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How Deposit Insurance Affects Financial Depth

(A Cross-Country Analysis)

Robert Cull

Whether the adoption of explicit deposit insurance strengthens financial markets or weakens them depends on the circumstances in which it is adopted. Adopting it to counteract instability appears to have little (or negative) effect. Adopting it when government credibility and institutional development are high appears to have a positive effect on financial depth.

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Summary findings

Should we expect deposit insurance to have a positive effect on development of the financial sector? All insurance pools individual risks: premiums are paid into a fund from which losses are met. In most circumstances, a residual claimant to the fund (typically a private insurance company) loses money when losses exceed premiums. Claimants that underprice risk tend to go bankrupt.

With most deposit insurance, however, the residual claimant is a government agency with very different incentives. If the premiums paid by member banks cannot cover current fund expenditures, the taxpayer makes up the shortfall. Facing little threat of insolvency, there is less incentive for administrative agencies to price risk accurately.

In the United States, researchers have found that the combination of increasing competition in banking services and underpriced deposit insurance led to riskier banking portfolios without commensurate increases in bank capital. Deposit insurance may facilitate risk-taking, with negative consequences for the health of the financial system.

On the positive side, insurance may give depositors increased confidence in the formal financial sector — which may decrease the likelihood of bank runs and increase financial depth. Indeed, simple bivariate correlations between explicit insurance and financial depth are positive. But when one also controls for income and inflation, that relationship disappears — in fact, the partial correlation between changes in subsequent financial depth and the adoption of explicit insurance is negative (and quite pronounced).

Counterintuitive though it may be, that stylized fact may be partially explained by the political and economic factors that motivated the decision to establish an explicit scheme. The circumstances surrounding decisions about deposit insurance are associated with different movements in subsequent financial depth.

Adopting explicit deposit insurance to counteract instability in the financial sector does not appear to solve the problem. The typical reaction to that type of decision has been negative, at least with regard to financial depth in the three years after the program's inception.

Adopting explicit deposit insurance when government credibility and institutional development were high appears to have had a positive effect on financial depth.

This paper — a product of the Development Research Group — is part of a larger effort in the group to study the design, implementation, and effects of deposit insurance programs. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Paulina Sintim-Aboagye, room MC3-422, telephone 202-473-7644, fax 202-522-1155, Internet address psintimaboagye@worldbank.org. January 1998. (30 pages)

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I. Introduction

Should we really expect deposit insurance to have a positive effect on financial sector development? All insurance pools individual risks -- premiums are paid into a fund from which losses are met. In most circumstances, there is a residual claimant to the fund (typically a private insurance company) that loses money when losses exceed premia. Those claimants that underprice risk tend to go bankrupt. With most deposit insurance, however, the residual claimant is replaced by a government agency with very different incentives. If the premia paid by member banks cannot cover current fund expenditures, it is the taxpayer rather than the government agency that makes up the shortfall. Facing little threat of fund insolvency, there is less incentive for administrative agencies to price risk accurately.

Deposit insurance funds that underprice risk provide managers of banks with an incentive to hold excessively risky portfolios. Because deposit insurance lowers the price

(interest rate) that banks must pay to attract deposits, the banks that profit most are not well-capitalized ones that manage risks prudently -- they could attract deposits at low prices with or without insurance. It is, rather, poorly capitalized banks with portfolios comprised of very risky assets that profit most from the ability to attract cheap deposits. Although there has been a recent move to establish risk-based capital guidelines (e.g. the Basle Agreements), in many cases prudent banks and risky banks pay the same premium rate on their deposits. In such systems, the incentive to become a risky bank is probably strong.

In the U.S. case, the combination of increasing competition in banking services and underpriced deposit insurance appears to have led to riskier banking portfolios without commensurate increases in bank capital. Keeley (1990) finds evidence that, as competition in banking increased, franchise values of banks declined.[2] Barth, Brumbaugh, and Litan (1990) point out that many of the largest banks in the U.S. had capital to assets ratios between 3-5% in the late 80s and early 90s, a far cry from the 8% ratio for insured commercial banks in the 1960s. While capital was declining, bank portfolios became increasingly focused on real estate lending, mortgage-backed securities, and standby letters of credit, all relatively risky activities (Hetzel (1993)).

The stylized facts for the U.S. suggest that deposit insurance may have helped facilitate greater risk taking, which may have had negative implications for the overall

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[2] One source of that competition came from a commercial paper market that attracted many of the banks' largest corporate clients.

health of the financial system. Akerloff and Romer (1993) helped formalize the connection between deposit insurance, low capital ratios, and excessive risk taking; and in a recent cross-country analysis, Demirguc-Kunt and Detragiache (1997) found a pronounced positive partial correlation between explicit deposit insurance and systemic bank insolvencies. As Caprio and Klingebiel (1996) point out, over the last twenty years systemic bank insolvencies have become increasingly common; in many cases, bail-out costs ranged from *10-50%* of GDP. Politicians that ignore incentives in the banking sector appear to do so at their peril. Stylized facts, theoretical predictions, and empirical work strongly suggest that incentives resulting from deposit insurance have had a negative effect on financial sector development. To the extent that financial development affects economic growth, and a growing body of empirical evidence strongly suggests that it does, the link between deposit insurance and financial development may be an important one.[3]

Given the incentive problems, why would governments create deposit insurance programs? In short, insurance provides assurances to savers which may spur de-personalized capital mobilization and thus be a source of financial sector stability and growth. Diamond and Dybvig (1983), for example, emphasize the self-fulfilling nature of bank panics. Explicit deposit insurance may eliminate that possibility, which may in turn have a beneficial effect on financial depth. The main focus of this paper is to determine

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[3] Authors have long emphasized the connection between a well-functioning financial sector and economic performance (e.g. Schumpeter (1912)). Goldsmith (1969) and McKinnon (1973) offered important early cross-country analyses of financial development and growth. More recently, King and Levine (1993) have shown that the level of financial intermediation is a good predictor of long-run rates of economic growth, capital accumulation, and productivity improvements. For a complete summary of the empirical literature on the links between financial institutions and economic growth, see Levine (1997).

whether explicit deposit insurance programs have actually contributed to financial sector development. I find that, since 1980, countries that established explicit schemes experienced post-inception increases in financial depth that were, on average, slightly larger than the typical increases for countries that retained implicit insurance. However, when one controls for other relevant factors that affect financial depth (including inflation and real per capita income), explicit programs were associated with less financial depth than implicit ones.

I also study the context surrounding the adoption of explicit insurance. Although we may conclude that, on average, deposit insurance has not been positively associated with financial sector development, there may have been instances when it was beneficial. For example, the programs may have been a success when governments confronted the incentive problems discussed above through improved supervision and prudential regulation of banks. Both Calomiris (1992) and Kane and Hendershott (1996) find links between the effectiveness of monitoring and supervision and the solvency of deposit insurance schemes.

More generally, the credibility of an explicit scheme as viewed by depositors may be an important determinant of subsequent movements in financial depth. Depositors likely respond favorably to government actions that alleviate uncertainty. In Argentina's 1989 financial crisis, for example, Baer and Klingebiel (1995) point out that, although the government took actions that imposed costs on time deposit holders, the deposit to

currency ratio rebounded shortly thereafter. Credible actions that alleviate uncertainty appear to foster increased financial depth, even in the midst or the immediate wake of a financial crisis.

I find that explicit deposit insurance programs were positively correlated with subsequent increases in financial depth if they were adopted when proxies for institutional development and government credibility were high. Governments have been more likely to adopt an explicit scheme when volatility in the banking sector[4] was low and when neighboring countries were also doing so. To a lesser extent, they have also been more likely to adopt insurance in the aftermath of a systemic bank crisis and in countries with strong legal systems. The largest declines in financial depth have occurred when explicit insurance was adopted while financial sector volatility was high. However, after controlling for the interaction between explicit insurance and financial instability, explicit insurance was *positively* correlated with subsequent changes in financial depth. These results indicate a link between the circumstances surrounding the adoption of an explicit program and financial depth. In contrast to adopting deposit insurance in an unstable period, adoption due to strong legal traditions or as a post-crisis intervention (factors more closely associated with credibly assuring depositors), appears to have a positive effect on financial depth.

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[4] Volatility is measured as either the standard deviation or the coefficient of variation in M2/GDP.

II. Deposit Insurance and Financial Depth: Correlations

At the simplest level, it appears that those countries that adopted explicit deposit insurance from 1980-95 enjoyed slightly higher growth in financial depth than those that did not (Table 1). In the three years after the inception of an explicit program, the average increase in the ratio of M2 to GDP (M2/GDP) was 2.6%. For quasi-money to GDP (QM/GDP), the average increase was 1.9%. The average three-year changes in M2/GDP and QM/GDP for those countries that retained implicit schemes from 1980-95 were both 1.8%. The higher M2/GDP figures for countries with explicit programs do appear to be influenced by a handful of observations. The median three-year increase on that measure for both "explicit" and "implicit" countries was 0.8%. However, for QM/GDP, perhaps a purer indicator of financial development because it does not include M1, the median change was 1.8% for explicit countries and 0.9% for implicit ones.

Table 1: Post-Deposit Insurance Changes in Financial Depth 1980-1995

Summary Statistic	Average Change in M2/GDP (Three Years After Explicit Deposit Insurance Enacted)		Average Change in Quasi-Money/GDP (Three Years After Explicit Deposit Insurance Enacted)	
	Explicit[5]	Implicit[6]	Explicit	Implicit
Mean	+2.6%	+1.8%	+1.9%	+1.8%
Median	+0.8%	+0.8%	+1.8%	+0.9%
Standard Dev.	9.6%	2.6%	4.1%	2.0%
Minimum	-8.7%	-2.5%	-7.1%	-0.8%
Maximum	+32.1%	+9.4%	+8.7%	+6.4
Observations	15	29	15	31

[5] Includes only those countries that adopted explicit insurance from 1980-95. More pronounced differences between implicit and explicit countries are evident when those countries that adopted explicit insurance prior to 1980 are included in the calculations.

[6] For those countries that maintained implicit deposit insurance (the control category), changes in financial depth were first calculated over all possible three year periods from 1980-95; those three-year figures where then averaged.

Of course, the slight disparities in growth in financial depth highlighted in Table 1 may be driven by factors other than explicit deposit insurance. For example, countries that adopted explicit schemes tended to have much higher real per capita income than those that did not (Table 2).[7] Given the strong link between income and financial depth emphasized by other authors (Gertler and Rose (1994), for example), one would expect that, in countries with higher income, financial depth would be greater, with or without explicit deposit insurance. It is, however, unclear why the *change* in financial depth should necessarily be greater for countries with higher real per capita income.[8] Countries that adopted explicit programs also had slightly lower inflation than those that did not, which also may have spurred greater growth in financial depth independent of deposit insurance. Similarly, because large fiscal deficits are often associated with financial disintermediation, larger deficits for implicit countries may also have had a dampening effect on financial depth unrelated to explicit insurance.

With respect to banking sector stability, explicit countries had much lower coefficients of variation for M2/GDP, which may indicate that it was prior stability (rather than the adoption of explicit insurance) that was largely responsible for the relatively large increases in financial depth. In short, the data in Table 2 make it clear that isolating the effect of explicit deposit insurance on future financial depth is difficult, and that the

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7 Among the explicit countries in Table 2, I include countries that adopted deposit insurance prior to 1980. These countries are also included in the regressions that follow.

8 It is true that countries that have high real income also tend to have well developed financial infrastructure (Levine (1997)). Perhaps those countries with better infrastructure are in a better position to capitalize on the benefits of deposit insurance. We might, therefore, expect subsequent changes in financial depth to be positively correlated with real per capita income.

relatively large increases in depth for countries with explicit schemes should, perhaps, be attributed to a host of other factors. Section III offers a more formal attempt to disentangle the relationship between the circumstances surrounding deposit insurance decisions and their eventual impact on financial depth.

Table 2: Characteristics of Countries with Explicit and Implicit Deposit Insurance Programs

Variable	Explicit Programs			Implicit Programs		
	Mean	St Dev	Obs	Mean	St Dev	Obs
PerCap Inc*	7268	4406	31	4042	4377	45
Inflation	14.3%	16.8%	33	19.0%	20.4%	31
3yr Deficits	3.0%	3.4%	32	3.9%	4.6%	39
M2 Instabil*	6.9%	6.3%	35	15.3%	9.5%	23
Law Index*	3.92	1.79	43	2.74	1.31	43
Bank Crisis	25.8%	--	31	14.3%	--	56

Notes: Per capita income measured in 1985 $US. For explicit countries, income and inflation figures are for the year of the program's adoption, deficits and M2 stability are for the three years prior to adoption, and bank crises are for the five years prior to adoption. For implicit countries, income, inflation, deficit, and M2 stability are averaged over all years for which data were available. Bank crisis data are for the five years leading up to the last decision to retain an implicit program (i.e., 1990-94). For both implicit and explicit countries, the ICRG Law Index (a six-point scale with higher values indicating a stronger legal tradition) is averaged over 1985-91. M2 instability is the coefficient of variation in M2/GDP (standard deviation/mean). Bank crisis is a dummy variable equal to one if a bank crisis occurred.
* Means for explicit and implicit are different from one another at the t = 0.05 level. (results similar when variance for each sample assumed equal or unequal).

Cross-country regressions for the level of financial depth in 1992 indicate that the positive link between explicit deposit insurance and financial development suggested by the summary statistics in Table 1 is closely associated with income levels. Controlling for income and the average level of inflation from 1990-92, the partial correlation between explicit deposit insurance and financial depth is actually *negative*.[9] The estimated coefficients for the explicit deposit insurance variable imply large reductions in financial

[9] Similar qualitative results apply when deficits as a percentage of GDP are included in the regression and when the coefficient of variation in M2/GDP replaces inflation as a measure of instability. The instability measures enter the regressions with the expected negative sign, but they never approach conventionally accepted levels of significance, perhaps because they are averaged over a relatively brief time period (1990-92).

depth -- for M2/GDP the reduction is roughly 10%; for QM/GDP, 8%. However, the t-statistics for these coefficients are significant at only at the .10-.16 levels.[10]

Table 3: Explicit Deposit Insurance and Level of Financial Depth, 1992

Explanatory Variable	Dep Var: M2/GDP		Dep Var: Quasi-Money/GDP	
	(1)	(2)	(3)	(4)
Constant	0.275	0.283	0.156	0.158
	(7.06)	(7.02)	(4.52)	(4.40)
Per Capita Inc	0.043	0.043	0.034	0.034
	(6.51)	(6.48)	(5.91)	(5.84)
Explicit Dep Ins	-0.097	-0.104	-0.080	-0.082
	(1.53)	(1.62)	(1.42)	(1.43)
Avg Inflation (90-92)		-.004		-.001
		(0.83)		(0.27)
Adj. R-Squared	.49	.47	.44	.44
Observations	51	51	51	51

Notes: t-statistics in parentheses. Per Capita Income measured in thousands of 1985 $US. Inflation measured as average annual percentage change in consumer price index.

Regression analysis of short-term financial deepening provides a somewhat stronger indication that explicit deposit insurance is negatively associated with financial development. Controlling again for inflation and income (both changes and levels), the dummy variable for explicit deposit insurance is negatively and significantly associated with changes in M2/GDP and QM/GDP (Table 4). The estimated coefficients indicate that, holding other factors constant, countries with explicit deposit insurance experienced 2-3% less growth in M2/GDP and QM/GDP in the three years after the program's inception than did the typical country that retained implicit insurance. The overall fit of the change in financial depth regressions is good -- income level enters positively and

[10] Though weak, the result is somewhat reminiscent of the Demirguc-Kunt and Detragiache (1997) finding that explicit insurance is positively correlated with systemic banking crisis.

significantly;[11] income changes also enter positively, though insignificantly; and, inflation enters negatively and significantly. On the basis of the regression results in Tables 3 and 4, one would conclude that explicit deposit insurance has typically been *negatively* correlated with financial development. The next section analyzes the decision to create an explicit program in order to explain this negative partial correlation.

Table 4: Explicit Deposit Insurance and Changes in Financial Depth

Explanatory Variable	Dep Var: Change in the Ratio of M2 to GDP		Dep Var: Change in the Ratio of Quasi-Money to GDP	
	(1)	(2)	(3)	(4)
Constant	2.268	1.800	2.259	2.137
	(3.15)	(2.01)	(3.27)	(2.48)
Per Capita Inc	0.247	0.276	0.199	0.245
	(2.29)	(2.21)	(1.93)	(2.04)
Explicit Dep Ins	-2.980	-2.867	-1.581	-1.738
	(3.58)	(2.85)	(1.98)	(1.80)
Avg Inflation	-0.084	-0.080	-0.065	-0.065
	(5.71)	(4.70)	(4.60)	(3.99)
% Change, Real Per Capita GDP		0.276		0.134
		(1.39)		(0.91)
Adj. R-Squared	.52	.46	.37	.34
Observations	43	40	43	40

Notes: t-statistics in parentheses. Per Capita Income measured in thousands of 1985 $US (Source: Summers-Heston). Inflation measured as average 3-year percentage change in consumer price index. For countries with explicit programs, inflation was averaged over the three-year period just after inception. For those with implicit insurance, inflation was averaged over all 3-year periods from 1980-95 for which data were available. Countries with inflation rates higher than 80% were excluded from these calculations.

III. The Decision to Create an Explicit Deposit Insurance Scheme

From a methodological perspective, isolating the link between explicit deposit insurance and financial depth is difficult because the decision to create an explicit scheme likely depends on many factors that also drive future financial depth. Accounting for the

[11] This is little surprise given the summary statistics in Table 2. Again, however, the theoretical link between income levels and changes in financial depth is not well established.

co-determination between institutional or policy variables like deposit insurance and economic outcomes is, of course, a common problem. Here the decision to adopt explicit insurance (an institutional choice) is modeled as a function of economic and institutional outcomes up to that point. The decision components (explanatory variables) from this reduced form are correlated with future financial depth in different ways, indicating that the circumstances surrounding a program's adoption may exert a powerful influence on subsequent outcomes in the financial sector. The issue of causation cannot be completely laid to rest, however -- as noted, past economic outcomes may dictate *both* the deposit insurance choice and future outcomes in the financial sector. In this sense, the deposit insurance choice may not be causing the financial sector outcomes. At the least, however, the strategy enables one to (1) isolate the links between particular past economic and institutional outcomes and the deposit insurance decision, and (2) estimate the independent association between some of these decision factors and subsequent financial market reactions. In turn, one can readily interpret the partial correlations as providing support for the idea that the factors underlying the deposit insurance choice do, in some sense, shape or cause the future reactions.

Among the past economic outcomes that may influence decisions to adopt deposit insurance are past volatility in the financial sector including past systemic banking crises. Among the institutional factors that may affect these decisions are a country's legal traditions and the influence of its neighbors or of international lending institutions such as

the IMF and the World Bank. The link between deposit insurance and each of these factors is discussed in turn.

Prior Financial Instability

Adopting insurance in a turbulent period may signal an alarm bell for depositors. Policy makers, therefore, may attempt serious banking reform only in relatively calm periods. Also, financial instability is often closely related to inflation. Because few explicit schemes index coverage for inflation, a program adopted in an inflationary period may not be a credible form of depositor protection.[12] If such credibility is important to policy makers, volatility measures such as inflation and the standard deviation of M2/GDP should be negatively related to the adoption of deposit insurance.

Post-Banking Crisis

In the wake of a severe crisis, an explicit program may be necessary to restore depositors' faith. Unlike the pre-crisis instability described above, governments need not worry about the signal sent by adopting deposit insurance as the crisis has already occurred. One would, therefore, expect a positive relationship between past crisis and the adoption of explicit insurance.

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[12] Another hypothesis is that variation in M2/GDP is a signal of the ease with which depositors can exit a country's financial system in case of impending problems (exchange rate depreciation, real estate lending bubbles). Because exit is a form of self-insurance, the need for explicit insurance may be lower in countries that have active financial sectors as measured by variation in M2/GDP.

Legal Traditions

As individual income (and thus wealth) grows, the need to protect property rights likely becomes greater. Explicit deposit insurance may, therefore, be one example of improved property rights.[13] Another view is that there is little point in adopting deposit insurance in a country where legal traditions are especially weak. In those instances, depositors are unlikely to believe that insurance coverage is meaningful. Countries that scored high on the ICRG index of legal development should have been more likely than others to adopt deposit insurance.[14]

External Pressure

Some countries may be prodded into adopting explicit deposit insurance. For example, countries that joined (or were attempting to join) the European Union were required to adopt an explicit program. Similarly, countries may be required to adopt explicit insurance as part of the IMF's or the World Bank's loan conditionalities. In addition, close links between countries may prompt some to mimic the policy choices of

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13 Knack and Keefer (1995) argue the reverse, however. In their view, because the income gains associated with improved property rights are so high, it is more likely that changes in property rights drive income rather than the reverse. Co-determination between these variables is a difficult problem, one that is beyond the scope of this paper. Each of these variables is used in the models of deposit insurance choice that follow.

14 The index was created by a private international risk service, the International Country Risk Guide. Here we use only the "rule of law" component of their ratings. This variable "reflects the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes." Higher scores indicate "sound political institutions, a strong court system, and provisions for an orderly succession of power." Lower scores indicate "a tradition of depending on physical force or illegal means to settle claims." Upon changes in government in countries scoring low on this measure, new leaders "may be less likely to accept the obligations of the previous regime." See Knack and Keefer (1995) for additional description.

their neighbors.[15] Such pressure is, admittedly, difficult to measure. Here we employ the percentage of countries within a region that adopted explicit insurance as a crude proxy for pressure.[16] One would expect a positive relationship between these "neighbor" effects and explicit deposit insurance.

The regression analysis that follows controls simultaneously for banking instability, and the other aspects of deposit insurance decisions described above to better isolate the effect of each component on financial depth. The results in Table 5 indicate that the probability of adopting explicit insurance increases by 25-30%[17] for countries that experienced systemic banking crises within the preceding five years.[18] However, in only one specification (model 3) does the crisis coefficient achieve significance at the .10 level.

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15 Neighbor effects in the U.S. have been studied by Case et al. (1989). They find that a state's level of per capita income is affected by the expenditure levels of its neighbors. In specifying neighborliness they note that, "various measures of distance between neighbors yield similar results, as long as the measures are powerful enough to select a small number of states as a given state's neighbors." (p. 19). The argue that "copycatting" is not confined to subfederal jurisdictions but also may be practiced by national governments.

16 In the models of deposit insurance choice that follow, the country in question (i.e., the one making the choice) is excluded from the regional pressure calculation.

17 All percentage change estimates were calculated at the means of the explanatory variables in Table 5.

18 The bank crisis dummy variable used here comes from Demirguc-Kunt and Detragiache (1997). They define "full-fledged" crises as those where at least one of the following four conditions held: (1) the ratio of non-performing assets to total assets in the banking system exceeded 10%; (2) the cost of the rescue operation was at least 2% of GDP; (3) the episode involved a large scale nationalization of banks; (4) extensive bank runs took place or emergency measures such as deposit freezes, prolonged bank holidays, or generalized deposit guarantees were enacted by the government. To identify crises that satisfy these criteria they relied on four recent studies: Caprio and Klingebiel (1996), Kaminsky and Rhinehart (1996), Lindgren *et al.* (1996), and Sheng (1995). Based on the crisis dates reported in Demirguc-Kunt and Detragiache (1997) and Caprio and Klingebiel (1996), I constructed a dummy variable equal to one if a crisis had occurred during any part of the five years leading up to the adoption of explicit deposit insurance. For countries that retained implicit schemes, the crisis dummy equaled one if a crisis occurred from 1989-1993. Because the papers used to construct the crisis dummy focus on 1980-1995, countries that adopted explicit deposit insurance prior to 1980 are dropped from the regression analysis in Table 5.

A somewhat more pronounced relationship is evident between explicit deposit insurance and banking instability (significant at the t=.01-.10 level). For a one standard deviation increase in the coefficient of variation in M2/GDP, the probability of adopting an explicit scheme declines by 27%. In other words, as instability increases, governments have typically been less willing or able to formalize deposit insurance arrangements.

Banking sector instability, moreover, appears to exert an influence on the deposit insurance decision independent of income and institutional development. In model 1 of Table 5, the ICRG index of legal institutional development is included as an explanatory variable. For every one-point increase on that six-point scale, the estimated coefficient implies an 8% increase in the probability of adopting explicit deposit insurance. The relationship between explicit insurance and the ICRG index does not achieve the same level of significance as that between past financial crisis and explicit insurance. As noted, however, income levels are highly correlated with ICRG scores, which may suggest that it is income rather than institutional development per se that influences the deposit insurance decision. In model 2 of Table 5, real per capita income replaces the ICRG legal index as an explanatory variable. The estimated coefficient is positive and significant.[19]

[19] Though not displayed here, when the ICRG index and per capita income both enter the regression, their estimated coefficients and t-statistics are much smaller than when they enter separately.

Table 5: Regression Analysis, Deposit Insurance Decision

Explanatory Variables	Dependent Variable: Dummy =1, if Explicit Deposit Insurance Program Adopted (Probit Estimates)							
	Probit (z-score) (1)	dF/dX % change (1a)	Probit (z-score) (2)	dF/dX % change (2a)	Probit (z-score) (3)	dF/dX % change (3a)	Probit (z-score) (4)	dF/dX % change (4a)
Constant	.128 (0.19)	--	.117 (0.20)	--	-.332 (0.43)	--	-.500 (0.52)	--
Prior Instability	-.077 (2.29)	-3.04%	-.106 (2.52)	-4.07%	-.061 (1.76)	-2.40%	-.079 (1.68)	-2.93%
Recent Financial Crisis	.737 (1.49)	27.9%	.741 (1.37)	28.8%	.821 (1.64)	30.6%	.735 (1.17)	28.2%
Legal Tradition	.203 (1.38)	8.06%			.153 (0.96)	6.06%	.009 (0.04)	0.3%
Real GDP Per Capita			.154 (1.96)	5.90%				
% Neighbors Adopted EDI (since 1980)					1.30 (1.04)	0.51%		
% Neighbors Adopted EDI (since 1985)							3.07 (1.86)	1.14%
Obs.	43		40		42		33	
Chi-Sqr(3)	13.38		19.48		13.96		12.89	
Prb > ChiSq	.0039		.0002		.0074		.0118	
Pseudo R2	.225		.357		.240		.291	

Notes: z-scores in parentheses in Columns (1), (2), (3), and (4). % changes in columns 1a, 2a, 3a, 4a computed at the means of the independent variables. Prior Instability is the coefficient of variation (standard deviation divided by mean) for M2/GDP over the three years prior to the adoption of explicit deposit insurance. For those countries that retained implicit insurance, the coefficient of variation is calculated over all three-year periods from 1980-95 for which data were available. Recent Financial Crisis is a dummy variable = 1, if a systemic financial crisis occurred within the five years prior to the deposit insurance decision. For those with implicit deposit insurance, the five year period was 1989-93. Legal Tradition is a six-point index created by the International Country Risk Guide. Higher scores indicate "sound political institutions, a strong court system, and provisions for an orderly succession of power." Legal tradition data averaged over 1985-1991. "% Neighbors adopted EDI" is the percentage of countries within a region that adopted explicit deposit insurance after the date specified (above). Regional pressure figures exclude the country in question from the calculation. The five regions for developing countries were Africa, Asia, Latin America and the Caribbean, the Middle East, and Transitional Socialist Economies. Developed countries were all grouped into one category (region).

Finally, regional pressure (contagion) is positively associated with decisions to adopt explicit deposit insurance, especially recently. Among those countries that had not yet adopted explicit insurance by 1985, the probability of adoption was positively associated with the percentage of neighboring countries that adopted insurance from 1985-95 (model 3). The estimated coefficient implies that the probability of adopting explicit deposit insurance would increase by about 30% if the percentage of neighboring countries that also did so increased by one standard deviation (27%). Although the proxy used here is crude, it does appear that there may be "contagion" effects associated with explicit deposit insurance.

IV. Changes in Financial Depth: Regressions

The data suggest that banking stability, systemic crises, institutional development (especially as it relates to income), and neighbor effects all have influenced deposit insurance decisions. Though the relationship between explicit insurance and banking stability is clearly the most pronounced, the partial correlations with the other explanatory variables in Table 5 are of the expected sign and approach conventionally accepted levels of significance in some specifications. In the regressions for changes in financial depth that follow, the interaction between explicit insurance and instability is included as an explanatory variable. A negative partial correlation between changes in financial depth and that interaction term might indicate that timing effects matter -- in particular, adopting explicit insurance in a turbulent environment may send a bad signal to the banking sector. The deposit insurance dummy also enters these regressions on its own, which should

capture the non-stability related components of explicit insurance, and their influence on financial depth. In this way, the deposit insurance decision is de-composed to determine whether its individual aspects had different effects on subsequent changes in financial depth. The underlying rationale is that financial actors, particularly depositors, may respond to explicit insurance differently depending on their perceptions of why it was adopted.

In other specifications the interaction between explicit insurance and prior financial sector volatility was replaced with an interaction between explicit insurance and the ICRG legal index. This term should help capture the degree to which an explicit scheme is perceived as credible by depositors. This test is similar to that for the interaction between explicit insurance and prior volatility -- both prior volatility and poor legal institutions are indications that the circumstances surrounding the adoption of explicit insurance are less than ideal from depositors' perspectives. One would, therefore, expect both to have a negative effect on subsequent financial depth.[20]

Table 6 summarizes the results.[21] In both the M2/GDP and QM/GDP regressions,

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[20] One could argue that financial instability is caused by poor legal institutions, and thus the test using the interaction between explicit insurance and the ICRG legal index is more appropriate. However, the simple bi-variate correlation between the ICRG index and volatility (as measured by the coefficient of variation in M2/GDP) is only -.32, which suggests that only a fraction of financial market instability can be explained by poor institutions. Since the ICRG index and prior financial instability measures appear to capture similar but not identical effects, results for both interaction terms are discussed below.

[21] The countries used in the regression analysis are listed in Appendix I. They comprise a good mix of developed and developing countries. Bolivia is excluded from the regression analysis; its average 3-year rate of inflation during this period was 1065%. When that observation is included, estimated coefficients change dramatically and the overall fit of the regressions declines substantially. At the

the estimated coefficients for inflation and real per capita income are quite similar to those in Table 4 -- inflation enters negatively and significantly in all specifications. Changes in real income also enter positively, although that coefficient is never significant. The interaction term between explicit insurance and banking sector instability enters negatively and significantly, which might suggest that adopting deposit insurance in a turbulent period contributes to reduced financial depth.[22] A less causative interpretation would be that, in countries that adopt deposit insurance to stop or delay a crisis (i.e., those with high financial instability), the program has been unsuccessful -- financial depth decreased anyway.[23]

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outset, 103 countries were included in the analysis. Missing data, however, limits me to forty-one countries (at most) in the regressions reported here.

22 As noted, members of the European Union were required to adopt explicit deposit insurance (if they had not already done so) in the late 1980s. While it is difficult to know for certain whether their motivation to adopt was membership in the Union or was driven by other factors, it is plausible that depositor reactions to an EU-directed scheme may be different than to other insurance programs. The EU effect is potentially important in three of the cases in this sample -- Belgium (adoption 1985), Denmark (1988), and Ireland (1989). However, the qualitative results of the analysis are unchanged when a dummy variable is used for these cases or when they are dropped from the regressions.

23 This does not mean that adopting deposit insurance in turbulent periods is necessarily a bad idea. The relevant counter-factual analysis would estimate how much further financial depth would have fallen in the absence of deposit insurance. The result should, however, give policy makers an indication that deposit insurance is unlikely to stop or reverse crisis.

Table 6: De-Composed Deposit Insurance Choices and Subsequent Changes in Financial Depth

Explan. Variable	Dep Var: Change in Ratio of M2 to GDP			Dep Var: Change in Ratio of Quasi-Money to GDP		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	.264	.201	-1.48	.775	.720	-.549
	(0.30)	(1.02)	(1.11)	(0.88)	(0.73)	(0.40)
Avg. Inflat.	-.111	-.115	-.093	-.095	-.097	-.081
	(6.73)	(6.29)	(5.42)	(5.71)	(5.47)	(4.57)
% Growth	.092		.108	.046		.060
(Real GDP)	(0.69)		(0.79)	(0.34)		(0.42)
Income Per		0.065			0.046	
Capita		(0.52)			(0.38)	
Explicit	1.98	2.18	3.79	2.04	2.18	3.38
	(1.63)	(1.52)	(2.36)	(1.68)	(1.56)	(2.04)
Exp x Volat	-1.42	-1.40	-.576	-.985	-.957	-.369
	(3.71)	(3.31)	(3.67)	(2.56)	(2.31)	(2.28)
Volatility1	1.102	1.100		.986	.981	
(st dev M2)	(4.33)	(3.68)		(3.85)	(3.38)	
Volatility 2			.357			.305
(coef of var)			(3.54)			(2.93)
Adj. R-Sqre	.603	.528	.575	.475	.422	.406
Obs	40	41	40	40	41	40
F	12.83	9.93	11.56	8.05	6.84	6.34
Prob > F	.0000	.0000	.0000	.0000	.0002	.0003

Notes: t-statistics in parentheses. Observations for countries with average 3-year inflation higher than 1000% excluded from the analysis. Avg inflat. and Income Per Capita are described in notes to Table 4. Explicit is a dummy variable equal to one for countries with explicit deposit insurance. Volatility 1 is the standard deviation of M2/GDP. For countries with explicit insurance, the standard deviation was computed over the three years prior to its adoption. For countries that retained implicit insurance, standard deviations were computed for all three-year periods from 1980-95; the average of those standard deviations enters these regressions.[24] Volatility 2 is the coefficient of variation in M2/GDP (standard deviation/mean). It was computed over the same time intervals as Volatility 1. % growth (real GDP) is the average annual growth rate in real GDP. For implicit countries it was computed over the same time intervals as the volatility measures. For explicit countries it was computed over the three years just after a program's inception.

The dummy variable for explicit insurance, which should capture non-stability-related circumstances surrounding deposit insurance decisions such as past crises, legal tradition, and neighbor adoption effects, appears to exert a very different influence on

[24] Similar qualitative results obtain when the standard deviation in M2/GDP is computed over the five years prior to adoption for countries with explicit schemes, and when a simple standard deviation from 1980-95 is computed for countries that retained implicit insurance.

changes in financial depth.[25] Its estimated coefficient is positive and significant across many specifications in Table 6.[26] The net effect of adopting explicit insurance should, however, be calculated for a given level of volatility. In model (3), for example, the net effect of deposit insurance evaluated at the sample mean for volatility (a coefficient of variation in M2/GDP equal to 10.26%) is negative; the estimated coefficient is -2.12, which is significantly different from zero at the t = 0.07 level. For a volatility level one standard deviation below the sample mean (a coefficient of variation in M2/GDP equal to 1.53%), the result is reversed -- the estimated coefficient is 2.91 which is significantly different from zero at the t = 0.05 level. For those countries that did not adopt explicit deposit insurance, however, the sample *minimum* for volatility was 5.1%. At that

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25 In the Table 6 results, Mexico, Finland, and Norway are included among the countries with explicit deposit insurance. In each case, the government has explicitly declared that *all* deposits in their banking system are covered by insurance. Since they lack coverage limits, they are somewhat different than the other countries with explicit insurance. Indeed, one might argue that their systems have more in common with implicit schemes. The qualitative results of this analysis are, however, unchanged when one or all of these observations are excluded.

26 As noted, another way to test whether the institutional aspects of deposit insurance positively affect subsequent changes in financial depth is to interact the explicit insurance dummy variable with the ICRG legal index. This interaction term should capture the credibility of deposit insurance from the depositors' perspective. Indeed, when that interaction term replaces the one in Table 6, its estimated coefficient is positive and significant. The coefficient on the explicit dummy, which, in that specification, should capture non-institutional aspects of deposit insurance, is *negative* and significant. The qualitative results are, therefore, similar for either interaction term -- for countries with high levels of prior financial stability or strong legal traditions, the net effect of explicit deposit insurance on subsequent financial depth appears to be positive (See Appendix 2, Table 8).

Regardless of the choice of interaction term, the explicit dummy and per capita income compete for explanatory power -- the dummy's estimated coefficients and t-statistics are largest (in absolute value) when income is left out of the regression. It appears that aspects of the deposit insurance decision not related to banking sector instability exert a positive influence on subsequent changes in financial depth, and that this effect is closely tied to income levels. Its not clear, however, that income level should enter the change in financial depth regressions as an explanatory variable. While there is a positive relationship between *changes* in income and changes in financial depth, there is little reason to expect income *level* to be related to subsequent changes in M2/GDP and QM/GDP. The results in Table 6, therefore, should not be interpreted as implying that the institutional aspects of adopting deposit insurance have little effect on subsequent financial depth when one controls for income. Rather, institutional aspects have a positive impact on depth, and

volatility level, the net effect of explicit insurance is positive, though not statistically different from zero at conventionally accepted levels. Similar qualitative results obtain for all specifications in Table 6. In short, at low levels of volatility explicit insurance is positively associated with subsequent financial deepening -- unfortunately, those countries that have yet to adopt explicit insurance tend to have high financial sector volatility.[27]

The pronounced positive partial correlation between financial volatility and changes in financial depth in Table 6 requires explanation. Past volatility is, perhaps, one indication that future volatility will be high (other things equal). While volatility may indicate something about the magnitude of future changes in financial depth, it should not necessarily be an indicator of the direction of those changes -- and thus not a very useful explanatory variable in these regressions. However, inflation, which also enters the regressions significantly, is itself a measure of volatility. Inflation's predicted effect on financial depth, moreover, is clearly negative; thus, the component of volatility *not* related to inflation might be better thought of as an institutional measure capturing the activity level in the financial sector. Indeed, the residuals from a regression of volatility on inflation are largest for countries like Switzerland -- those have particularly active financial

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there is a strong association between institutional development and income. Sorting out the lines of causation between income and institutional development is beyond the scope of this paper.

[27] I also split the sample into high- and low-volatility sub-samples and re-ran the regressions in Table 6. For high-volatility countries the relationship between explicit insurance and subsequent changes in financial depth was positive, though insignificant; for low-volatility countries, the estimated coefficient was negative and significant. Coefficients are estimated with more error for these small sub-samples, but the qualitative results are supportive of those presented in the paper. Similar results obtain when the sample is split according to ICRG legal tradition scores; explicit insurance is associated with increased depth for high scorers, decreased depth for low scorers, although neither of those coefficients achieves significance.

sectors relative to GDP. After controlling for inflation, it should come as less a surprise, therefore, that volatility is associated with increased financial depth.[28]

It should also be noted that the results are not particularly sensitive to the volatility measure chosen. Neither the standard deviation in M2/GDP nor its coefficient of variation is a perfect measure of volatility. Standard deviation probably overstates volatility for countries with particularly well-established banking sectors. In Switzerland, for example, where M2/GDP is over 100%, a 5% swing in M2/GDP is quite common. In developing countries with M2/GDP near 10-20%, a 5% swing is not all that common. Yet Switzerland, whose banking sector is relatively stable, would appear to be more volatile than many developing countries based only on their standard deviation. While the coefficient of variation (standard deviation/mean) corrects for the "Switzerland problem", it introduces others. For countries with similar standard deviations, the measure captures cross-sectional variation in the level of M2/GDP. Thus, for developed countries, whose standard deviations tend not to exceed 1-2% per year, those with high M2/GDP levels appear to be more stable than the others. Fortunately, although each measure has its

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[28] For countries that adopted explicit deposit insurance, however, the regression results do imply that the net effect of volatility on subsequent changes in financial depth is negative and significant at the t=0.10 level. The estimated coefficient is simply the sum of the volatility coefficient and the coefficient for the interaction term (-.219).

Perhaps a more complete indication of the possible effects of deposit insurance and volatility on subsequent financial depth can be obtained from the sample means for the independent variables (Table 2). For countries that did not adopt explicit insurance, the average coefficient of variation in M2/GDP was 15.3%, average inflation was 19%, and the average real growth rate was a bit less than 1%. Evaluated at those levels of the independent variables, the model implies a 2.8% reduction in M2/GDP after adopting explicit insurance. That estimated reduction is significantly different from zero at the t=0.07 level. By contrast, evaluated at those levels of the explanatory variables, the model implies a 2.3% increase for a country that retained implicit insurance (also significantly different from zero).

limitations -- standard deviation weighing *changes* in M2/GDP too heavily, the coefficient of variation weighing M2/GDP *levels* too heavily -- the qualitative results of the regression analysis are insensitive to the measure selected.

The regression analysis in Table 6 has a number of policy implications. One way to interpret the results is to apportion the decision to adopt explicit deposit insurance across the decision components. Thus, if a government's desire to adopt explicit deposit insurance is due to present financial instability, one might expect that decision to meet with a reduction in financial depth (other things equal). Decreased financial depth, moreover, will likely be associated with lower real growth. In those cases where governments adopted explicit insurance when the standard deviation of M2/GDP was greater than 2%, subsequent economic growth was, on average, .3% lower than it had been in the three years prior (Table 7).

Table 7: Real Growth Rates for Countries that Adopted Explicit Deposit Insurance

Volatility in Three Years Prior to Adoption of Explicit Insurance	Real Growth Rate in Three Years Prior to Adoption of Explicit Insurance	Real Growth Rate in Three Years After the Adoption of Explicit Insurance	Observations
Stan Dev M2/GDP >2%	0.4%	0.1%	10
Stan Dev M2/GDP <2%	2.2%	3.2%	14

Notes: Growth rates from Summers-Heston.

By contrast, if volatility is low, and the motivation for adopting explicit insurance stems from a past crisis or is part of a general improvement in legal institutions, one might expect increased financial depth accompanied by a higher real growth rate. Indeed, in those cases where governments adopted explicit insurance when the standard deviation in M2/GDP was less than 2%, subsequent economic growth was 1% higher than it had been in the prior three years. What may be most important, moreover, is not the government's

true motivation for adopting explicit insurance, but rather the *public perception of that motivation*. At the least, the regressions suggest that the expected effect should not be negative in countries with stable financial sectors and sound legal traditions.

V. Conclusions

Simple bi-variate correlations between explicit insurance and financial depth are positive. However, when one also controls for income and inflation, that relationship disappears -- in fact, the partial correlation between changes in subsequent financial depth and the adoption of explicit insurance is negative (and quite pronounced). Counter-intuitive though it may be, that stylized fact may be partially explained by the political and economic factors that motivated the decision to establish an explicit scheme. To date, governments have been most likely to adopt explicit insurance in instances where their financial sectors were tranquil and their neighbors were also doing so. To a lesser extent, they adopted explicit schemes in countries where legal institutions were strong, or in the aftermath of a systemic banking crisis. These circumstances surrounding deposit insurance decisions, moreover, are associated with different movements in subsequent financial depth. Adopting explicit insurance to counteract instability in the financial sector does not appear to solve the problem -- the typical reaction to that type of decision has been negative, at least with regard to financial depth in the three years after the program's inception. Given their short time horizons and the effect that financial development may have for economic growth, policy makers may be interested in these results. As in other cases, when and why they adopt a policy may be as important as the policy itself.

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Appendix I. Countries Used in Regression Analysis

Argentina (e)
Austria (e)
Belgium (e)
Bangladesh (e)
Bolivia (i)
Cameroon (i)
Canada (e)
Chile (e)
Colombia (e)
Costa Rica (i)
Denmark (e)
Ecuador (i)
Egypt (i)
El Salvador (e)
Finland (e)
Gabon (i)
Guatemala (i)
Honduras (i)
Iceland (e)
India (e)
Ireland (e)
Israel (i)
Ivory Coast (i)
Japan (e)
Jordan (i)
Kenya (e)
Korea (i)
Mexico (e)
Netherlands (e)
Nigeria (e)
Norway (e)
Pakistan (i)
Paraguay (i)
Philippines (e)
Singapore (i)
Spain (e)
Sri Lanka (i)
Switzerland (e)
Thailand (i)
Trinidad/Tobago (e)
Uruguay (i)
Venezuela (e)

(e) explicit deposit insurance (i) implicit deposit insurance

Appendix II. Credibility of Deposit Insurance Schemes: ICRG/Explicit Insurance Interaction Results

Table 8: Change in Financial Depth Regressions, Interact Explicit Insurance with Legal Traditions

Explan. Variable	Dependent Variable: Change in M2 as a % of GDP		Dependent Variable: Change in Quasi-Money as a % of GDP	
	(1)	(2)	(3)	(4)
Constant	.333	2.64	.353	2.88
	(0.25)	(3.24)	(0.28)	(3.70)
Avg. Inflat.	-.093	-.075	-.080	-.060
	(4.85)	(4.13)	(4.48)	(3.49)
% Growth	.174	.199	.095	.122
(Real GDP)	(1.16)	(1.26)	(0.68)	(0.81)
Explicit	-3.02	-3.94	-1.81	-2.81
	(1.85)	(2.38)	(1.19)	(1.78)
Exp x Law	.688	.496	.681	.470
	(2.08)	(1.48)	(2.21)	(1.48)
Volatility	.211		.230	
	(2.16)		(2.53)	
Adj. R-Sqre	.474	.419	.402	.310
Obs	40	40	40	40
F	8.03	8.03	6.24	5.38
Prob > F	0.0000	0.0001	0.0003	0.0017

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