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New Evidence from the Regulatory Capital Mix

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Abstract

Although bank capital regulation permits a bank to choose freely between equity and subordinated debt to meet capital requirements, lenders and investors view debt and equity as imperfect substitutes. It follows that the mix of debt in regulatory capital should isolate the role that the market plays in disciplining banks. I document that since the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) reduced the ability of the FDIC to absorb losses of subordinated debt investors, the mix of debt has had a positive effect on the future outcomes of distressed banks, as if the presence of debt investors has worked to limit moral hazard. To mitigate concerns about selection, I use the variation across banks in the mix of debt in capital generated by cross-state variation in state corporate income tax rates. Interestingly, instrumental variables (IV) estimates document that selection problems are indeed important, but suggest that the benefits of subordinated debt are even larger. I conclude that the market may play a useful direct role in regulating banks.

Key words: bank capital regulation, market discipline, subordinated debt

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I. Introduction

Economists and bank regulators have recently shown great interest in involving the market more in the supervision of banks, in particular through the use of mandatory subordinated debt requirements. A proposal by a group of economists at the American Enterprise Institute (1999) recommended to the Basel Committee on Bank Supervision that the current risk-based capital framework be scrapped and replaced by tougher leverage requirements, part of which would be met through the continuous issue of subordinated debt. Recently, Wall and Evanoff (2000) have proposed adding a mandatory subordinated debt requirement to the current risk-based capital regime, where institutions regularly roll over short-term debt. The potential for market discipline created by subordinated debt has also been considered extensively in a Staff Study (1999) by the Board of Governors of the Federal Reserve. Moreover, the third pillar of the New Basel Accord introduced in January 2001 is predicated on market discipline though increased transparency and disclosure.

There are two potential mechanisms through which mandatory subordinated debt could improve the supervision of commercial banks. First, the market could provide information about default risk that helps supervisors allocate

supervisory resources in the right place or prevents supervisors from forbearing against problem banks. Second, subordinated debt investors could discipline banks directly through restrictive covenants that prevent moral hazard during financial distress.

The existing empirical literature has largely focused on evaluating the efficacy of this first mechanism, i.e. the ability of bond holders to price changes in bank risk. While early research found little relationship between the measured subordinated debt spreads over U.S. Treasuries and measures of risk from the bank balance sheet, studies using more recent data have been more successful in finding evidence that subordinated debt holders are effective monitors of bank behavior.[1] The conventional interpretation of the newfound relationship between spreads and risk is that subordinated debt holders felt safe under

[1] Avery, Belton, and Goldberg (1988) found no evidence in a sample of the 100 largest Bank Holding Companies over 1983-1984 that debt spreads were sensitive to either ratings by Moody's or Standard and Poor's or a FDIC index of risk. Gorton and Santomero (1990) argued that the spread-risk relationship should actually be non-linear. As the payoffs to subordinated debt effectively look like those to equity when leverage is high. This observation did little, however, to help uncover a relationship between debt prices and risk, casting serious doubts on the ability of subordinated debt to impose any market discipline on banks.

Flannery and Sorescu (1996) investigated the issue over a longer panel using more recent data (1983-1991) on 422 bonds issued largely by Bank Holding Companies. The authors found that spreads are sensitive to measures of leverage, accruing loans past due, and real estate holdings of the holding company, but that this relationship is strongest with more recent data. These findings were largely confirmed by DeYoung et. al. (1998). Jagtiani, Kaufman, and Lemieux (1999) find evidence that there is little difference between the pricing of debt issued by banks or bank holding companies. Morgan and Stiroh (2001) also present evidence that the spread - risk relationship on bank bonds is weaker for larger and less transparent banks.

implicit guarantees by the FDIC to assume any losses, which were ended by Congress through FDICIA in 1991.[2]

However, the crucial question is not whether or not the price of debt is sensitive to risk, but whether or not this risk-pricing (or enforcement of covenants) would actually deter banks from taking risks that they would otherwise not take. There has been less work on this issue, as only Bliss and Flannery (1999) even attempt to answer this exact question in a recent study, making a clear distinction between monitoring and influencing by debt holders, but fail to find any evidence that the market influences bank behavior.[3] This paper attempts to fill this gap in the literature by measuring the direct effect of subordinated debt on bank behavior.

A starting point for such an investigation must be Levonian (2001), who argues that a substitution away from equity towards subordinated debt in a bank's capital structure only increases leverage, which in turn worsens the underlying

[2] This story is difficult to reconcile, however, with widespread evidence that depositors have imposed market discipline on banks Hannan and Hanweck (1988) found that interest rates on Jumbo Certificates of Deposit issued by 300 large banks in 1985:I were sensitive to balance sheet measures of risk. Park and Peristiani (1998) found evidence in a sample of Savings and Loans over 1987-1991 that banks one would predict to fail on the basis of balance sheet characteristics paid higher interest rates to uninsured depositors and had slower growth rates of uninsured deposits. Finally, Cook and Spellman (1994) concluded that GAAP insolvent Savings and Loans paid risk premia on their insured deposits in 1987-1988.

[3] The authors study a sample of 107 Bank Holding Companies over 1986-1998 that issued Y-9 Call Reports to the Federal Reserve, had stock prices reported in the CRSP Stock Returns and Master Files, and bond prices in the Warga/Lehman Brothers Corporate Bond Database. The authors found no evidence that bank behavior responds to excess security returns, and concluded that neither bond holders nor stockholders prominently influence managerial action.

incentives for excessive risk-taking created by the mis-pricing of deposit insurance. If the presence of subordinated debt in a bank's capital structure is going to create market discipline, this effect is going to have to be powerful enough to offset the effect that higher leverage has on bank behavior. How might this happen? A bank concerned enough about its future or its standing in other markets (i.e. its ability to issue letters of credit or trade in derivatives markets) will have reduced moral hazard incentives, and will want to protect its bond rating at the first sign of trouble. Moreover, bond investors understand these incentives, and make an attempt to mitigate moral hazard by including restrictive covenants.[4] Whether or not the bank's reputation and these covenants are enough to eliminate the greater incentive for moral hazard created by increased leverage is the question tested by this paper.

In order to measure the ability of bond investors to influence bank behavior, it is necessary to rule out the possibility that any corrective behavior is being driven by pressure from regulators. A natural way to circumvent this identification problem is to recognize that regulators and bond holders care about different measures of capital. On one hand, subordinated debt investors view equity capital as the amount of losses that the bank can absorb before eating away their

[4] A recent study by Goyal (2001) documents that restrictive covenants included on subordinated debt are sensitive to a bank's charter value, especially during the 1980s when the banking industry was severely distressed.

claims. On the other hand, to a first approximation regulatory capital is the sum of equity capital and subordinated debt, and represents the amount of losses that the bank can absorb before eating away at the claims of depositors. In order to measure market discipline, a simple exercise would be to compare banks with the same regulatory capital ratios (and thus face similar pressure from regulators), but differ in the amount of subordinated debt on their balance sheets (and thus face different pressure from investors). Given a measure of financial distress, a reasonable test of market discipline would be to compare across the mix of debt in regulatory capital the ability of financially distressed banks to recover.

The analysis below implements this exact strategy for the sample of commercial banks (1984-2004) and bank holding companies (1986-2004), and makes conclusions largely consistent with the existing literature. While the capital mix appears to have had an adverse effect on the ability of a bank to recover before FDICIA, since 1991 the mix has a strong positive effect on future outcomes, especially for stand-alone banks where debt is held by outside investors.

An important caveat to this analysis is that the presence of subordinated debt on a bank balance sheet is not exogenous. The most obvious concern is that within-

bank variation in the capital mix is related to changes in the bank's financial condition, as the mix increases following the writing off of problem loans. This phenomenon seems to bias the analysis towards finding an adverse link between the mix and future outcomes. On the other hand, it is also possible that investors permit greater leverage to banks which have a greater ability to recover from distress, implying that any observed relationship between mix and future outcomes does not reflect market discipline, but rationing by the market.[5] I deal with these selection issues using cross-state variation in state corporate income tax rates an in instrument for the presence of subordinated debt in a bank's capital structure. It turns out that there is a strong robust relationship between corporate tax rates and the mix of debt in regulatory capital, which permits an analysis without concern about these selection issues. After correcting for selection, the beneficial effect of mix on future outcomes is much stronger. The paper concludes that the market has the ability to play an important role in the supervision of banks, especially during financial distress.

The paper is organized as follows: the data are described in Section II and analyzed without dealing with selection issues in Section III; Section IV outlines results using corporate tax rates as an instrument; and Section V concludes.

[5] While such rationing would certainly be a form of market discipline, it implies that one cannot extend the results here to make judgements about mandatory debt requirements, which would require all banks to issue debt.

II. Data

This study employs annual December data from the *Call Reports of Income and Condition* which describe the historical balance sheets and income statements of commercial banks over 1976-2004. In addition, I use annual December data on the consolidated reports of bank holding companies from the Y-9C over 1986-2004. Table 1 documents the key variables used in the analysis below.

Regulatory capital is measured as the ratio of equity plus subordinated debt to total assets in line 1, while the capital mix is measured as the ratio of subordinated debt to the sum of subordinated debt plus equity in line 2. The capital mix is windsorized at 0 and 1 in order to eliminate the influence of a few extreme observations. Line 3 documents that only 5 percent of the bank-years and 18 percent of the BHC-years in the sample have a non-zero mix, while column (3) of line 2 suggests that the average mix of debt in capital for banks (BHCs) with any subordinated debt is equal to 11.77 (17.71) percent. Figure 1 illustrates the number of commercial banks and holding companies which have subordinated debt on their balance sheets. More than 1,200 banks and almost 2,500 bank holding companies had issued subordinated debt in 1986, but this

number has declined dramatically over the last 20 years, as less than 250 commercial banks and 500 bank holding companies have subordinated debt on their balance sheets in 2004. This decline in number of institutions with subordinated debt appears to have started in 1979, when just under 2,800 commercial banks had debt in their capital structure.

The analysis below uses variation in state-year corporate income tax rates as an instrument for the mix of debt in regulatory capital. Since banks and bank holding companies often operate in different states, I construct an institution's tax rate by weighting each state's effective tax rate with the share of a that institution's deposits in the state, using the June Summary of Deposits for each year of the sample. Line 7 reports effective tax rate on $1 million in corporate profits, and the difference between columns (2) and (3) as well as (5) and (6) illustrate a simple look at our first stage. In particular, banks facing higher state income tax rates tend to have more debt in their capital structure, while BHCs facing higher income tax rates have their leverage limited.[6]

This study uses the ratio of problem loans to capital in order to define financial distress. Problem loans are defined as the ratio of loans past due 30-89 days plus

[6] The balance sheet of the parent largely consists of an equity investment in the subsidiary bank(s) financed by the issue of subordinated debt, implying that debt service is funded with dividends from the equity position. As state corporate income taxes reduce dividends dollar-for-dollar, the first-order effect of taxes on parent leverage is negative.

loans past due 90-180 days plus loans no longer accruing interest. Since bank failures are primarily driven by declines in credit quality and the buffer that the bank against future credit losses is capital, this seems to be the key ratio for analyzing bank creditworthiness. Moreover, Ashcraft (2006) documents that the 85th percentile of this ratio over all bank years (which is approximately equal to 40 percent) closely approximates a CAMEL rating of 3/4/5, as illustrated by Figure 2. While using the ratio of problem loans to capital permits the use of more historical data than CAMEL ratings since the latter are available starting only in 1987, the underlying data for problem loans is available starting in 1984. It follows that the empirical analysis below uses annual December data over 1984-2004.

III. Analysis

This section analyzes the impact that the mix of bank capital has on the probability of future financial distress. This relationship is captured in the analysis below through the following basic equation:

$$(1) \quad Pr(distress)_{i,t+1} = \beta_0+\beta_1 CAPITAL_{i,t}+\beta_2 MIX_{i,t}+\beta_3 X^{baseline}_{i,t}+\beta_4 X^{extemded}_{i,t}+\varepsilon_{i,t}$$

The baseline controls $X^{baseline}$ include log bank assets, dummies for BHC and MBHC affiliation (only when using the Bank Sample), and a full set of time effects. The extended controls $X^{extended}$ include the other variables listed in Table 1: the ratio of loans and securities to assets; the ratio of loan portfolio types to total loans; the ratio of large deposits to assets; and the ratio of loan loss provisions and net income to assets. This equation is estimated by both Probit and OLS, and all of the reported standard errors are corrected for heteroskedasticity and clustered at the bank level in order to account for dependence across time for each bank.

A. Regulatory Capital Mix and Future Financial Distress

Table 2 documents the a first pass at the relationship between the mix of subordinated debt in regulatory capital and the probability of financial distress in one year. Panel (A) uses the Bank Sample 1984-2004 while Panel (B) uses the BHC Sample 1986-2004. The first four columns of the table report marginal effects from Probit estimation of equation (1) while the second four columns report estimates from OLS estimation of the linear probability model. Focusing on the Probit model, columns (1) and (2) are estimated for the sub-sample of distress bank-years while columns (3) and (4) columns are for the sub-sample of

healthy bank-years. Columns (1) and (3) use the baseline set of covariates while columns (2) and (4) use the full set of covariates.

Focusing first on the banks, line 1 documents the obvious negative relationship between regulatory capital and the probability of future financial distress. A one percentage point increase in the capital ratio reduces the probability of future distress for currently-distressed banks by 1.78 percent in column (2), which is small relative to the mean of the dependent variable [61.02% from line 21 of Column (5) in Table 1].

Line 2 of the table documents that the mix of debt typically has an adverse effect on outcomes of the bank. While an increase in debt is associated with an increase in the probability of future distress for both healthy and distressed banks, the effect of mix is much stronger for currently distressed banks. The marginal effect in column (4) suggests that a 10 percentage point increase in the mix of debt increases the probability of future distress by 1.62 percentage points, which is small relative to the dependent mean but similar to the measured effect of capital. Putting these numbers together, a one percentage point increase in regulatory capital has the same measured effect as a 10 percentage point reduction in the mix of debt in preventing future distress.

Lines 3 and 4 of the table document that a bank affiliated with a holding company in either the one-bank and multi-bank flavor has an advantage in recovering from financial distress and in preventing a transition into financial distress, a fact documented by Ashcraft (2006). Line 5 documents that log bank size tends to increase inertia, as it increases the probability that a distressed bank remains distressed and the probability that a healthy bank remains healthy. The final four columns of the table document that these results are robust to the linear probability model.

Panel (B) of the Table documents that in contrast to the banks, there is little link between the capital mix for BHCs, especially with the Extended set of controls. Not only is the coefficient in column (2) of line 8 no different from zero statistically, it is one-eighth the size of the same coefficient in line 2, implying that this result is not driven by the lower power of the smaller sample.

In summary, a first pass in measuring the relationship between the mix of subordinated debt in regulatory capital and future bank outcomes yields only negative or neutral conclusions, depending on who issues the debt. At the bank level, it appears that the greater leverage associated with a substitution from

equity to subordinated debt undermines the ability of a distressed bank to recover, and increases the probability that a healthy bank becomes distressed. While there is no direct evidence that this former phenomenon is driven by moral hazard, it is well-known that an increase in leverage increases the return to risk-taking created by fixed-rate deposit insurance. As moral hazard involves undertaking negative net present value projects, this would be consistent with the observed reduction in the probability of recovery from distress. On the other hand, at the holding company level, there is little connection between the mix and recovery from financial distress. In order to better understand what is driving these differences, I explore the data in further detail.

B. Differences Across BHC-Affiliation

It seems plausible that the discipline which debt investors impose on a bank is significantly different when these investors are also equity holders of the bank, as is typically the case for banks affiliated with bank holding companies. In particular, if the parent holds both subordinated debt and equity issued by the bank, it is not clear how the mix would affect the ability of a distressed bank to recover. At the same time, as has been noted in the market discipline literature, the payoffs to subordinated debt are similar to the payoffs to equity once the

bank becomes financially distressed. In this case, there might be little difference between a parent and an outside investor in affecting bank behavior.

In order to develop evidence on these issues, Table 3 estimates equation (1) for the sub-sample of BHC-affiliated (in panel A) and stand-alone banks (in panel B), removing the variables BHC and MBHC from the specification. The marginal effects in lines 2 and 7 suggest that the effect of mix on future distress for currently distressed institutions is typically smaller for stand-alone banks than BHC-affiliated institutions, but the differences are quite small and not statistically different from each other with the extended set of covariates in column(2).

In summary, there appears to be little difference in the discipline imposed on a distressed bank by outside investors versus a parent holding company. Since the effect of an increase in the mix is adverse regardless of ownership, one might just interpret this result as documenting that neither a parent nor an outside investor is able to do much to prevent moral hazard by a troubled institution.

C. Differences Across FDICIA

The existing academic literature on market discipline has documented that debt spreads appear to be more sensitive to measures of risk since reforms of deposit insurance through FDICIA in 1991 which made it more difficult for the FDIC to bail out subordinated debt investors when resolving a failed bank. Given this result, it seems reasonable to test whether or not the adverse effects of capital mix measured over the entire sample have been mitigated since 1991.

Focusing first on debt issued by banks, Table 4 estimates equation (1) over two sub-samples: 1984-1990 in panel (A) and 1991-2004 in panel (B). Lines 1 and 8 document that regulatory bank capital has become significantly less effective for both currently-distressed and healthy banks in preventing future financial distress. Interestingly, columns (1) and (2) document that the adverse effects of mix measured before FDICIA in panel (A) have significantly weakened in more recent years in panel (B), to the extent that the mix of debt in regulatory capital now has a strong positive effect on future bank behavior. Columns (3) and (4) document that the adverse effects of the mix for healthy banks in panel(A) have been greatly reduced, although small adverse effects remain.

Looking at line 3 versus line 10 or line 4 versus line 11, there has been a significant increase in the returns to one-bank and multi-bank holding company

affiliation, which can be attributed to reforms of bank holding company regulation through FIRREA in 1989 and FDICIA in 1991. Finally note that log assets have a similar effect across time periods, and that results from the Probit model are confirmed by the OLS estimates of the linear probability model.

In conclusion, consistent with the existing academic literature, FDICIA appears to have had a significant impact on the influence of debt investors over bank outcomes.

If FDICIA has increased market discipline of banks by fixed-income investors, one might ask the question if there were important differential effects across BHC-affiliation. If there was no discipline previously because investors felt they would be bailed out, it seems reasonable to think that once investors face the risk of loss that they behave differently if they also have an equity position in the bank. Table 5 investigates this question by measuring the effect of FDICIA separately for BHC-affiliated and stand-alone banks separately.

The first two columns of Table 5a document in lines 2 and 7 that the adverse effects of the mix measured before FDICIA have been eliminated for distressed BHC affiliates. In the second column, an increase in the mix actually reduces the

probability of future distress, as if the presence of debt has a beneficial effect, and this is statistically different from zero at the 10 percent level of confidence. Table 5b replicates this analysis for the sub-sample of stand-alone banks. The estimated marginal effect in column (2) of line 2 documents that the mix had a much stronger adverse effect before FDICIA on stand-alone banks BHC affiliates. Along these lines, column (2) of line 7 suggests that FDICIA had a much stronger effect on stand-alone banks, and that mix actually has a stronger positive effect for stand-alone institutions than BHC-affiliates.

Table 6 studies how the impact of debt issued by bank holding companies has changed in response to FDICIA, and has a format similar to table 4. Note that the sample beings in 1986, which reduces the number of years we have before deposit insurance reforms, and reduces our precision. Comparing the marginal effects in column (2) for currently-distressed institutions across lines 2 and 7, there is a clearly a shift from an adverse to a beneficial measured effect of mix on future bank outcomes, this is not statistically different from zero. Looking at healthy institutions there is a similar shift, although it is smaller and also not different from zero.

In summary, there is evidence consistent with the hypothesis that FDICIA had a significant impact on the amount of discipline which fixed-income investors impose on both banks and bank holding companies, although results for the latter group are statistically weak, and the results for banks are strongest for stand-alone institutions where changes in the mix are most likely to have real effects.

IV. Selection in the Choice of Regulatory Capital Mix

The results displayed above are compelling in part because they tell a simple story that is largely consistent with existing academic literature. That being said, one might be concerned the potential endogeneity of bank capital mix. In particular, the primary threat to the analysis above is the fact that within-bank variation in the mix is clearly related to its current financial condition, which in turn is related to future financial condition. In particular, as a bank becomes financially distressed, it charges off problem loans against equity, which obviously increases the amount of debt in the mix. To the extent that an increase in the mix simply corresponds to greater financial distress, this creates a bias towards finding adverse effects of debt on future distress. The analysis above

did not use bank fixed effects in order to avoid this problem, but that does not mean that this variation disappears from the data.

A secondary threat to identification is that the mix of debt is chosen by the bank. If fixed-income investors permit banks which they feel are better able to recover from financial distress to take more leverage, then any observed benefits of greater subordinated debt might really reflect the greater ability of the banks which issued the debt and not the actions taken by investors to prevent future distress. The change in returns to mix since FDICIA could simply reflect the fact that investors have rationed banks with the worst ability to recover from the market. In order to minimize these problems, we need to limit the variation in the mix that we use when estimating the net benefits of subordinated debt.

A. Effective Corporate Tax Rates and Capital Mix

While finding a valid instrument can often be a challenging exercise, there is a natural candidate for isolating plausibly exogenous variation in the mix of debt in regulatory capital. Since interest on debt is tax-deductible, it follows that cross-sectional variation in state corporate income taxes should generate useful cross-sectional variation in the mix at the bank level. As the instrument focuses

the analysis on cross-state variation, it mitigates each of the two threats to identification mentioned above. Note that the use of cross-sectional variation eliminates any within-bank variation in the mix, and there should be no relationship between corporate income tax rates and the ability of a bank to recover from financial distress other than through the mix.

At the BHC level, the connection between state corporate income tax rates and leverage is more subtle. While taxes also influence the optimal mix of capital, the first-order effect of higher state taxes is to reduce the income that the parent receives from its subsidiary banks through dividends. Since a parent with subsidiaries in high tax states will have a smaller dividend stream to service the subordinated debt which it issues, it will be compelled to take less leverage as taxes increase. It follows that one expects there to be a negative relationship between taxes and the mix of debt in capital when looking at consolidated BHCs.

In order to reduce the dimensionality of very complicated state corporate income tax codes, I focus on the effective tax rate on $1 million in corporate profits. Appendix Table A1 documents for each state the mean effective tax rate over the sample period, as well as the maximum, the minimum, and the time series standard deviation. Note that while there is considerable cross-sectional

variation in corporate income tax rates across states, there is very little variation in tax rates within a state over time. It follows that our analysis will not be able to use state fixed effects, implying that our instrument largely consists of cross-sectional variation in state corporate income taxes. As banks and bank holding companies operate in multiple states, an institution's tax rate is constructed using weights on each state in which it operates equal to its share of deposits in that state (relative to its total deposits) from the June Summary of Deposits.

Since 95 percent of the bank-years and 83 percent of the BHC-years in our sample have a mix of zero, it is appropriate to estimate our first stage relationship between the mix and effective tax rates using a Tobit model, which is done in Table 7. The first column uses the baseline set of covariates, while the second column uses the extended set of controls. The coefficient in line 1 documents a strong, positive, statistically significant relationship between corporate tax rates and the amount of debt in regulatory capital for commercial banks. The magnitude of the coefficient in column (2) suggests that a 1 percentage point increase in the effective tax rate on $1 million leads to an increase of 0.41 percentage points in the mix, which is large relative to the dependent mean of 59 basis points. On the other hand, for bank holding companies, the coefficient in line 4 documents an equally-strong negative relationship between the tax rate

and mix of debt in capital, confirming the premise that the first-order effect of state taxes is to reduce leverage at the parent level. In summary, the first stage appears to be strong and has the right theoretical sign, implying that we have a promising start to dealing with potential threats to identification.

B. IV Estimates of the Benefit of Capital Mix

Since the first stage of our analysis is a Tobit and the second stage is either a Probit or OLS on a linear probability model, one cannot implement an instrumental variables estimator in the traditional fashion. As an approximation to a very complicated maximum likelihood problem, I use the first-stage to predict the mix for each bank, and then use the predicted mix instead of the actual mix in the second stage.

Table 8 replicates the results of Table 2, but now deals more convincingly with the problem of identification. The coefficients for banks in panel (A) of line 2 are striking, as each of tem is strongly negative, suggesting that after accounting for selection, the capital mix has a large beneficial effect. As in Table 2, the benefits of mix are larger for distressed banks in columns (1) and (2) than for healthy banks in columns (3) and (4), but it is noteworthy that the amount of debt in

regulatory capital even has a strong effect in preventing future financial distress for healthy banks. The final four columns document that these results are quite similar when using the linear probability model. In summary, these results suggest that the amount of subordinated debt in regulatory capital has an important positive effect throughout the sample.

Focusing on BHCs in Panel (B), one finds similar results to the banks for distressed institutions in columns (2) and (6) of line 9, but the magnitudes are even larger. The marginal effect indicates that an increase in the mix by 10 percentage points reduces the probability that a currently-distressed institution is distressed one year in the future by 20.88 percentage points in column (2). While there is some evidence that the mix of debt has an adverse effect on the transition of healthy BHCs into distress in column (4), these measured effects are two orders of magnitude smaller.

In summary, instrumental variables estimates suggest that the mix of debt in regulatory capital has a strong beneficial impact in reducing moral hazard by distressed banks. Since the instrument works in different directions at the Bank and BHC level on the mix, it is difficult to tell a simple story which dismisses the validity of the empirical strategy.

V. Conclusions

This study documents evidence that an increase in the amount of subordinated debt in regulatory capital has an important positive effect in helping a bank recover from financial distress. This result suggests that fixed-income investors are able to exert significant influence on the behavior of a distressed institution that are aligned with the interests of bank supervisors, and sheds positive light on proposals by several economists which would force banks to issue subordinated debt.

Future work will study the mechanism through which the amount of debt in the regulatory capital mix actually creates these benefits. While Goyal (2001) documents that subordinated debt covenants have been sensitive to bank financial condition, there is no direct evidence that these covenants affect bank behavior. Moreover, one might expect that banks which have franchise value dependent on debt ratings (as would be the case for institutions which issue a significant enough amount of lines of credit, for example) would have a strong incentive to reverse financial difficult.

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Figure 1: Banks and BHCs with Subordinated Debt

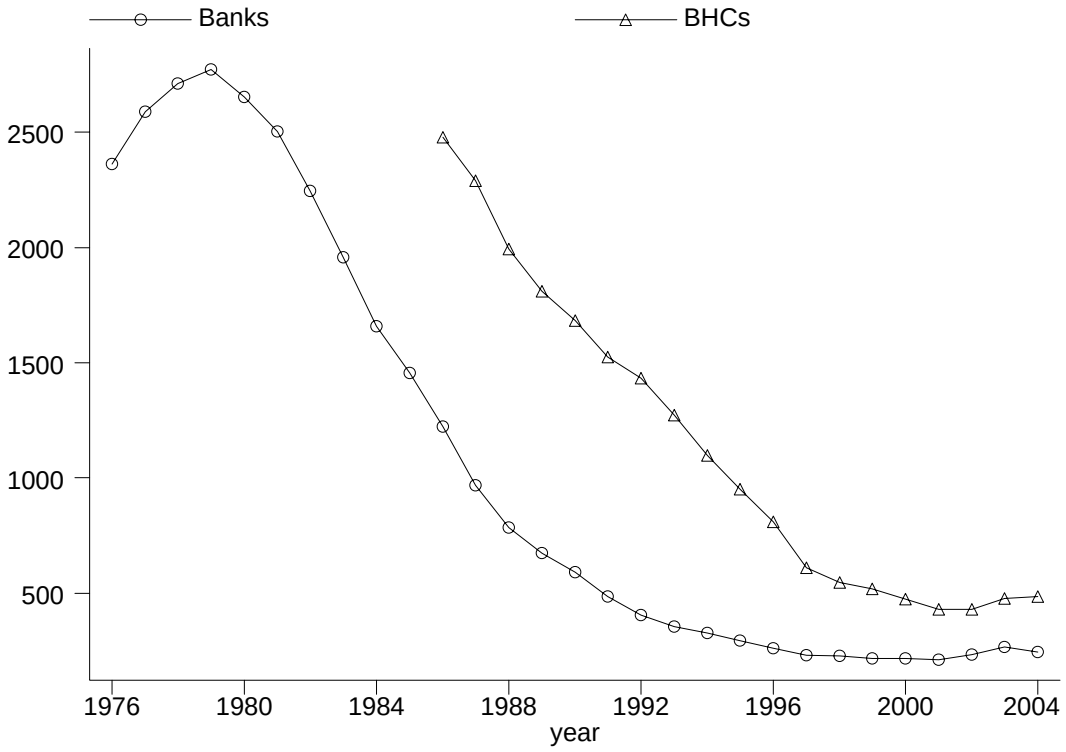

Figure 2: Financial Distress and CAMEL ratings

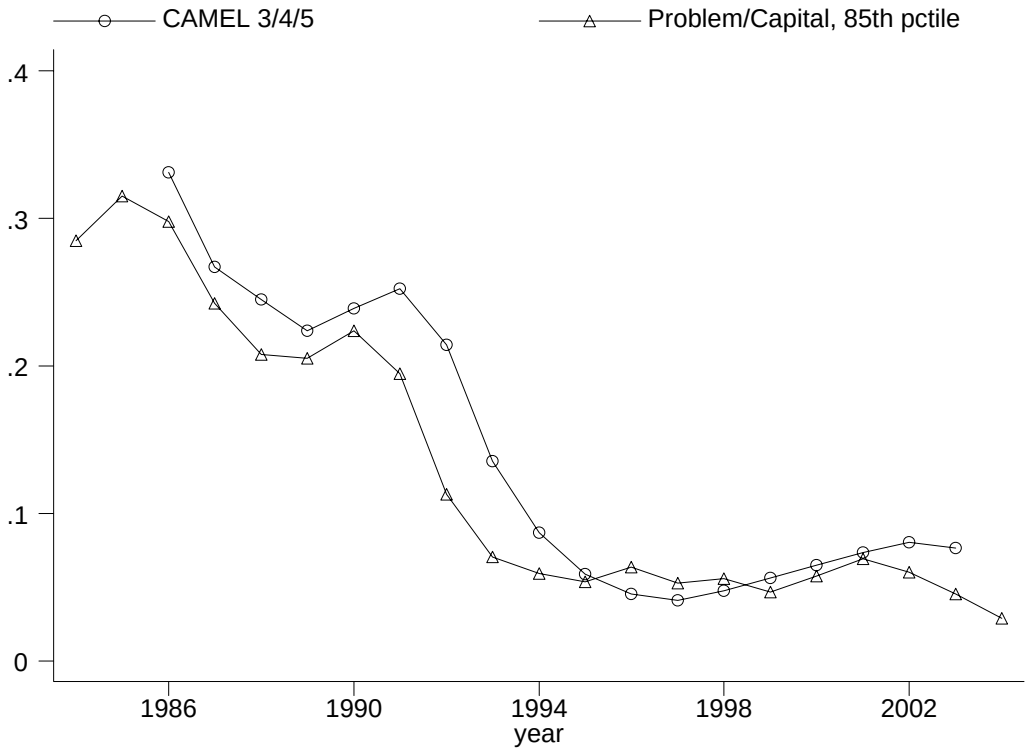

Table 1: Summary Statistics						
	Bank Sample			BHC Sample		
	Full	Mix = 0	Mix > 0	Full	Mix = 0	Mix > 0
1. Capital/Assets	0.1038	0.1050	0.0818	0.0852	0.0867	0.0777
	(0.0875)	(0.0890)	(0.0465)	(0.0337)	(0.0347)	(0.0270)
	226,258	214,937	11,321	27,239	22,611	4,628
2. Capital Mix	0.0059	0.0000	0.1177	0.0318	0.0000	0.1771
	(0.0343)	(0.0000)	(0.1018)	(0.1238)	(0.0000)	(0.2442)
	226,259	214,937	11,322	27,557	22,611	4,946
3. 1(Capital Mix > 0)	0.0500	0.0000	1.0000	0.1795	0.0000	1.0000
	(0.2180)	(0.0000)	(0.0000)	(0.3838)	(0.0000)	(0.0000)
	226,259	214,937	11,322	27,557	22,611	4,946
4. MBHC	0.2950	0.2812	0.5570	0.0003	0.0002	0.0006
	(0.4560)	(0.4496)	(0.4968)	(0.0159)	(0.0133)	(0.0246)
	226,259	214,937	11,322	27,557	22,611	4,946
5. BHC	0.7259	0.7202	0.8332	0.0028	1.0000	1.0000
	(0.4461)	(0.4489)	(0.3728)	(0.0524)	(0.0000)	(0.0000)
	226,259	214,937	11,322	27,557	22,611	4,946
6. log(Assets)	11.0303	10.9393	12.7573	12.8657	12.6418	13.8893
	(1.3304)	(1.2020)	(2.1918)	(1.3334)	(0.9666)	(2.0878)
	226,259	214,937	11,322	27,557	22,611	4,946
7. Effective tax rate	0.0594	0.0591	0.0657	0.0619	0.0620	0.0613
	(0.0313)	(0.0314)	(0.0303)	(0.0297)	(0.0295)	(0.0306)
	226,259	214,937	11,322	27,557	22,611	4,946
8. Provisions/Assets	-0.0517	0.0017	-1.0603	0.0038	0.0035	0.0050
	(25.3300)	(0.0063)	(113.0109)	(0.0085)	(0.0087)	(0.0073)
	225,110	213,801	11,309	27,540	22,611	4,929
9. Net Income/Assets	0.0371	0.0015	0.7115	0.0089	0.0092	0.0072
	(16.9077)	(0.0130)	(75.4347)	(0.0114)	(0.0102)	(0.0156)
	225,110	213,801	11,309	27,557	22,611	4,946
10. Securities/Assets	0.2796	0.2835	0.2058	0.2609	0.2681	0.2283
	(0.1564)	(0.1571)	(0.1206)	(0.1238)	(0.1254)	(0.1105)
	226,259	214,937	11,322	27,557	22,611	4,946
11. Loans/Assets	0.5522	0.5491	0.6119	0.6072	0.6052	0.6162
	(0.1648)	(0.1653)	(0.1425)	(0.1308)	(0.1319)	(0.1255)
	226,259	214,937	11,322	27,557	22,611	4,946
12. Large Deposits/Assets	0.1031	0.1031	0.1038	0.1071	0.1076	0.1049
	(0.0808)	(0.0803)	(0.0896)	(0.0675)	(0.0670)	(0.0698)
	226,259	214,937	11,322	27,550	22,607	4,943

Table 1: Summary Statistics (continued)						
	Bank Sample			BHC Sample		
	Full	Mix = 0	Mix > 0	Full	Mix = 0	Mix > 0
13. C&I Loans/Loans	0.1894	0.1860	0.2549	0.1964	0.1887	0.2318
	(0.1318)	(0.1300)	(0.1473)	(0.1179)	(0.1155)	(0.1220)
	224,072	212,759	11,313	27,557	22,611	4,946
14. Consumption Loans/Loans	0.1816	0.1802	0.2083	0.1410	0.1356	0.1657
	(0.1439)	(0.1424)	(0.1677)	(0.1106)	(0.1084)	(0.1167)
	224,072	212,759	11,313	27,557	22,611	4,946
15. Agriculture Loans/Loans	0.1079	0.1115	0.0410	0.0453	0.0486	0.0303
	(0.1659)	(0.1681)	(0.0976)	(0.0928)	(0.0964)	(0.0724)
	224,072	212,759	11,313	27,557	22,611	4,946
16. Real Estate Loans/Loans	0.4987	0.5021	0.4332	0.5889	0.6040	0.5199
	(0.2060)	(0.2058)	(0.1990)	(0.1834)	(0.1799)	(0.1835)
	224,072	212,759	11,313	27,557	22,611	4,946
17. Residential Mortgages/Loans	0.2571	0.2589	0.2226	0.2196	0.2333	0.1572
	(0.1628)	(0.1634)	(0.1472)	(0.1817)	(0.1812)	(0.1707)
	224,072	212,759	11,313	27,557	22,611	4,946
18. Commercial Real Estate/Loans	0.1390	0.1393	0.1326	0.1757	0.1865	0.1264
	(0.1202)	(0.1208)	(0.1068)	(0.1401)	(0.1397)	(0.1310)
	224,072	212,759	11,313	27,557	22,611	4,946
19. Problem Loans/Capital	0.1476	0.1433	0.2280	0.1853	0.1753	0.2340
	(7.1872)	(7.3727)	(0.5912)	(8.0628)	(8.8209)	(1.4757)
	226,252	214,937	11,315	27,169	22,571	4,598
20. Distress	0.1500	0.1433	0.2772	0.1735	0.1442	0.3077
	(0.3571)	(0.3504)	(0.4476)	(0.3787)	(0.3513)	(0.4616)
	226,259	214,937	11,322	27,557	22,611	4,946
21. Pr(Distress in 1 year)	0.1432	0.1366	0.2693	0.1542	0.1339	0.2469
	(0.3503)	(0.3434)	(0.4436)	(0.3611)	(0.3406)	(0.4313)
	208,098	197,726	10,372	25,601	21,008	4,593

Table notes: the first three columns of the table describe the Bank Sample, which includes annual December observations on Commercial Banks 1984-2004, while the second three columns of the table describe the BHC Sample, which includes annual December observations on Bank Holding Companies 1986-2004. The second and fifth columns report summary statistics for the sub-sample with a zero mix of debt in regulatory capital, while the third and sixth columns report for the sub-sample with non-zero mix. Each line reports the mean over the standard deviation and the number of observations with non-missing values.

Table 2: Regulatory Capital Mix and Future Financial Distress

	Probit				Linear Probability			
	Distressed		Healthy		Distressed		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Bank Sample								
1. Capital/Assets	-2.0658***	-1.7783***	-0.6980***	-0.4820***	-1.9665***	-1.6375***	-0.3133***	-0.2811***
	(0.1645)	(0.1699)	(0.0317)	(0.0221)	(0.1538)	(0.1511)	(0.0190)	(0.0210)
2. Capital Mix	0.2078***	0.1590**	0.1361***	0.0629***	0.1686***	0.1213**	0.1868***	0.1042***
	(0.0671)	(0.0717)	(0.0209)	(0.0163)	(0.0538)	(0.0557)	(0.0253)	(0.0260)
3. BHC	-0.0193**	-0.0133*	-0.0045***	-0.0018	-0.0191***	-0.0132*	0.0003	-0.0012
	(0.0076)	(0.0080)	(0.0015)	(0.0012)	(0.0074)	(0.0075)	(0.0017)	(0.0017)
4. MBHC	-0.0442***	-0.0488***	-0.0017	-0.0046***	-0.0428***	-0.0463***	0.0012	-0.0038**
	(0.0078)	(0.0079)	(0.0013)	(0.0010)	(0.0074)	(0.0073)	(0.0016)	(0.0016)
5. Log(assets)	0.0230***	0.0197***	-0.0070***	-0.0076***	0.0220***	0.0184***	-0.0061***	-0.0094***
	(0.0026)	(0.0031)	(0.0005)	(0.0005)	(0.0023)	(0.0028)	(0.0006)	(0.0007)
6. Observations	31,247	31,223	173,476	172,996	31,247	31,223	173,476	172,996
7. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. BHC Sample								
8. Capital/Assets	-1.1674***	-1.1126**	-0.6618***	-0.3574***	-1.0461***	-0.9347***	-0.5634***	-0.1844**
	(0.4472)	(0.4579)	(0.1196)	(0.1080)	(0.3697)	(0.3521)	(0.1082)	(0.1020)
9. Capital Mix	0.0786	0.0298	0.0895***	0.0255	0.0713	0.0197	0.1369***	0.0355
	(0.0995)	(0.1209)	(0.0300)	(0.0243)	(0.0870)	(0.0992)	(0.0438)	(0.0403)
10. Log(assets)	0.0307***	0.0146**	-0.0078***	-0.0063***	0.0260***	0.0128**	-0.0092***	-0.0079***
	(0.0053)	(0.0069)	(0.0013)	(0.0013)	(0.0043)	(0.0057)	(0.0016)	(0.0017)
11. Observations	4,013	4,011	21,290	21,286	4,013	4,011	21,290	21,286
12. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004 in panel (A) and bank holding companies 1986-2004 in panel (B). The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 3: Regulatory Capital Mix of Commercial Banks and BHC Affiliation

	Probit				Linear Probability			
	Distress		Healthy		Distress		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. BHC-Affiliated Commercial Banks								
1. Capital/Assets	-2.5054***	-2.1860***	-0.5415***	-0.4714***	-2.3822***	-1.9817***	-0.1473***	-0.2217***
	(0.2162)	(0.2273)	(0.0449)	(0.0246)	(0.1988)	(0.1995)	(0.0066)	(0.0235)
2. Capital Mix	0.2051**	0.1537	0.1031***	0.0459***	0.1610**	0.1138	0.1391***	0.0729**
	(0.0818)	(0.0892)	(0.0172)	(0.0157)	(0.0672)	(0.0698)	(0.0266)	(0.0280)
3. Log(assets)	0.02155***	0.01775***	-0.00595***	-0.00685***	0.02005***	0.01625***	-0.00475***	-0.0075***
	(0.0028)	(0.0036)	(0.0005)	(0.0005)	(0.0025)	(0.0032)	(0.0006)	(0.0007)
4. Observations	21,657	21,631	127,836	126,222	21,657	21,631	127,836	126,222
5. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. Stand-Alone Commercial Banks								
6. Capital/Assets	-1.4684***	-1.3436***	-0.5310***	-0.4362***	-1.4289***	-1.2858***	-0.1999***	-0.2976***
	(0.2351)	(0.2252)	(0.0464)	(0.0367)	(0.2211)	(0.2076)	(0.0125)	(0.0261)
7. Capital Mix	0.1619	0.1409	0.1708***	0.0747**	0.1382	0.1127	0.2627***	0.1285**
	(0.1104)	(0.1132)	(0.0458)	(0.0349)	(0.0892)	(0.0887)	(0.0595)	(0.0568)
8. Log(assets)	0.0093	0.0074*	-0.0085***	-0.0100***	0.0095	0.0072*	-0.0079***	-0.0147***
	(0.0059)	(0.0071)	(0.0013)	(0.0013)	(0.0059)	(0.0067)	(0.0014)	(0.0017)
9. Observations	9,702	9,652	48,902	47,768	9,702	9,652	48,902	47,768
10. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004. The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 4: Regulatory Capital Mix of Commercial Banks and FDICIA

	Probit				Linear Probability			
	Distress		Healthy		Distress		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Before FDICIA (1984-1990)								
1. Capital/Assets	-2.2657***	-1.9574***	-0.9106***	-0.8339***	-2.2602***	-1.8897***	-0.3036***	-0.4580***
	(0.1937)	(0.1855)	(0.0814)	(0.0619)	(0.1792)	(0.1701)	(0.0145)	(0.0386)
2. Capital Mix	0.2369***	0.2364**	0.2378***	0.1189**	0.1938***	0.1873**	0.2825***	0.1542**
	(0.0742)	(0.0792)	(0.0438)	(0.0397)	(0.0582)	(0.0595)	(0.0486)	(0.0491)
3. BHC	-0.0029	-0.0040	0.0031	0.0039*	-0.0028	-0.0042	0.0117	0.0036
	(0.0083)	(0.0087)	(0.0031)	(0.0027)	(0.0082)	(0.0083)	(0.0031)	(0.0031)
4. MBHC	-0.0348***	-0.0384***	0.0054*	-0.0061***	-0.0340***	-0.0374***	0.0104***	-0.0031
	(0.0085)	(0.0086)	(0.0031)	(0.0027)	(0.0082)	(0.0081)	(0.0033)	(0.0033)
5. Log (assets)	0.0232***	0.0195	-0.0060***	-0.0115***	0.0222***	0.0183***	-0.0038***	-0.0132***
	(0.0029)	(0.0034)	(0.0012)	(0.0012)	(0.0026)	(0.0031)	(0.0013)	(0.0014)
6. Observations	22,732	22,667	68,049	67,114	22,732	22,667	68,049	67,114
7. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. After FDICIA (1991-2004)								
8. Capital/Assets	-1.2353***	-1.2149***	-0.3367***	-0.2980***	-1.1809***	-1.1387***	-0.1041***	-0.1864***
	(0.2810)	(0.2781)	(0.0287)	(0.0212)	(0.2594)	(0.2518)	(0.0047)	(0.0134)
9. Capital Mix	-0.1239	-0.3533**	0.0791***	0.0313**	-0.1223	-0.3393***	0.0998***	0.0405**
	(0.1518)	(0.1622)	(0.0160)	(0.0144)	(0.1495)	(0.1534)	(0.0195)	(0.0196)
10. BHC	-0.0620***	-0.0425***	-0.0076***	-0.0059***	-0.0615***	-0.0409***	-0.0057***	-0.0082***
	(0.0144)	(0.0154)	(0.0013)	(0.0012)	(0.0142)	(0.0146)	(0.0016)	(0.0016)
11. MBHC	-0.0821***	-0.0799***	-0.0045***	-0.0048***	-0.0813***	-0.0764***	-0.0036***	-0.0062***
	(0.0162)	(0.0163)	(0.0011)	(0.0009)	(0.0160)	(0.0157)	(0.0013)	(0.0013)
12. Log (assets)	0.0221***	0.0203***	-0.0066***	-0.0060***	0.0218***	0.0193***	-0.0067***	-0.0075***
	(0.0049)	(0.0058)	(0.0005)	(0.0005)	(0.0048)	(0.0055)	(0.0005)	(0.0006)
13. Observations	8,627	8,616	108,689	106,876	8,627	8,616	108,689	106,876
14. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004. The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 5a: Regulatory Capital Mix and FDICIA for BHC-Affiliates

	Probit				Linear Probability			
	Distress		Healthy		Distress		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Before FDICIA (1984-1990)								
1. Capital/Assets	-2.7009***	-2.1920***	-0.9792***	-0.9951***	-2.6370***	-2.0736***	-0.2496***	-0.4222***
	(0.2320)	(0.2546)	(0.1371)	(0.0655)	(0.2212)	(0.2222)	(0.0151)	(0.0576)
2. Capital Mix	0.2097**	0.0957	0.1972***	0.0784*	0.1666**	0.1053	0.2382***	0.0994*
	(0.0893)	(0.0956)	(0.0443)	(0.0427)	(0.0729)	(0.0758)	(0.0570)	(0.0604)
3. Log(assets)	0.0243***	0.0132***	-0.0031**	-0.0103***	0.0227***	0.0176***	0.0000	-0.0123***
	(0.0032)	(0.0043)	(0.0014)	(0.0017)	(0.0028)	(0.0037)	(0.0014)	(0.0020)
4. Observations	15,773	15,752	44,747	44,179	15,773	15,752	44,747	44,179
5. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. After FDICIA (1991-2004)								
6. Capital/Assets	-1.6883***	-1.4356***	-0.3540***	-0.3008***	-1.6727***	-1.3341***	-0.0961***	-0.1715***
	(0.3916)	(0.4154)	(0.0293)	(0.0263)	(0.3801)	(0.3829)	(0.0048)	(0.0162)
7. Capital Mix	0.0068	-0.3718*	0.0711***	0.0261	0.0082	-0.3166	0.0840***	0.0211
	(0.1788)	(0.2068)	(0.0189)	(0.0179)	(0.1778)	(0.1934)	(0.0201)	(0.0213)
8. Log(assets)	0.0127**	0.0069	-0.0072***	-0.0062***	0.0126***	0.0078	-0.0071***	-0.0072***
	(0.0055)	(0.0069)	(0.0005)	(0.0005)	(0.0055)	(0.0064)	(0.0005)	(0.0006)
9. Observations	5,884	5,879	83,089	82,043	5,884	5,879	83,089	82,043
10. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004. The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 5b: Regulatory Capital Mix and FDICIA for Stand-Alone Banks

	Probit				Linear Probability			
	Distress		Healthy		Distress		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Before FDICIA (1984-1990)								
1. Capital/Assets	-1.7830***	-1.5041***	-0.8423***	-0.6762***	-1.8087***	-1.5041***	-0.4155***	-0.5135***
	(0.2765)	(0.2562)	(0.0934)	(0.0732)	(0.2697)	(0.2505)	(0.0288)	(0.0532)
2. Capital Mix	0.2253**	0.3237***	0.2685***	0.1064	0.1885**	0.2449***	0.3266***	0.1123
	(0.1232)	(0.1226)	(0.0944)	(0.0690)	(0.0942)	(0.0856)	(0.0929)	(0.0903)
3. Log(assets)	-0.0038	-0.0007	-0.0141***	-0.0166***	-0.0033	-0.0010	-0.0126***	-0.0203***
	(0.0070)	(0.0082)	(0.0024)	(0.0024)	(0.0070)	(0.0079)	(0.0024)	(0.0029)
4. Observations	6,959	6,915	23,302	22,935	6,959	6,915	23,302	22,935
5. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. After FDICIA (1991-2004)								
6. Capital/Assets	-0.8028**	-0.9977***	-0.3228***	-0.3108***	-0.7642**	-0.9283***	-0.1147***	-0.1911***
	(0.3498)	(0.3482)	(0.0447)	(0.0330)	(0.3167)	(0.3201)	(0.0098)	(0.0206)
7. Capital Mix	-0.3705	-0.7586**	0.1065***	0.0372	-0.3664	-0.7154**	0.1838***	0.0911
	(0.3100)	(0.2974)	(0.0313)	(0.0240)	(0.3066)	(0.2779)	(0.0656)	(0.0605)
8. Log(assets)	0.0309***	0.0381***	-0.0048***	-0.0053***	0.0304***	0.0353***	-0.0053***	-0.0078***
	(0.0098)	(0.0127)	(0.0012)	(0.0013)	(0.0096)	(0.0118)	(0.0015)	(0.0017)
9. Observations	2,743	2,737	25,600	24,833	2,743	2,737	25,600	24,833
10. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004. The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 6: Regulatory Capital Mix of BHCs and FDICIA

	Probit				Linear Probability			
	Distress		Healthy		Distress		Healthy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Before FDICIA (1986-1990)								
1. Capital/Assets	-1.2435**	-1.4658***	-1.5757***	-1.1157***	-1.2395**	-1.3301***	-1.4838***	-0.8764***
	(0.4856)	(0.4838)	(0.2770)	(0.2550)	(0.5135)	(0.4882)	(0.2370)	(0.2550)
2. Capital Mix	0.1380	0.0868	0.2426**	0.0922	0.1290	0.0380	0.2454**	0.0852
	(0.1172)	(0.1246)	(0.1126)	(0.0956)	(0.1019)	(0.1085)	(0.1279)	(0.1140)
3. Log (assets)	0.0426***	0.0286***	-0.0033	-0.0076	0.0368***	0.0256***	-0.0041	-0.0082
	(0.0063)	(0.0083)	(0.0045)	(0.0053)	(0.0047)	(0.0069)	(0.0048)	(0.0057)
4. Observations	2,216	2,215	3,953	3,949	2,216	2,215	3,953	3,949
5. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. After FDICIA (1991-2004)								
6. Capital/Assets	-0.9877	-0.3157	-0.5103***	-0.2838**	-0.8619*	0.0140	-0.4115***	-0.1916**
	(0.6780)	(0.7608)	(0.1318)	(0.1128)	(0.5028)	(0.5473)	(0.0959)	(0.0929)
7. Capital Mix	-0.0389	-0.0806	0.0709**	0.0209	-0.0365	-0.0447	0.1086***	0.0338
	(0.1575)	(0.2100)	(0.0279)	(0.0252)	(0.1525)	(0.1834)	(0.0369)	(0.0365)
8. Log (assets)	0.0015	-0.0110	-0.0108***	-0.0078***	0.0013	-0.0075	-0.0104***	-0.0087***
	(0.0094)	(0.0116)	(0.0014)	(0.0014)	(0.0092)	(0.0102)	(0.0013)	(0.0014)
9. Observations	1,797	1,796	17,337	17,337	1,797	1,796	17,337	17,337
10. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of bank holding companies 1986-2004. The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Table 7: State Corporate Income Tax Rates and Regulatory Capital Mix				
	Banks		BHCs	
	(1)	(2)	(3)	(4)
1. Effective tax rate	0.5476***	0.4099***	-0.4661***	-0.3626***
	(0.0374)	(0.0379)	(0.0637)	(0.0657)
2. Capital/Assets	-0.0769***	-0.0818***	-0.6233***	-0.4813***
	(0.0254)	(0.0291)	(0.0726)	(0.0747)
3. BHC	-0.0262***	-0.0245***		
	(0.0031)	(0.0031)		
4. MBHC	0.0458***	0.0308***		
	(0.0027)	(0.0027)		
5. Log(assets)	0.0861***	0.0767***	0.0682***	0.0610***
	(0.0010)	(0.0010)	(0.0013)	(0.0015)
6. Observations	226,258	223,035	27,239	27,233
7. Specification	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004 in the first two columns and bank holding companies 1986-2004 in the second two columns. The table reports estimated coefficients and standard errors from a Tobit model. The baseline specification in columns (1) and (3) includes the ratio of regulatory capital to assets, the mix of subordinated debt in regulatory capital, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in columns (2) and (4) includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets.

Table 8: "IV" Estimates of the Link Between Regulatory Capital Mix and Future Financial Distress

	"IV" Probit				"IV" Linear Probability			
	Distressed		Healthy		Distressed		Healthy	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
A. Bank Sample								
1. Capital/Assets	-2.0517***	-1.8135***	-0.5350***	-0.4624***	-1.9573***	-1.6726***	-0.1859***	-0.2739***
	(0.1707)	(0.1688)	(0.0331)	(0.0242)	(0.1580)	(0.1503)	(0.0067)	(0.0185)
2. Capital Mix	-0.3665**	-0.7762***	-0.2657***	-0.2335***	-0.3531**	-0.7405***	-0.4010***	-0.4270***
	(0.1722)	(0.2539)	(0.0306)	(0.0372)	(0.1647)	(0.2329)	(0.0400)	(0.0557)
3. BHC	-0.0301***	-0.0337***	-0.0107***	-0.0080***	-0.0295***	-0.0327***	-0.0078***	-0.0115***
	(0.0087)	(0.0102)	(0.0017)	(0.0016)	(0.0084)	(0.0095)	(0.0019)	(0.0022)
4. MBHC	-0.0279***	-0.0261**	0.0120***	0.0023	-0.0275***	-0.0251***	0.0211***	0.0094***
	(0.0106)	(0.0107)	(0.0021)	(0.0016)	(0.0101)	(0.0098)	(0.0024)	(0.0023)
5. Log(assets)	0.0574***	0.0819***	0.0177***	0.0111***	0.0549***	0.0776***	0.0306***	0.0246***
	(0.0153)	(0.0200)	(0.0027)	(0.0029)	(0.0146)	(0.0184)	(0.0035)	(0.0044)
6. Observations	31,359	31,283	176,738	173,990	31,359	31,283	176,738	173,990
7. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended
B. BHC Sample								
8. Capital/Assets	-2.2874***	-2.0875***	-0.4889***	-0.2272*	-2.0730***	-1.8153***	-0.3373**	-0.0418
	(0.6546)	(0.6454)	(0.1475)	(0.1315)	(0.5584)	(0.5350)	(0.1371)	(0.1350)
9. Capital Mix	-1.6584***	-1.8833**	0.2582**	0.2520**	-1.5344***	-1.7143**	0.3462***	0.2764
	(0.5954)	(0.8149)	(0.1084)	(0.1331)	(0.5579)	(0.7301)	(0.1293)	(0.1731)
10. Log(assets)	0.1428***	0.1287***	-0.0241***	-0.0213***	0.1294***	0.1164***	-0.0301***	-0.0240**
	(0.0405)	(0.0501)	(0.0074)	(0.0082)	(0.0376)	(0.0446)	(0.0088)	(0.0106)
11. Observations	4,013	4,011	21,290	21,286	4,013	4,011	21,290	21,286
12. Specification	Baseline	Extended	Baseline	Extended	Baseline	Extended	Baseline	Extended

Table notes: the sample refers to annual December data on the population of commercial banks 1984-2004. in panel (A) and bank holding companies 1986-2004 in panel (b) The first four columns of the table report marginal effects from a Probit model while the last four columns report estimates from a linear probability model. The baseline specification in odd-numbered columns include the ratio of regulatory capital to assets, the predicted mix of subordinated debt in regulatory capital from Table 6, log bank assets, dummy variables for BHC and MBHC affiliation, the ratio of problem loans to capital, and a full set of time effects. The extended specification in even-numbered columns includes controls for asset and loan portfolio composition, the return on assets, the ratio of provisions to assets, and the ratio of time deposits greater than $100,000 to assets. Standard errors are corrected for heteroskedasticity and clustered at the bank level. Columns (1), (2), (5), and (6) refer to bank-years of financial distress, defined as institution with ratio of problem loans to equity is larger than the 85th percentile of all bank-years, while other columns refer to healthy bank-years.

Appendix

Table A1: Effective State Corporate Income Tax on $1 million in Business Profits

State	Mean	Max	Min	Sd	State	Mean	Max	Min	Sd
AK	0.0898	0.0898	0.0898	0.0000	**MT**	0.0689	0.0750	0.0675	0.0028
AL	0.0500	0.0500	0.0500	0.0000	**NC**	0.0706	0.0775	0.0600	0.0065
AR	0.0608	0.0622	0.0593	0.0015	**ND**	0.0974	0.1030	0.0300	0.0203
AZ	0.0967	0.1047	0.0800	0.0084	**NE**	0.0717	0.0771	0.0656	0.0059
CA	0.0925	0.0960	0.0884	0.0020	**NH**	0.0774	0.0825	0.0700	0.0047
CO	0.0533	0.0598	0.0500	0.0040	**NJ**	0.0911	0.1046	0.0900	0.0041
CT	0.1121	0.1150	0.0950	0.0061	**NM**	0.0848	0.1080	0.0480	0.0126
DC	0.0996	0.1000	0.0950	0.0014	**NV**	0.0000	0.0000	0.0000	0.0000
DE	0.0870	0.0870	0.0870	0.0000	**NY**	0.0908	0.1000	0.0900	0.0028
FL	0.0550	0.0550	0.0550	0.0000	**OH**	0.0889	0.0910	0.0871	0.0020
GA	0.0600	0.0600	0.0600	0.0000	**OK**	0.0554	0.0600	0.0500	0.0052
HI	0.0629	0.0642	0.0628	0.0004	**OR**	0.0667	0.0750	0.0660	0.0025
IA	0.1118	0.1118	0.1118	0.0000	**PA**	0.0998	0.1225	0.0850	0.0152
ID	0.0798	0.0800	0.0770	0.0008	**RI**	0.0869	0.0900	0.0800	0.0048
IL	0.0462	0.0480	0.0400	0.0035	**SC**	0.0523	0.0600	0.0500	0.0044
IN	0.0337	0.0340	0.0300	0.0011	**SD**	0.0000	0.0000	0.0000	0.0000
KS	0.0423	0.0450	0.0400	0.0026	**TN**	0.0600	0.0600	0.0600	0.0000
KY	0.0714	0.0767	0.0581	0.0063	**TX**	0.0000	0.0000	0.0000	0.0000
LA	0.0755	0.0755	0.0755	0.0000	**UT**	0.0500	0.0500	0.0500	0.0000
MA	0.0814	0.0950	0.0240	0.0259	**VA**	0.0620	0.0861	0.0600	0.0072
MD	0.0700	0.0700	0.0700	0.0000	**VT**	0.0809	0.0939	0.0600	0.0085
ME	0.0818	0.0818	0.0818	0.0000	**WA**	0.0000	0.0000	0.0000	0.0000
MI	0.0303	0.1176	0.0220	0.0262	**WI**	0.0790	0.0790	0.0790	0.0000
MN	0.0932	0.0980	0.0501	0.0130	**WV**	0.0910	0.0975	0.0695	0.0072
MO	0.0566	0.0625	0.0500	0.0064	**WY**	0.0000	0.0000	0.0000	0.0000
MS	0.0483	0.0499	0.0300	0.0055					

Table notes: the data refer to annual state corporate income tax data, and cover 1986-1998. The table reports summary statistics fort he effective tax rate on $1 million in business profits for each state over the time period.