Controlling Fiscal Costs of Banking Crises

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I. Introduction

In recent decades, a majority of countries—rich and poor alike—have experienced a systemic banking crisis requiring a major—and expensive—overhaul of their banking system. Not only do banking crises hit the budget with outlays that have to be absorbed by higher taxation (or spending cuts), but they are also costly in terms of foregone economic output.

Many different policy recommendations have been made for limiting the cost of crises; but there has been little systematic effort to see whether these recommendations work in practice. This paper attempts to bridge that gap. Specifically, we seek to quantify the extent to which fiscal outlays incurred in resolving banking system distress can be attributed to crisis management measures of a particular kind adopted by the government during the early years of the crisis. We do this by analyzing forty crises around the world for which we have data. This data includes information on costs and on the nature of the resolution and intervention policy.

We find that fiscal costs are systematically associated with a set of crisis management strategies. Our empirical findings reveal that unlimited deposit guarantees, open-ended liquidity support, repeated recapitalizations, debtor bail-outs and regulatory forbearance add significantly and sizably to costs. Using the regression results to simulate the effects of these policies, we find that if countries had not extended unlimited deposit guarantees, open-ended liquidity support, repeated recapitalizations, debtor bail-outs and regulatory forbearance, average fiscal costs in our sample could have been limited to about 1 per cent of GDP - little more than a tenth of what was actually experienced. On the other hand, policy could have been worse: had countries engaged in all of the above policies the regression results imply that fiscal costs in excess of 60 per cent of GDP would have been the result.

Our model takes careful account of the independent role of macro shocks both in contributing to and in revealing bank insolvency, and of the fact that a bad resolution strategy can be more damaging when the origins of the crisis are chiefly microeconomic in nature.

The remainder of the paper is organized as follows: Section II reviews the nature and extent of banking crises costs. Section III discusses the alternative crisis resolution tools highlighting the choice between strict and accommodating policy. Section IV presents our empirical evidence measuring the extent to which costs are influenced by these policy choices. Section V concludes.

II. The costs of banking crises

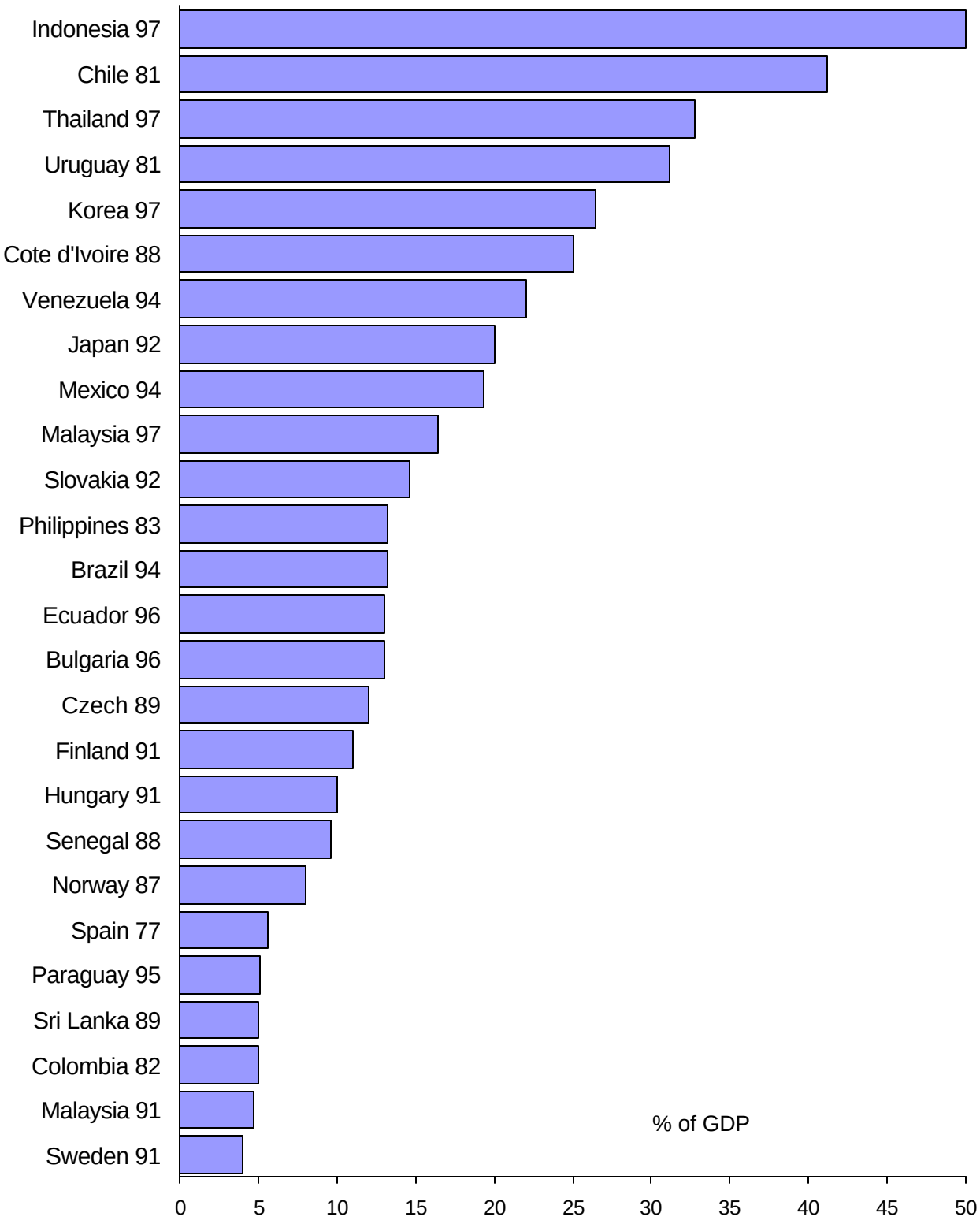
No type of country has been free of costly banking crises in the last quarter century. The prevalence of banking system failures has been at least as great in developing and transition countries as in the industrial world. By one count, 112 episodes of systemic banking crises occurred in 93 countries since the late 1970s and 51 borderline crises were recorded in 46 countries (Caprio, Klingebiel 1999).

Governments and, thus ultimately taxpayers, have largely shouldered the direct costs of banking system collapses. These costs have been large: in our sample of 40 countries governments spent on average 12.8 percent of national GDP to clean up their financial systems (Figure 1 shows some of the higher costs in our sample). The percentage was even higher (14.3) in developing countries. Some crises have led to much larger outlays: governments spent as much as 40-55 per cent of GDP in the early 1980s crises in Argentina and Chile. A substantial part of the costs of the recent East Asian crisis – now projected in the region of 20-55 per cent of GDP for the three worst-affected countries – will ultimately fall on the budget. Despite the fact that their economies are small, developing economies as a group have suffered cumulative fiscal costs in excess of $1 trillion. Among industrialized countries, Japan's long- and drawn out banking crisis has been the costliest; to date, the Japanese authorities have spent around 20 percent of GDP to restructure the system.

Fiscal outlays are not the only dimension in which banking collapses impose costs on the economy. Indeed, to the extent that bailing-out depositors amounts to a transfer from taxpayers to depositors, this is not a net economic cost at all. But, when a government makes the bank's claimants whole, its net costs tend to be correlated with the true economic costs. For one thing, the deficiency to be covered reflects the prior waste of investible resources from bad loan decisions. Furthermore, the assumption by government of large and unforeseen bail-out costs can destabilize the fiscal accounts, triggering high inflation and currency collapse -- costly in themselves -- as well as adding to the deadweight cost of taxation.

Nevertheless, it is acknowledged that fiscal costs do not include costs borne by depositors and other creditors of failed banks (in some cases) and also do not take into account that part of the burden borne by depositors and borrowers in the form of widened spreads for bad loans that were left on banks' balance sheets. Moreover, they do not reflect costs that arise from granting borrowers some monopoly privilege or other means to improve their profits and thereby repay their loans. And finally, these estimates do not capture the slowdown in economic activity when resources are driven out of the formal financial sector (and into less efficient uses) and stabilization programs are derailed.

Figure 1: Fiscal costs of anking crises



III. Alternative Strategies for Managing Crises

Although all banking systems are subject to ongoing supervision, awareness of emerging problems of solvency typically triggers an intensified management process. Starting with a diagnosis of the scope of the crisis, notably as to whether or not it should be considered of systemic proportions, the authorities pass through a decision-tree which terminates with actions such as closures of financial institutions, nationalization, liquidation, disposition of assets, etc. A range of possible policy responses to distress in the banking system exists, and the appropriate decision will depend on difficult-to-summarize factors such as what the causes of the crisis are, what other initial conditions prevail and political constraints facing the regulatory authorities.

It is convenient to distinguish between policies for the short-term containment phase while the crisis is still unfolding, and those needed for the rehabilitation and restructuring phase. In each case we can characterize the policy choice as being between a strict and a more accommodating or gradualist stance. In general, the strict policies emphasize decisive, not to say abrupt, preventive action: a gradualist position can be defended in circumstances where the authorities have other ways of limiting further risk-taking.

Containment Phase

In the early stages of any financial crisis when the crisis is still unfolding, the government typically implements a number of policy measures aimed at restoring public confidence in the banking system to minimize repercussions on the real sector. As they struggle to contain the crisis, governments are faced with at least two key strategic questions:

(i) Should open-ended liquidity support be extended to all financial institutions including insolvent ones?
(ii) Do governments need to provide generalizes government guarantees to depositors and creditors of financial institutions (in times of severe disruption) to stem a loss of confidence in the system as a whole?

Liquidity support. The classic doctrine is that the central banks should abstain from providing open-ended emergency liquidity support to a bank unless it is satisfied that the bank is viable and oversight is adequate. Proponents of this view observe that liquidity support has often been used by governments to delay crisis recognition and to avoid intervening in de facto already failed institutions, and they argue that open-ended liquidity support is doomed to fail because managerial and shareholder incentives suddenly shift for a financial institution when it becomes insolvent. As against this, an alternative view recognizes that crisis conditions make it all but impossible to distinguish between solvent and insolvent institutions, and argues that a generalized crisis leaves the authorities with little option but to extend liquidity support.

Blanket guarantees. A second contentious point is whether governments should or should not extend explicit generalized guarantees to depositors and creditors, to stem the loss of confidence in the financial system. Some take a strict line here too, arguing that guarantees, if they are credible, reduce large creditors' incentives to monitor financial institutions, thereby providing ready funds to managers and shareholders to be used in "gambling to resurrect" their insolvent banks. They further point out that extensive guarantees also limit the governments' maneuverability in terms of how to allocate losses in the future, with the result that they may end up carrying most of the cost on the budget. Others reason that, by extending a timely and temporary guarantee, the authorities can avoid the much greater fiscal and economic costs that can result from a widespread panic, such as can be triggered or exacerbated by the closure of a few banks.

The Medium-Term Rehabilitation and Restructuring Phase

During the rehabilitation and restructuring phase, the authorities' focus is to restore the capital position of banking institutions and to resolve bad assets. In this phase, key strategic questions facing the authorities include the following three:

(i) Is it safe for governments to allow banks to strengthen their capital base over time through increased profits either via implicit or explicit forbearance?
(ii) Should the authorities insist on accomplishing the full recapitalization immediately, or can recapitalization be done in stages?
(iii) Should the post-crisis recovery of non-performing bank claims be centrally managed or left to the bank?
(iv) Should the government intervene to help borrowers meet their debts?

Forbearance. If banks still have a franchise value, they could in principle restore their capital over time by retaining profits. But such a "flow solution" may require allowing banks to function while undercapitalized, and as such typically requires some forbearance relative to strict application of prudential requirements. On a conceptual level one can distinguish between three degrees of forbearance. In the most accommodating form of forbearance banks that are generally known to be insolvent are allowed to remain open. An intermediate degree of forbearance can be characterized by governments allowing banks known to be severely undercapitalized to remain open under existing management for an extended period, e.g. more than twelve months. A somewhat less accommodating forbearance policy can be characterized either by temporary relaxation of other regulations, in particular loan classification and loan loss provisioning requirements, by the turning of a blind eye to violations of laws, standards and regulation by either individual banks or the entire banking system, or by hasty line-of-business deregulation of banking, designed to open new profit opportunities to financially weak banks by permitting them to engage in unfamiliar business such as securities trading, investment banking, credit card and travel services, etc. Opponents of forbearance point to the apparent contradiction involved in relaxing requirements just when they bite. Proponents of forbearance policies observe that regulation should be state-contingent, and that relaxation in response to macroeconomic downturns can provide better overall *ex ante* risk sharing, as well as sheltering bank customers from the disruption to financial

services (including credit crunches) that may result from widespread suspensions and bank closures.

Repeated recapitalizations. Instead of relying on a flow of future profits, stock solutions require immediate capital injections, supported by the government and designed to restore the solvency of viable but insolvent or marginal solvent institutions back to solvency (liquidating non-viable institutions can also be seen as a stock solution). If such recapitalization needs to be repeated, this may be interpreted as an indication of capital forbearance at the earlier stage. Opponents of a policy resulting in repeated recapitalizations point to the moral hazard entailed, with banks' incentives to collect on their loans and borrowers' incentives to repay undermined, as both await the next 'bailout'. Proponents of partial (and hence repeated) recapitalizations point to the fiscal pressures that can result from immediate recognition of the full need for additional capital.

Asset management companies. The two extreme choices for asset resolution strategies include setting up a government agency with the full responsibility of acquiring, restructuring, and selling the assets—the so-called centralized approach—or letting banks manage their own non-performing assets—the so-called decentralized approach. Opponents of centralized asset management companies (AMCs) argue that such agencies face a number of obstacles to operate effectively. They maintain that it may be difficult to insulate those entities against political pressure especially if they hold a large portion of corporate claims. Furthermore, they point out that a transfer of loans breaks the links between banks and corporations, links that may have positive value given banks' privileged access to corporate information. And finally, they continue if AMCs do not manage their assets actively, credit discipline in the whole financial system can be undermined, increasing the overall costs of the crisis. Proponents of centralized AMCs observe that the centralization of assets permits a consolidation of skills and resources, as well as easier monitoring and supervision of workout practices. They argue that, as claims are consolidated, more leverage will be obtained over debtors and perverse links between banks and corporations can be broken, thus allowing better collection on (connected) loans.[1]

Public Debt Relief Programs. If bailouts of banks are politically unpopular, an indirect way of relieving the crisis, and possibly getting real economic activity back under way is the introduction of a public debt relief program. Critics of this approach argue that, in addition to obvious moral hazard, it risks being more open-ended, attracting borrowers who would never have been able to repay even in good times, and diverting additional investible resources to firms that should not be considered creditworthy going forward.

[1] For cross country experience with asset management companies see Klingebiel (2000).

IV. The Empirical Evidence

Having considered the various intervention and resolution policy tools that governments can adopt and that may influence the fiscal costs of the crisis, we now turn to the empirical evidence. Perhaps there are no unique answers to these questions: the specific country circumstances may determine what is the correct policy choice. But we can look at the statistical relationship between policy choices and crisis costs. Modeling the cross-country variation in the size of the fiscal costs requires us to take account both of policy variables and exogenous variables. The severity of a triggering macroeconomic recession and other factors unrelated to the management and resolution policy can obviously increase the overall insolvency independently of the policies adopted, and we need to take account of this if we are not to risk assigning too much importance to the role of policy. The resolution policies can in turn deepen the losses (and their influence will depend on the extent to which the crisis is caused by microeconomic management deficiencies in the banks). Finally, the government can choose to cover more or less of the overall losses. These considerations are elaborated on in Section IV.1, before proceeding to describe the data in Section IV.2 and the regression results (Section IV.3).

IV.1 Modeling: methodological issues

We attempt to model the cross-country variation in actual fiscal costs, as a function of the use of these policy tools. There are several pitfalls in attempting to model the costs of crisis that make this issue more complex than may at first sight appear. In this section we draw attention to some of these methodological issues. Readers unconcerned with methodology can proceed directly to Section IV.2.

In order to see whether there is any evidence that intervention and resolution policies can lower the ultimate fiscal cost of banking crises we need to consider the manner in which such costs emerge and crystallize over time. After all, a large fiscal cost could reflect either sudden adverse exogenous shocks, or a slow deterioration in solvency tolerated by a lax regulatory regime; and the fiscal cost of a given degree of insolvency can also depend on policy. So while our interest is chiefly in the role of regulatory policy, we need to consider how to interpret data that will surely also be influenced by these other types of factor.

A banking crisis can sometimes be dated to a particular incident (such as the closure of 16 banks in Indonesia in late 1997). But such dramatic events rarely represent either the beginning or the end of the process. More typically, the underlying insolvency has been evolving over a lengthy period of time and the crisis event is merely a *dénouement*, the point at which the insolvency is revealed to the public. Sometimes the regulator will already be well-informed of conditions, sometimes not; but even in the latter condition, underlying weaknesses were generally already present, even if not detected.[2]

[2] In some instances, a solvent and sound banking system will be plunged into insolvency by an exceptional shock - war, say, or a devastating natural disaster. This type of event can be encompassed by our approach also. By definition, though, soundly-run banks try to manage their affairs so as not to assume any sizable

One way of capturing the implications of this perspective is to assume that there is an underlying though unobserved or latent variable representing the degree of insolvency in the banking system. This variable evolves over time depending on external conditions, and also on some internal dynamics (which need not be explicitly modeled here): for example, there may also be a tendency for an insolvent system to move more rapidly into deeper insolvency. At some point the crisis emerges into the open, and either then or later there is a resolution involving public fiscal outlays to meet all or part of the financial deficiency as measured by the latent variable.

The modeling strategy underlying the regressions which we report does not involve any attempt to explain whether, why or when a crisis occurs.[3] Instead, our data is drawn from countries where some form of crisis did occur, so we can proceed on the assumption that a crisis of insolvency has occurred, and ask what difference will intervention and resolution policies make to the ultimate fiscal cost.

Let $-z_i(t)$ be the net worth at time t of each bank i, (i = 1 to n). Then the gross financial deficiency of the system at time t is the sum of each bank's gross deficiency (since negative net worth at one bank cannot be offset by a positive net worth at another bank):

$$Z(t) = \sum_{i=1}^{n} \max[\, z_i(t), 0]$$

Each $z_i(t)$ evolves over time depending on the degree of risk assumed in the portfolio and the size of exogenous shocks. Optimal bank regulation limits fiscal exposure by insisting on a minimum value of $z_i(t)$ conditioned on the degree of risk, and monitors compliance periodically (Caprio and Honohan, 2000). *Ex ante* the policy is one of limiting the value of the implicit rolling put option granted by the state to the banking system (Merton, 1977); *ex post* the fiscal costs represent the maturity value of the option. In an ideal world of accurate measurement, and frequent monitoring, banks that are unable to comply will be intervened promptly and the probability of fiscal costs arising will be low and confined to instances of unusually severe shocks. The realized fiscal costs in such circumstances will reflect bad luck more than bad policy, and will tends to be correlated with measures of adverse macroeconomic shocks. In reality failed banks have been allowed to operate with low or negative values of z_i for extended periods. The delay in starting the resolution process may itself be one of the biggest contributors to fiscal cost. When the insolvent bank is eventually effectively intervened at time T, the net deficiency $z_i(T)$ thus depends not only on the size of the adverse shocks it has encountered, but on how long it has been allowed to function with low or negative values of z_i and on the risk that was being assumed by the bank, i.e. on the degree to which regulatory policy deviated from the optimum -- or in short on the value of the implicit put option.

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risk of failure. Adverse shocks generally serve to reveal what would have been recognized as insolvency if the bank's portfolio had been valued at (risk-adjusted) market value.

[3] The pathbreaking studies of Demirguç-Kunt and Detragiache (1998, 1999) identify the measurable factors that prove significant in cross-country econometric analysis, and also display the limited ability of such equations to predict crises out of sample.

The final component of the ultimate fiscal cost is the mapping from $z_i(T)$ to the fiscal outlays. This depends on the degree to which other claimants are made to absorb losses and on the degree to which the full value of the portfolio at time T is realized by the State.

We can schematically capture the way in which the evolution of the bank's financial deficiency z over time depends on the size of exogenous shocks, and on the degree to which the system is capitalized, as follows:

$$z(t) = f(z(t\text{-}1))+u(t) \qquad (1)$$

where u is a zero-mean stochastic process with variance s; $f(z)/z$ is an increasing function, $f(z)=z$ for large negative values of z (well-capitalized bank), $f(z)>z$ for positive values of z (declining expected value of insolvent bank over time).

At some date T the system is intervened and the process (1) comes to a halt. The probability of intervention at time t $P(z(t),R)$ is a function of latent variable $z(t)$ and of the regulatory policy stance R. Both first derivatives of P are positive: a higher financial deficiency of the banks increases the probability of intervention, as does a stricter policy stance R. Note that in the regressions we have data only for intervention and resolution policy, and not on other aspects of preventative policy: the omission of variables capturing preventative policy may tend to bias the results in the direction of exaggerating the importance of intervention and resolution *per se*.

Even without knowing the date of intervention T, combining the intervention probability with the process z allows us to deduce that the expected deficiency at the time of intervention $E\{z(T)\}$depends on the variance of exogenous shocks s and on the strictness of intervention policy R. Given knowledge of T, the expected value of $z(T)$ also depends on the size of actual shocks observed prior to T.

Finally, the fiscal cost f of the bank failure depends on $z(T)$, on the liberality of the bail-out policy for claimants and on the effectiveness of asset recovery.

The degree to which we can simply aggregate this story for the system as a whole depends on the degree to which developments are synchronized. Taking this to be a reasonable basis for arriving at an estimating equation, we draw on (1) to motivate a corresponding equation for the evolution of the aggregate indicator of insolvency Z(t):

$$Z(t) = f(Z(t\text{-}1))+U(t) \qquad (1')$$

This discussion points to three components of the ultimate expected fiscal cost F. First, the scale of adverse shocks U in the period before the date of intervention T; second the strictness R of intervention policy (or the value of the implicit put option offered by the regulator); third, the degree S to which the capital deficiency at the time of insolvency maps to fiscal costs, reflecting the degree of bail-out and of asset recovery.

The estimating equation will then be of the general form

$$F = F(U,R,S) + e, \qquad (2)$$

where U, R and S represent sets of explanatory variables as described below, and e is a disturbance term.

In addition, we may have supplementary information which allows us to distinguish between episodes where microeconomic bank management deficiencies were particularly prevalent (as distinct from episodes where government interference in the banking system was a direct cause of insolvency, or where a macroeconomic boom and bust cycle was the dominant factor). In the presence of microeconomic management deficiencies, prompt intervention becomes even more important. Also, asset recovery may subsequently be more difficult. Therefore, in the regressions, we also test for the significance of slope dummies M (for the variables proxying R and S) distinguishing the more "micro" episodes.

An important point to note is that observed policy actions may be jointly determined by the underlying strictness of policy R and the severity of the crisis. This will make the observed variables endogenous, potentially biasing the estimates unless validly instrumented.

IV.2 Sample and variables

A major challenge has been to develop an adequate data set, not only to characterize the regulatory policies that were in effect, and other causal factors, but also the actual fiscal costs, for which most data sources are not very reliable. The sources and methods for the data are described in the Data Appendix.

Our sample consists of 34 countries (27 of them developing or transition economies) which have experienced significant fiscal costs from bank failures during 1970-2000. This is the maximal number of countries for which we have sufficient information both on fiscal costs and on regulatory practice. In six of these countries, two distinct episodes can be identified, and these are treated separately, to give 40 distinct country experiences.

The variable to be explained is the estimated total direct fiscal cost of the banking crisis as a percentage of GDP.[4] The explanatory variables can be divided into three groups (fuller definitions are in the Data Appendix):

Crisis resolution policy variables. In line with the discussion of Section II.1, we employed seven variables measuring resolution policy and instruments used. These are all dummy variables taking the value 0 when policy was strict and 1 when the more relaxed option was chosen.

[4] The results reported employ the functional form log y. This was chosen to reduce the skewness of the dependent variable. After the log transformation, the skewness is -0.4, kurtosis 2.3, Jarque-Bera statistic 2.0; for the untransformed cost variable these figures are 1.5, 4.8 and 21.5. A drawback of this functional form is that it is undefined as cost goes to zero. Alternative functional forms such as log (1+*cost*) and *cost*/(1+*cost*) actually gave qualitatively similar results.

LIQSUP indicates whether emergency liquidity support was provided to banks. It takes the value 1 if governments extended support for longer than 12 months and the overall support is greater than total banking capital (happened in 23 of our 40 cases).

GUAR is a dummy variable which takes on value of 1 in cases where governments either issued an explicit guarantee or market participants were implicitly protected from any losses if public banks' market share exceeded 75 percent (also 23 cases).

Two measures of forbearance: *FORB-A* = 1 if insolvent banks were permitted to continue functioning; *FORB-B* = 1 if other bank prudential regulations were suspended or not fully applied. The number of cases of forbearance in our sample are 9 and 26 respectively.

Three other dummies: one indicating where banks were repeatedly recapitalized *REPCAP* (9 cases); one indicating where governments set up centralized asset management companies *AMC* (15 cases); finally we included a dummy variable indicating where governments implemented an across-the-board public debt relief program *PRDP* (9 cases)

Table 1: *Characterizing Government Responses to Banking Crisis*

Policy Tools		*No of countries implementing*[a]
Liquidity Support	*LIQSUP*	23
Unlimited Guarantee	*GUAR*	23
Forbearance (a)	*FORB-A*	9
Forbearance (b)	*FORB-B*	26
Repeated Recapitalization	*RECAP*	9
Centralized AMCs	*AMC*	15
Public debt relief program	*PDRP*	9

[a]Out of a total of 40 countries.

As indicated, the most commonly used crisis resolution tools in our sample of financial crises were forbearance, liquidity support and unlimited government guarantees on bank deposits. Interestingly, authorities were selective as to which dimensions to relax: thus the policy choices along different dimensions are not strongly correlated (see Table 1). That means, for example, that governments which used liquidity support did not necessarily employ any particular other crisis tool.

Table 2: *Correlation matrix for individual policy measures*

	LIQSUP	*GUAR*	*FORB-A*	*FORB-B*	*REPCAP*	*PDRP*
LIQSUP	1	0.28	-0.02	0.22	0.1	0.10
GUAR		1	-0.14	0.32	0.46	-0.02
FORB-A			1	0.27	-0.14	0.28
FORB-B				1	0.27	0.27
REPCAP					1	0.00
PDRP						1

Macroeconomic indicators. Of course many crises were triggered or exacerbated by exogenous macroeconomic conditions. In order to control for the impact of macro-shocks on the fiscal costs we explored a variety of alternative indicators. From this larger set (see Table 3) the two indicators that were consistently significant were the real interest rate *REALINT* and the change in equity prices *STOCKPRICE* (taken to the third power to increase the contribution of large values).

Table 3: *Distribution of macro and micro-indicators before the onset of the financial crisis*

	Quartile I	Median	Quartile III	Max/Min
Macro indicators				
Real deposit interest rates*[a]		4.2	2.5	0.8
GDP growth*	-1.6	-0.2	0.9	9.3
Change in equity prices*	-27.0	-10.8	20	211
Current account as % GDP†	-5.8	-3.9	-0.6	2.3
Fiscal balance as % GDP†	-4.7	-1.2	0.3	5.1
Cumulative TOT change*	-5.7	-0.6	3.4	21.2
External debt as % GDP*	56.3	14.4	9.2	7.9
Micro indicators				
Growth in credit/GDP ratio†	407	214	147	115.7
Loan-to-deposit ratio*	190.5	138.9	111.4	87.6
Bank reserves/deposits	47.3	16.7	8.4	4.4
Government indicators				
Share of government in total bank claims	91.3	17.6	11.0	4.0
Bank borrowing from central bank / total bank lending	80.0	15.9	6.0	2.7

*Average for one year before crisis;
†Average for two years before crisis;
[a] Could also be micro indicator.

Indicators of the nature of the bank failures: We employ two alternative indicators selecting the more micro-oriented episodes. *MICRO* identifies episodes where micro deficiencies were significant; *RELMIC* identifies the smaller number of episodes where micro deficiencies were the dominant factor. As with all of the other variables, the definitions are elaborated in the appendix. These are used as slope dummies with elements of the policy variables.

IV.3 Regression results

The main results are summarized in Tables 6-8.[5] We find that the explanatory variables employed – mainly the policy variables – can explain between 60 and 80 per cent of the cross-country variation in fiscal costs: an impressive testimony to the importance of good intervention and resolution policy. And the estimated policy impact is sizable as well as statistically significant.

[5] Tables 6 and 7 exclude the observations for Argentina (1980) and Egypt: these proved to be large outliers in all of the regressions where they were included (several are reported in Table 3) - Argentina providing a large positive residual and Egypt a large negative one. There is particular doubt about the reliability of the costs data in each of these cases. Another case, Czech Republic, is excluded from these results because of some missing data.

Beginning with the parameter estimates for the macro indicators, it is clear that macro difficulties, as indicated by high real interest rates and falling equity prices, do have the predicted effect on total costs of crisis. (Other macro variables were explored, as listed in the Appendix, but these were the ones which survive as most significant). However, the function of including these variables is mainly to ensure that the omission of macro factors does not bias the estimate of policy variables.

The indicators comprising crisis resolution tools are all measured in such a way that an increase would be expected to increase the expected fiscal cost. The results reported include all the significant effects that were obtained. In each case the sign of the effect is as expected.[6] Varying the specification by including or excluding explanatory variables does not significantly affect the size of the coefficients. This applies also to whether or not the macro variables are included or not (compare 6.1 with 6.2 or 6.3).

The most consistently significant explanatory variables are *LIQSUP* and the two *FORB*s; *GUAR* is also consistently significant. Of the regressions in Table 6, 6.2 is a parsimonious one almost achieving the lowest SER. But a lower SER and higher R-bar squared is achieved by including all of the policy variables as in 6.4 (although here *GUAR* and *PDRP* are not significant at conventional levels). Replacing *FORB-B* by its product with the dummy *MICRO* achieves a small improvement relative to 6.2, only modestly supporting the hypothesis that a given degree of regulatory strictness will have higher fiscal costs where the micro-management environment is bad.

The policy message from Table 6 seems clear enough: open-ended liquidity support, regulatory forbearance and an unlimited depositor guarantee are all significant contributors to the fiscal cost of banking crisis.

The role of micro deficiencies is much reinforced by the results of Table 7, which employs the alternative measure *RELMIC*. While this is a more subjective variable, identifying cases where micro deficiencies were the dominant cause, its use interactively with elements of the policy variables improves the fit of the equation, without much affecting the values of the other coefficients. The lowest SER is in equation 7.6. This includes one surprising sign, namely that on the interactive term between *REPCAP* and *RELMIC*: this indicates that repeated capitalizations have less costly consequences in the episodes that were predominantly driven by micro deficiencies. Our interpretation of this finding is that repeated capitalizations were instead more costly in those episodes where government ownership or intervention was the dominant factor. The significance of the variable *REPCAP* is problematic in other regressions.

The results of Table 8, including Argentina, 1980 and Egypt, are broadly in line with those of Table 6 and 7 in terms of significance and size of coefficients, though with a poorer fit. We also experimented with alternative functional forms -- several different

[6] But note that no significant effect was found for the two other resolution policies explored, namely a deposit freeze and establishment of a public asset management company.

forms give a similar fit without dominating the one shown (though as noted below, the exact functional form does have implications for the size of out-of-sample predictions).

We need to acknowledge one obvious potential problem of simultaneity here, in that really big crises may have triggered adoption of policies such as unlimited guarantees or liquidity support (especially if these policies can be seen to some extent as being analogous to burying one's head in the sand). In order to verify that our results are not contaminated by such reverse causality, we employed an instrumental variables approach. The instruments used were those published by ICRG and measuring corruption in the government system (*CORRUPT*) and law and order tradition (*LAWORDER*) as well as dummy variables for the dates on which crises began (there are 14 such dates: each year-dummy takes the value 1 for the countries whose crisis began on that year, zero otherwise. This choice of dummies implies that we suppose that these instruments could be correlated with the policies of liquidity support and unlimited guarantees, without being themselves influenced by the size of the crisis (for example, adoption of policies might be influenced by date-specific policy "fashions"). As shown in Table 6A, two-stage least squares estimates of the main equations using these instruments come out close to the ordinary least squares results. Considering also that a regression of the residuals on these instruments is not significant, this suggests that reverse causality is not a problem for the interpretation of our results.

The size effect of "poor" resolution policies

Our empirical findings reveal that unlimited deposit guarantees, open-ended liquidity support, repeated recapitalizations, debtor bail-outs and regulatory forbearance add significantly and sizably to costs. If we were to take the regression results literally (equation 6.4) and to simulate the effects of "uniformly strict" and "uniformly lax" policy packages, we would obtain rather extreme results. Thus equation 6.4 implies that a country which did not have unlimited deposit guarantees, open-ended liquidity support, repeated recapitalizations, debtor bail-outs or regulatory forbearance, would have a predicted fiscal cost of only about 1 per cent of GDP; on the other hand, a country which adopted the reverse policy in each case would have a predicted fiscal cost in excess of 60 per cent of GDP. Inasmuch as they are calculated beyond the range of the sample, and also taking into account their sensitivity to the functional form of the equation, these limiting projections should probably not be taken too literally. Perhaps more realistic are the estimated impact of switching one policy from strict to lax (holding all others constant at the sample mean value) which, as shown in column B of Table 4, amount to several percentage points of GDP.

Another caveat worth reiterating is that we have not included variables measuring pre-intervention preventative policy in the final regressions. (As noted before, in the initial regressions we employed proxies for the micro-economic environment, but these did not prove significant; see Appendix). To the extent that such policy is important (and to the extent that they would be correlated with the included policy variables), their omission from the equation may have the effect of biasing the estimated coefficients of the included policy variables. An accommodating pre-crisis policy which had allowed

big risks to be taken might well be associated with an accommodating intervention and resolution policy which allowed the post-crisis losses to mount.

Table 4: *Estimated individual impact of policy variables on fiscal costs*
in % of GDP

	Best Policy employed in % of cases	Estimated saving (% of base case fiscal cost) by switching one policy tool from: strict value		lax value
		A	B	C
LIQSUP	0.421	1.6	3.4	-39.0
FORB-A	0.763	1.2	5.6	-34.2
FORB-B	0.158	1.1	0.9	-34.0
REPCAP	0.763	1.1	5.2	-33.1
GUAR	0.447	0.6	1.5	-22.4
PDRP	0.789	0.6	3.6	-21.1
Memo: no policy switch (base case cost)		*1.0*	*6.7*	*62.6*

Columns A and B show the effect of a policy relaxation, switching the value of (one policy variable from strict to lax) on the predicted cost of crisis; Column A assumes all other variables held at strict values; Column B sets the other policy dummies in the regression at their sample mean (fractional) values. Column C show the effect of a policy tightening assuming all other variables left at their lax values. Thus, for example, a policy of unlimited liqudity support would increase average crisis cost by 1.6% of GNP by comparison with the value which would occur if all variables were held at their strict values. The estimated extreme strict (A) and lax (C) base case costs should be treated with caution, as they refer to out of sample points and are sensitive to functional form of the estimated equation.

Tables 4 and 5 show the estimated individual impact of policy variables on fiscal costs: Table 4 shows the impact as a percentage of GDP, Table 5 as a percentage of base-case fiscal costs. The results illustrate that among the different policies tools, liquidity support and forbearance measures seem to be the costliest measures, with the equation predicting that, if deposit guarantees, forbearance and repeated recaps are employed, not extending liquidity support could halve the expected fiscal cost.

Table 5: *Estimated individual impact of policy variables on fiscal costs*
as % of base case fiscal cost

	Best Policy employed in % of cases	Estimated saving (% of base case fiscal cost) by switching one policy tool from: strict value		lax value
		A	B	C
LIQSUP	0.421	165.1	50.8	-62.3
FORB-A	0.763	120.6	82.9	-54.6
FORB-B	0.158	118.6	13.1	-54.3
REPCAP	0.763	112.1	77.5	-52.9
GUAR	0.447	55.7	21.9	-35.8
PDRP	0.789	50.7	38.2	-33.6

Columns A and B show the effect of a policy relaxation, switching the value of (one policy variable from strict to lax) on the predicted cost of crisis; Column A assumes all other variables held at strict values; Column B sets the other policy dummies in the regression at their sample mean (fractional) values. Column C show the effect of a policy tightening assuming all other variables left at their lax values. Thus, for example, a policy of unlimited liqudity support would increase average crisis cost by 65% of the value which would occur if all variables were held at their strict values.

Despite the caveats, the estimates clearly indicate that substantial potential savings are at stake. Their implication is that departures from a strict approach to prompt intervention through liquidity support of insolvent institutions, forbearance, and repeated capitalizations have resulted in a sizable increase in the fiscal cost of banking system failures, as have the use of unlimited guarantees and public debt relief programs.[7]

Is there a trade-off between fiscal costs and economic recovery?

We also explored whether there was any obvious trade-off between fiscal costs and economic growth recovery. In other words, might countries that employed costly policy measures such as liquidity support, unlimited guarantees or forbearance policies have recovered faster from banking crises and suffered less severe output losses? Using a standard approach to measuring output losses – albeit one which may overstate the contribution of banking crisis to output loss – regression results (Appendix Table A5) indicate that that does not seem to be the case. Except for liquidity support, all of the policy variables proved insignificant. And in the case of liquidity support, the positive coefficient indicates that extension of liquidity support actually appeared to have prolonged the crisis as crisis recovery took longer and output loss was bigger.

V. Conclusion

We have made a first attempt to quantify how effective intervention and resolution policy can be in lowering the fiscal costs of banking crises. While much discussion suggests that the costs of banking crises chiefly represent exogenous shocks, we find evidence to support the view that these policies do matter.

Of course it may also be that the underlying policy philosophy that tends to generate "strict" policy choice is also associated a wider environment which has helped contain costs in the pre-recognition phase, i.e. before the crisis is recognized as such. By the time containment and resolution policies come into play, some of the damage will have already have been done.

Indeed, although we have emphasized intervention and resolution policy, it is not really possible to draw an unambiguous line between these and prevention policies. To the extent that these have been explicitly included, our estimates may somewhat exaggerate the separate role of intervention and resolution as opposed to prevention.

The data on which we rely are tentative, and one should not rely too heavily on the precise coefficient estimates. But the effects we model are nevertheless statistically significant, have a consistent sign and are economically large. In particular, open-ended liquidity support, regulatory forbearance and an unlimited depositor guarantee are all

[7] The manner in which estimates of the cost of the US S&L crisis steadily mounted from $30 billion to $180 billion as the crisis unfolded, a rise often attributed to forbearance, illustrates the magnitudes that can be involved.

significant contributors to the fiscal cost of banking crisis. Countries which avoid these policies can expect to reduce the costs of any future crises by a very considerable amount.

Containment and resolution of banking crises is not an easy matter, and the exact policy approach cannot be dictated by the results of a model simplified in order to be adapted to econometric testing. We can hardly claim to have proved what the best policy choice is in all circumstances. Nevertheless, our findings clearly tilt the balance in favor of a "strict" approach to crisis resolution, rather than an accommodating one. At the very least, they emphasize that regulatory authorities which choose an accommodating or gradualist approach to an emerging crisis need to be sure that they have some other way of controlling risk-taking.

Table 6: *Main regression results*

Equation:	6.1		6.2		6.3		6.4		6.5		6.6		6.7		6.8	
Variable	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
REALINT			0.430	2.77	0.419	2.77	0.367	2.43	0.425	2.84	0.506	3.34	0.433	2.89	0.502	3.40
STOCKPRICE					-0.019	-1.67			-0.020	-1.73					-0.020	-1.72
LIQSUP	0.878	2.70	0.996	3.32	0.867	2.88	0.975	3.37	0.790	2.61	0.967	3.21	0.945	3.22	0.831	2.75
FORB-A	0.513	1.38	0.826	2.32	0.760	2.17	0.791	2.25	0.632	1.77	0.937	2.73	0.864	2.51	0.877	2.62
FORB-B	1.230	2.77	0.994	2.40	1.081	2.66	0.782	1.95	1.006	2.49						
REPCAP							0.752	1.99					0.690	1.79		
GUAR	0.504	1.55	0.746	2.41	0.817	2.69	0.443	1.30	0.863	2.86	0.917	3.05	0.610	1.78	1.005	3.39
PDRP							0.410	1.17	0.489	1.39			0.456	1.31		
FORB-B*MICRO											1.150	2.46	0.886	1.92	1.261	2.75
C	3.084	8.38	3.426	9.58	3.409	9.79	4.122	9.25	3.674	9.35	3.535	10.11	4.196	9.61	3.527	10.39
R-squared	0.491		0.589		0.623		0.656		0.646		0.592		0.655		0.627	
Adjusted R-squared	0.429		0.525		0.550		0.575		0.563		0.528		0.574		0.555	
S.E. of regression	0.928		0.847		0.824		0.800		0.812		0.844		0.802		0.819	
Sum squared resid	28.43		22.94		21.05		19.22		19.78		22.79		19.28		20.80	
Log likelihood	-48.41		-44.33		-42.70		-40.96		-41.52		-44.20		-41.03		-42.47	
Durbin-Watson stat	1.583		1.867		1.697		1.755		1.510		1.792		1.733		1.700	
Mean dependent var	1.904		1.904		1.904		1.904		1.904		1.904		1.904		1.904	
S.D. dependent var	1.228		1.228		1.228		1.228		1.228		1.228		1.228		1.228	
Akaike info criterion	2.811		2.649		2.616		2.577		2.606		2.642		2.581		2.604	
Schwarz criterion	3.026		2.908		2.917		2.922		2.951		2.901		2.925		2.905	
F-statistic	7.948		9.171		8.535		8.164		7.807		9.278		8.120		8.699	
Prob(F-statistic)	0.000		0.000		0.000		0.000		0.000		0.000		0.000		0.000	

Notes: The sample includes 38 episodes, not including Argentina, 1980 and Egypt.
Dependent variable is log(cost).

Table 6A: *Main regression results (method: two-stage least squares)*

Equation:	6.1A		6.2A		6.3A		6.4A		6.5A	
Variable	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
REALINT			0.461	2.84	0.459	2.83	0.371	2.36	0.459	2.66
STOCKPRICE					-0.062	-0.27			-0.124	-0.62
LIQSUP	0.907	2.00	1.005	2.63	1.023	2.80	0.983	2.78	0.839	2.20
FORB-A	0.573	1.29	0.882	2.88	0.874	2.88	0.795	2.34	0.716	2.17
FORB-B	1.132	2.62	0.926	1.96	0.932	1.97	0.777	1.57	0.871	1.96
REPCAP							0.742	2.25		
GUAR	0.780	2.22	0.923	2.99	0.906	2.88	0.459	1.27	0.988	3.22
PDRP							0.410	1.14	0.565	1.37
C	3.251	5.72	3.539	10.24	3.534	10.11	4.127	10.50	3.809	9.17
R-squared	0.478		0.584		0.587		0.656		0.614	
Adjusted R-squared	0.415		0.520		0.507		0.575		0.523	
S.E. of regression	0.940		0.851		0.862		0.800		0.848	
Sum squared resid	29.146		23.196		23.037		19.218		21.570	
Durbin-Watson stat	1.596		1.910		1.908		1.758		1.746	
Mean dependent var	1.904		1.904		1.904		1.904		1.904	
S.D. dependent var	1.228		1.228		1.228		1.228		1.228	
F-statistic	6.606		7.251		6.098		6.955		5.729	
Prob(F-statistic)	0.001		0.000		0.000		0.000		0.000	

Notes: The sample includes 38 episodes, not including Argentina, 1980 and Egypt.
Dependent variable is log(cost);
Method is TSLS; instruments for LIQSUP and GUAR are: CORRUPT, LAWORDER and (14) dummies for the date on which crises began.

Table 7: *Regression results separately identifying predominantly micro crises*

Equation:	7.1		7.2		7.3		7.4		7.5		7.6	
Variable	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
REALINT	0.441	3.18	0.481	3.38	0.341	2.67	0.449	3.30	0.502	3.65	0.366	2.86
STOCKPRICE							-0.015	-1.48	-0.018	-1.79	-0.012	-1.26
LIQSUP	0.989	3.83	1.029	3.97	1.100	4.95	0.889	3.39	0.921	3.58	1.026	4.50
FORB-A	0.790	2.61	0.753	2.49	0.900	3.44	0.707	2.34	0.642	2.15	0.817	3.05
REPCAP	0.721	2.19	0.678	2.05	1.427	4.02	0.613	1.85	0.534	1.63	1.272	3.42
FORB-B*RELMIC	1.195	2.83	1.082	2.51	1.097	2.98	1.270	3.04	1.139	2.73	1.132	3.09
REPCAP*RELMIC					-1.721	-3.48					-1.574	-3.13
GUAR*RELMIC	0.606	1.90	0.502	1.52	1.018	3.19	0.716	2.22	0.602	1.86	1.038	3.28
PDRP*RELMIC			0.335	1.16	1.116	3.35			0.435	1.53	1.113	3.37
C	3.789	10.01	3.870	10.11	4.320	12.28	3.678	9.71	3.762	10.04	4.212	11.75
R-squared	0.700		0.713		0.797		0.720		0.741		0.808	
Adjusted R-squared	0.641		0.645		0.741		0.655		0.670		0.746	
S.E. of regression	0.735		0.731		0.625		0.722		0.706		0.619	
Sum squared resid	16.77		16.05		11.32		15.62		14.45		10.71	
Log likelihood	-38.38		-37.54		-30.91		-37.03		-35.55		-29.86	
Durbin-Watson stat	2.105		2.246		1.593		2.130		2.318		1.622	
Mean dependent var	1.904		1.904		1.904		1.904		1.904		1.904	
S.D. dependent var	1.228		1.228		1.228		1.228		1.228		1.228	
Akaike info criterion	2.388		2.397		2.101		2.370		2.345		2.098	
Schwarz criterion	2.690		2.742		2.488		2.715		2.733		2.529	
F-statistic	12.03		10.62		14.25		11.03		10.38		13.10	
Prob(F-statistic)	0.000		0.000		0.000		0.000		0.000		0.000	

Notes: The sample includes 38 episodes, not including Argentina, 1980 and Egypt.
Dependent variable is log(cost)

Table 8: *Regression results including two outliers*

Equation:	8.1		8.2		8.3		8.4		8.5	
Variable	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
REALINT					0.282	1.52	0.201	1.04	0.235	1.20
STOCKPRICE									-0.015	-1.06
LIQSUP	0.679	1.97	0.577	1.66	0.604	1.77	0.707	2.15	0.624	1.85
FORB-A	0.633	1.51	0.461	1.09	0.605	1.43	0.775	2.00	0.694	1.76
FORB-B	1.093	2.16	0.915	1.83	0.809	1.63				
REPCAP	1.054	2.52	0.950	2.13	0.756	1.66	1.428	2.74	1.267	2.34
GUAR			0.234	0.61	0.493	1.19				
PDRP			0.806	1.96	0.884	2.17				
FORB-B*RELMIC							1.268	2.25	1.304	2.31
REPCAP*RELMIC							-1.704	-2.29	-1.553	-2.05
GUAR*RELMIC							1.069	2.18	1.092	2.23
PDRP*RELMIC							1.040	2.03	1.038	2.03
C	3.653	6.90	4.093	7.31	4.221	7.60	4.086	7.75	3.977	7.42
R-squared	0.419		0.483		0.518		0.571		0.587	
Adjusted R-squared	0.353		0.390		0.413		0.461		0.463	
S.E. of regression	1.052		1.021		1.002		0.960		0.958	
Sum squared resid	38.72		34.43		32.12		28.57		27.54	
Log likelihood	-56.11		-53.76		-52.37		-50.02		-49.29	
Durbin-Watson stat	1.879		1.760		1.772		1.480		1.551	
Mean dependent var	1.893		1.893		1.893		1.893		1.893	
S.D. dependent var	1.307		1.307		1.307		1.307		1.307	
Akaike info criterion	3.055		3.038		3.018		2.951		2.964	
Schwarz criterion	3.266		3.334		3.356		3.331		3.387	
F-statistic	6.312		5.147		4.915		5.166		4.735	
Prob(F-statistic)	0.001		0.001		0.001		0.000		0.001	

Notes: The sample includes all 40 episodes including Argentina, 1980 and Egypt.
Dependent variable is log(cost)

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Data Appendix

A.1 Description of Data

A.1.1 Dependent variable

The dependent variable is ex-post fiscal costs of financial distress as a percentage of GDP. Data was obtained for 41 episodes involving 35 countries. The first date shown for the crisis is the date at which the existence of the crisis became publicly known. The fiscal cost figure includes both fiscal and quasi-fiscal outlays for financial system restructuring, including the recapitalization cost for banks, bailout costs related to covering depositors and creditors and debt relief schemes for bank borrowers.

Sources for fiscal cost and for date of crisis: Caprio and Klingebiel (1997), Caprio and Klingebiel (1999), and Lindgren, Garcia and Saal (1996); conflicts between different sources were reconciled with the help of consultations with country experts.

A.1.2 Data on Crisis Resolution Tools.

Drawing on the main elements of accepted best practice for crisis resolution, we classify each government's approach along the following seven dimensions.

Issuance of a blanket government guarantee *GUAR*
Did the government issue an explicit guarantee? Were market participants implicitly protected as deposits of state-owned institutions account for more than 75 percent of total banking deposits?

Liquidity support to insolvent institutions. *LIQSUP*
Did the government provide substantial liquidity support to insolvent institutions? (Substantial is defined as liquidity support surpassing total aggregate financial system capital).

Deposit Freezes
Did the government freeze deposits in institutions that were intervened in for a substantial period of time? (Substantial is defined as a period over 12 months).

Forbearance *FORB*
Did the government forbear in any of the following progressively less liberal ways?
Forbearance Type I: banks are left in open distress, i.e. unable to pay depositors' rejected at clearing; no access to interbank market; widely believed to insolvent (except for public banks) for at least a three months period.
Forbearance Type II: banks were permitted to function under existing management though known to be severely undercapitalized.
Forbearance Type III: regulations (in particular loan classification and loan loss provisioning) are relaxed or the current regulatory framework is not enforced for at least a twelve months period to allow banks to recapitalize on a flow basis; or competition is restricted.

(In the regressions, *FORB1* takes the value 1 if there is any forbearance of type A; *FORB3* takes the value 1 if there is any forbearance of type A, B or C)

Repeated Recapitalizations REPCAP
Did the government recapitalize banks via a one off support scheme or did banks go through repeated rounds of recapitalizations?

Public Debt Relief Program PDRP
Did the government implement a broad debt relief program for corporates and/or other types of borrowers, including through an exchange rate guarantee program or rescue of corporates?

Public AMCs
Did the government set up a centralized publicly owned asset management company to which non-performing debt of banks was transferred?

Sources for crisis resolution measures: We extended the dataset from Caprio and Klingebiel (1996) in terms of countries and policy variables. Information on the policy variables was obtained from official country sources, from the World Bank Regulatory Database, Garcia (1999) and other IMF reports and interviews with country experts.

These variables are shown in Table A1

A.1.3 Control Variables

We have assembled data summarizing (i) macroeconomic conditions (ii) indicators of the regulatory and management environment affecting bank management ("micro factors") and (iii) the degree of government intrusion.

Macro indicators (average for one or †two years before the crisis date).
- real interest rate (could also be a micro indicator);
- real GDP growth;
- percentage change of stock market prices;
- fiscal balance as a percentage of GDP†;
- current account as percentage of GDP†;
- short-term external debt as share of GDP and
- percentage change in the terms of trade.

Micro indicators:
- growth in bank credit relative to GDP (as proxy for relaxed credit risk standards)
- real deposit interest rate (possible proxy for financial system distress as banks bid up rates to stay afloat);
- enforcement of creditor rights series (as proxy of the effectiveness of the legal system), and
- bank average loan to deposit ratio (as proxy for liquidity risk).

Government intrusion indicators:

- bank reserves (cash plus with central bank) as percentage of deposits;
- share of government in total claims of banks;
- bank borrowing from central bank as percentage of their total deposits.

Each continuous control variable was normalized to zero mean and unit standard deviation. Quartiles of these variables are shown in Table A2.

Sources for control variables: *International Financial Statistics* - bank data refers to deposit money banks; IFC Emerging Markets Database; La Porta et al. (1998) (for enforcement of creditor rights). These were supplemented by national sources.

A1.4 Composite variables

Two alternative dummy variables of the importance of micro (bank management) factors were derived. Both are shown in Table A3

The first, *MICRO* takes the value 1 when the country has a high average value of the micro indicators mentioned above relative to other countries; otherwise zero.[8] Thus, countries where *MICRO* is 1 are measured as having had micro problems.

The second, *RELMIC* is a judgmental indicator based on our informed assessment as to whether micro factors were the primary factor, i.e. whether they were *relatively more important* than macro or government factors in each crisis (Honohan, 2000). In principle, since any country where *MICRO* is 1 is measured as having had micro problems, we should suppose that *RELMIC* = *MICRO* . However, in our data there are some violations of this reflecting the fact that *MICRO* is data-based and *RELMIC* is a subjective/judgmental variable. (Both variables were defined before regressions were estimated.)

Two other composite variables were also calculated, one to summarize macro and the other government intrusion. However, since these proved insignificant in estimation they are not further discussed here.

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[8] Specifically, each country was scored 0,1,2 or 3 for each of the micro variables corresponding to the quartile score; the mean for each country of these quantized scores was then computed and *MICRO* set to 1 for countries at or higher than the median across countries.

Table A1*: Intervention/Resolution Policy Tools*

	Country	Period	Fiscal Cost % of GDP	Guarantee		Liquidity support		Deposit Freezes	Forbearance			Repeated Recaps	Public AMC	Public Debt Relief Program
				Explicit	> 75 % state-owned	to DMB	to NBFIs		A	B	C			
1	Argentina	1980 – 1982	55.1	no	yes	no	no		no	no	yes	no	no	yes
2	Argentina	1995	0.5	no	no	no	no	yes	no	no	no	no	no	no
3	Australia	1989-1992	1.9	no	no	no	no	no	no	yes	no	no	no	no
4	Brazil	1994 – 1996	13.2	no	no	no	no	no	yes	no	yes	no	no	yes
5	Bulgaria	1996 -1997	13.0	no	yes	yes	.	no	yes	yes	yes	no	no	no
6	Chile	1981 – 1983	41.2	no	no	yes	no	yes	no	no	yes	no	no	yes
7	Colombia	1982 – 1987	5.0	no	yes	yes	no	no	no	no	no	no	no	no
8	Cote d'Ivore	1988 - 1991	25.0	no	no	yes	.	no	yes	yes	yes	no	yes	no
9	Czech Republic	1989 - 91	12.0	yes	yes	no	no	yes	no	no	yes	yes	yes	no
10	Ecuador	1996 - ongoing	13.0	no	no	no	no	no	yes	yes	no	no	no	yes
11	Egypt	1991 – 1995	0.5	yes	no	no	yes	yes	no	yes	yes	no	yes	no
12	Finland	1991-1994	11.0	yes	no	yes	.	no	no	yes	no	no	yes	no
13	France	1994-95	0.7	no	no	no	no	no	no	yes	no	no	yes	no
14	Ghana	1982 - 1989	3.0	no	yes	yes	.	no	yes	yes	yes	no	no	yes
15	Hungary	1991 - 1995	10.0	no	yes	yes	.	yes	no	no	yes	yes	no	no
16	Indonesia	1992 – 1994	3.8	no	no	no	no	no	no	yes	yes	no	no	no
17	Indonesia	1997 – ongoing	50.0	yes	yes	yes	no	no	no	yes	yes	yes	yes	no
18	Japan	1992 - ongoing	20.0	yes	no	yes	.	no	no	yes	yes	yes	no	no
19	Malaysia	1985 - 88	4.7	no	no	.	yes	no	no	yes	no	no	no	no
21	Malaysia	1997 – ongoing	16.4	yes	no	no	no	yes	no	yes	yes	yes	yes	no
22	Mexico	1994 – ongoing	19.3	yes	no	yes	no	no	no	yes	yes	yes	yes	yes
23	New Zealand	1987-90	1.0	no	no	yes	.	no	no	no	no	no	no	no
24	Norway	1987-93	8.0	yes	no	yes	.	no	no	yes	no	no	no	no
25	Paraguay	1995 - ongoing	5.1	yes	no	yes	yes	no	no	yes	yes	no	no	no
26	Philippines	1983 – 1987	13.2	no	no	yes	.	yes	yes	yes	yes	no	yes	yes
27	Philippines	1998 – ongoing	0.5	no	no	no	.	yes	no	no	no	no	no	no
28	Poland	1992-95	3.5	no	yes	yes	.	no	no	yes	yes	no	no	no
29	Senegal	1988 - 1991	9.6	no	yes	yes	.	no	no	yes	yes	no	yes	yes
30	Slovenia	1992 - 1994	14.6	yes	yes	no	no	yes	yes	no	yes	no	yes	no

	Country	Period	Fiscal Cost % of GDP	Guarantee		Liquidity support		Deposit Freezes	Forbearance			Repeated Recaps	Public AMC	Public Debt Relief Program
				Explicit	> 75 % state-owned	to DMB	to NBFIs		A	B	C			
31	South Korea	1997 – ongoing	26.5	yes	no	yes	yes	no	yes	no	yes	yes	yes	no
32	Spain	1977-85	5.6	no	no	yes	.	no	no	yes	no	no	no	no
33	Sri Lanka	1989-93	5.0	yes	yes	no	no	no	no	yes	no	yes	yes	no
34	Sweden	1991-94	4.0	yes	no	no	no	yes	no	no	no	no	yes	no
35	Thailand	1983 – 87	2.0	no	no	no	no	no	no	yes	yes	no	no	no
36	Thailand	1997 – ongoing	32.8	yes	no	no	yes	yes	no	yes	yes	no	no	no
37	Turkey	1982 – 85	2.5	no	no	no	no	yes	no	no	no	no	no	no
38	Turkey	1994	1.1	yes	.	no	no	yes	no	no	yes	no	no	no
39	United States	1981-91	3.2	no	no	no	no	yes	yes	yes	yes	no	no	no
40	Uruguay	1981 – 84	31.2	no	yes	yes	yes	no	no	no	yes	yes	yes	yes
41	Venezuela	1994 – 97	22.0	no	no	yes	no	.	no	yes	yes	no	no	no

Table A2: *Micro Indicators and Composites*

	Countries	Period	Growth in credit/ GDP (I)	Real deposit interest rate (II)	Loan classification[a] (III)	Enforcement of creditor rights[b] (IV)	Loan to deposit ratio (V)	Micro Index Average I-V	*MICRO* 0 if average >.2.4	*RELMIC* " primarily micro"[c]
1	Argentina	1980 – 1982	3	1	2	2	3	2.2	1	1
2	Argentina	1995	1	2	3	4	2	2.4	0	0
3	Australia	1989-1992	3	3	3	4	2	3.0	0	0
4	Brazil	1994 – 1996	2	.	3	3	2	2.0	1	1
5	Bulgaria	1996 -1997	4	1	3	.	4	2.4	0	1
6	Chile	1981 – 1983	1	3	3	4	1	2.4	0	0
7	Colombia	1982 – 1987	3	2	2	1	3	2.2	1	1
8	Cote d'Ivore	1988 - 1991	4	1	1	2	1	1.8	1	1
9	Czech Republic	1989 - 91	2	3	1	3	.	2.8	1	1
10	Ecuador	1996 - ongoing	1	4	3	2	3	2.6	0	0
11	Egypt	1991 – 1995	4	1	.	1	4	2.0	1	1
12	Finland	1991-1994	3	2	4	4	1	2.8	0	0
13	France	1994-95	4	2	4	4	1	3.0	0	0
14	Ghana	1982 - 1989	4	1	1	1	4	2.2	1	1
15	Hungary	1991 - 1995	4	2	1	3	1	2.2	1	0
16	Indonesia	1992 – 1994	1	4	1	1	2	1.8	1	0
17	Indonesia	1997 – ongoing	3	4	2	3	2	2.8	0	1
18	Japan	1992 - ongoing	2	2	4	3	2	2.6	0	0
19	Malaysia	1985 - 88	1	4	2	3	2	2.4	0	0
20	Malaysia	1997 – ongoing	2	3	2	3	2	2.4	0	0
21	Mexico	1994 – ongoing	1	4	2	2	1	2.0	1	1
22	New Zealand	1987-90	2	2	4	2	4	2.8	0	0
23	Norway	1987-93	1	4	1	4	2	2.4	0	0
24	Paraguay	1995 - ongoing	2	3	3	4	3	3.0	0	0
25	Philippines	1983 – 1987	3	3	2	1	1	2.0	1	1
26	Philippines	1998 – ongoing	1	3	3	2	3	2.4	0	0
27	Poland	1992-95	2	1	1	2	4	2.0	1	1
28	Senegal	1988 - 1991	4	4	1	1	1	2.2	1	1
29	Slovenia	1992 - 1994	.	4	1	4	3	2.4	0	0

	Countries	Period	Growth in credit/ GDP (I)	Real deposit interest rate (II)	Loan classification[a] (III)	Enforcement of creditor rights[b] (IV)	Loan to deposit ratio (V)	Micro Index Average I-V	*MICRO* 0 if average >.2.4	*RELMIC* " primarily micro"[c]
30	South Korea	1997 – ongoing	2	3	2	2	1	2.0	1	0
31	Spain	1977-85	3	1	1	2	4	2.2	1	0
32	Sri Lanka	1989-93	1	2	.	1	3	1.4	1	1
33	Sweden	1991-94	1	2	3	4	1	2.2	1	0
34	Thailand	1983 – 87	2	3	1	1	3	2.0	1	0
35	Thailand	1997 – ongoing	3	4	1	2	1	2.2	1	0
36	Turkey	1982 – 85	3	1	1	4	4	2.6	0	1
37	Turkey	1994	4	1	3	4	4	3.2	0	1
38	United States	1981-91	2	3	4	4	2	3.0	0	0
39	Uruguay	1981 – 84	3	1	.	2	3	1.8	1	1
40	Venezuela	1994 – 97	4	4	2	1	4	3.0	0	0

[a]Thresholds set as follows: Provisioning required at 360 days overdue; *do.* at 120 days overdue; forward-looking criteria.
[b]Based on la Porta et al. (1998); thresholds set at scores of 6; 12; 18.
[c]See text .

A.1.2 Data on output loss and length of crisis

To explore whether there is a tradeoff between fiscal costs and economic recovery we ran regression using an IMF estimate of output loss and recovery time as dependent variables.

Output loss: We use the approach of and data from the IMF World Economic Outlook (1998) and update it for the more recent crises. This approach calculates output loss as the extent to which country's GDP growth deviated from trend GDP growth that the country had exhibited before the crisis.

Recovery time: According to the IMF methodology this is defined as 1 plus the number of years that real GDP growth rates are below trend growth rates.

The regression results (shown in Table A5) indicate little impact of the policy variables on these measures. Only the liquidity support variable is significant at the 5 per cent level.

Table A3: *Distribution of output loss, recovery time and crisis length*

	Output loss In percent of GDP	Recovery time In years
Mean	12.5	3.5
Median	8.4	3.0
Max	45.6	9.0
Min	0	1.0

Table A4: *Estimated length of crisis, gross output loss and recovery time*

Country	Recovery time	Recovery time in years	Gross output loss In percent of GDP
Argentina	1980-82	4	16.6
Argentina	1995-96	3	11.9
Australia	1989	1	0
Brazil	1994	0	1
Bulgaria	1996-97	3	20.4
Chile	1981-88	9	45.5
Colombia	1982-85	5	65.1
Czech Republic	1989	1	0
Ecuador	1996	1	0.9
Egypt	1991-94	5	6.5
Finland	1991-96	7	23.1
France	1994	1	0
Ghana	1982	2	6.6
Hungary	1991-92	3	13.8
Indonesia	1992-present	9	42.3
Indonesia	1997-present	4	33.0
Japan	1992-present	9	27.7
Malaysia	1985-87	4	13.7
Malaysia	1997-present	4	22.8
Mexico	1994	2	9.6
New Zealand	1987-92	7	18.5
Norway	1987-93	8	19.6
Paraguay	1995	1	0
Philippines	1983-86	5	25.7
Philippines	1998-present	3	7.5
Poland	1992	1	0
Senegal	1988	1	0
Slovenia	1992	2	2.1
South Korea	1997-98	3	16.5
Spain	1977	1	0
Sri Lanka	1989-90	3	0.5
Sweden	1991-92	3	6.5
Thailand	1983	2	8.7
Thailand	1997-present	4	31.5
Turkey	1982	1	0
Turkey	1994	2	9.1
United States	1981-82	3	5.4
Urugay	1981-85	6	41.7
Venezuela	1994-96	4	14.1

Table A5: *Regression results for GDP growth rate losses & recovery time*

Regression:	Growth loss A5.1		Growth loss A5.2		Growth loss A5.3		Growth loss A5.4		Recovery time A5.4	
Variable	Coeff.	t-Statistic	Coeff.	z-statistic	Coeff.	t-Statistic	Coeff.	z-Statistic	Coeff.	z-Statistic
REALINT	0.024	1.018	0.487	1.060	0.011	0.400	0.371	0.733	-0.824	-1.44
STOCKPRICE	0.003	0.117	0.470	1.275	0.015	0.600	0.817	1.615	0.041	0.09
LIQSUP	0.090	2.005	1.956	-2.270	0.111	2.442	2.429	2.381	2.000	2.25
FORB-A	-0.048	-0.885	-0.744	-0.691	-0.014	-0.267	0.101	0.090	-2.315	-1.70
FORB-B	0.006	0.094	0.151	0.128					0.188	0.16
REPCAP	0.059	1.000	1.636	1.406	0.122	1.690	2.412	1.615	-0.539	-0.48
GUAR	-0.016	-0.291	-0.334	-0.333					0.165	0.15
PDRP	0.058	1.075	0.372	0.348					0.944	0.83
FORB-B*RELMIC					-0.019	-0.253	-1.064	-0.714	1.180	0.80
REPCAP*RELMIC					-0.119	-1.180	0.425	0.185		
GUAR*RELMIC					-0.002	-0.024	-0.489	-0.412		
PDRP*RELMIC					0.068	0.974	-1.382	-0.686		
C	0.211	2.960	1.700	1.211	0.231	3.206	2.313	1.353		
R-squared(McFadden)	0.247		0.231		0.262		0.267		0.280	
Adjusted R-squared	0.054				0.040					
S.E. of regression	0.128		0.482		0.129		0.473		0.451	
Sum squared resid	0.510		7.204		0.500		6.713		6.306	
Log likelihood	30.50		-21.32		30.86		-20.31		-19.35	
Durbin-Watson stat	1.958				1.821					
Mean dependent var	0.125		0.500		0.125		0.500		0.400	
S.D. dependent var	0.132		0.506		0.132		0.506		0.496	
Akaike info criterion	-1.075		1.516		-1.044		1.516		1.418	
Schwarz criterion	-0.696		1.900		-0.622		1.934		1.798	
F-statistic	1.276				1.182					
Prob(F-statistic)	0.292				0.342					
LR-statistic			12.81				14.82			
Prob(LR-statistic)			0.118				0.096			
Method	OLS		Logit		OLS		Logit		Logit	

Notes: The sample includes all episodes (i.e. n = 40).