DO FINANCIAL CRISES DISCIPLINE FUTURE CREDIT GROWTH?

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Abstract

This paper tests one aspect of whether financial markets can provide strong discipline over domestic macroeconomic policies by looking at the behavior of credit markets following financial crises. While financial markets often fail to give strong warning signals before a crisis, at times they might still provide a secondary form of discipline by helping to force needed economic adjustments once a crisis has broken out, as witnessed by the euro crisis. In this paper we present a test of this hypothesis with respect to the rate of credit growth, a frequent contributor to financial crises. Using a sample 58 banking crisis episodes from 1977 to 2010,we find that after banking crises on average rates of credit expansion fall substantially and financial regulation and supervision is strengthened. However, there is a substantial degree of regional and within-region differences in these discipline effects and for a sizeable minority of cases there is no evidence of discipline effects. We also find that both democracy and the presence of post crisis IMF programs are associated with larger drops in the rate of credit creation from pre to post crisis periods.

I. Introduction

It has frequently been argued that financial markets can provide strong discipline over the financial behavior of governments and central banks. This view is personified in the comment made by a former presidential advisor that if he were reincarnated he'd like to come back as the financial market because then he could scare anyone. To many, such discipline would be a good thing, helping to offset various biases toward excessive financial laxity discussed in the literatures on time inconsistency problems, political business cycles, etc. To others, generally from the left of the political spectrum, such discipline is seen as being excessively harsh, forcing governments to curtail desirable actions.

1

Both of these frequently expressed views share the assumption that for good or ill, financial markets do provide considerable discipline over the decision making of public officials. Recent analysis, however, suggests that such discipline is often lacking. Indeed the frequency of financial crises themselves suggests the limitations of this discipline hypothesis, at least in its strong form that market discipline will force governments to correct policies that are heading toward crises.

Two things are required for this strong form of the discipline hypothesis to work: that markets give early warning signals that government policies are heading towards problems *and* that governments then respond to these signals. As documented in Willett, Chiu, and Walter (2014) there are many cases in which financial markets have failed to give any substantial early warning signals. The failure of interest rate premia to rise substantially on government debt of countries such as Greece before the outbreak of the euro crises is an important recent example. Similarly Prabha, Wihlborg, and Willett (2012) find little evidence of strongly rising risk premia on the debt of the major commercial banks before the US subprime crisis.

Once the euro crisis broke out, however, it appears that financial markets "woke up" and at least until the time of the ECB's commitment to do whatever it takes to save the euro, they reacted sensitively to the policies being adopted. Indeed some have argued that during the height of the euro crisis the markets imposed excessively harsh discipline on governments. While much more detailed analysis is necessary these developments suggest that there is likely a good bit of truth to the discipline *during* crises hypothesis.

In this paper we explore a third type of discipline hypothesis. Do painful financial crises induce governments and private sector decision makers to adopt more prudent policies for the future? In other words is there learning from the mistakes associated with crises? While such learning behavior seems quite plausible it is not obvious how strong the effect will be. In some countries special interest forces may continue to generate excessive credit creation even in the face of public demands for reform. Regulatory reforms that are undertaken may prove to be largely ineffective in the face of such pressures. There may also be considerable disagreement about the major causes of crises and hence what lessons should be learned. For example at the political level the right in the United states has frequently argued that the major cause of the

subprime crisis was excessive government interference in the housing markets while many on the left have blamed excessive financial deregulation.[1]

There is also a well-known tendency for memories to be short. This isn't always the case. The horrors of the German hyperinflation still inform the anti-inflation attitudes of the German officials and the general public. Still tendencies to lapse into past excesses cannot be fully discounted and our analysis finds a number of examples of such failures.

Our focus is on the extent to which banking crises tend to provide future discipline in the form of lower rates of credit growth than those prior to the crisis. We compare the rates of credit growth that preceded banking crises with subsequent growth rates. Of course bank credit tends to fall while a crisis is in process and this is typically the result more of the direct effects of the crisis than better disciplined policies. Thus we compare rates of credit growth after, not during, the crisis period with those that preceded the crisis.

Of course excessive credit growth is not the only cause of banking crises so comparing before and after rates of credit growth does not capture the full range of possible discipline effects but there has been considerable research on the relationship between credit growth and banking crises. The general conclusion of this research is that while many credit booms do not end in banking crises a majority of banking crises are preceded by credit booms. For example, Mendoza and Terrones (2008) find slightly over a majority of crises in their sample are preceded by credit booms while Elekdag and Wu (2011) find 69 percent of crises were preceded by booms in their sample.

High credit growth is the result of a combination of financial sector and government decisions and regulations. For example in the US subprime crisis excessive risk taking by banks played a major role, while Alan Greenspan's belief that competition in the banking sector would provide sufficient discipline (such that little regulatory oversight was needed) proved to be false. Many argue that the low interest rate policy of the Federal Reserve also contributed importantly to the buildup of the housing and credit bubble. For the most part regulators had the ability to offset these factors but failed to do so. Thus the bubble was the result of the interaction of a number of government and private sector policies. It would be hoped that the crisis would

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[1] This divide is reflected among others in the Final Report of the National Commission of the Causes of the Financial and Economic Crisis in the US (Angelides and Thomas 2011). The majority report (chaired by Phil Angelides, a Democrat) included two dissenting statements from Republican members of the commission: one written by Wallis and another by Henessey, Holtz-Eakin, and Thomas.

generate better discipline over all of these major factors but we believe that it is reasonable to focus initially on the composite effects.

While we will likely never be able to fully accurately assign relative weights to the various factors that contribute to these outcomes, it is possible to explore some aspects of these composite effects. In section 3 we investigate to what extent financial crises are followed by strengthening of financial regulation and supervision, i.e. to what extent is there an increase in regulatory discipline.[2]

Our results indicate that while on average rates of credit growth fall and financial supervision is strengthened following crises there are substantial differences across countries in the responses of both credit growth and strengthening of financial supervision. Thus it becomes important to attempt to understand the major factors that influence these differences. We begin this process by investigating the roles of democracy and of the presence of IMF programs in influencing these reactions. We find strong correlations between both democracy and IMF programs and the amounts of drops in rates of credit expansion following crises.

The paper is organized as follows. In section II, we describe the data on credit growth and banking crisis, and we explain how we set up the data for analysis. In section III we present cross-country comparisons of changes in credit growth from the pre- to the post-crisis periods. Section IV looks at changes in the strength of regulation and supervision after banking crises, while sections V and VI investigate the effects of IMF programs and democracy. Section VII offers concluding comments.

II. Set Up and Data Description

This study examines 58 banking crisis (country-year) episodes, the onset years of which occurred between 1980-2003, and we focus on a sub-set of 42 crisis episodes which were

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[2] Some studies have looked at the effects of crises on financial liberalization more generally (e.g. Mian, Sufi, and Trebbi 2014 and Rosas, Aguilera, and Ward 2013). However, it is not clear whether more financial liberalization unambiguously enhances post-crisis discipline effects. For example, financial liberalization that is accompanied by stronger capital regulation and supervision should reduce the likelihood of banking crises (e.g. Angkinand et al. 2010). Thus we focus on strengthening of prudential supervision which should unambiguously be associated with more discipline. It should be noted, however, that strengthening of formal financial oversight does not always translate into more effective supervision in practice. For example the high scores that the US received in the standard measures of quality of regulation (Abiad et al. 2008) did not keep regulators from failing to take sufficient actions to head off the US sub-prime crisis.

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preceded by positive pre-crisis credit expansion.[3] Our main variables of interest are credit growth, banking crisis, capital regulation and supervision (CRS), IMF programs[4] and democracy scores. CRS is proxied by a score measuring countries' compliance with international standards of banking supervision taken from Abiad et al. (2008), while data set on degrees of democracy are taken from Polity 2 and the combined scores of Freedom House and Polity 2. A more detailed explanation on the CRS and democracy measurements can be found in sections IV-VI.

Banking crisis data is taken from Laeven and Valencia (2012) who document occurrences of systemic banking crisis worldwide[5]. In this data set,[6] a country experiences the onset of a banking crisis in a particular year if there is either a significant bank run or a substantial government intervention to rescue the banking sector (bank holiday, deposit freeze, liquidity support, or outright bank takeovers). This data set is chosen because it has the widest country and period coverage of all existing data sets (it covers 145 countries with over 150 crisis episodes).

As discussed in the introduction, in an attempt to capture what constitutes "excessive" credit growth, scholars have used a number of different measures of private credit growth with varying results (see Table 1 for a summary). The two main underlying measures are growth in real credit and growth in credit/GDP. Each of these measures is designed to take into account one of the important factors that should influence the rate of non-excessive credit growth. Ideally one would like to compare actual credit growth with the results of a well-specified equation indicating what rate of credit growth is appropriate. Unfortunately there is no agreement in the literature on how such appropriate levels of credit growth should be estimated. This is reflected in the various measures that have been used to identify periods of credit booms. Thus we have adopted the cruder measures that have been used in the recent literature. In our preliminary analysis, we chose real growth of credit instead of growth of credit/GDP, since the latter measure

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[3] Ideally we would like to include countries hit by the global financial crisis of 2007-09. However, given that we are comparing credit growth in the post-crisis period and we only have credit data up to 2010, we do not have sufficiently recent credit data to include these crises.

[4] Participation in IMF programs are taken from a data set complied by Dreher (2006).

[5] Another widely-used data set for banking crises is Reinhart and Rogoff (2009, 2011), which uses a smaller sample of countries. As there are some discrepancies between the two, we plan to do robustness checks using Reinhart and Rogoff's data set in the future.

[6] We largely used banking crisis data from Laeven and Valencia (2012) in its original form, with some modifications. First, the authors code Brazil 1990 and 1994 as two separate cases of banking crisis. We exclude Brazil 1990 as an episode, given the authors' of the data set consider this a borderline crisis. Second, we exclude Chile 1976, given that the closure of banks only happened on a large scale in 1981.

does not account for the possibility that credit and GDP could have very different trends and recovery patterns after the crisis. In other words, we might face a situation where credit and GDP are falling individually; however, the growth in credit/GDP might go up because the fall in credit is smaller in magnitude than the fall in GDP. Therefore, we include a sensitivity analysis using these two different measures in the following section.

For our main analysis we follow the recent trend and use the growth of real credit[7] as our main measure, although we will also do sensitivity analysis using the other frequently used credit measure, the ratio of credit to GDP[8]. In our primary analysis we use the criterion that real credit growth before a crisis be positive and this condition is met for 42 of the 58 advanced and emerging market countries for which we were able to obtain a complete set of data.
The argument is that when high credit growth has not preceded a crisis then there would seem to be no major reason to try to reduce future credit growth. It is only when prior credit growth has been seen to be excessive that we would expect that there might be a learning experience that leads to reductions in future credit growth.[9]

Table1. Measures of credit growth

Measures of credit	Data source	Authors	Binary or continuous variable	Main Findings
1.Real credit or real credit per capita	International Financial Statistics (IFS)	Mendoza and Terrones (2008) use real credit/capita, Elekdag and Wu (2011) use real credit.	Binary variable :coded as 1 when credit deviates from its trend by a certain threshold. A standard Hodrick-Prescott (HP) is applied to separate the data into trend and cyclical components.	The majority of banking crises in emerging markets are preceded by credit booms.
2. Credit/GDP	World Development Indicators	Gourinchas, Valdes and Landerretche	Binary variable coded similarly as above, using a modified	The link between credit growth and banking crisis is tenuous. Most

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[7] Private credit data is taken from International Financial Statistics. We operationalize credit growth as the annual change in the natural log of real credit (the natural log of real credit in year t minus the natural log of real credit in year t-1). Following Beck et al. (2000) and Mendoza and Terrones (2008), real credit is the average of two contiguous end-of-year values of nominal credit, deflated by the end-of-year consumer price index. Private credit is defined as amount of claims held by both banks and non-bank financial intermediaries to the non-financial private sector.

[8] Other variables that are used are growth rates of the ratio of real bank credit to real GDP and real bank credit per capita. This sensitivity analysis has not been conducted yet.

[9] That real credit growth be positive is a fairly weak criterion for inclusion and may bias the analysis against finding discipline effects. We plan to also investigate the responses to cases where credit booms (a situation where real credit exceeds its long-run trend over a threshold factor) have been formally identified preceding crises.

	(WDI)	(2001)	(expanding) HP filtering technique.	banking crises are preceded by lending booms, *but* most lending booms are not followed by a banking crisis.
	WDI	Borio and Drehman (2009)	Binary variable, set using expanding HP filter.	In 18 industrial countries (1980-2008), sharp increases in both credit and asset prices precede banking crises.
	WDI	Joyce (2011), Demirguc-Kunt & Detragiache (1998)	Continuous variable: the level of private credit to GDP ratio.	An increase in credit/GDP significantly raises the probability of a banking crisis.
3. Real private credit growth/real GDP growth.	WDI	Caprio and Klingebiel (1997)	Binary variable coded as 1 when real credit growth/real GDP growth over the past three years is between 0-2.5%.	Positive link between rapid credit growth and crises applies to Latin America, but not when considering a larger set of countries.
4. Net domestic credit: the sum of net credit to the nonfinancial public and private sector.	WDI	Eichengreen and Arteta (2002)	Continuous variable.	In 75 emerging markets (1975-97), credit growth is positive and significantly related to banking crisis probabilities.

Pre- and Post-Crisis Sample Periods: Choosing a Time Window

As our main data analysis compares time plots of growth rates of credit before and after the onset of banking crisis episodes, one important point regarding the data set up is the time window or what periods to choose as our pre-crisis sample and post-crisis sample. Previous research suggests that it takes a few years of high credit growth to generate crises (Caprio and Klingebiel 1997, Dell'Ariccia et al. 2012). Behind a credit-growth induced banking crisis is a high number of bad loans. It could take a number of years for bad loans to accumulate and become evident that they need to be written-off. However, Amri, Prabha, and Wihlborg (2013) find that the preceding year or two is more substantively significant in explaining banking crises, compared to cumulative credit growth over 3-4 years preceding the crisis.

Given the foregoing, we take a conservative approach and use a four-year window for our average pre-crisis credit growth rates.[10] For the crisis period, examination of the data suggests that a conservative window to capture the declines in credit growth that usually occur during

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[10] Mian et al. (2014) apply a similar method and they use five years before the onset year and five years after the last year of crisis as their pre- and post-crisis samples.

crises is again three years. Thus we begin our post crisis period at t plus four years and again use a four- year window.[11] In other words, taking t as the onset year of a banking crisis, years t-3 to years t make up the pre-crisis sample period, while years t+4 to t+7 make up the post-crisis sample period. Our choice is broadly in line with similar research that looked at how credit behaves after financial crises (i.e. during output recovery periods). For example, Takats and Upper [12](2013) find that credit drops after a crisis on average level off within two years, which strengthens our case for deleting the 3-year period immediately after the onset of a banking crisis. We choose a 3-year window to delete in order to be conservative. Furthermore, while studying the relationship between capital flows and credit booms, Elekdag and Wu (2011) find that "typical credit boom lasts about three years, with a buildup, peak, and ending phase each lasting one year on average." One point to acknowledge is that even after deleting the three-years immediately after the onset of a banking crisis, there are potential biases. One is that as a country recovers from a banking crisis, if there has been a sharp drop in credit during the crisis this may overshoot an appropriate level so that above average credit growth might be appropriate for a year or two. This would create a bias against finding discipline. Thus we believe that our estimates for cases of post-crisis discipline are conservative.

One way to allay concerns regarding this type of potential bias is to calculate how long it takes for credit to return to its "normal" levels. Yet defining what "normal" is would be difficult. Clearly, what we observe in one or two years before the crisis is not normal, as this is the period where credit overshoots (hence a credit boom). In fact, if the immediate pre-crisis credit growth is too high (and thus problematic), this is not the ideal level that we'd want to return to. Table 2 reports the average trend of credit and GDP during and after banking crises. The second column reports average deviation of the log of real credit from its trend, using a Hodrick Prescott filter.[13] Nevertheless, the figures cited here suggest that our choice of time-

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[11] Future sensitivity testing will vary these parameters.

[12] Takats and Upper (2013, p. iii): "we examine data from 39 financial crises, which were preceded by credit booms. In these crises the change in bank credit, either in real terms or relative to GDP, consistently did not correlate with growth during the first two years of the recovery. In the third and fourth year, the correlation becomes statistically significant but remains small in economic terms." This paper also excludes financial crises which were not preceded by strong increase in credit and those which occurred in an environment of hyperinflation.

[13] We follow the filtering method suggested by Mendoza and Terrones (2008) and Elekdag and Wu (2011). We note however, that there are flaws in applying this type of filter, which assumes a linear trend. In particular, the trend line would be biased upward and incorporate strong credit growth before the crisis. We are currently investigating other possible filtering methods that might mitigate this problem.

window discussed in the previous paragraph is reasonable. For example, as seen from column 3, in the pre-crisis period (t-3 to t) we see that real credit does tend to blow up, enter the negative territory *during* the crisis and recovery period (t+1 to t+3) and in the post crisis period (t+4 to t+7), average real credit growth is no longer negative and starts to resemble the average figures observed before the crisis.

Table 2. Credit and GDP Growth around and during banking crises

	Average Deviation of Real Credit from Trend*	Average Annual Real Credit Growth	Average Annual Real GDP Growth	Average Annual Credit/GDP Growth
t-3	0.72%	3.19%	3.05%	2.72%
t-2	0.36%	3.92%	2.61%	4.94%
t-1	4.67%	8.32%	2.26%	9.40%
t	7.51%	7.22%	0.58%	6.86%
t+1	3.93%	-1.20%	-0.76%	2.93%
t+2	-3.45%	-4.33%	2.58%	0.86%
t+3	-4.57%	0.87%	3.83%	-0.74%
t+4	-3.38%	4.04%	3.84%	1.41%
t+5	-3.99%	2.76%	3.87%	0.43%
t+6	-3.32%	4.64%	4.34%	2.10%
t+7	-2.0%	6.28%	3.19%	4.77%

Note: *Deviation from trend is the percentage point difference between the variable log of real credit and its (HP Filtered) trend. t is the onset year of banking crisis.

III. Banking Crisis as Potential Source of Future Discipline: Examining Credit Growth Before and after a Financial Crisis

In this section we examine patterns in the changes in annual growth of real credit before and after banking crises episodes. Following the suggestion of Takats and Upper (2013), we exclude cases where average annual growth of real credit is negative before the crisis (e.g. Russia 1998, Venezuela 1994, Bolivia 1986, and Poland 1992).[14] To help fix ideas of post-crisis market discipline, in figures 1 and 2 below we present examples of a banking crisis episode that fits well with the post crisis discipline hypothesis (Malaysia 1997) and one episode (Thailand

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[14] Contrary to popular view, there are indeed episodes of systemic banking crises which are not preceded by strong credit growth. The dynamics of credit bust (if any) would therefore be very different if we include these 16 episodes where cumulative credit growth was negative before the crisis. For example, using real credit growth as a measure, the average pre-crisis CG is actually lower than non-tranquil years CG (3.61% vs 5.83%), which is puzzling. To investigate this further, in the future we would be looking at the specific cases of the 16 banking crisis episodes which were preceded by a negative 3-year credit growth.

1983) which does not. Malaysia experienced a sharp increase in annual real credit growth before the crisis (17.5%) , and a much lower growth of annual credit several years after the crisis had ended (1.13% in the post-crisis period). Meanwhile, Thailand's post-crisis credit growth did not fit with this pattern.

Figure 1. Malaysia: annual growth of real credit before, during (1997-1999) and after the crisis.
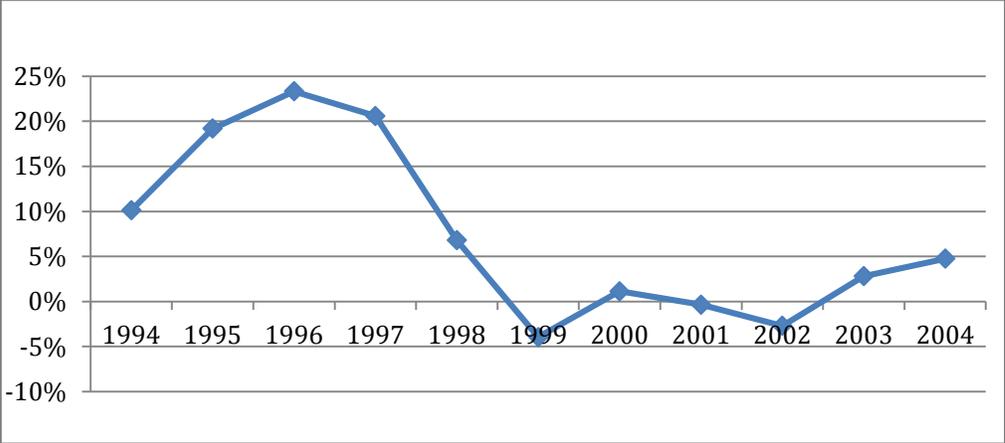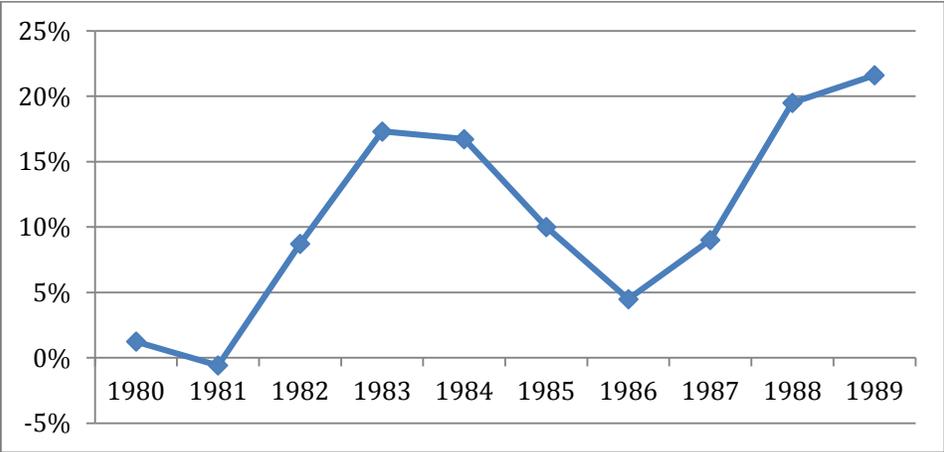

Figure 2. Thailand: annual growth of real credit before, during (1983) and after the crisis.

We analyze 42 credit-growth driven banking crisis episodes[15], out of the 58 advanced and emerging market countries for which we were able to obtain a complete set of data. Based on this sample, in the pre-crisis period (t-3 to t), average annual growth of real credit is 9.86% (std. deviation 7.2%). In the post-crisis period (t+4 to t+7), average annual growth of real credit is 2.82 % (std. deviation 13.8%). The average difference between pre-crisis to post-crisis is -7.04 % points, which is calculated by subtracting the pre-crisis value from the post-crisis value. Thus on average, the countries examined here experienced a *lower* average real credit growth after the banking crisis. This is illustrated in figure 3 below.

Figure 3. Annual real credit growth, before, during, and after a banking crisis, *t* is the onset year of the banking crisis
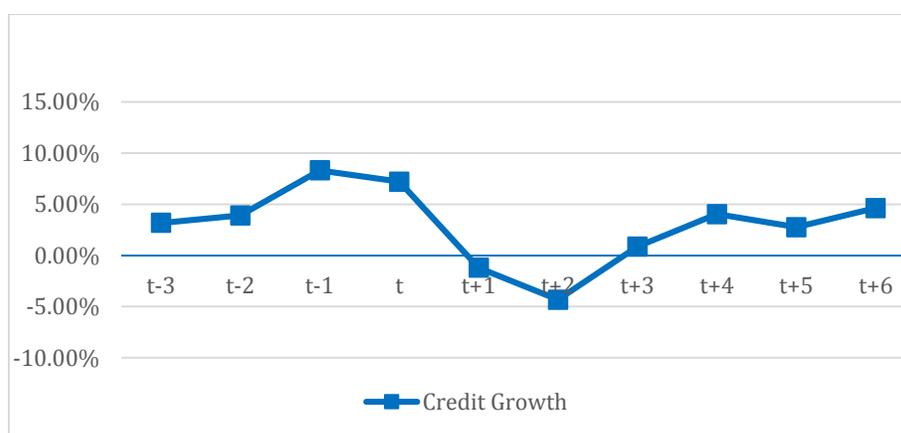
In table 3, we provide the episode-by-episode data. We see that there is considerable variation in results. Twenty-eight of the 42 cases (67 percent) are followed by lower credit growth and in 27 out of those 28 cases, the drop in credit growth is greater than 2 percentage points. In 16 of those 28 cases, the drop is ten percentage points or greater.

Table 3. Real Credit Growth from Pre to Post-Crisis Period - Episodes are arranged in descending order of pre-crisis credit growth

No.	Country	Region	Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Difference	Tranquil Years
1	Chile	Latin America/Caribbean	1981	36.48%	-0.55%	-37.03%	5.87%
2	Philippines	East Asia	1997	23.75%	-1.07%	-24.82%	1.04%
3	Mexico	Latin America/Caribbean	1994	22.64%	-2.89%	-25.54%	3.72%

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[15] These 42 country-year episodes occurred in 33 countries from 1980-2003. The first crisis episode in the sample is Argentina 1980 and the last one is Dominican Republic 2003. Taking the pre- and post-crisis periods defined as 4 year windows, the entire sample period for our analysis is 1977-2010.

4	Bolivia	Latin America/Caribbean	1994	21.96%	3.10%	-18.86%	5.26%
5	Malaysia	East Asia	1997	18.31%	1.13%	-17.18%	10.28%
6	Uruguay	Latin America/Caribbean	1981	16.45%	-3.06%	-19.51%	-1.58%
7	Thailand	East Asia	1997	15.87%	0.71%	-15.16%	7.71%
8	Nepal	South Asia	1988	13.83%	16.18%	2.34%	10.96%
9	Indonesia	East Asia	1997	13.20%	10.13%	-3.06%	15.13%
10	Peru	Latin America/Caribbean	1983	12.95%	-22.63%	-35.58%	2.02%
11	Paraguay	Latin America/Caribbean	1995	12.82%	-2.13%	-14.95%	1.17%
12	Dominican Rep.	Latin America/Caribbean	2003	12.29%	6.34%	-5.95%	3.45%
13	Uruguay	Latin America/Caribbean	2002	11.85%	9.26%	-2.59%	-1.58%
14	Korea, Rep.	East Asia	1997	11.36%	7.45%	-3.91%	9.22%
15	Argentina	Latin America/Caribbean	1980	10.56%	-14.86%	-25.42%	15.29%
16	China	East Asia	1998	10.26%	12.46%	2.20%	11.24%
17	Sweden	Europe & C.Asia	1991	10.07%	1.88%	-8.19%	0.37%
18	Egypt, Arab Rep.	Middle East & N. Africa	1980	9.82%	4.19%	-5.63%	5.86%
19	Burkina Faso	Sub-Saharan Africa	1990	9.70%	-0.87%	-10.57%	9.07%
20	Finland	Europe & C.Asia	1991	8.96%	-3.07%	-12.03%	4.32%
21	Costa Rica	Latin America/Caribbean	1994	8.53%	21.09%	12.57%	14.84%
22	Philippines	East Asia	1983	8.38%	4.92%	-3.45%	1.04%
23	Uganda	Sub-Saharan Africa	1994	8.09%	14.40%	6.31%	9.32%
24	Colombia	Latin America/Caribbean	1982	7.84%	-1.57%	-9.42%	6.44%
25	United States	North America	1988	7.76%	3.94%	-3.82%	4.88%
26	Ecuador	Latin America/Caribbean	1982	7.30%	-55.16%	-62.46%	-19.85%
27	Argentina	Latin America/Caribbean	1989	7.11%	8.21%	1.10%	15.29%
28	Argentina	Latin America/Caribbean	1995	7.05%	-8.77%	-15.82%	15.29%
29	Thailand	East Asia	1983	6.67%	18.60%	11.93%	7.71%
30	Colombia	Latin America/Caribbean	1998	5.95%	5.29%	-0.67%	6.44%
31	Brazil	Latin America/Caribbean	1994	5.69%	-4.72%	-10.41%	19.67%
32	Costa Rica	Latin America/Caribbean	1987	4.71%	8.53%	3.82%	14.84%
33	Mexico	Latin America/Caribbean	1981	3.74%	-3.47%	-7.21%	3.72%
34	India	South Asia	1993	3.42%	8.11%	4.68%	10.89%
35	Jordan	Middle East & N. Africa	1989	3.18%	9.58%	6.40%	9.80%
36	Morocco	Middle East & N. Africa	1980	3.04%	4.81%	1.77%	9.23%
37	Sri Lanka	South Asia	1989	2.31%	35.46%	33.15%	11.22%
38	Japan	East Asia	1997	2.06%	-16.50%	-18.57%	0.71%
39	Jamaica	Latin America/Caribbean	1996	1.64%	-5.80%	-7.44%	1.45%
40	Norway	Europe & C.Asia	1991	1.43%	7.22%	5.79%	5.24%
41	Argentina	Latin America/Caribbean	2001	1.37%	18.61%	17.24%	15.29%
42	Kenya	Sub-Saharan Africa	1992	0.81%	12.49%	11.68%	4.12%

We think it is important to compare these figures using an alternative credit growth indicator, which is the growth in credit/GDP.[16,17] One argument against simply looking at real credit growth is that high credit growth by itself is not a cause of concern if credit is being used to finance a growing real economy. Therefore, we examined whether the 42 episodes outlined in Table 3 also experience a positive growth in credit/GDP during the pre-crisis period (see table A1 in the Appendix). Out of these 42 episodes, five experienced a negative growth in credit/GDP in the pre-crisis period. These are Costa Rica (1987, 1994), Egypt (1980), India (1993) and Mexico (1981).[18] In these five episodes, while credit and GDP both went up, the average growth in credit/GDP is negative because the increase in GDP (the denominator) is greater in magnitude than the increase in real credit (the numerator). This illustration stresses that both indicators have their own strengths and weaknesses. In the future, we will conduct a sensitivity analysis where we will have sub-samples of countries which have positive pre-crisis credit growth according to either measure and another sub-sample where we include only countries with positive real credit growth and positive credit/GDP growth in the pre-crisis period.

We test whether the average difference in credit growth reported in Table 3 is significant. We conduct Kolmogorov-Smirnov tests for equality in distributions, as reported in Figure 4 and Table 4. Figure 4 shows the kernel densities of the annual growth in real credit for pre- and post-crisis sample periods for the 42 banking crisis episodes with positive growth of real credit in the pre-crisis period. The null of equality of distributions is rejected at the 1% level according to a Kolmogorov-Smirnov test.

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[16] To be precise, the annual growth in real credit/real GDP. We stress this because credit and GDP are deflated using different price indexes: real credit is deflated using Consumer Price Index, while real GDP is deflated using a GDP deflator.

[17] Another alternative to real credit growth is growth of nominal bank credit. However, we excluded this measure given that many of these banking crisis episodes were accompanied by hyperinflation (e.g. Brazil and Argentina), which would act as an upward-bias in nominal credit figures. Using measures such as real credit and real credit/real GDP partly deals with the banking crisis that involved cases of hyperinflation. In their analysis of output recoveries following banking crises, Takats and Upper (2013) who exclude hyperinflation-related crisis episodes.

[18] Meanwhile, we also have cases of negative growth in real credit but a positive growth in credit/GDP during the pre-crisis period such as Russia 1998 and Bolivia 1986. As earlier discussed, this can occur if the country experiences negative GDP growth of a larger magnitude than the fall in real credit.

Figure 4. Is the Difference in Average Real Credit Growth Pre-and Post-Crisis Significant?
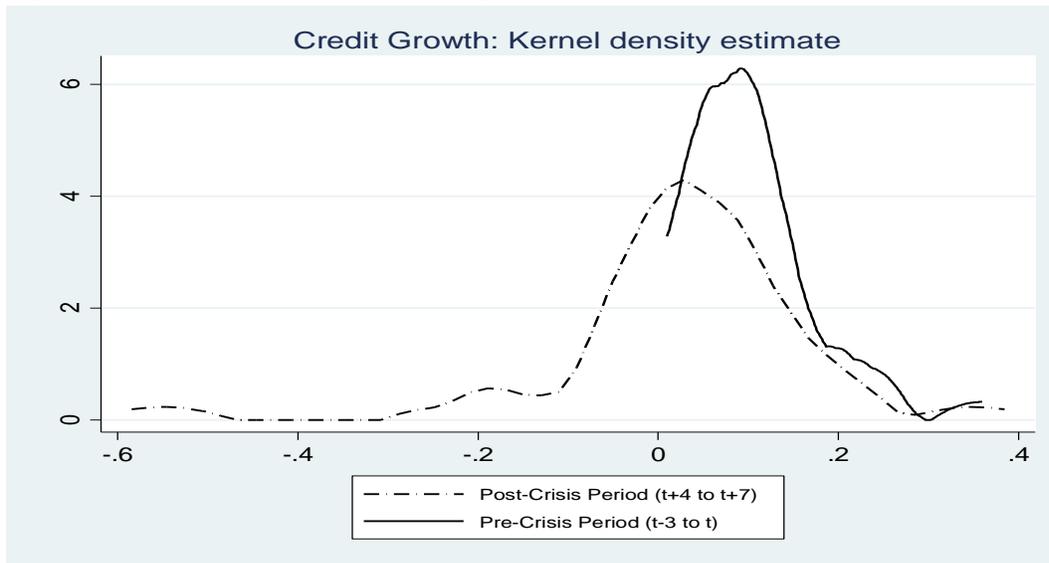

Table 4. Pre-and Post-Crisis Real Credit Growth: Equality of Distribution Test

	Kolmogorov-Smirnov tests for the equality of two distributions		
	Pre-crisis average Credit Growth (t-3 to t)	Post-crisis average Real Credit Growth (t+4 to t+7)	Before-After Difference
Sub-sample (42)	9.86%	2.82%	-7.04%*

Note: *The difference is significant at the 1% level.

     As shown in table 4, the change in real credit growth from pre- to post-crisis period is significant for the 42 cases of banking crises that were preceded by positive pre-crisis period credit growth. Not surprisingly we found that the difference is not significant if we include the entire sample of 58 crisis episodes[19] that consisted of both positive and negative pre-crisis period credit growth. Not only is there less scope for falls in credit growth for the countries that did not have pre-crisis real credit growth but it is also more likely that authorities and bankers would see no reason to try to lower future credit growth as credit growth wouldn't appear to have been a major cause of their banking crises.

     In figure 5 below we show the relationship between the pre-crisis rates of growth (Y-axis) and the change in the growth rates before and after a banking crisis (X-axis). The plots indicate

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[19] The test of difference in distributions for the entire sample of 58 crisis episodes is not included here.

a strong negative relationship: the higher the pre-crisis credit growth, the smaller the change in growth rates after the banking crisis. This suggests the possibility that those countries with the highest pre crisis rates of credit growth have weak political, and/or institutional situations that make it difficult to make adjustments in the wake of crises.[20] If correct, this would imply that crises fail to impose substantial discipline for the cases where it is needed most.

Figure 5. Pre-Crisis Real Credit Growth and Change in Growth Rates after the Crisis
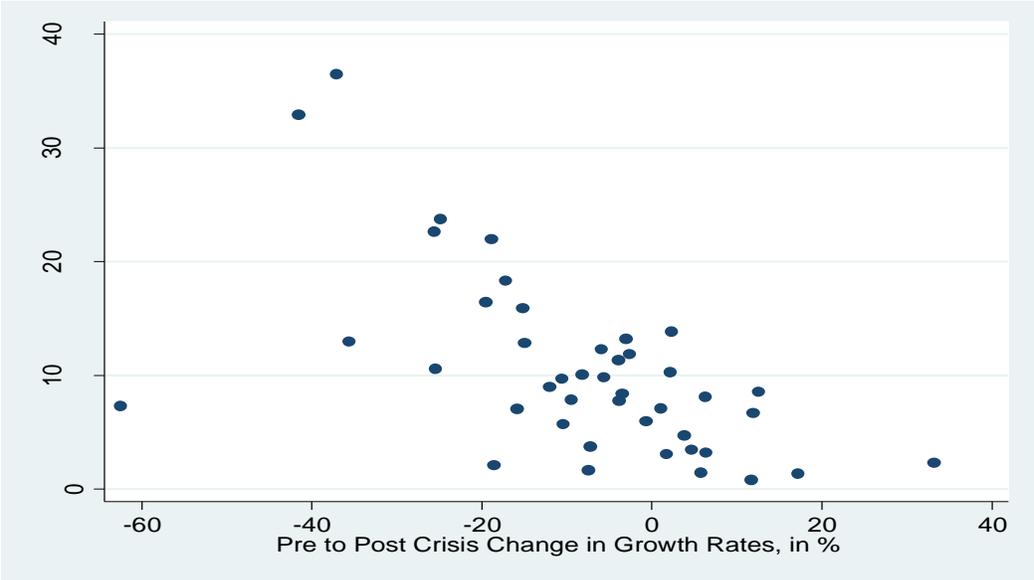
In table 5 we investigate whether there are significant regional variations in the patterns. The regional comparisons, summarized below, show that credit growth after a financial crisis declined substantially in the regions of East Asia and the Pacific, Europe and Central Asia, Latin America and the Caribbean, and North America (which contains only the US, since Canada had no systemic banking crises over the sample period). In the Middle East/North Africa there is little change. Sub-Saharan Africa shows a non trivial increase while in South Asia (Nepal, India, and Sri Lanka), credit growth from the pre-crisis period to the post-crisis period increased by a huge 13.4 %. As shown in table 6 size this was due primarily to Sri Lanka, although all three countries showed credit increases from the pre to post-crisis sample periods. It should be noted that Sri Lanka did not have a particularly high pre-crisis credit growth (2.31%) which is approximately one standard deviation below the average of 10.33%.

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[20]We are going to test for this in the future.

Sri Lanka's post-crisis credit growth was enormous in 1995 (t+6), at 79%. We plan to investigate this case further.

Table 5 Comparison of Real Credit Growth from Pre to Post-Crisis Period, by Region

No.	Region	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Difference
1	East Asia and Pacific	12.21%	4.20%	-8.01%
2	Europe and C. Asia	6.82%	2.01%	-4.81%
3	Latin America/Caribbean	11.99%	-2.56%	-14.55%
4	Middle East/N. Africa	5.35%	6.19%	0.85%
5	North America	7.76%	3.94%	-3.82%
6	South Asia	6.52%	19.92%	13.40%
7	Sub Saharan Africa	6.20%	8.67%	2.47%

Table 6 Country-by-Country Comparison of Average Annual Real Credit Growth from Pre to Post-Crisis Period, South Asia

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Difference
1	Nepal	1997	13.83%	16.18%	2.34%
2	India	1997	3.42%	8.11%	4.68%
3	Sri Lanka	1983	2.31%	35.46%	33.15%

Unlike South Asia, on average, East Asian crisis-hit countries experienced a drop in real credit growth after the financial crisis (compared to pre-crisis levels), with the exception of China 1998 and Thailand 1983 (Table 7). Five cases – Philippines 1997, Malaysia 1997, Thailand 1997, Indonesia 1997 and South Korea 1997 – had above average pre-crisis credit growth, and in the post-crisis period, the growth rate is lower. In the 1997 Asian Financial Crisis, the drop in credit growth is largest in Philippines, Malaysia, and Thailand, while the drop is relatively moderate in South Korea, and even more so in Indonesia. Within the same region, there clearly exists variations in the performance of credit growth before and after financial crises.

Table 7. Country-by-Country Comparison of Average Annual Real Credit Growth from Pre to Post-Crisis Period, East Asia and the Pacific

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Percent Difference
1	Philippines	1997	23.75%	-1.07%	-24.82%
2	Malaysia	1997	18.31%	1.13%	-17.18%
3	Thailand	1997	15.87%	0.71%	-15.16%
4	Indonesia	1997	13.20%	10.13%	-3.06%
5	Korea, Rep.	1997	11.36%	7.45%	-3.91%
6	China	1998	10.26%	12.46%	2.20%
7	Philippines	1983	8.38%	4.92%	-3.45%
8	Thailand	1983	6.67%	18.60%	11.93%
9	Japan	1997	2.06%	-16.50%	-18.57%

Similarly, Latin American banking crises also differ from each other in terms of their pre- and post-crisis credit growth changes. Chile 1981, Brazil 1994 and Mexico 1994, all of which had substantially above-average pre-crisis credit growth, experienced a strong reduction in credit growth after banking crises, while Argentina 2001 had the opposite pattern (see Table 8 below). In the appendix (Tables A2-A4), we also present within-region comparisons for Middle East and North Africa, Sub-Saharan Africa, and Europe and Central Asia.

Table 8. Country-by-Country Comparison of Average Annual Real Credit Growth from Pre to Post-Crisis Period, Latin America/Caribbean

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Percent Difference
1	Chile	1981	36.48%	-0.55%	-37.04%
2	Brazil	1994	32.94%	-8.60%	-41.54%
3	Mexico	1994	22.64%	-2.89%	-25.54%
4	Bolivia	1994	21.96%	3.10%	-18.86%
5	Uruguay	1981	16.45%	-3.06%	-19.51%
6	Peru	1983	12.95%	-22.63%	-35.58%
7	Paraguay	1995	12.82%	-2.13%	-14.95%
8	Dominican Republic	2003	12.29%	6.34%	-5.95%
9	Uruguay	2002	11.85%	9.26%	-2.59%
10	Argentina	1980	10.56%	-14.86%	-25.42%
11	Costa Rica	1994	8.53%	21.09%	12.57%
12	Colombia	1982	7.84%	-1.57%	-9.42%
13	Ecuador	1982	7.30%	-55.16%	-62.46%
14	Argentina	1989	7.11%	8.21%	1.10%

15	Argentina	1995	7.05%	-8.77%	-15.82%
16	Colombia	1998	5.95%	5.29%	-0.67%
17	Brazil	1994	5.69%	-4.72%	-10.41%
18	Costa Rica	1987	4.71%	8.53%	3.82%
19	Mexico	1981	3.74%	-3.47%	-7.21%
20	Jamaica	1996	1.64%	-5.80%	-7.44%
21	Argentina	2001	1.37%	18.61%	17.24%

On a final note, several countries in our sample had notably high credit growth on the onset year of the crisis, such as Indonesia 1997 (16% annual growth in real credit), Malaysia 1997 (20.5% annual growth in real credit), and Chile 1981 (19.5% annual growth in real credit).This jump in annual CG during the onset year may be a result of public sector intervention to rescue the banking sector. Diaz-Alejandro (1985) and Velasco (1987) have both noted that the bailout of the banking system may have contributed to acceleration in credit creation, as central banks provided subsidized lines of credit to back the financial system's rescheduling of loans, and sectoral lines of credit under soft financial conditions. Since we only have annual data for banking crises, it is also possible that high rates of credit growth in the first part of a year were followed by crises toward the end of the year.

To summarize this section[21], the majority of the banking crises episodes we examined showed large and statistically significant reductions in credit growth from before to after the crisis. As suggested in the introduction, this drop can be attributed to a combination of different factors besides discipline and what we are likely capturing is the composite of all these effects. However, by excluding the periods immediately following the crises we believe that we have abstracted from some of the most important of these other influences. Thus our calculations are likely to have captured a substantial element of pure discipline.

IV. Changes in Regulation and Supervision

In this section, we examine the extent to which one of the possible channels of discipline, "regulatory discipline" — the strengthening of bank regulation and supervision— played a role

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[21] While our analysis captures the behavior of bank credit immediately before and following a banking crisis, there has been an interest in investigating how these two credit growth variables behave in these non-crisis or tranquil periods, where countries are nowhere near a banking crisis. In appendix A5, we present these comparisons in two additional tests. In sum, average real credit growth in the pre-crisis years is quite a bit higher compared to non-tranquil years (9.76% in non-tranquil years for real credit growth compared to 6.82%), while considerably lower during the credit-bust years (2.55% in non-tranquil years for real credit growth versus 6.82%).

in explaining the drop in credit growth in the post-crisis period. More effective banking supervision such as on-site audits is a way to discipline banks and prevent excessive credit growth, as the information gained by bank supervisors enables them to more effectively impose remedial measures on imprudent banks (Delis and Staikouras 2011).

The case for attempting to improve regulation and supervision after a crisis should not depend on the rate of credit growth before the crisis so for this purpose we examine our original sample of 58[22] banking crisis episodes from 1980-2005, and calculate changes in national scores of bank capital regulation and supervision (henceforth CRS) that took place during or following a banking crisis. We also include separate figures for the smaller (sub) sample of 42 countries with positive pre-crisis credit growth that we analyzed in the previous section. The data is taken from the Financial Reform Dataset by Abiad et al. (2008) and is constructed based on whether a country has adopted international standards of financial supervision (i.e. Basel Standards of Effective Supervision). Each country's score is the sum of the following dimensions: 1)stringency of capital adequacy ratios, 2) independence of regulatory authorities from executive influence, 3)effectiveness of on-site and off-site monitoring, and 4)the universality of types of financial institutions that fall under the purview of the official supervisory agency. The index has four possible values/categories: unregulated (0), less regulated (0.33), largely regulated (0.67), and highly regulated (1).[23] These scores are coded by the authors, applying judgment based on various official and unofficial country policy reports, legal documents, as well as expert opinion reports (See Appendix B for the questions that make up the index).

Such data sets are of course far from perfect proxies, but they have been used in a number of studies (e.g. Ongena et al. 2013, Copelovitch and Singer 2014), and we believe are worth using. Among competing data sets [24]on banking regulation and supervision, this CRS index has the most extensive cross-country and time-series coverage. Another advantage is that it includes information on the effectiveness of on-site and off-site bank monitoring, items which several important studies (e.g. Jackson and Roe 2009, Quintyn and Taylor 2002) argue are excellent ways to capture supervisory effectiveness. One interpretation that has emerged is that the CRS

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[22] This includes countries that had negative and positive credit growth before the crisis.
[23] Based on the authors' original classifications we rescaled the values to be between 0 and 1.
[24] To name a few: Barth, Caprio, Levine (2011), IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), and a recently published data set by Jordana and Rosas (2014) on the degree of autonomy of banking regulators .

index is a good proxy for "regulatory independence" (see e.g. Masciandaro et al. 2011).The main caveat[25] however, is that there is no compelling evidence that high compliance with international standards of capital stringency substantially reduces the likelihood of financial crises, as the 2008 global financial crisis attests (see e.g. Barth, Caprio, Levine 2006 and Wilf 2012). Alternative and more comprehensive data sets on bank regulation and supervision do exist,[26] however they are only available since the late 1990s.

As seen in figure 6 below an interesting feature of the data is that across all country groups, the trend in CRS scores has been increasing. Because we are looking at before and after changes over fairly short time periods we have not attempted to de-trend the data but plan to do this in future robustness checks.

**Figure 6. Capital Regulation & Supervision (by average income group), 1973-2005**

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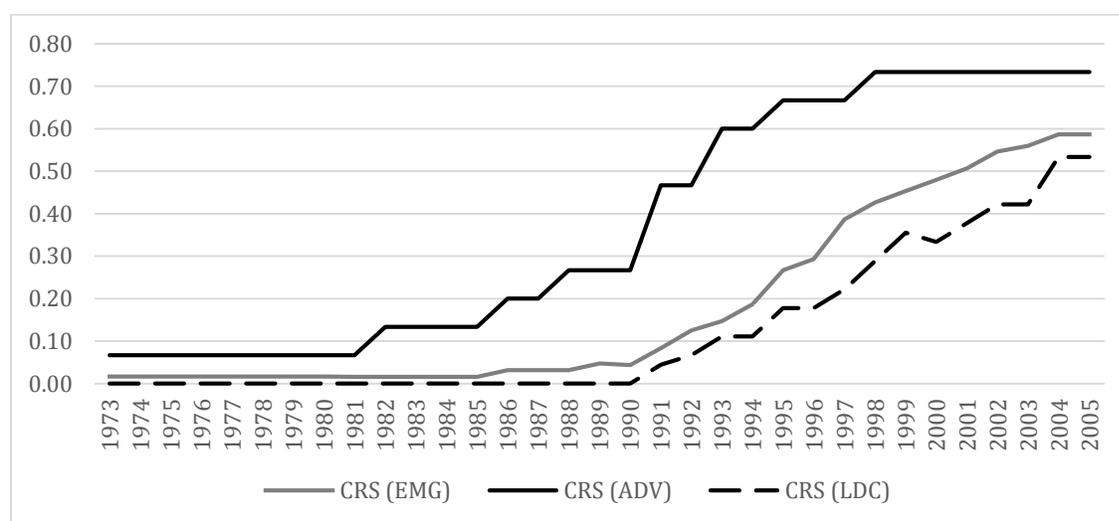
[25] Another weakness of this data set is that it has been rescaled by the authors in its published version. Originally, a highly regulated country would have a final score that adds up to 6 (see Appendix B). However, in the dataset this figure is rescaled to be between 0 and 3. The problem arises when interpreting changes in CRS scores from 0 to 1 (e.g. Thailand 1995). We cannot ascertain from which dimension the change originated (capital stringency or effectiveness of on-site monitoring)

[26] Barth, Caprio, Levine (2011) has a very wide scope (more than 100 dimensions) ranging from limitations on bank activity, entry regulations, as well as the regulatory features of deposit insurance system. The IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) data set contains useful variables such as regulations on limitations on foreign-currency borrowing and loan-to-value ratios.

We begin our specific data analysis by reporting the proportion of countries that improved CRS after a banking crisis versus the countries that remain in a regulatory status quo (see figure 7). We found no cases where the regulatory scores declined after a crisis. Out of the 58 country-year banking crisis episodes in our sample (figure 7, panel A), 26 cases (45%) were followed by an increase in regulatory and supervisory strength within five years[27] after a banking crisis. The remaining 32 cases (55%) did not experience a change in CRS score.[28] These are mainly banking crisis episodes that occurred over the 1980s, which make up roughly 40% of the banking crises in our sample (see figure 8 for a distribution of banking crisis by decades).[29] The story is slightly different for the 1990s. Out of 30 country-year banking crisis episodes in our sample that occurred in the 1990s, 21 cases (70%) were followed by an increase in regulatory and supervisory strength within five years after a banking crisis. The remaining 9 cases (30%), including Russia 1998, Argentina 1995, and Colombia 1998, did not experience a change in CRS score.

Figure 7. Proportion of countries with and without post-crisis regulatory changes

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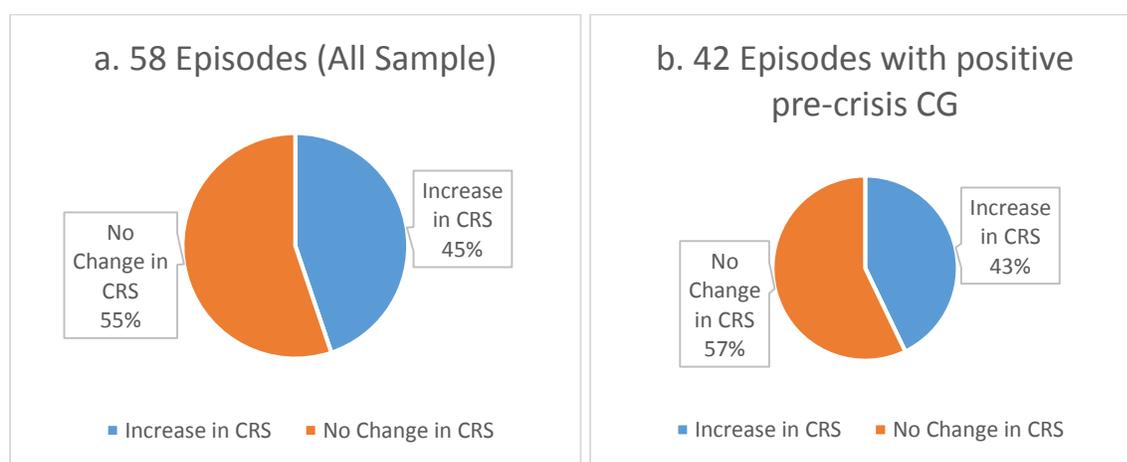
[27] We also conducted a Kolmogorov-Smirnov test to compare CRS scores from pre-crisis and post-crisis sample periods and found that the difference is significant (p-value=0.0001). We choose these six years as a sample period because most regulatory reforms take place from the onset year up to 5 years after the onset. As seen in figure 9, there are not much changes in regulatory scores in year t+6.

[28] A similar distribution is observed when we look at the smaller sample of countries which had high credit growth before the crisis (figure 7, panel B). Out of 42 episodes, 32 (roughly 57%) were not followed by an improvement in CRS scores.

[29] In fact, most countries started out with very low CRS scores but after the early 1990s following a relatively widespread adoption of Basel, the average CRS scores started to increase, starting with advanced economies.

It is interesting to note that several countries improved their CRS scores before the onset of a banking crisis.[30] Figure 8 describes the temporal distribution of changes in regulatory and supervisory strength after crises, to see how many years after the onset of a banking crisis does it take for regulatory reform to occur. The distribution over the crisis year and the four following ones is fairly even with a drop off in year 5 and a further drop in year 6. This indicates that there was considerable variability across reforming countries in the speed with which they adopted reforms.

In short, the majority of banking-crisis episodes were not followed by a regulatory improvement, but a substantial minority were. This provides considerable scope for further investigation of the factors that influenced whether there was substantial regulatory change[31].

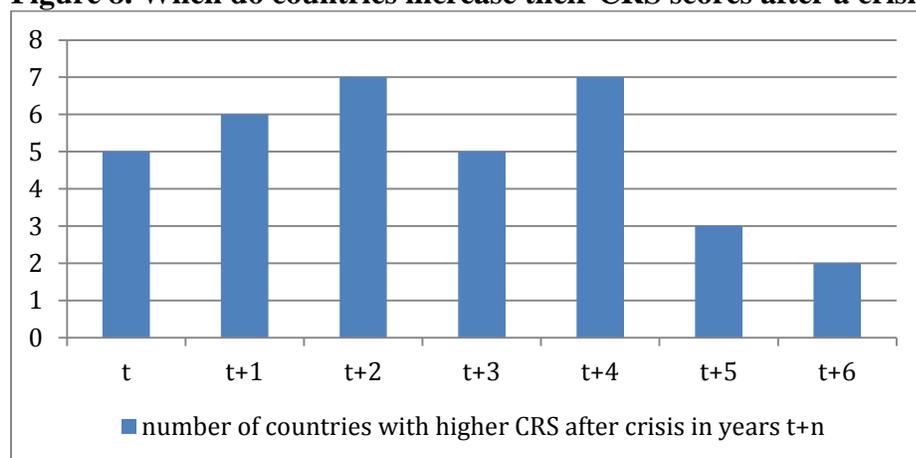**Figure 8. When do countries increase their CRS scores after a crisis?**

Table 9[32] provides a comparison of the pre-crisis level of CRS scores against the post-crisis change in CRS scores, for both the entire sample and the sub-sample of positive pre-crisis credit growth episodes. For the entire sample, the average improvement is 16 percentage points, which means that on average, CRS scores went up from an initial score of 0.13 to 0.29. There is more than a doubling of CRS scores during the period five years following the onset of a banking

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[30] E.g. Thailand and Korea implemented regulatory strengthening two years before the onset of a crisis. Five countries, including China (1998) increased their CRS scores one year before the start of a banking crisis.
[31] A step in this direction is made by Mian, Sufi, and Trebbi (2014), although they focus on an aggregate measure of financial reform and deregulation and not necessarily regulation and supervision per se. They argue that party polarization and political fragmentation which typically follow a banking crisis often prevents the necessary regulatory discipline from taking place.
[32] For episode-by-episode data on changes in CRS, please refer to Appendix C.

crisis. Meanwhile, crisis-hit countries with positive credit growth before crises had a higher initial CRS score (0.16), and post-crisis average CRS scores that rose to 0.32. This 0.16 improvement is similar to that for the full sample.

Table 9. Changes in Capital Regulation and Supervision Score following a Banking Crisis

	Average Initial CRS Score (one-year before the onset of the crisis)	Average change in CRS score from pre to post crisis[33]
Average for all 58 episodes	0.13	0.16
Average for 42 episodes of positive pre-crisis credit growth	0.16	0.16

In tables 10a and 10b we calculated the regional comparisons of changes in CRS scores. As can be seen, the regional distribution is quite uneven. For example, as per table 11a, in both North America and Europe, CRS strengthened by 0.33, while in the Middle East and North Africa region, none of the countries that were hit by a banking crisis increased their regulatory strength. There appears to be no notable difference in initial CRS scores between the entire sample and the sub-sample of countries with positive pre-crisis credit growth, with the exception of countries in the Sub-Saharan Africa group. High credit-growth countries in this region started out with higher CRS scores (Table 10b) compared to the Sub-Saharan countries in entire sample (Table 10a).

Table 10a. Changes in Capital Regulation and Supervision Score following a Banking Crisis, by Region (All 58 Episodes)

	Region	Average Initial CRS Score (one-year before the onset of the crisis)	Average change in CRS score from pre to post crisis
1	East Asia & Pacific	0.22	0.15
2	Europe and Central Asia	0.14	0.33

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[33] We calculated changes that occurred within a 5-year window of a banking crisis (t to t+5) and take the difference between it and each country's pre-crisis CRS score. The scores have been rescaled to reflect a continuum between 0(lowest CRS score) and 1(highest CRS score). The third column represents the average difference between the score prior to the crisis and after the crisis. For example, a change of 0.19 means that 0.19 (out of 1) is added to the initial pre-crisis score.

3	Latin America & Caribbean	0.12	0.12
4	Middle East & North Africa	0.11	0.00
5	North America	0.67	0.33
6	South Asia	0.00	0.11
7	Sub-Saharan Africa	0.03	0.15

Table 10b. Changes in Capital Regulation and Supervision Score following a Banking Crisis, by Region (42 episodes of positive pre-crisis CG)

	Region	Average Initial CRS Score (one-year before the onset of the crisis)	Average change in CRS score from pre to post crisis
1	East Asia & Pacific	0.22	0.145
2	Europe and Central Asia	0.22	0.44
3	Latin America & Caribbean	0.13	0.13
4	Middle East & North Africa	0.11	0.00
5	North America	0.67	0.33
6	South Asia	0.00	0.11
7	Sub-Saharan Africa	0.11	0.22

Group variation also exists across different income groups of countries, as shown in Table 11 below. The initial or pre-crisis values for CRS are substantially higher in advanced economies compared to emerging markets and the less developing economies group. The differences in the magnitude of post-crisis regulatory reform (CRS score change) is however, less stark. Advanced economies experienced on average a 0.40 increase in the regulatory and supervisory score (compared to an initial CRS score of 0.33), which is equivalent to over a 100% improvement in CRS. An increase in CRS of a similar magnitude is observed in emerging markets, where the average CRS score went up from 0.12 to 0.26. Meanwhile, less developing economies increased their post-crisis CRS scores from 0.09 to 0.21.

Table 11. Changes in Capital Regulation and Supervision (CRS) after a Banking Crisis, by Income Group

	Group	Average Initial CRS Score	Number of countries in group	Average change in CRS score from pre to post crisis*
1	Advanced Economies	0.33	5	0.40
2	Emerging Market Economies	0.12	34	0.14
3	Less Developing Economies	0.09	19	0.12

Is there any relationship between a country's initial (i.e. pre-crisis) regulatory regime and the changes that countries made from pre- to post-crisis periods? The initial level of regulatory stringency seems to matter. Compared to countries that had some initial level of substantive regulation (a score of 0.33 or 0.67), countries that started with a score of 0 (which is considered "unregulated"), tended to have somewhat less improvement in CRS after the crisis (see Table 12). To be precise, the proportion of initially "unregulated" countries which had improved CRS scores after a crisis is 44% (18 episodes out of 40), while the proportion of countries with higher initial CRS scores which improved CRS scores after the crisis is 55% (10 episodes out of 18). However, there is little difference in average post-crisis CRS score changes for the two groups. Out of the 26 episodes which were followed by an increase in CRS, the average score change for the initial unregulated group is 0.35, while the average score change for the higher initial CRS group is 0.33.

Table 12. Distribution of Initial Level CRS with Changes in CRS Post-Crisis

Number of crisis episodes with initial CRS Scores of 0 or greater than 0	Number of crisis episodes with average post-crisis CRS scores 0 or greater than 0		Total (episodes)
	0 ("Unregulated")	0.33-0.67 ("less to largely regulated")	
0 ("Unregulated")	22 episodes	18 episodes	40
0.33-0.67 ("less to largely regulated")	10 episodes	8 episodes	18

Note: The numbers reported are the number of crisis episodes which fit the appropriate categories. For example, 22 out of 40 (56%) of the countries that an initial level of CRS equals to zero did not experience a change in CRS scores after a crisis.

To sum up, although the majority of the banking crises episodes in our sample (55% for the sample of 58 crises and 57% for the sub-sample of 42 episodes with positive pre-crisis credit growth) are not followed by a change in CRS scores, a substantial minority do. In fact, on average post-crisis CRS scores improved by 0.16, and some countries (e.g. Sweden, see Appendix C) went from a pre-crisis score of 0 to 0.67. Moreover, among the reformers, there is a good deal of variability in the initial pre-crisis CRS scores, and also in the speed with which they adopted regulatory reforms.

V. The Effects of IMF Programs

Our previous data analysis shows that on average, credit growth fell by about 7 percentage points from the pre- to the post-crisis period for the sub-sample of 42 countries with positive pre-crisis credit growth. One of the explanations for this discipline is a learning effect by domestic officials and financial institutions from banking crises. Another potentially important mechanism is that IMF programs following crises could be an external source of discipline. While there is considerable dispute about the effectiveness of IMF programs (see e.g., Bird and Rowlands 2014, Bird 2007, and Steinwand and Stone 2008), we think that it is

interesting to test whether the presence of IMF programs influences changes in credit growth from pre- to post-crisis periods.[34]

Table 13 presents a distribution of pre- and post-crisis differences in credit growth depending on whether there was an IMF program.[35] We find that countries with IMF programs experience a sharper drop in credit growth after the crisis, which indicates potentially, a greater discipline effect. However, it should also be noted that countries with IMF programs have a higher pre-crisis CG average compared to countries with no IMF programs. This is consistent with the hypothesis that the presence of IMF involvement leads to higher pre-crisis credit growth although this hypothesis would obviously require a good deal more analysis before being accepted.[36]

Table 13. With or Without IMF: Comparing Differences in Credit Growth from pre- to post-crisis sample periods (based on 42 episodes of credit-driven banking crisis)[37]

Credit Growth Measure:	IMF Involvement	Pre-Crisis Average	Post-Crisis Average	Before-After Difference	Tranquil Years (non-crisis) Average
Real Credit	With IMF	11.65%	0.92%	-10.74%	6.85%
	With no IMF	7.93%	4.18%	-3.75%	6.79%
Credit/GDP	With IMF	9.91%	-1.52%	-11.43%	3.93%
	Without IMF	5.71%	1.84%	-3.88%	2.63%

Somewhat surprisingly we found no tendency for IMF programs to have a strong effect on changes in regulation and supervision. Indeed the average change for countries without IMF programs was slightly higher than for those countries with programs, 0.22 versus 0.18[38] Furthermore this was not due to those with IMF programs already having higher CRS scores and

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[34] Another alternative would be that perhaps private foreign lenders are simply reluctant to lend to countries that recently experienced crises, and this explains why credit growth tends to be slow. For an extension of this paper, it would be interesting to examine whether international capital flows are additional factors that help account for variations in responses to banking crises.

[35] We consider crisis episodes that were followed by an IMF stand-by arrangement up to 3 years after the onset of the banking crisis to be an episode with an IMF program and otherwise, no IMF program.

[36] We are currently investigating the association of pre-crisis IMF programs with credit growth.

[37] The differences in credit growth change for the two groups (with and without IMF) is not statistically significant. The p-value of the Kolmogorov-Smirnov tests are higher than the conventional levels of significance.

[38] Burkina Faso, China, India, Jamaica, Japan, Malaysia, Nepal, Norway, Sweden, Tanzania, Uganda, and the United States are the nations in the sample that did not receive post-crisis IMF programs.

hence having less room for increases. The average initial level for the IMF program countries was .07 compared with .12 for the others.[39]

VI. Effects of Democracy

VI.1. Democracy and Credit Growth

As discussed in previous sections, although the majority of credit growth-driven banking crises in our sample show substantial reductions in credit after the crisis, there are considerable variations in the pre- and post-crisis period growth rates of credit across different regions and also within countries in the same region. In this section, we investigate the extent to which political and institutional variables help explain these differences. Interestingly, in the 42 banking crisis episodes that we investigate, democracies and non-democracies (based on the regime category observed during the onset of the banking crisis) are quite evenly split (although there are more democracies, see Table 14), thus we focus on democracy scores.[40] The average number of crises per country is 26/22 (for democracies) and 16/16 (for non-democracies).

Table 14. Democracy vs Non-Democracies at the onset of 42 Cases of Banking Crises (1980-2002)

Non-Democracies (16)	Democracies (26)
Argentina 1980	Argentina 1989, 1995, 2001
Burkina Faso 1990	Bolivia 1994
Chile 1981	Brazil 1994
China 1998	Colombia 1982, 1998*
Egypt 1980	Costa Rica 1987, 1994
Indonesia 1997	Dominican Republic 2003
Jordan 1989	Ecuador 1982
Kenya 1992	Finland 1991
Morocco 1980	India 1993*
Mexico 1981	Jamaica 1996
Malaysia 1997	Japan 1997
Nepal 1988	Mexico 1994*
Philippines 1983	Norway 1991
Thailand 1983	Peru 1983
Uganda 1994	Philippines 1997
Uruguay1981	Paraguay 1995*

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[39] We also note that countries that improve regulations and supervision experience larger drops in real credit growth compared to those that do not improve CRS (-6.57% versus -.3.75%), although this difference is not significant based on a Kalmogorov-Smirnov test for equality of distribution. Meanwhile, there is no substantive nor significant difference in the post-crisis changes in the growth rate of Credit/GDP between countries that do and do not improve their CRS scores. We are currently investigating reasons behind this.

[40] The left column of table 13 includes countries that are considered democracies today (as of 2010 data) such as Argentina, Chile, Colombia, Indonesia, Mexico, Philippines, Thailand, and Uruguay. The average number of crises per country would change depending on the measure of democracy used. If we use the combined Freedom House and Polity 2 scores, there is an even split between democracies and democracies at the year of the crisis onset (21-21).

	South Korea 1997
	Sri Lanka 1989*
	Sweden 1991
	Thailand 1997
	Uruguay 2002
	United States 1988

Source: Polity 2 based on the democracy score observed during the onset year of the crisis. * indicate that these were considered autocracies according to the combined Freedom House and Polity 2 category defined by Hadenius and Teorell (2007).

There is a growing literature on how different political regimes (authoritarian versus democratic) contribute to the likelihood of banking crises (e.g. Lipscy 2011, McCarty, Poole and Rosenthal 2013) and shape policy responses to these crises (e.g. Mian et al. 2014, Rosas et al. 2013, Rosas 2009, Ha and Kang 2012, Pepinsky 2008, Rodrik 1999), yet the role of democracy in enhancing or impeding the discipline effect provided by financial crises is quite rarely studied.[41] Thus we compare democracy scores and the change in credit growth from the pre- to post-crisis period, and test whether there is any relationship between democracy and financial regulatory and supervisory reform, for the sample of 42 banking crisis episodes preceded by positive credit growth. [42]

To capture degrees of democracy, we use Polity 2 democracy levels and also a dichotomous variable for democracies versus non-democracies. According to Mukherjee et al. (2013), if polity2 score is greater than +4, the country in question is considered a democracy. [43] For a robustness check, we also use the combined Freedom House and Polity2 index. According to Hadenius and Teorell (2007), if the combined Freedom House and Polity Scores (on a scale of 0-10) is greater than 7.5, the country in question is considered a democracy. It should be noted that many of the countries in our sample experience a regime change/transition, from authoritarian to more democratic regimes.[44]

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[41] Campello (2014) discusses democracy and discipline, but in the context of discipline provided by elections.
[42] We do not start with strong a priori expectations about the effects of the degree of democracy on financial policy responses to crises given that there are a number of competing hypotheses concerning the political and institutional factors that will influence policy responses to crises. This is an area that could be investigated for future research..
[43] See Hogstrom (2013) for a survey on the use of democracy indices in political science.

[44] We found a statistically significant increase in democracy from the pre- to the post-crisis sample period This is not entirely surprising given that it has been documented elsewhere (e.g. Gasiorowski 1995, Pepinsky 2008) that economic and financial crises often lead to the breakdown of authoritarian regimes. In our sample, out of the 16 non-democratic regimes (at the time of the crisis), four experienced a regime switch to democracies within five years after the crisis began (Argentina 1980, Indonesia 1997, Mexico 1994 , and Nepal 1988). With the exception of Nepal, these countries were considered highly authoritarian (Polity scores lower than -7). Nine out of 16 episodes were followed by an increase in Polity 2 scores five years from the crisis onset, which means the countries became "less" authoritarian from pre- to post-crisis periods (e.g. Jordan 1989 and Kenya 1992). There are no cases of

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We document the relationship between democracy and changes in credit growth from pre- to post-crisis periods in table 15 and figure 9 below. We transform the original democracy scores from each indicator into a dichotomous (democracy vs non-democracies) variable. It appears that democracies experience a substantially stronger drop in credit growth from pre- to post-crisis periods, compared to autocracies, -7.5% versus -4.3%. However, these differences are not significant.[45] The null of equality of distributions is not rejected at any of the conventional levels according to a Kolmogorov-Smirnov test. The difference in credit growth changes between the two groups is much starker if we use democracy data from Polity 2. Here the difference is -8.4% versus -3.4%, or almost 5 percentage points.

Table 15. Pre- to Post-Crisis Change: Democracies vs Non-Democracies

	Kolmogorov-Smirnov tests for the equality of two distributions		
	Democracies (1)	Non Democracies (2)	Difference (1)-(2)
Average change in credit growth from pre- to post-crisis (Combined Freedom House and Polity)	-7.51%	-4.3%	-3.21%
Average change in credit growth from pre- to post-crisis (Polity Score)	-8.37%	-3.43%	-4.94%

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regime switches from democracies to autocracies in our sample of 42 episodes, although three of the 16 episodes were followed by no change in Polity 2 scores five years after the crisis (China 1998, Malaysia 1997, and Thailand 1983).

[45] Although there appears to be a correlation between democracy and post-crisis fall in credit growth, the lack of significance in the Kolmogorov-Smirnov tests may be due to the low number of observations (n=42). We plan to further this analysis with pooled OLS regressions, incorporating the pre-crisis sample years and post-crisis sample years, which would increase the number of observations.

Figure 9. Pre- to Post-Crisis Change in Credit Growth: Democracies vs Non-Democracies
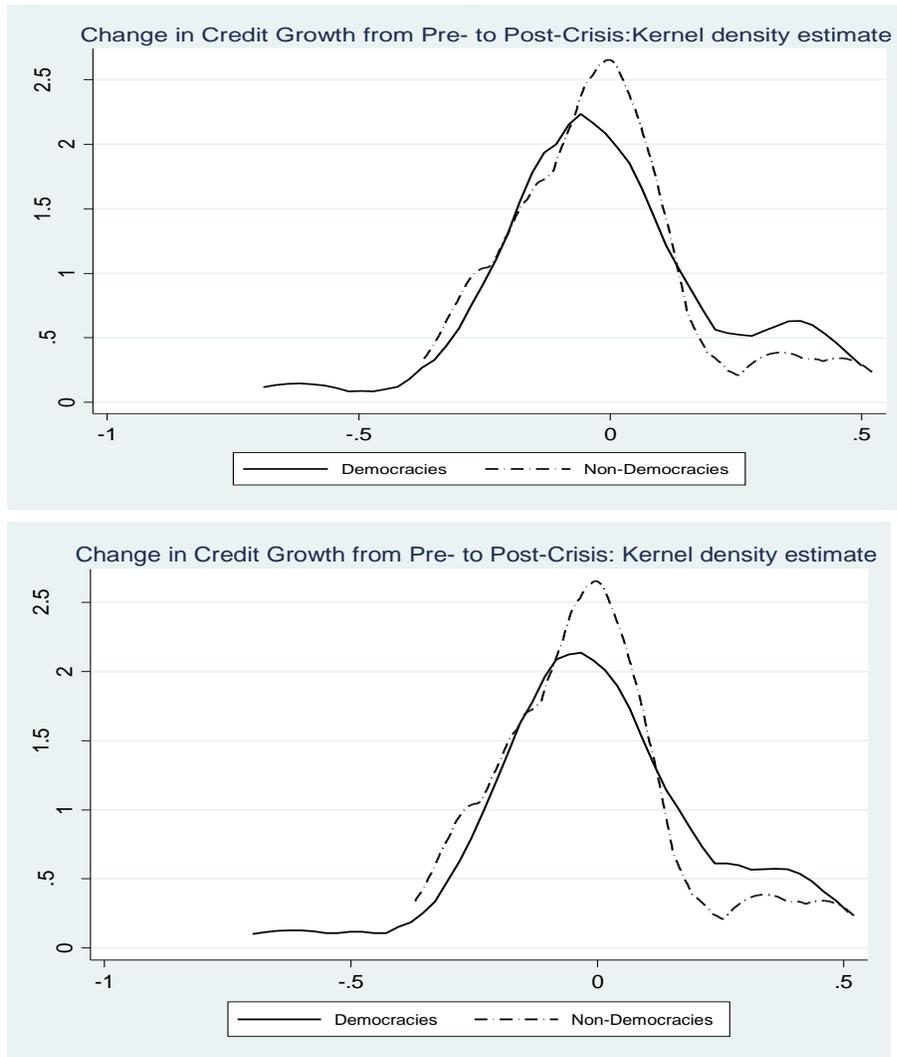
Note: The top panel is based on Polity 2, and the bottom panel is based on a combined Freedom House and Polity 2.

VI.2. Democracy and Financial Regulation and Supervision

      We look at the democratic characteristics of countries that experience regulatory reform after a banking crisis versus those that do not. [46] Tables 16a and 16b compare democracy scores for the two groups of countries: those which improved their capital regulation and supervision after the crisis, and those whose CRS scores remained the same after a crisis. Figure 10 plots the Kernel Density estimates for the two groups, using Polity 2 scores. The results show that there is a large and statistically significant difference in average democracy scores between countries

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[46] Other questions that we could look at are: how many repeat crisis offenders experienced regime switch from autocracy to democracy? Did they experience a lower credit growth the second crisis around?

which do not reform their banking regulations and supervision post-crisis, versus those that do.[47] This presents strong evidence that the less democratic is a country the less likely is reform. This in turn suggests that greater democracy acts as an important counter to the influence of financial special interests at times when financial issues rise to the top of public awareness such as tends to occur during and shortly after financial crises[48].

Table 16a. Democracy Level and CRS Reform Using Polity2 Score

	Kolmogorov-Smirnov tests for the equality of two distributions		
	Increase in CRS post-crisis (1)	No change in CRS post-crisis (2)	Difference (1)-(2)
Average Democracy Score	5.31	1.56	3.75**

Note: The Kolmogorov-Smirnov test for the difference in distributions is significant at the 5% level(**)

Table 16b. Democracy Level and CRS Reform Using Combined Freedom House and Polity2 Score

	Kolmogorov-Smirnov tests for the equality of two distributions		
	Increase in CRS post-crisis (1)	No change in CRS post-crisis (2)	Difference (1)-(2)
Average Democracy Score	7.23	5.46	1.77*

---

[47] Our findings suggest much stronger reforms in the area of supervision and regulation after crises than Mian et al. (2014) find for an aggregate measure of financial liberalization. They also find that there are a "substantial share" of cases where reforms go in a less liberal direction.

[48] Mian et al. (2014) find evidence that crises are accompanied by increases in political polarization.

Figure 10. CRS and Democracy
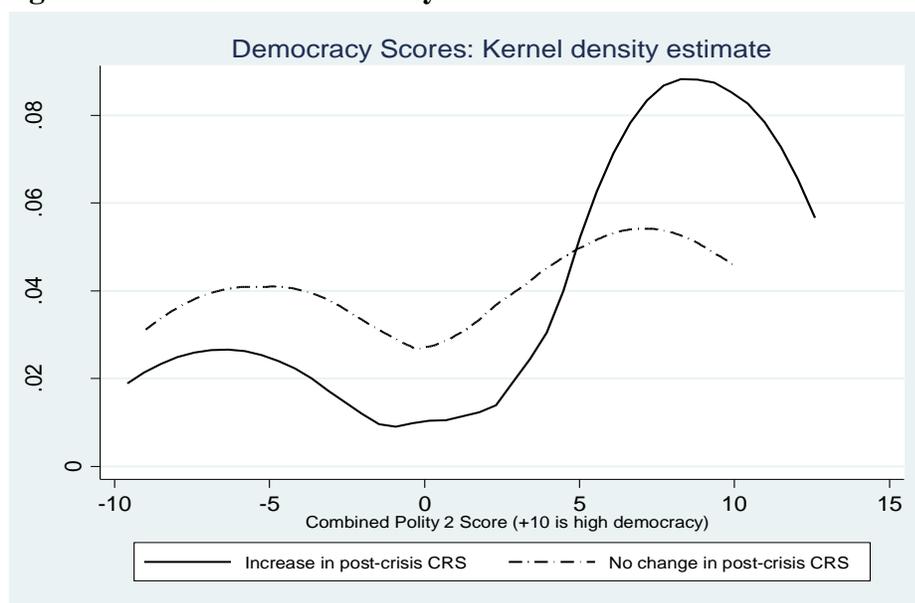
In short, the preliminary analysis conducted here provides some supporting evidence that democracy plays a role in enhancing ex post discipline following banking crises. Democracies tend to have stronger financial regulation and supervision, and more substantial reductions in credit growth following financial crises.[49]

VII. Concluding Comments

The frequency of major financial crises demonstrates that there are often serious deficiencies in the provision of ex ante discipline over financial behavior. In this paper we investigate whether crises themselves provide some degree of ex post discipline. Our primary focus is on rates of credit growth which have been found to be an important determinant of financial crises. While changes in the rate of credit growth after crises may be influenced by many factors we believe that discipline effects are a major influence on the before and after rates of credit growth that we calculate, especially as we delete the periods immediately following crises where the disruptive effects of the crises generally lead to sharp declines in the provision

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[49] We also found that on average democracy scores are were higher in the post-crisis sample than the pre-crisis sample period. This is consistent with previous research (i.e. Gasiorowski 1995) that financial crises often contribute to the breakdown of authoritarian regimes. While we do not want to make too much of our preliminary findings this is a topic that deserves further study.

of credit. Our results show that on average rates of credit growth fall following financial crises, and that these changes are large and generally statistically significant. There is also a great deal of variability across regions and countries, however.

Discipline effects may come both from changes in government policies and from increased prudence in private sector behavior. As a start at attempting to unbundle these various effects we investigate the impact of crises on changes in government financial supervision and regulation. We find that for a substantial minority of countries there are increases in the degree of regulation and supervision following crises. For both rates of credit growth and degrees of supervision we found a good deal of variability in the magnitudes of these post-crisis improvements within and across different regions and levels of economic development.

This substantial variability of responses raises the issue of what factors influence these differences. We investigate two such possible factors, the degree of democracy and the presence of IMF programs.[50] We find that democracies experience a greater drop in rates of credit expansion in post-crisis periods and that more democratic regimes in our sample are also more likely to increase their CRS scores after crises. We also find that IMF programs are associated with substantial increases in post crisis discipline, suggesting that at least in this area IMF programs have a good deal of effectiveness. On the other hand we found a somewhat surprising result that increases in regulation and supervision were not significantly associated with greater reductions in real credit growth, suggesting a lack of effectiveness on their part. This is an issue that clearly calls for more research.

There is considerable scope to expand investigation of possible explanations of the differences in responses to other political and institutional factors such as the number of veto players. While we focus on banking crisis in this study, we believe similar studies of fiscal and currency crises would also be well worthwhile as would looking at possible discipline effects on monetary and fiscal policies and on whether crises make future crises less likely.

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[50] In the future, besides using the ratio of credit to GDP as our credit variable and the Reinhart and Rogoff data set for financial crises we plan to complement our analysis with econometric regression to test the effects of changes in CRS and democracy on the changes in credit growth from the pre- to the post-crisis periods.

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APPENDIX.

A1. Annual Growth of Credit/GDP Pre to Post-Crisis Period based on the 42 Episodes identified in Table 3

No.	Country	Region	Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Difference	Tranquil Years
1	Chile	Latin America/Caribbean	1981	39.91%	-7.45%	-47.36%	2.16%
2	Mexico	Latin America/Caribbean	1994	23.21%	-4.96%	-28.17%	1.05%
3	Bolivia	Latin America/Caribbean	1994	22.63%	1.69%	-20.94%	2.06%
4	Philippines	East Asia	1997	19.47%	-5.71%	-25.19%	-2.20%
5	Uruguay	Latin America/Caribbean	2002	18.66%	1.43%	-17.23%	-3.77%

6	Argentina	Latin America/Caribbean	1995	18.07%	-4.82%	-22.89%	5.33%
7	Uruguay	Latin America/Caribbean	1981	15.76%	-8.73%	-24.50%	-3.77%
8	Peru	Latin America/Caribbean	1983	14.30%	-15.89%	-30.19%	4.44%
9	Argentina	Latin America/Caribbean	1980	14.06%	-4.14%	-18.20%	5.33%
10	Uganda	Sub-Saharan Africa	1994	12.61%	7.28%	-5.33%	3.50%
11	Paraguay	Latin America/Caribbean	1995	12.40%	-1.61%	-14.01%	0.05%
12	Thailand	East Asia	1997	11.45%	-4.26%	-15.71%	3.50%
13	Brazil	Latin America/Caribbean	1994	11.23%	-6.95%	-18.18%	0.52%
14	Sweden	Europe/Central Asia	1991	9.49%	-2.42%	-11.91%	-1.88%
15	Finland	Europe/Central Asia	1991	9.40%	-8.76%	-18.16%	1.97%
16	Malaysia	East Asia	1997	8.77%	-3.00%	-11.77%	4.93%
17	Nepal	South Asia	1988	7.76%	13.27%	5.51%	8.09%
18	Colombia	Latin America/Caribbean	1998	6.45%	1.31%	-5.14%	3.31%
19	China	East Asia	1998	6.28%	0.63%	-5.65%	1.58%
20	Philippines	East Asia	1983	6.04%	-1.57%	-7.61%	-2.20%
21	Colombia	Latin America/Caribbean	1982	5.60%	n/a	n/a	3.31%
22	Thailand	East Asia	1983	4.57%	7.01%	2.44%	3.50%
23	Indonesia	East Asia	1997	4.55%	5.27%	0.71%	9.14%
24	Dominican Republic	Latin America/Caribbean	2003	4.51%	-2.42%	-6.93%	0.04%
25	Kenya	Sub-Saharan Africa	1992	4.48%	-1.09%	-5.56%	1.44%
26	United States	North Amercia	1988	4.38%	1.67%	-2.71%	1.93%
27	Ecuador	Latin America/Caribbean	1982	3.82%	-13.05%	-16.87%	-3.70%
28	Argentina	Latin America/Caribbean	2001	3.52%	6.55%	3.03%	5.33%
29	Jordan	MENA	1989	3.36%	5.80%	2.44%	2.64%
30	Korea, Rep.	East Asia	1997	3.31%	3.71%	0.40%	2.30%
31	Burkina Faso	Sub-Saharan Africa	1990	3.18%	-2.68%	-5.85%	7.47%
32	Jamaica	Latin America/Caribbean	1996	1.94%	-7.46%	-9.41%	1.23%
33	Argentina	Latin America/Caribbean	1989	1.81%	11.49%	9.68%	5.33%
34	Norway	Europe/Central Asia	1991	1.37%	3.13%	1.76%	0.23%
35	Japan	East Asia	1997	1.20%	-5.96%	-7.16%	0.67%
36	Morocco	MENA	1980	0.51%	-16.23%	-16.74%	4.74%
37	Sri Lanka	South Asia	1989	0.40%	41.57%	41.17%	7.35%
38	Egypt, Arab Rep.	MENA	1980	-0.73%	4.45%	5.19%	0.70%
39	Costa Rica	Latin America/Caribbean	1987	-0.85%	-1.94%	-1.09%	21.71%
40	Costa Rica	Latin America/Caribbean	1994	-1.94%	17.92%	19.86%	21.71%
41	India	South Asia	1993	-3.55%	5.36%	8.91%	5.75%
42	Mexico	Latin America/Caribbean	1981	-5.31%	-3.58%	1.72%	1.05%

A2. Average Annual Real Credit Growth from Pre to Post-Crisis Period, Middle East/N. Africa

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Percent Difference
1	Egypt, Arab Rep.	1980	9.82%	4.19%	-5.63%
2	Jordan	1989	3.18%	9.58%	6.40%
3	Morocco	1980	3.04%	4.81%	1.77%

A3. Average Annual Real Credit Growth from Pre to Post-Crisis Period, Sub-Saharan Africa

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Percent Difference
1	Burkina Faso	1990	9.70%	-0.87%	-10.57%
2	Uganda	1994	8.09%	14.40%	6.31%
3	Kenya	1992	0.81%	12.49%	11.68%

A4. Average Annual Real Credit Growth from Pre to Post-Crisis Period, Europe and Central Asia

No.	Country	Banking Crisis Onset Year	Pre Crisis (t-3 to t)	Post Crisis (t+4 to t+7)	Before-After Percent Difference
1	Sweden	1991	10.07%	1.88%	-8.19%
2	Finland	1991	8.96%	-3.07%	-12.03%
3	Norway	1991	1.43%	7.22%	5.79%

A5. What Does Credit Growth Look Like in "Tranquil" (Non-Crisis) Years?

The earlier paragraphs established that on average, out of a sub-set of 42 at least partially credit-driven banking crisis episodes, our measures of credit growth (annual percent change in real credit and real credit/real GDP) dropped by about 7% points from pre- to post-crisis periods. While deleting years immediately after the crisis, our time window of pre- and post-crisis sample captures the behavior of credit growth during what are called distressed or non-tranquil periods (see e.g. Gourinchas and Obstfeld 2012). It is worth investigating how these two credit growth variables behave in these non-crisis or tranquil periods, where countries are nowhere near a banking crisis. How do they compare to the crisis periods?

We conduct two additional tests to answer this question. First, we calculate compare average credit growth during pre-crisis period, post-crisis period, and tranquil years, which is defined as all other years that are not part of pre-, during, and post-crisis sample period, following the suggestion of Gourinchas and Obstfeld. In table 9, we report this comparison for two measures of credit, real credit growth and growth in real credit/real GDP. The pattern that emerges from Table 9 is that during the credit-boom years (pre-crisis average), average credit growth is higher compared to non-tranquil years (9.76% in non-tranquil years for real credit growth compared to 6.82%), while considerably lower during the credit-bust years (2.55% in non-tranquil years for real credit growth versus 6.82%).

Table A6. Credit Growth during Pre-and Post-Crisis Periods versus Tranquil Times: A Comparison (42 Episodes)

Credit Growth Measure	Pre-Crisis Average	Post-Crisis Average	Before-After Difference	Tranquil Years (non-crisis) Average
1.Real Credit	9.76%	2.55%	-7.24%	6.82%
2.Credit/GDP	7.81%	0.12%	-7.69%	3.82%

As an alternative way of comparing how credit behaves in crisis versus tranquil times, we estimate "the conditional expectation of credit growth as a function of the temporal distance from a banking crisis, relative to a common tranquil time baseline." (Gourinchas and Obstfeld, p. 237). We regress separately three indicators of credit growth (real credit growth, growth of real Credit/real GDP, and growth of nominal credit) on a dummy variable which equals to one for pre- and post-crisis sample years [t-3, t+3], and equals zero otherwise. In other words, all other years outside this 7-year window would be coded as zero. We also check for robustness using a dummy variable that equals 1 for periods t-5 to t+5, and zero for other "tranquil" years and obtain similar results. The estimating equation is described in equation (1) below.

$$Credit\ Growth_{i,t} = \beta_0 + \beta_1 Dcrisis3 + \epsilon_{i,t} ....(1)$$

where Dcrisis3= is a dummy variable that equals 1 for the sample period 3 years before a crisis, the crisis year, and 3 years after a crisis.

Estimating equation (1) using panel country and time-fixed effects, the estimated size of the β_1 coefficients range from -0.036 to -0.041, and are significant at the 1% level for the variable real credit growth, but not for growth of real credit/GDP or growth of nominal GDP. This means that the difference between expected value of credit growth during non-tranquil and tranquil years can be as high 4.1% points (the average annual credit growth in the sample is 5.76%). The negative sign on the *Dcrisis3* estimated coefficient suggests that taking non-tranquil and tranquil times together, the post-crisis credit busts have a larger effect than the pre-crisis credit booms.[51]

Appendix B. A Note on the Measurement of Financial Regulation and Supervision from Abiad et al. (2008)

The Capital Regulation and Supervision (CRS) Index constructed by Abiad et al. is a scaled index going from 0-3,where 3 is the highest score. These scores are coded by authors based on various official and unofficial country policy reports and expert opinion reports. The authors of the database rely on their judgment for the scoring but use specific questions to guide the scoring. The guidelines are outlined below, categorized along the 4 different dimensions which they use to quantify FRS:

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[51] It is unclear why the authors (Gourinchas and Obstfeld) decided to use pre-crisis years as part of their definition of non-tranquil years, given that credit growth is on average the largest during this period, which is also known as the credit boom period. This formulation does not seem to be appropriate for the specific question of our research since it combines pre- and post-crisis data. Nevertheless, an interesting follow-up question to tackle in the future is to estimate the size of the bust, relative to the size of the boom.

1. Capital adequacy.
Has the country adopted CAR(capital adequacy ratio) based on Basel or the equivalent (8%)? (0/1).

2. Supervisory and Institutional Independence.
Is the supervisory agency independent from executive influence – can they always intervene to correct/resolve a troubled bank?   (0/1/2)
a. No independence (0): Ultimate jurisdiction Supervisory agency under Ministry of Finance, frequent turnover of Agency Head.
b. Partial independence (1): independent under the law, but the adequate legal framework for resolving problems is not well articulated. E.g. The board of the supervisory agency is   chaired by the MOF, but board has a fixed term.
c. Fully independent (2): legally and de facto independent from the executive branch.

3. Effectiveness of monitoring
Does the supervisory agency conduct effective on-site and off-site bank monitoring (0/1/2).
      -No legal framework for on- and off-site monitoring (0)
      -Legal framework for on/offsite monitoring present, but considered ineffective (1)
      -Legal framework present, and monitoring is sophisticated (2)

4. Coverage: Can some types of financial institutions "escape" supervision?
 Does a country's banking supervisory agency cover all financial institutions without exception? (0/1)
 -If all banks are under supervision by supervisory agencies without exception (1)
 - If some kinds of financial institutions are not exclusively supervised by the banking supervisory/ are excluded from banking supervisory agency oversights   (0).

C. Changes in Capital Regulation and Supervision Score following a Banking Crisis (Episodes with Positive Pre-Crisis Credit Growth), 1980-2005

No.	Country	Region	Year of BC Onset	Initial Level of CRS Score at t-1 years to Banking Crisis	Average change in CRS score from pre to post crisis
1	Argentina	Latin American & Caribbean	1980	0.0000	0.0000
2	Argentina	Latin American & Caribbean	1989	0.0000	0.0000
3	Argentina	Latin American & Caribbean	1995	0.3333	0.3333
4	Argentina	Latin American & Caribbean	2001	0.3333	0.0000
5	Bolivia	Latin American & Caribbean	1994	0.0000	0.3333
6	Brazil	Latin American & Caribbean	1994	0.0000	0.3333
7	Burkina Faso	Sub-Saharan Africa	1990	0.0000	0.3333
8	Chile	Latin American & Caribbean	1981	0.0000	0.3333
9	China	East Asia	1998	0.0000	0.3333
10	Colombia	Latin American & Caribbean	1982	0.0000	0.0000
11	Colombia	Latin American & Caribbean	1998	0.3333	0.3333
12	Costa Rica	Latin American & Caribbean	1987	0.0000	0.0000
13	Costa Rica	Latin American & Caribbean	1994	0.0000	0.3333
14	Dominican Republic	Latin American & Caribbean	2003	0.6667	0.0000
15	Ecuador	Latin American & Caribbean	1982	0.0000	0.0000
16	Egypt, Arab Rep.	Middle East & North Africa	1980	0.0000	0.0000
17	Finland	Europe & Central Asia	1991	0.0000	0.3333
18	India	South Asia	1993	0.0000	0.0000
19	Indonesia	East Asia	1997	0.0000	0.3333
20	Jamaica	Latin American & Caribbean	1996	0.3333	0.3333
21	Japan	East Asia	1997	0.3333	0.3333
22	Jordan	Middle East & North Africa	1989	0.3333	0.0000

23	Kenya	Sub-Saharan Africa	1992	0.0000	0.0000
24	Korea, Rep.	East Asia	1997	0.3333	0.3333
25	Malaysia	East Asia	1997	0.3333	0.3333
26	Mexico	Latin American & Caribbean	1981	0.0000	0.0000
27	Mexico	Latin American & Caribbean	1994	0.0000	0.3333
28	Morocco	Middle East & North Africa	1980	0.0000	0.0000
29	Nepal	South Asia	1988	0.0000	0.0000
30	Norway	Europe & Central Asia	1991	0.6667	0.3333
31	Paraguay	Latin American & Caribbean	1995	0.0000	0.0000
32	Peru	Latin American & Caribbean	1983	0.0000	0.0000
33	Philippines	East Asia	1983	0.0000	0.0000
34	Philippines	East Asia	1997	0.0000	0.3333
35	Sri Lanka	South Asia	1989	0.0000	0.0000
36	Sweden	Europe & Central Asia	1991	0.0000	0.6667
37	Thailand	East Asia	1983	0.0000	0.0000
38	Thailand	East Asia	1997	0.3333	0.3333
39	Uganda	Sub-Saharan Africa	1994	0.3333	0.3333
40	United States	North America	1988	0.6667	0.3333
41	Uruguay	Latin American & Caribbean	1981	0.0000	0.0000
42	Uruguay	Latin American & Caribbean	2002	0.3333	0.0000