induced a credit crunch by making loans more costly to hold for banks than government securities.[5]

Various authors, using different methodologies, have contributed to this interpretation. Some of the relevant papers have used cross-sectional bank-level data. Bernanke and Lown (1991) show that loan growth at individual banks between 1990:Q2 and 1991:Q1 was positively linked to initial capital ratios. Peek and Rosengren (1995) introduce an influential method to address the issue of identification of supply-induced effects. Namely, they argue that capital-unconstrained banks should react to negative shocks to capital by intensifying deposit taking, thus, when banks are not capital-constrained, one should expect a negative relationship between shocks to capital and deposit taking. On the contrary, they find a positive link between shocks to capital and the dynamics of deposits in 1990. They conclude this evidence suggests that the capital constraints for banks were pervasive as the Basel Committee ratios were phased in and, indeed, show that this impact is larger for banks having lower initial capital ratios. Berger and Udell (1994) concur that the expansion of loans was lower in 1990-92 for less-capitalized banks, but do not detect a sensitivity of loan expansion to capital ratios higher than the one observed during the recession of the early 1980s. All in all, most contributions published on the issue[6] support the hypothesis that the capital crunch adversely affected loan expansion in the US at the beginning of the 1990s.

Another episode that has received attention as one in which a capital crunch was likely refers to the Scandinavian countries' crisis of the early 1990s. At the beginning of the 1990s Scandinavian banks were heavily exposed to the sharp economic recession and suffered significant loan losses and decreased profitability. Bank capital became scarcer not only because of the events above but also because stricter capital requirements were introduced in response by regulators in order to implement European prudential standards. Applying to the three Scandinavian countries the methodology proposed by Peek and Rosengren (1995), Minetti (1998) finds support for the hypothesis of a capital crunch for Norway and Sweden but not for Finland. In particular, for Norway and Sweden he detects a positive relationship — and not a negative one as it should have been the case if banks were not capital-constrained —between capital shocks and the dynamics of deposits.[7]

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[5] Following the 1988 Basel Committee rules, loans to the private sector require the bank to post a minimum of 8% in qualifying capital equivalent, whereas credits on the State sector bear a zero requirement. In the US, Basel Committee capital standards were formally approved in 1989 and phased in at the end of 1990.

[6] A notable exception is Sharpe (1995), who presents a survey of this literature and a critical review of its research findings. He argues that the evidence in favor of a capital crunch is far from conclusive, the only exception being the evidence for banking in New England where the support for the capital crunch is reasonably firm.

[7] Minetti's lack of evidence of a capital crunch for Finland is consistent with the results of Vihriälä (1997), who also concurs on this finding.

The link between bank capital standards and banks' loan supply came again under investigation in assessing the Japanese and East Asian crisis. According to many studies, in Japan the fragility of the banking system was a major culprit behind the persistent crisis — or lack of recovery — the country experienced through the 1990s. The hypothesis of a capital crunch is also frequently cited as a possible explanation for the retrenchment in lending by Japanese banks, in light of both the increasing burden of NPLs and of the fact that Japanese authorities have paid more and more attention to Basel Committee CARs. Woo (1999) addresses the capital crunch issue on a cross-section of Japanese banks, using the methodology put forth by Peek and Rosengren (1995). Although he does not find similar results for the previous years, the evidence reported supports the capital crunch hypothesis for 1997, possibly the year in which the enforcement of capital adequacy was stiffened the most. Regarding East Asian crisis countries, it has been noted that, in response to the crisis, all of them adopted measures to strengthen bank capital adequacy enforcement. Some authors have claimed that this contributed — at least partly — to the East Asian credit crunch (Ding, Domaç and Ferri, 1998; Ito and Pereira da Silva, 1999). Ferri and Kang (1999) address this issue for Korea, an interesting country to study since the decision to stiffen capital requirements was enacted by Korean regulators immediately upon the inception of the crisis. Once more, applying to Korean banks the methodology put forth by Peek and Rosengren (1995) and controlling for each bank's share of bad loans, they find a positive and significant link between shocks to capital and the expansion of deposits. They also show that those banks suffering from larger negative capital shocks experienced a more marked slow-down in the expansion of loans and increased more their lending rates. Thus, curtailing credit expansion could be the result of intensified credit rationing and/or of stiffer lending rates.

On the theoretical ground, Holmström and Tirole (1997) develop a model, which provides a rationale for applying looser banking norms in recessions. In a model in which agents both in the real and in the financial sector may be capital constrained, Holmström and Tirole reach the conclusion that intermediaries should satisfy market-determined capital adequacy ratios but these ratios should be pro-cyclical, i.e. higher during expansions and lower during recessions.[8]

A comprehensive paper by the Basel Committee on Banking Supervision (1999a) surveys the evidence for G-10 countries on the response of banks to the introduction and enforcement of the 1988 CARs. The paper's main findings are that "there is some evidence that bank capital pressures during cyclical downturns in the US and Japan may have limited bank lending in those periods and contributed to the economic weakness in some macroeconomic sectors". However, the report argues that for G-10 countries these effects "may well have reflected both regulatory and market pressures on banks to

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[8] Some authors even question the idea that enforcing increased capital standards would provide the proper incentives for banks to reach a more efficient allocation of credit. For instance, Hellman, Murdoch and Stiglitz (1999) argue that the net worth of a bank consists of two components. On the one hand stands the easily measurable bank's paid in capital. On the other hand, the bank possesses a hardly measurable "goodwill" capital, stemming from its "informational capital" on borrowers accumulated through the effective but costly screening and monitoring of those borrowers. They argue that enforcing increased capital standards will lead banks to rely more on the paid in capital component to the detriment of the "informational capital" component. Accordingly, they show that enforcing increased capital standards may induce banks to "under-invest" in their screening and monitoring of borrowers, thus leading to a worsening – rather than an improvement – in the allocation of credit.

maintain ratios at least as high as minimum."[9] In a recent analysis, the Basel Committee on Banking Supervision (2000) has argued that — other things being equal — risk-sensitive capital requirements tend to increase the pro-cyclical nature of capital ratios and this, therefore, may exert an impact on the macroeconomic cycle. The analysis goes on to note that although the empirical evidence for developed countries — as already mentioned — is mixed, the relevance of the impact is likely to be highly dependent on historical and institutional factors and, more specifically, on the presence of an important bank credit channel in the economy.

Besides the possible impact of the introduction of bank CARs outlined above, there is one additional issue of specific relevance to emerging economies. Specifically, we contemplate the hypothesis that the impact of this regulatory restriction could be smaller if the ownership of the domestic bank is in a Western country.[10]

There are various reasons why we could *ex ante* expect this to be the case. First, a significant entry of foreign banks may not only improve the efficiency of the recipient domestic banking market (e.g. Claessens, Demirgüç-Kunt, and Huizinga, 1998; Clarke, Cull, D'Amato, and Molinari, 1999), but also stimulate sounder banking practices and, thus, render the domestic banking system more resilient to negative shocks. Second, foreign banks can perform a "stabilizing" role in emerging economies: to the extent that the local domestic market is not the bulk of their business, it is unlikely that a local negative shock will precipitate a systemic crisis for foreign banks.[11] Accordingly, in the face of a major shock, a large share of foreign banks might partially offset "lending channel" detrimental effects[12] vis-à-vis a situation in which only national banks lend in the domestic market.[13] Third, a significant presence of foreign banks might reduce direct capital flights when the shock occurs: depositors who perceive the heightened risk of domestic banks can flee to foreign banks in the domestic market rather than fleeing abroad. Moreover, if the banking crisis and the currency crisis are compounded, foreign banks are the most convenient way to "dollarize" domestic deposits.[14] Fourth, to the

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[9] Basel Committee on Banking Supervision (1999a), p. 2.

[10] We exclude Japanese ownership because the Japanese crisis largely coincided with the period of observation — the 1990s — thus making it a possible further source of instability rather than a stabilizing factor (Peek and Rosengren, 1997).

[11] Demirgüç-Kunt, Levine, and Min (1998) have explored the link between foreign bank entry and occurrence of currency/financial crises in emerging economies. They find that increased foreign bank presence lowers the probability of systemic banking crises. However, we must distinguish between foreign banking in emerging economies carried out in the retail domestic market and international banking in emerging economies of the wholesale type. Whereas the former may generally act as a "stabilizing" factor, the latter may be a "de-stabilizing" factor: e.g. Peek and Rosengren (1998) argue that Japanese banks' curtailed wholesale international lending to South-East Asia contributed to the crisis.

[12] Obviously, this role of foreign banks in offsetting domestic lending channel effects should not be exaggerated. To the extent that foreign banks tend to lend mostly to the top tier of domestic borrowers, when the shock hits, it will be impossible for them to reach out to smaller businesses with which they didn't have previous relations.

[13] An additional reason according to which the presence of foreign banks may be stabilizing applies to countries that, having adopted a currency board, are impaired at providing lending of last resort to illiquid banks (Caprio, Dooley, Leipziger, and Walsh, 1996). In such a situation, at least theoretically, foreign banks could obtain liquidity from their mother country's central bank.

[14] Some hold that dollarization – the extreme form of currency substitution – would help defuse the problem of sudden stops and reversal in capital inflows which so often precipitate the twin crises (Calvo, and Reinhart, 1999). In fact, it is argued, explicit dollarization would avoid in emerging economies the

extent that domestic monetary/financial authorities have accepted a significant presence of foreign banks, they have "tied their hands" in the sense that it is much more difficult for them to distort the allocation of credit or extract regulatory rents from the banking system (Kane, 1998; 1999). In turn, a large presence of foreign banks is a potent reassuring signal.

3. Testing hypotheses and methodology

In choosing our econometric approach we were aware of the well-known problem of identifying supply-driven contractions in intermediation. As we underscored above, in fact, such contractions may also stem from demand determinants. Accordingly, our results would be hardly interpretable if our approach didn't pay enough attention to the identification issue. In view of this, the methodology we follow in our econometric analysis is the one proposed by Peek and Rosengren (1995). The Peek and Rosengren framework can be easily generalized in order to model the effect that changes in capital regulation might have caused on deposits and loans of banks operating in emerging economies. In particular, capital shortages in the banks included in our sample may have derived from two sources: the first is given by loan losses, which forced banks to write down capital; the second is due to changes in regulation which raised banks' capital ratio.

In order to derive the implications of the two sources of shocks it is useful to refer to the following simplified version of the banks' balance sheet:

$$D + (RK + EK) = D + TK = L + B \tag{1}$$

where D = Deposits, RK = Regulatory Capital, EK = Excess Capital, TK= Total Capital, L = Loans, and B = Bonds.

We also assume that capital regulation is defined by the leverage ratio:

$$k = RK/L \tag{2}$$

and that supply determined loans can be expressed as

$$L = RK/k \tag{3}$$

From equations (1) and (2) we obtain the following expression for deposits:

$$D = L + B - (RK + EK) = RK/k - RK - EK + B$$

which by total differentiation becomes:

$$dD = ((1/k)-1)dRK + (RK)d(1/k) - dEK + dB \tag{4}$$

As a matter of completeness, assuming that banks do not wish to change their bond holdings ($dB = 0$), we can also totally differentiate the expression (3) for loans and have:

$$dL = (1/k)dRK + RKd(1/k) \tag{5}$$

Both expressions (4) and (5) are discussed within three distinct scenarios:

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build-up of currency mismatches, which trigger financial sector crises when capital inflows come to a sudden stop.

1. the crisis case, when a negative shock to total capital affects bank lending and liabilities (i.e. $dTK<0$);

2. the regulatory case, when a change in regulation raises the fixed minimum capital requirement (i.e. $dk>0$);

3. the case of crisis with regulatory change, when the regulatory restriction takes place during a financial crisis and the previous two impacts need to be considered simultaneously.

3.1 The crisis case

It is easy to see from (4) that if the bank is capital constrained ($dEK = 0$ and $dTK = dRK$), the impact of a decrease in capital (and in regulatory capital) determines an effect of equal sign (reduction) in deposits. Alternatively, if the bank is not capital constrained ($dRK = -dEK$ and $dTK = 0$) the impact will be of opposite sign. This is the case considered by Peek and Rosengren that we shall label as the "crisis case".

Following Peek and Rosengren we have that:

1.1 $dTK < 0$ ↻ $dD/dTK > 0$ if the bank is capital constrained;

1.2 $dTK < 0$ ↻ $dD/dTK < 0$ if the bank is not capital constrained.

1.3 $dTK < 0$ ↻ $dL/dTK > 0$ if the bank is capital constrained.

1.4 $dTK < 0$ ↻ $dL/dTK = 0$ if the bank is not capital constrained.

3.2 The case of regulatory change

Let's now consider the "regulatory case". Capital shortage may derive from an increase in capital ratio (here the leverage ratio k). If effective, this exogenous increase will cause a reduction in deposits of the constrained banks ($dEK = 0$). The impact on the unconstrained bank instead will be null, since there will only be a substitution of excess capital with regulatory capital $dEK=-RK \times (dk/k)$[15].

Therefore in this second case we have that an increase in the capital ratio ($k = K/L$) has a clear-cut impact on deposits and loans whenever the bank is capital constrained:

2.1 $dk > 0$ ↻ $dD < 0$ if the bank is capital constrained;

2.2 $dk > 0$ ↻ $dD = 0$ if the bank is not capital constrained;

2.3 $dk > 0$ ↻ $dL < 0$ if the bank is capital constrained;

2.4 $dk > 0$ ↻ $dL = 0$ if the bank is not capital constrained.

Note though that an increase in the capital ratio ($dk > 0$) does not imply a predefined variation of total capital TK. Still, where banks are capital constrained and have limited asset alternative to loans a positive correlation between changes in capital

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[15] This expression can be derived substituting the relation, dRK = -dEK, which holds for unconstrained banks, in equation 4.

and deposits should be expected. In addition, the correlation becomes stronger with the increase of the leverage ratio (k)[16].

3.3   The case of crisis with regulatory change

We are now ready to consider the third case in which capital shortage may derive both from losses and from the introduction of a more restrictive capital regulation. If the bank is capital constrained $(dEK = 0)$ we shall have a cumulative effect driven by the capital reduction due to losses (lower deposits) and by a higher capital ratio (lower deposits). The impact on deposits of the negative shock on capital, foreseen by Peek and Rosengren, would therefore be reinforced. If the bank is not capital constrained then the cumulative effect should be similar to that foreseen by Peek and Rosengren. In fact the increase in regulatory capital would be absorbed by a compensating reduction in excess capital $(dEK = dRK)$ with no effects on deposits (eq. *2.2*) while the negative shock to total capital would again be transmitted with a negative sign to deposits (eq. *1.2*).

Looking at the loan side we can easily see that the increase in capital ratio (k) (eq. *2.3*) and the decrease in total capital (TK) (eq. *1.3*) will have a negative impact for capital constrained banks. The sum of the two effects in the "crisis" plus "regulatory tightening" is likely to have a magnified effect.

3.1 $\partial TK < 0$ $\Rightarrow$ $\partial D/\partial TK > 0$ if the bank is capital constrained;

3.2 $\partial TK < 0$ $\Rightarrow$ $\partial D/\partial TK < 0$ if the bank is not capital constrained.

3.3 $\partial TK < 0$ $\Rightarrow$ $\partial L/\partial TK > 0$ if the bank is capital constrained.

3.4 $\partial TK < 0$ $\Rightarrow$ $\partial L/\partial TK = 0$ if the bank is not capital constrained.

4. Sample selection and testing strategy

We have just shown under the latter two scenarios the impact of a regulatory change and have seen that a regulatory change can only reinforce the effect of a crisis on deposits and lending and that it might have as well a detrimental effect on the supply of credit if exercised in a stable economy. The next step is to test those theoretical hypotheses on a sample of banks operating in emerging economies. Although in principle interesting, we disregard the first hypothesis, i.e. the crisis case, given the sufficient evidence already provided in the literature.

In particular, we need to identify those emerging economies in which capital requirements were not only subject to increase, but the increase was also enforced. It is a matter of fact that national regulators had a certain leeway in the effective enforcement of bank CARs. As a result, enforcement didn't always follow the introduction of the 1988 Basel CARs. This was the case especially in countries where the supervisory authority lacked the necessary strength and independence.

In order to identify the emerging economies where bank CARs were effectively enforced, we made an extensive survey of the collection of the IMF Article IV

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[16] From equation (4) we can observe that for a capital constrained banks (i.e. when $dTK=dRK$) $dD/dTK>0$ if $dTK/TK < (1/(1-k)) \cdot (d(k)/k)$.

Consultation documents, considering all the reports from the last decade for a large selection of emerging economies. These documents offered us an independent and well informed assessment of whether and when enforcement had followed the introduction of the 1988 Basel CARs.

In these documents we looked for a number of indicators of a more rigorous stance on the part of bank supervisory authorities. Among them, we considered: i) a more severe approach to provisioning practices (e.g. the introduction of more restrictive criteria in the definition of non-performing loans or more stringent provisioning requirements); ii) changes in the bankruptcy regulation; iii) the implementation of bank restructuring programs and/or reorganization of bank supervisory agencies.

On the basis of these indicators we detected 16 countries in which the introduction or the revision of capital requirements was accompanied by measures of more effective supervision. For each of them we have also identified the year in which these measures were taken. This group includes 10 countries in which the regulatory change happened in conjunction with an exchange rate and/or financial crisis (Argentina, Brazil, India, Korea, Malaysia, Mexico, Paraguay, Thailand, Turkey, and Venezuela)[17] and other 5 non-crisis countries (Chile, Costa Rica, Hungary, Poland, and Slovenia). A sixth non-crisis country (Morocco) had to be eliminated due to the lack of data on bank loans and deposits associated to different accounting procedures of Islamic banking. We also contemplated the possibility of different degrees of enforcement, identifying a subset of 10 countries for which the evidence of enforcement is more convincing. In this latter group the crisis countries were 8 and the non-crisis 2. A more detailed description of the change in legislation occurred in each country and the year of enforcement is contained in Table 1 (for crisis countries), in Table 2 (for non-crisis countries), and in Table 3 (for countries that were considered but not included due to lack of evidence).

On the basis of the 15 selected countries we then verified the number of banks for which we have (from Bankscope) the balance sheet/profit and loss accounts in the years which precede and follow the enforcement date, as required for the empirical analysis. In the 15 countries previously listed we were able to select 572 banks (474 for crisis countries and 98 for non-crisis countries). Table 4 contains the sample composition by country, including also additional information on: (i) the percentage of banks with foreign ownership in Western countries; (ii) the percentage of banks that were undercapitalized in the pre-enforcement year; and (iii) the percentage of banks suffering an asset reduction either at year t or at year $(t+1)$ or at year $(t+2)$.[18] The largest percentage of banks included in the sample are Brazilian and Indian, the smallest those of Venezuela and Slovenia. India is also the country with the lowest foreign presence in the banking sector (only 4%), but it is worth noticing that Western ownership is on average larger in non-crisis than in crisis countries. Venezuela had the largest percentage both of undercapitalized banks and of banks suffering an asset reduction either in the year of enforcement or in the following two years.

The specific international composition of our sample might well affect the empirical results, although we will control for this problem as accurately as possible. Still, it is not an easy task to disentangle the effect of the enforcement of CARs in

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[17] We identified crisis countries according to the two lists provided in Detragiache and Demirgüç-Kunt (1998) and Kaminsky and Reinhart (1999).

[18] Including these two variables in the empirical analysis is important for the reasons stated above.

emerging economies, especially for those economies contemporaneously experiencing a financial crisis. In Section 3 we pointed out a transmission mechanism caused by a financial tightening and/or a regulatory shock, originating from a contraction in assets and especially affecting capital constrained banks. In Table 4 column 3 we make an attempt to evaluate the potentially capital constrained banks in our sample; we do this by computing the percentage of banks with CARs lower than the sample median by country, at the year preceding the enforcement. This proxy is the best we could find, given the limited information available on CARs regulation by country, especially before the enforcement. On average capital constrained banks, so defined, represent nearly half of our sample. An alternative and indirect measure is provided in the last column of Table 4, reporting the percentage of banks with a drop in assets occurring the years immediately following the enforcement. As expected, such percentage is higher in crisis countries, whereas the share of undercapitalized banks is analogous between non-crisis and crisis countries.

Table 5 (for crisis countries) and table 6 (for non crisis countries) provide an overview of the trend in the most important variables in our study: they report by country the percentage change in assets, equities, loans and deposits occurring the year before the enforcement, the year of enforcement and two years after the enforcement. Furthermore, the two tables also show the evolution of the equity/asset ratio. Data in the tables were computed on a restricted sample excluding Western owned banks; however, the values presented in each columns are not strictly comparable, due to missing observations.

At a first glance the capital asset ratio in all countries does not seem on average to have raised following the change in regulation. There are few exceptions, as Argentina, Paraguay or Turkey. Moreover, in countries like Venezuela, Thailand, Malaysia, Korea or Brazil, where the crisis was deeper, we found on average a substantial drop in assets, loans and/or equity. In general, there is no clear-cut evidence that equity increased (at an accelerated pace) with the regulatory restriction in most countries. In some countries the data show that (the rate of growth of) loans declined even significantly.

Table 6, concerning non-crisis countries, shows a less clear trend. During the change in regulation three countries out of five, namely Hungary Poland and Slovenia, reported a drop in the average level of equity, or of deposits and loans.

Nevertheless, the informational content of these descriptive statistics should not be overstated. Indeed, because of the international and intertemporal composition of our sample the descriptive statistics used so far are not informative enough and one needs to move into the empirical estimation in order to control for potential heterogeneity. Our testing procedure is based on the construction of an international panel whose observations are centered on the year of enforcement. The panel we managed to assemble is an unbalanced one because of: (i) there are some missing observations across time, and (ii) the available time length varies by country. The construction of a panel is justified by the fact that the announcement of the change in regulation might have occurred at any time during the year (for instance in Venezuela and Brazil it was in June, in Paraguay in December). In general, we expect not to be able to capture the enforcement effect in the same year. It might instead be spread also over the following years.

In order to test for the effect on deposits and loans of a shock to CARs, we use the Peek and Rosengren approach, but with some adjustment specifically tailored to our case. We do take into account explicitly the international and inter-temporal dimensions of our

sample, by means of panel analysis and by including control variables for year and macro-economic effects. We estimate the two following regressions:

$$\Delta D_t / A_{t-1} = a_0 + a_1 TK_{t-1}/A_{t-1} + (a_2 + a_3 TK_{t-1}/A_{t-1})(\Delta TK_t/A_{t-1})$$
$$+ a_4 Log(A_t) + a_5 Dsh + a_6 Dfb(\Delta TK_t/A_{t-1}) + a_i'\mathbf{Dy}_t + a_j'\mathbf{X}_t + \varepsilon_D$$

$$\text{with } t = (1, t, t+1, t+2) \qquad (6)$$

$$\Delta L_t / A_{t-1} = b_0 + b_1 TK_{t-1}/A_{t-1} + (b_2 + b_3 TK_{t-1}/A_{t-1})(\Delta TK_t/A_{t-1})$$
$$+ b_4 Log(A_t) + b_5 Dsh + b_6 Dfb(\Delta TK_t/A_{t-1}) + b_i'\mathbf{Dy}_t + b_j'\mathbf{X}_t + \varepsilon_L$$

$$\text{with } t = (1, t, t+1, t+2) \qquad (7).$$

In (6) and (7) the variables ΔTK, ΔD, ΔL are normalized by the beginning of period assets. The effect of a change in total capital on ΔD or ΔL is captured by the estimates of the a_2 and b_2 parameters, provided that potential demand side shocks are controlled for by the logarithm of total assets ($Log(A)$), and country/time varying effects are captured by the vector of macro variables $\mathbf{X}$. Vector $\mathbf{X}$ includes real GDP growth, the local exchange rate as currency units per US dollar and the local nominal interest rate.[19] The vector $\mathbf{Dy}_t$ includes year dummies, having as reference category the year preceding the enforcement, and ε_D, ε_L are normal i.i.d. random errors. All remaining coefficients aim to disentangle the impact of a change in total capital on the dependent variable according to three different effects. Specifically, the first effect refers to initially undercapitalized banks, where the impact (identified by a_3 and b_3) is expected to decrease with the level of banks' initial leverage ratio (capital over total assets). The second effect regards banks suffering a drop in total assets (here the dummy $Dsh = 1$,[20] which is the case for some 60% of the banks; Table 4), that evidently are in a wholly different situation than the other banks. The third effect concerns banks that are owned by foreign Western investors (here the dummy $Dfb = 1$, which is the case for one out of four banks; Table 4). For the reasons outlined above, these banks may be better fit to cope with the regulatory restriction.

This methodology can be applied straightforwardly to banks in crisis countries. Indeed, in crisis countries banks normally suffer negative shocks to their capital. Our expectation is that not only $\Delta L/A$ will be positively related to the change in the bank capital endowment, but also $\Delta D/A$ will exhibit the same feature. Should we obtain this result, we will be able to claim that the capital constraints associated with the enforcement of the CARs did shrink bank intermediation, thus further reducing the supply of credit. Such a result should be reinforced where the negative impact of a crisis on bank capital has been strengthened by a more severe enforcement discipline. Typically we would expect the effect of the change in capital to be smaller for banks which have a higher initial leverage ratio (i.e. Capital/Total assets) and correspondingly we expect the estimates of the a_3 and b_3 coefficients to be negative, proving that the effect of the change in capital decreases when the ratio of capital over total assets increases.

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[19] Source: International Financial Statistics by the IMF.
[20] The dichotomous variable Dsh takes the value 1 if there is a contraction in total asset at the time of the enforcement or within two years, 0 otherwise.

On the contrary, this methodology does not deliver easily interpretable results for non-crisis countries. There is, in fact, no guarantee that negative capital shocks will prevail for banks in countries that are enforcing CARs during a non-crisis period. In this case, however, any attempt to distinguish approximately (*ex ante*) capital constrained banks from those unconstrained runs into a small sample problem, since the non crisis sample only includes 98 banks.[21] In light of this problem, we chose to evaluate the effect of the change in capital on deposits and loans only for low capitalized banks, interacting the dummy *Dlow* with the change in total equity:[22]

$$\Delta D_{it} / A_{it-1} = \nu_0 + \nu_1 \Delta TK_{it} / A_{it-1} + \nu_2 (Dlow \times \Delta TK_{it} / A_{it-1}) + \nu_3 Log(A_{it}) + \sum_i \nu_i' Dy_{it} + \sum_j \nu_j' X_{it} + \varepsilon_D$$

$$\text{with } i = 1, \dots, N, \; t = 1, \dots, 2 \qquad (8)$$

$$\Delta L_{it} / A_{it-1} = \varphi_0 + \varphi_1 \Delta TK_{it} / A_{it-1} + \varphi_2 (Dlow \times \Delta TK_{it} / A_{it-1}) + \varphi_3 Log(A_{it}) + \sum_i \varphi_i' Dy_{it} + \sum_j \varphi_j' X_{it} + \varepsilon_L$$

$$\text{with } i = 1, \dots, N, \; t = 1, \dots, 2 \qquad (9).$$

Alternatively, we could replace *Dlow* in (8) and (9) with the dummy (*Dsh*) selecting those banks experiencing a drop in assets, which itself supposedly identifies undercapitalized banks forced to reducing their assets to meet their CAR obligations. In equations (8) and (9) therefore some of the regressors included in the crisis and regulatory case have been left aside. The reason has already been clarified in Section 3.2: showing a positive correlation between the change in deposits and loans and in total capital as only confined to capital constrained banks. Finally, it is worth stating that both sets of equations (6)-(7) and (8)-(9) are reduced forms of the systems exposed in Section 3.3 and Section 3.2 respectively. In our reduced forms, the impact on deposits and loans of a change in CAR regulations will be indirectly estimated only through the effect of the change in total capital.

5. The empirical analysis: main results

5.1 Testing the crisis with regulatory change hypothesis

The empirical estimates of equations (6) and (7) for banks in crisis countries are reported in Table 7. The results are obtained by means of panel analysis, controlling for bank fixed effects and for country trends in both the financial and the real sector.

The effect of changes in capital on both the change in deposits and the change in loans is strong and consistent with the theory. As predicted by the theoretical analysis of the crisis case with regulatory enforcement, changes in deposits and in loans are

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[21] Were it feasible to regress equations (6) and (7) above separately for the two classes of banks, we would expect that a_2 and b_2 be insignificant for the unconstrained banks but significant — and positive — for the constrained banks. Alternatively, we would expect that a_2 and b_2 be significant for both classes but their size be smaller for unconstrained than for constrained banks.

[22] The dummy *Dlow* takes the value 1 if the bank has a capital asset ratio lower than the country median the year before the enforcement, 0 otherwise.

positively affected by changes in capital, and the effect is larger for low capitalized banks. The a_3 parameter in the deposit regression is negative and strongly significant and, in addition, the coefficient of the low capitalization proxy *Dsh* is significant in the loan equation. Moreover, in both equations, though neater in the loan regression, the capital crunch effect is generally weaker for foreign owned banks. This is shown by the fact that the change in capital, when interacted with the dummy *Dfb*, takes a negative coefficient as opposed to the estimated value found for the variation in capital on its own. Indeed, in the panel estimation for the change in loans the specific effect for foreign owned banks is negative and larger in size than the impact of changes in capital of their own, suggesting that the capital crunch effect does not regard foreign owned banks.

Note that in both regressions the time dummies, having as reference category the year prior to the enforcement, are all negative and generally significant. This result seems consistent with the hypothesis that the negative impact of the regulatory change spans also to the year following the enforcement.[23] We also find that all the results mentioned so far are much weaker two years after the enforcement, which suggests crisis economies possess some capacity to respond to the financial crisis.

To check for the robustness of our results, in addition to the panel, we report in Tables 8 and 9 the cross section OLS estimates of equations (6) and (7) restricted to the year of the enforcement and the year after. The evidence found is weaker, though still generally consistent with previous results. In the deposit equation, the effect of the slow down in capital accumulation due to the joint effect of the crisis and the rise in CAR is significant at the 10% level at time t and at the 1% level in year $t+1$. This result might be driven by the regulation enforcement becoming effective only in $t+1$ in countries — such as Malaysia, Korea, Thailand and Paraguay — where the CAR enforcement happened towards the end of the year. In the loan regression, instead, the coefficient of the change in capital is positive and significant in both years, suggesting the presence of a credit crunch immediately upon the regulatory enforcement. The evidence of no capital crunch found for foreign banks in the panel regression is visible only one year after the announcement for the loans while it is not evident for deposits.

In order to corroborate the conclusions found we also regress equations (6) and (7) selecting crisis countries where we found strong supporting evidence of the enforcement taking place. The results are analogous to the ones obtained for the full sample of crisis countries (Table 10). This reinforces the case that, in emerging economies, one should not underestimate the possibility of a credit supply retrenchment induced by CAR revision.

5.2   Testing the regulatory change hypothesis

The theoretical analysis exposed in Section 3 found that even when exerted in a stable economy, the enforcement of capital asset requirements can curtail credit supply, particularly if less-well capitalized banks are the main source of financial intermediation. However, due to small sample problems, we could not restrict our tests to undercapitalized banks only. Instead, we create a dichotomous variable (*Dlow*) for

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[23] We need however to state a caveat. We cannot exclude that our result is driven by simultaneous business cycle effects — possibly not adequately controlled by the macro variables included — or simply by differences in the sample composition — due to the unbalanced nature of our panel.

undercapitalized financial institutions using as the cut-off point the median of the capital asset ratio by country, computed the year before the enforcement. Adopting the specification (8) and (9), we then interact the computed variable *Dlow* with the change in capital, in order to capture the difference in the banking response to the regulatory shock, underlined in Section 3. In (8) and (9) the effects of foreign banks is disregarded, since they were mostly well-capitalized.

The empirical results of the panel analysis are contained in Table 11 and are obtained restricting the sample period to the enforcement year and to the two following years. Compared with the results of the crisis case, we find similar or even neater evidence. Both changes in deposits and loans are positively correlated with changes in capital for under-capitalized banks and the estimated coefficients are even bigger than the ones in Table 7. The main difference worth mentioning relates to the persistence of the effect of the change in capital. As opposed to the case of crisis countries, where it was omitted because it was insignificant, this effect is still detected in year ($t+2$) — which therefore was included in the analysis — for non-crisis countries.

While alternative interpretations cannot be ruled out, a possible explanation runs as follows. Crisis countries experience the CAR enforcement together with their crisis. If, as it often happens (Kaminsky and Reinhart, 1999), they experience twin crises coupling the financial crisis with an exchange rate crisis, then this may help explain two findings of ours. First, we found that the extent of the capital crunch is larger for crisis than for non-crisis countries. This could be explained by the fact the CAR enforcement hits crisis countries, which are already plundered by the pervasive illiquidity associated with the twin crises. Second, however, we found that the capital crunch is less persistent in crisis than in non-crisis countries. This could have to do with the fact that the former countries — contrary to the latter — experience a sizable depreciation of their exchange rates, and this is not only a curse as, at the same time, it also enhances their external competitiveness and helps their quicker recovery.

We also implemented a sensitivity analysis replacing the dummy *Dlow* with the variable *Dsh* already used in the crisis case. The results are collected in Table 12 and they generally support the conclusions already drawn.

6. Conclusions

This paper has provided new evidence on the effects that a stricter enforcement of minimum capital discipline can have on bank intermediation in less developed financial systems. In this respect, we have not limited our attention to the simple revision of capital ratios but have also considered those measures — e.g. improving accounting standards, adopting rigorous provisioning practices and more binding bankruptcy laws — which make capital requirement more sensitive to the change in the quality of banks' portfolios. Our paper offers a clear support to the general presumption that the "capital crunch" — the credit crunch associated to a stricter enforcement of bank capital regulation — is more pervasive in those countries where the credit channel is more important — i.e. where alternatives to bank credit are less developed.

Notwithstanding the general recognition that capital regulation may have different macroeconomic effects according to the divers institutional and developmental characteristics of each economy, still we observe that bank capital regulation has not yet

clearly addressed the distinct needs of less developed economies. More specifically, the recent proposal of a new Capital Accord set out by the Basel Committee in its Consultative paper still refers to the needs of "internationally active banks" and more generally addresses problems faced by developed countries' banking systems.

This paper contributes to the ongoing discussion on the new Capital Accord, stressing the fact that economies which mostly rely on bank credit may have to devote particular attention to the process of enforcement of a stricter capital discipline. The presence of different institutional constraints need not be read as an alibi for not modernizing capital regulation. It should instead motivate a timely revision of these constraints, on the part of the domestic authorities, and more differentiated regulatory options on the part of the international authorities setting regulatory standards.

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Appendix

Table 1: Identifying CAR Enforcement in Crisis Countries

Country	Year of Enforcement	Supporting Evidence	Evidence of Stronger Enforcement
Argentina	1994	Good	⏱ CAR has been increased from 8.5% (December 93) to 11.5% (January 95) and regulatory capital has increased from $6.7 bn to $8.7 bn from December 93 to May 95 ⏱ In June 1994, have been introduced stricter rules on loan loss provisioning.
Brazil	1997	Good	⏱ Capital requirements were increased from 8% to 10% ⏱ Introduction of consolidated supervision
India	1996	Good	⏱ CAR of 8% (deliberated in 1991) become effective in March 1996 ⏱ More restrictive loan classification procedure introduced ⏱ Strengthening of on-site supervision
Korea	1997	Good	⏱ In December 1997 the issuance of stricter loan classification and provisioning rules (which still fall behind international practices) was announced: it was planned to take place by July 1998.
Malaysia	1997	Good	⏱ In late 1997, after the crisis unfolded, new stricter loan classification and provisioning rules were announced. The new rules should be substantially in line with best international practices. Their implementation was supposed to start in January 1998. The Malaysian authorities changed their mind later on, in September 1998
Mexico	1993	Weak	⏱ Introduction of 8% CAR but weak accounting procedures (massive deferred tax credit in Tier 2) may have reduced the impact.
Paraguay	1994	Weak	⏱ 15% CAR has been introduced but there is evidence of weak enforcement.
Thailand	1997	Good	⏱ In late 1997, after the crisis unfolded, the issuance of new stricter loan classification and provisioning rules was announced. The new rules should be in line with best international practices. Implementation was supposedly phased-in July 1998/end-2000.
Turkey	1994	Good	⏱ Introduction of 8% CAR
Venezuela	1994	Good	⏱ Capital requirements were increased from 3% to 6% (to 8% in the first quarter 1996) at a rate of 2% per year, ⏱ NPL were reduced from 15% to 7% of total loans

Table 2: Identifying CAR Enforcement in Non-Crisis Countries

Country	Year of Enforcement	Supporting Evidence	Evidence of Stronger Enforcement
Chile	1997	Good	⏱ Introduction of 8% CAR
Costa Rica	1998	Weak	⏱ CAR is increased from 9% to 10% but is not binding ⏱ No evidence of previous evolution of capital regulation
Hungary	1992 and 1994	Good	⏱ 1992: stricter provisioning rules with a revised bankruptcy code made provisioning effective with negative effects on bank lending ⏱ 1994 (a) In December 1994, 8% CAR (deliberated in 1991) became effective (b) New provisioning rules (c) But capital is supplied by the public sector
Poland	1993	Weak	⏱ A public recapitalization plan of the banking system is undertaken which will put the system on a right track from there on
Slovenia	1994	Weak	⏱ There is an increase of CAR from 6.25% to 8% but the system appears overcapitalized

Table 3: Further Evidence

Country	Year of Enforcement	Supporting Evidence	Evidence of Stronger Enforcement
Morocco	1994	Good	⏱ New 8% CAR have been deliberated in December 1993 to be in place by December 1996. Still the increase take place mostly in 1994 may be due to an effective bank supervision structure. ⏱ In May 1993 a new law on loan accounting and provisioning is passed ⏱ In May 1993 stronger powers are awarded to bank supervisions
South Africa		Lacking	⏱ No indication of introduction of CAR; stable capital ratios; positive credit growth.
Kenya		Lacking	⏱ Weak enforcement and scarce information
Tanzania		Lacking	⏱ Lending freeze as a result of increasing NPL in 1992
Nigeria		Lacking	⏱ Not enough information
Sri Lanka		Lacking	⏱ No enforcement and decreasing capital requirement
Israel		Lacking	⏱ Lack of information on capital requirement enforcement

Table 4

The Bankscope Sample

The table reports the number of banks by country included in the sample. For each country the percentage of foreign-owned banks, excluding the ownership held by other crisis and developing countries, is given. The percentage of under-capitalized banks is computed as the one of banks with CAR lower than the median level, by country, the year before the regulatory shock (i.e. at $t-1$). The last column includes by country, the percentage of banks with an asset contraction occurring in year t or $(t+1)$ or $(t+2)$.

Crisis Countries	No. of Banks in year t	% Western Banks	% Under-capitalized Banks in year $t-1$	% Banks with asset contraction in t or $t+1$ or $t+2$
Argentina	63	28.10	46.03	65.08
Brazil	133	36.84	49.62	67.67
India	71	4.23	49.30	28.17
Korea	27	7.41	29.63	51.85
Malaysia	62	16.13	43.55	87.10
Mexico	19	15.79	36.84	52.63
Paraguay	19	31.58	57.89	57.89
Thailand	20	10.00	30.00	75.00
Turkey	44	18.18	52.27	65.91
Venezuela	16	37.50	62.50	93.75
TOTAL	474	25.74	46.84	63.08
Non Crisis Countries				
Chile	32	46.88	50.00	46.88
Costa Rica	15	13.33	40.00	40.00
Hungary	23	52.17	34.78	56.52
Poland	17	17.65	64.71	64.71
Slovenia	11	18.18	36.36	18.18
TOTAL	98	34.69	45.92	47.96

Table 5
Crisis Countries- Bank Balance Sheet Statistics

The table contains the percentage change in assets, capital, loans and deposits by country computed at the enforcement year, the year before and the two following years. The average capital asset ratio is also reported. Values are deflated by the annual consumer- price index. The sample excludes foreign owned (more than 30% foreign share holder) banks. Values in each columns are not strictly comparable due to missing observations.

Countries	t -1	Enforcement Year t	t+ 1	t+2
Argentina	1993	1994	1995	1996
Equity/Assets	0.14	0.16	0.18	0.16
d Assets(%)	67.82	20.87	1.82	30.92
d Loan (%)	44.05	27.16	-2.77	20.98
d Deposit (%)	87.84	20.50	-1.76	26.63
d Equity (%)	11.87	12.04	-1.01	-1.51
Brazil	1996	1997	1998	1999
Equity/Assets	0.19	0.17	0.21	0.17
d Assets(%)	38.95	9.05	17.71	9.05
d Loan (%)	26.39	-9.37	65.29	-9.37
d Deposit (%)	41.89	31.50	52.13	31.50
d Equity (%)	10.12	-7.08	4.05	-7.08
India	1995	1996	1997	1998
Equity/Assets	0.06	0.06	0.06	0.06
d Assets(%)	9.05	13.50	15.83	9.53
d Loan (%)	22.23	9.11	12.73	6.24
d Deposit (%)	7.97	18.59	15.88	8.30
d Equity (%)	34.76	29.35	26.03	0.21
Korea	1996	1997	1998	1999
Equity/Assets	0.07	0.06	0.05	0.05
d Assets(%)	19.41	18.54	7.96	16.75
d Loan (%)	18.16	12.06	-15.90	15.25
d Deposit (%)	19.31	13.90	33.24	24.04
d Equity (%)	6.63	-7.33	-13.32	4.99
Malaysia	1996	1997	1998	1999
Equity/Assets	0.12	0.10	0.09	0.09
d Assets(%)	30.30	29.41	-10.72	6.75
d Loan (%)	37.63	27.12	-5.51	-0.73
d Deposit (%)	30.31	31.35	-11.23	11.65
d Equity (%)	37.66	26.05	-14.18	3.98
Mexico	1992	1993	1994	1995
Equity/Assets	0.08	0.07	0.05	0.05
d Assets(%)	3.21	32.52	48.64	3.04
d Loan (%)	22.02	30.35	40.86	6.00
d Deposit (%)	4.93	25.40	40.83	10.12
d Equity (%)	13.15	22.32	4.85	6.61

Table 5 (continued)

Countries	t -1	Enforcement Year t	t+ 1	t+2
Paraguay	1993	1994	1995	1996
Equity/Assets	0.09	0.12	0.12	0.13
d Assets(%)	19.97	13.16	17.73	2.30
d Loan (%)	23.49	11.82	31.86	-0.53
d Deposit (%)	18.93	10.98	25.23	10.66
d Equity (%)	56.44	67.61	24.68	12.98
Thailand	1996	1997	1998	1999
Equity/Assets	0.09	0.05	0.07	_
d Assets(%)	10.83	12.72	-8.57	_
d Loan (%)	13.86	13.97	-14.57	_
d Deposit (%)	10.45	16.05	-4.86	_
d Equity (%)	15.41	-32.04	-3.25	_
Turkey	1993	1994	1995	1996
Equity/Assets	0.08	0.13	0.10	0.11
d Assets(%)	42.51	-3.09	27.51	28.58
d Loan (%)	55.90	6.10	61.05	59.79
d Deposit (%)	71.94	6.52	49.17	192.98
d Equity (%)	-19.30	4.02	11.39	24.45
Venezuela	1993	1994	1995	1996
Equity/Assets	0.12	0.09	0.11	0.14
d Assets (%)	-16.10	30.15	-14.88	-9.08
d Loan (%)	-10.95	-5.10	5.74	-6.27
d Deposit (%)	-18.82	36.30	-15.84	-12.40
d Equity (%)	5.95	21.56	2.95	13.94

Table 6
Non Crisis Countries- Bank Balance Sheet Statistics

The table contains the percentage change in assets, capital, loans and deposits by country computed at the enforcement year, the year before and the two following years. The average capital asset ratio is also reported. Values are deflated by the annual consumer- price index. The sample excludes foreign owned (more than 30% foreign share holder) banks. Values in each columns are not strictly comparable due to missing observations.

Countries	t −1	Enforcement Year t	t+ 1	t+2
Chile	1996	1997	1998	1999
Equity/Assets	0.08	0.07	0.08	_
d Assets(%)	12.77	9.52	5.53	_
d Loans (%)	15.18	17.70	2.87	_
d Deposit (%)	11.57	7.48	7.68	_
d Equity (%)	5.74	4.57	12.23	_
Costa Rica	1996	1997	1998	1999
Equity/Assets	0.15	0.12	0.10	0.12
d Assets(%)	4.83	14.76	22.93	7.61
d Loan (%)	-1.90	13.22	37.20	17.88
d Deposit (%)	40.34	60.34	28.37	8.19
d Equity (%)	-1.19	6.45	8.17	13.48
Hungary	1993	1994	1995	1996
Equity/Assets	0.18	0.18	0.16	0.12
d Assets(%)	5.71	5.54	0.71	20.72
d Loan (%)	-8.14	24.41	-19.73	-0.84
d Deposit (%)	13.76	9.96	-5.48	24.40
d Equity (%)	-22.40	1.88	15.53	-1.10
Poland	1992	1993	1994	1995
Equity/Assets	0.12	0.07	0.10	0.10
d Assets(%)	8.84	0.19	5.91	12.62
d Loan (%)	-3.07	-2.87	-3.46	34.27
d Deposit (%)	7.68	-0.20	10.34	8.08
d Equity (%)	-3.13	10.53	18.87	6.69
Slovenia	1993	1994	1995	1996
Equity/Assets	0.19	0.19	0.16	0.15
d Assets(%)	33.04	26.19	24.58	11.88
d Loan (%)	30.57	32.18	39.04	-5.11
d Deposit (%)	54.33	119.31	27.78	13.73
d Equity (%)	31.83	13.25	12.45	2.59

Table 7

Crisis Countries: Panel Regression

The table reports panel regressions of equations (6) and (7) for the change in deposits and loans occurred in crisis countries the year before, the year of enforcement and the year after (i.e. at *t-1*, *t*, *t+1*).

Variables	Dep. Variable: DD/A Coefficient (Stand. Error)	Dep. Variable: DL/A Coefficient (Stand. Error)
Constant	-4.8875 (0.3651)***	-5.6219 (0.5266)***
∂K/A	1.8306 (0.4308) ***	0.9234 (0.5996)
K/A	3.1597 (0.2234)***	2.6376 (0.2970)***
K/A $\diamond$ ∂K/A	-3.0011 (0.8474)***	0.1231 (1.1642)
Dsh $\diamond$ ∂K/A	0.1666 (0.3820)	1.2917 (0.6032)**
D*fb* $\diamond$ ∂K/A	-0.3067 (0.3445)	-1.5567 (0.5505)***
Log(A)	0.5150 (0.0414)***	0.5963 (0.0590)***
D*y*(t)	-0.0114 (0.0277)	-0.0764 (0.0375)**
D*y*(t+1)	-0.0500 (0.0308) *	-0.0626 (0.0423)
Growth in GDP	0.4534 (0.2630)*	0.3066 (0.3525)
Interest rate	-0.0002 (0.0018)	0.0023 (0.0025)
Loc.Cur./(US$ $\diamond$ 10000)	-0.0006 (0.0008)	-0.0001 (0.001)
N	466	464
$\bar{T}$	2.62	2.61
R^2	0.40	0.26
	$F_{(465, 746)} = 1.887$	$F_{(463, 737)} = 1.379$

Note: *   Significant at the 10 percent confidence level
         **   Significant at the 5 percent confidence level
         *** Significant at the 1 percent confidence level

Table 8

Crisis Countries: OLS regression at the enforcement year (at time t)

Variables	Dep. Variable: DD/A Coefficient (Stand. Error)	Dep. Variable: DL/A Coefficient (Stand. Error)
Constant	-0.2935 (0.1598)*	-0.1665 (0.1323)
∂K/A	2.0002 (1.1872)*	1.5888 (0.9577)*
K/A	1.2460 (0.1945)***	0.7038 (0.1450)***
K/A ⊗ ∂K/A	3.6731 (2.3140)*	-4.1119 (1.6416)***
Dsh ⊗ ∂K/A	-0.9418 (1.1726)	0.9560 (0.9534)
Dfb ⊗ ∂K/A	0.9309 (1.4422)	3.3856 (1.1838)***
Log(A)	0.0254 (0.0089)***	0.0122 (0.0073)*
Growth in GDP	1.2317 (1.4114)	1.1943 (1.1729)
Interest rate	-0.0013 (0.0021)	-0.0008 (0.0017)
Loc.Cur./(US$⊗100)	-0.0003 (0.0005)	0.0002 (0.003)
N	436	433
R^2	0.13	0.12

Table 9

Crisis Countries: OLS Regression one year after the enforcement (at time $t+1$)

Variables	Dep. Variable: DD/A Coefficient (Stand. Error)	Dep. Variable: DL/A Coefficient (Stand. Error)
Constant	-0.2522 (0.0782)***	-0.4369 (0.1595)***
∂K/A	0.8933 (0.3759)***	0.8790 (0.7715)
K/A	1.0380 (0.1412)***	1.7822 (0.2985)***
K/A ⊗ ∂K/A	-0.4566 (0.8391)	6.6875 (2.0178)***
Dsh ⊗ ∂K/A	0.6612 (0.3820)*	2.1362 (0.8224)***
Dfb ⊗ ∂K/A	0.3597 (0.3496)	-2.3866 (0.8388)***
Log(A)	0.0262 (0.0063)***	0.0289 (0.0128)***
Growth in GDP	2.3089 (0.5119)***	1.7248 (1.0265)*
Interest rate	-0.0038 (0.0017)***	0.0017 (0.0035)
Loc.Cur./(US$⊗100)	-0.0006 (0.0003)***	-0.0002 (0.005)
N	419	413
R^2	0.30	0.18

Table 10

Crisis Countries With Good Supporting Evidence: Panel Regression

The table reports panel regressions of equations (6) and (7) for the change in deposits and loans occurred in crisis countries where we found good supporting evidence of an effective regulatory policy. The sample includes changes occurred the year before, the year of enforcement and the year after (i.e. at *t-1*, *t*, *t+1*).

Variables	Dep. Variable: ΔD/A Coefficient (Stand. Error)	Dep. Variable: ΔL/A Coefficient (Stand. Error)
Constant	-4.8574 (0.3787) ***	-5.7203 (0.5484)***
ΔK/A	1.8037 (0.4424) ***	0.8757 (0.6165)
K/A	3.1514 (0.2288) ***	2.6328 (0.3043)***
K/A $\diamond$ ΔK/A	-2.9822 (0.8679)***	0.1458 (1.1928)
Log(A)	0.5179 (0.0433) ***	0.5414 (0.0508)***
Dsh $\diamond$ ΔK/A	0.1784 (0.3917)	1.3131 (0.6197)***
Dfb $\diamond$ ΔK/A	-0.2907 (0.3531)	-1.5589 (0.5649)***
D*y*(t)	-0.0119 (0.0297)	-0.0838 (0.0401)**
D*y*(t+1)	-0.0481 (0.0326)	-0.0555 (0.0446)
Growth in GDP	0.4676 (0.2735)*	0.3717 (0.3663)*
Interest Rate	-0.0001 (0.0020)	0.0032 (0.0027)
Loc.Cur./(US\$ $\diamond$ 10000)	-0.0001 (0.0009)	0.0005 (0.0011)
N	428	426
$\overline{T}$	2.68	2.67
R^2	0.40	0.26
	F(427, 708) =1.911	F(425,699) = 1.411

Table 11

Non Crisis Countries: Panel Regression

In the table panel estimates of equations (8) and (9) for the change in deposits and loans occurred in non-crisis countries the year of enforcement and the two years after (i.e. at $t, t+1, t+2$).

Variables	Dep. Variable: DD/A Coefficient (Stand. Error)	Dep. Variable: DL/A Coefficient (Stand. Error)
Constant	-3.1708 (1.1117)***	-0.8572 (0.7470)
K/A	2.1899 (0.3116)***	0.9864 (0.2416)***
D*low* ◇ ☞K/A	2.8249 (1.4642)**	3.7816 (0.8555)***
Log(A)	0.2857 (0.0977)***	0.0793 (0.0662)
D*y*(t+1)	-0.0273 (0.0525)	0.0054 (0.0352)
D*y*(t+2)	-0.1370 (0.0905)*	0.0292 (0.0605)
Growth in GDP	0.5534 (0.7466)	0.8002 (0.4991)*
Interest rate	-0.0068 (0.0048)*	0.0046 (0.0033)*
Loc.Cur./(US$)	0.0004 (0.0020)	-0.0010 (0.0013)
N	98	97
$\overline{T}$	2.58	2.59
R^2	0.30	0.27
	$F(97,147) = 2.317$	$F(96,146) = 1.705$

Table 12

Non Crisis Countries: Panel Regression

The table reports panel regressions of the equations (8) and (9) (but with *Dsh* replacing the dummy *Dlow*) for the change in deposits and loans occurred in non-crisis countries the year of enforcement and the two years after (i.e. at $t, t+1, t+2$).

Variables	Dep. Variable: DD/A Coefficient (Stand. Error)	Dep. Variable: DL/A Coefficient (Stand. Error)
Constant	-3.0596 (1.1192)***	-1.0098 (0.7839)
K/A	2.2432 (0.3164)***	0.9710 (0.2562)***
Dsh ◇ ☞K/A	1.5132 (0.8938)*	1.2878 (0.6065)***
Log(A)	0.2660 (0.0989)***	0.0860 (0.0698)
D*y*(t+1)	-0.0346 (0.0528)	-0.0068 (0.0369)
D*y*(t+2)	-0.1464 (0.0906)*	0.0127 (0.0633)
Growth in GDP	0.5988 (0.7478)	0.7428 (0.5237)
Interest rate	-0.0070 (0.0048)	0.0059 (0.0034)*
Loc.Cur./(US$)	0.0008 (0.0020)	-0.0006 (0.0014)
N	98	97
$\overline{T}$	2.58	2.59
R^2	0.30	0.19
	$F(97,147) = 2.303$	$F(96,146) = 1.705$