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# The Effects of Resolution Methods and Industry Stress on the Loss on Assets from Bank Failures

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**ABSTRACT**

In this paper, we examine how the value of failed bank assets differs between two types of FDIC resolution methods: liquidation and private-sector reorganization. Our findings show that private-sector reorganizations do not deliver the expected cost-savings from 1986 to 1991, a period of industry distress. On a univariate basis, the net loss on assets is lower for a private-sector reorganization than for a liquidation in both a period of industry distress and of industry health. However, institutions with higher quality assets and higher franchise values are more likely to be resolved using a private-sector resolution. Once we control for this selection bias, we find that institutions that are resolved during periods of industry distress result in higher resolution costs than liquidation. During periods of industry health, private-sector resolutions are less costly than liquidations. We show that if a bank that failed during the post-crisis period instead failed during the crisis period, its net loss as a percent of assets would have been 3.232 percentage points higher. Given that the average net loss on assets ratio is 21.42 percent during our sample period from 1986 to 2007, the increase in costs is economically significant.

**JEL Classifications:** G21, G28, G33

**Keywords:** bank failures, bank resolution costs, FDIC receivership, fire sales, banking crises

**Opinions expressed in this paper are those of authors' and not necessarily those of the FDIC.**

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## I. Introduction

In this new era of bank failure resolutions, a careful analysis of the past is warranted. To provide useful guidance for an efficient resolution process, we undertake a thorough analysis of the resolution methods and loss on assets of 1,213 of the 1,244 banks that failed and were resolved by the FDIC from 1986 to 2007.

Our primary objectives are to examine how the value of failed bank assets differs between resolution methods and how it is affected by the condition of the banking industry. Our focal variable, the net loss on assets, is the difference between the book value of assets at time of sale and the proceeds received from the sale of assets, adjusted for premiums received for the deposit franchise.

Prior to a bank closing, the FDIC determines the resolution structures that it offers to potential bidders, markets the failing bank to these bidders, and evaluates the bids it receives. Two primary options are available to the FDIC. One option is to liquidate the assets and pay off the insured depositors. In this case, any value related to banking relationships and of deposit franchise is destroyed. Alternatively, the FDIC can sell all or part of the assets to an acquirer together with all or part of the deposits in a private-sector reorganization. In this case, customer relationships continue and are transferred to another institution. An FDIC liquidation is analogous to a Chapter 7 bankruptcy and a private-sector reorganization is analogous to a Chapter 11 bankruptcy. We define a private-sector reorganization method as one where more than 25 percent of the assets are purchased by an acquirer that is approved by the FDIC. When less than 25 percent of the assets are purchased by the acquirer we call this method an FDIC liquidation.[2]

[2] Our definition of private-sector reorganization is closely related to the FDIC's purchase and assumption (P&A) classification of resolutions. The difference is that our definition classifies P&As that transfer less

James (1991) proposed the "differential cost hypothesis" to explain the cost differences between resolution structures. According to this hypothesis the value of failed bank assets is less in an FDIC liquidation than a private-sector reorganization. The argument for this hypothesis is that a private-sector reorganization can preserve some of the franchise value. Given that the franchise value is non-negative, a private-sector reorganization should always be equally or less costly than a liquidation. This prediction is also consistent with the recent theoretical model developed by John, Mateti, and Vasudevan (2013) who show that firms in financial distress that are privately resolved have higher values than firms that go through liquidation. James (1991) finds empirical support for his hypothesis and shows that purchase and assumption resolutions are less costly than liquidations. Bovenzi and Murton (1988), and Brown and Epstein (1992) examine losses in bank failures during the period from 1985 to 1988 and also provide similar findings that support the differential cost hypothesis.

However, the differential cost hypothesis does not consider frictions that can arise in private-sector reorganizations. If there are costs associated with private-sector reorganization that exceed the franchise value that is preserved, then liquidation will result in lower costs. Shleifer and Vishny (1992, 2011) argue that these frictions and their associated costs can arise from a lack of investment capital in the industry due to distress. In situations where the degree of industry distress is severe, an asset sale may result in a price lower than its value in best use. In the context of resolving failed banks, this can occur because during a period of industry stress there are fewer qualified bidders available to bid on failed bank assets. As the volume of non-performing loans and

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than 25 percent of assets to an acquirer as an FDIC liquidation. In our robustness checks, we vary this cutoff point between zero and 50 percent.

defaulted loans increases, bidders may be more risk-averse which results in lower bids. Those firms that bid on failed bank assets know that during periods of industry distress they face less competition and therefore offer lower bids. Furthermore, the FDIC may prefer to pass assets because they are concerned that the accumulation of failed bank assets during a crisis would lead to a decline in liquidity of the deposit insurance funds.[3] Therefore, if the FDIC finds itself in a situation where a liquidation is not tenable because there are impediments to liquidating assets and paying off depositors in an orderly manner, a private-sector reorganization would result and might prove to be costlier than liquidation. We refer to this outcome as the "industry distress" hypothesis.

Our sample period allows us to test the validity of these two hypotheses utilizing two distinct economic and regulatory environments. The six-years from 1986 to 1991 represent a banking crisis period, when 1,020 FDIC insured banks failed. In contrast, 224 FDIC insured banks failed during the sixteen years from 1992 to 2007, which represent a more stable period of time for the banking industry. If the differential cost hypothesis holds then private-sector reorganizations should be less costly than FDIC liquidations in both time periods. If the industry distress hypothesis holds then the private-sector reorganizations are more costly than liquidation during the crisis period.

An important consideration when we compare the cost effectiveness of resolution methods is whether the FDIC receives viable bids from the private sector for the failed-bank assets. Institutions that have higher quality assets and a higher franchise value associated with their deposits are likely to attract more bidders with the result that more assets will remain in the private sector. Therefore, it would be misleading to compare

[3] As noted on p. 21 of FDIC (1998b) former FDIC Chairman L. William Seidman stated that when bank failures increase during a crisis holding assets uses up cash quickly, and that during the crisis forecasts indicated that the deposit insurance fund would be depleted by the end of 1990.

costs between the private-sector reorganization and the FDIC liquidations without controlling for the selection bias implicit in the resolution process. Our multivariate regressions control for this selection bias using a treatment regression.

In the first stage of our analysis, the probit regression, we model the outcome of the resolution process, which is either a private-sector reorganization or an FDIC liquidation. We posit that two objectives play a role in the resolution method outcome. One is the FDIC's regulatory mandate to minimize the cost to the insurance fund, and the other is to minimize the disruption to the community that the failed bank serves. Liquidating bank assets and paying off depositors can have a profound impact on a community because bank failures can lead to the destruction of relationship lending and a severe contraction in bank lending (Bernanke and Blinder 1992; Bernanke, Gertler, and Gilchrist 1996; Ashcraft 2005). We use factors that are proxies for the community disruption, such as business activity and personal income at the state level, as our instruments in the first-stage regressions.

Our tests show that these variables affect the outcome of the resolution process but not the loss on assets. We observe that FDIC liquidations are less likely in communities with low income and high unemployment rates. This outcome holds even during the 1992 to 2007 period when the FDIC was required to resolve banks in a manner that is least costly to the deposit insurance fund. One possible explanation of this result is that there is no conflict between minimizing the disruption to the community and minimizing the cost of the resolution.

In the second stage, we estimate equations for the net loss on assets, after we control for the selection bias in the resolution process. Our findings show that during the

crisis period, private-sector reorganizations yield a higher loss on assets. This evidence refutes the differential cost hypothesis of James (1991), and other previous research which finds that the Purchase and Assumption (P&A) is a less costly method during the crisis period. We show that the lack of controls for the selection bias in the earlier research causes the difference in the findings.

Our results for the crisis period support the arguments of Shleifer and Vishny (1992, 2011) that in situations when industry distress is severe, an asset sale may result in a price lower than its value in best use. We corroborate this argument and show that at a time when investment capital is scarce due to industry distress and that FDIC finds itself in an environment where there are impediments to a liquidation, a private-sector reorganization proves to be costlier than liquidation. Additional support for the Shleifer and Vishny (1992, 2011) comes from the results for the stable period of 1992 to 2007. We show that the net loss on assets is lower for private-sector reorganizations when the industry is not in distress. In other words, once the industry regained its health, the FDIC received bids for failed bank assets that were more advantageous. However, we cannot attribute the cause of this finding entirely to the change in industry conditions. During this period the enactment of FDICIA brought a new regime for failed bank resolutions, including the least cost test and changes to failed bank marketing strategies, which may have contributed to lower costs. Because the FDICIA period and the non-crisis periods overlap, we are unable to disentangle the effects of FDICIA from those of improved industry health.

Our results also add to the findings of a number of previous studies. Hoggarth, Reidhill, and Sinclair (2004) show that during banking crises liquidations are rare and

that banks are kept afloat usually at a cost to the government. Our evidence points to another type of cost to taxpayers, namely, private-sector resolutions become more expensive than liquidations during the crisis period of 1986 to 1991.

We also corroborate Acharya and Yorulmazer (2007a, 2007b), who argue that in a banking crisis surviving banks buy failed banks only at fire-sale prices because of liquidity constraints. Indeed, we find that when such conditions exist, liquidations can become unattractive and private-sector resolution can yield higher costs than liquidations.

In our analysis we do not focus on the recent crisis period for two reasons. First, our sample comprises resolutions that are terminated. In other words, we know the final cost to the FDIC of these resolutions. Out of the post-2007 failures, very few of the failed banks have been terminated as of the writing of this paper and final cost of these failures to the FDIC is not known.[4] Second, most failures of the post-2008 period were resolved through a loss-sharing arrangement. Loss sharing agreements were used much less frequently during the previous crisis.[5] However, some evidence exists for the 2008 to 2011 period that supports our arguments. Cowan and Salotti (2013) measure the implicit subsidy that the FDIC provides to acquiring banks using the abnormal stock returns that result from the announcement of the acquisition of a failed bank. They conclude that P&A transactions can be expected to be most costly at the time that they are most needed, during times of industry distress.

The remainder of this paper is organized as follows. Section II describes the characteristics of different FDIC resolution methods and provides information on the

[4] As of April 10, 2014, only 21 of the 510 banks that failed between 2007 and the present have been terminated.

[5] From 1986 to 2007, loss sharing agreements were used in 16 failures. After 2007, loss sharing agreements were used in 303 failures.

number and types of failures over the 1986 to 2007 period. Section III describes our empirical approach. In Section IV, we discuss our data sources and variables. Section V discusses our empirical results and section VI describes our robustness checks. Section VII concludes.

## II. Private-Sector Reorganization versus FDIC Liquidation of Failed-Bank Assets

In this section, we describe the FDIC resolution methods in terms of their traditional classifications and develop our classification of private-sector reorganizations and FDIC liquidations. Then, we discuss the factors that can potentially influence the difference in losses on assets between FDIC resolution methods.

### A. FDIC Resolution Methods

Banks can fail for a variety of reasons including undercapitalization, poor asset quality, weak risk management, insufficient liquidity, unsafe and unsound practices, and fraud. Whatever the cause of failure, the chartering agency has the authority to terminate the bank's charter and appoint the FDIC as the receiver. As part of the resolution process, the FDIC develops a marketing strategy that includes determining the resolution structures that it offers to potential bidders. The FDIC then markets the assets and liabilities of the failing bank and evaluates the bids it receives.[6]

One option that the FDIC is required to consider is a deposit payout, where the FDIC pays the insured depositors and liquidates the assets. This method is used if no bids are received, or the bids do not yield a less costly resolution than a payout. Alternatively,

[6] The FDIC compiles a list of potential acquirers, which includes financial institutions and private investors. This list is reviewed by the financial regulatory authorities involved in the transaction to determine which bidders will be approved to acquire the failing institution.

the FDIC can receive bids to purchase all or part of the assets and assume all or part of the deposit liabilities. The FDIC terms these resolutions as purchase and assumptions (P&A) transactions.

Another type of failure resolution method is open-bank assistance (OBA). Here the FDIC does not establish a receivership but provides financial assistance to an open institution to prevent it from failing. Generally, in an OBA the FDIC replaces the existing bank management. Because our measures of loss on assets rely on records from the receiverships, and because OBA transactions do not result in a receivership, we exclude them from our analysis.

An important complication that arises when we test the difference between the resolution methods is how to assign each failure to one of the two methods. One approach is to use the P&A method and the deposit payoff as the classifying variables. Previous research uses this classification. However, this classification is noisy because not all deposit payoff transactions transfer 100 percent of the assets to the FDIC. Similarly, not all P&A transactions pass 100 percent of the assets to the acquiring bank. Therefore, the tests are confounded if the classification ignores the amount of assets transferred in a private-sector organization of the failed institution.

Rather than use the traditional classification of P&A and deposit payoff, we use the percentage of assets transferred to the private sector as the classifying variable. Both the quality of the failed-bank assets and the percentage of assets transferred to the acquirer influence the loss on assets. For example, in one extreme when all of the assets are passed to the acquiring bank the customers do not lose their borrowing relationship with the bank and the link between the customer's deposits and loans is preserved. Thus,

the failed bank's franchise value is maintained and the receivership can recover this value. In the other extreme, when the FDIC liquidates all of the assets it does not extend any further credit—for example, it does not renew maturing loans or honor existing credit lines. The FDIC either holds the loans until maturity or sells the loans and other assets. Therefore, the borrowing relationship between the customer and the bank is destroyed and the receivership cannot recover the value of the relationship.

We define a private-sector reorganization as one where 25 percent or more assets are purchased by an acquiring bank; otherwise we classify a resolution as an FDIC liquidation. We use this cutoff point because we judge that if less than 25 percent of the assets are transferred to the acquiring bank then the link between the loans and the deposits is substantially disrupted. To check the robustness of our results we vary the cutoff point from zero to 50 percent.

### B. Differences in Loss on Assets between FDIC Resolution Methods

We define the net loss on assets as the difference between the book value of assets and the market value of assets less the franchise value.

$$NLA = BVA - MVA - FV$$

In a private sector reorganization, the franchise value is preserved and the net loss on assets can be expressed as

$$NLA_{PS} = BVA - MVA - FV$$

In a liquidation, the franchise value is lost and the net loss on assets can be expressed as

$$NLA_{LIQ} = BVA - MVA$$

James (1991) is the first to develop and test the differential cost hypothesis, which states that costs can be higher in an FDIC liquidation than in a private-sector reorganization because the franchise value of the bank is lost in an FDIC liquidation. This hypothesis is also consistent with John, Mateti, and Vasudevan (2013). In other words, we would expect that the net loss on assets in a private-sector reorganization would be lower than that in a liquidation if the franchise value is positive.

$$NLA_{PS} \leq NLA_{LIQ}$$

if

$$FV \geq 0$$

In addition, Carns and Nejezchleb (1992) argue that assets might be worth less in the hands of the FDIC because the acquiring bank in a private-sector reorganization may face fewer constraints than the FDIC in collections, loan restructuring, and legal actions. Also, after an asset is transferred to the FDIC, the asset can suffer a loss in value because the relationship between the bank and the customer breaks down and the customer can have a higher incentive to default (FDIC, 1998a). Thus, in a private-sector reorganization the FDIC can recover a higher percentage of the book value of the assets. Given that the value of deposit and borrower relationships, or the franchise value, is non-negative private-sector reorganizations should always be less costly that FDIC liquidations absent any additional frictions.

However, other factors can cause private-sector reorganization to yield a higher loss on assets. For example, a lack of investment capital in the industry due to distress (Shleifer and Vishny, 1992, 2011) can cause losses to be higher. In such situations the sale of assets may be characterized as a "fire sale." Shleifer and Vishny (1992, 2011) and Acharya and Yorulmazer (2007a, 2007b) argue that assets fetch prices below their value

in best use when two conditions prevail. The first condition is when firms in an industry cannot buy the failed firms' assets because they are themselves in financial distress. The second condition is when firms outside the industry face significant costs of acquiring and managing the failed firms' assets.

When we apply this theory to the banking industry, it implies that as bank failures become more frequent and the deposit insurance fund is depleted, the FDIC may prefer private-sector reorganizations. However, due to industry distress not many qualified bidders are willing to bid on failed banks. As the volume of non-performing and defaulted loans increases, bidders may be more risk-averse, which results in lower bids. Furthermore, those firms that bid on failed bank assets know that during periods of industry distress, they face less competition and therefore offer lower bids. These conditions can lead assets in a private-sector reorganization to have fire-sale prices ($MVA_{PS}$), which results in

$$MVA_{PS} < MVA_{LIQ}$$

and the net loss on assets in a private sector reorganization can be written

$$NLA_{PS} = BVA - MVA_{PS} - FV$$

However, an FDIC liquidation would have generated net loss on assets,

$$NLA_{LIQ} = BVA - MVA_{LIQ}$$

Thus, if

$$MVA_{LIQ} - MVA_{PS} \geq FV$$

then the net loss on assets in an FDIC liquidation will be smaller than that in a private sector resolution

$$NLA_{PS} \geq NLA_{LIQ}$$

We term this hypothesis the "industry distress hypothesis."

Our sample period, 1986 to 2007, allows us to examine the validity of the differential cost hypothesis and the industry distress hypothesis. We form two sub-periods: 1986 to 1991 and 1992 to 2007. The first sub-period represents a period of crisis for the banking industry and the second represents a stable environment.

From 1986 to 1991, the industry was in deep distress. There were record levels of bank failures during this period. In addition, in the fourth quarter of 1986, 10.27 percent or 1,457 of insured commercial banks were considered problem banks.[7] By the end of 1992, the proportion of problem banks dropped to 6.87 percent (787 banks).[8] The high number of failures rapidly depleted the deposit insurance fund. The fund balance declined from 84 basis points of domestic deposits in 1986 to one basis point of domestic deposits in 1992.[9] During this period, the environment is similar to that described by Shleifer and Vishny (1992, 2011), which provides an opportunity to test the industry distress hypothesis.

The industry regained health after 1991, and by the end of 2007 the number of problem banks dropped to 76, or less than 1 percent of the 8,533 insured depository institutions. The insurance fund increased from one basis point of domestic deposits in 1992 to 76 basis points of domestic deposits at the end of 2007.[10] During this period, the relative health of the industry resulted in more eligible bidders and higher demand for

[7] Problem banks are those that are on the FDIC "problem list" as reported in the FDIC's *Quarterly Banking Profile*.
[8] FDIC (1986), p. 5 and FDIC (1992). p. 5.

[9] FDIC (2009), p. 145.

[10] FDIC (2009), p. 145.

failed bank assets. Therefore, we would expect differential cost hypothesis to hold and private sector reorganizations to be less costly after 1991.

We should note that changes to the resolution process after the passage of the Financial Institutions Reform, Recovery and Enforcement Acts (FIRREA) in 1989 and the Federal Deposit Insurance Corporation Improvement Act (FDICIA) 1991 also had a positive impact on getting bids that were more advantageous to the FDIC. For example, prior to the passage of the FDICIA, a bid had to pass the cost test to be acceptable.[11] After FDICIA, however, the FDIC was required to choose the resolution method that was least costly to the deposit insurance fund(s). Bids received by the FDIC after 1991 were also positively influenced by different FDIC asset marketing strategies. First, bidders were offered smaller, homogenous loan pools rather than large loan portfolios and the portfolios were offered separate from the deposit franchise. Second, bidders were offered branches for sale separately, which allowed smaller institutions to participate in the bidding process. Last, the development of loss sharing arrangements to keep assets of a large bank failure within the banking system. Under loss sharing agreements the FDIC typically covers 80 percent of the losses (95 percent in exceptional cases) on loans purchased by the acquirer and reimburses direct expenses related to the disposition of the assets. The implementation of the least cost test plus these changes in marketing strategy may have contributed to lower loss on assets.

Panel A of Table 1 shows the number of banks that were insured by the Bank Insurance Fund (BIF) and the Deposit Insurance Fund (DIF) and failed from 1986

[11] The cost test required that the final resolution be less costly than a deposit payoff, however it did not require that the accepted bid be the least costly of all of the bids. This cost test was established in the Depository Institutions Deregulation and Monetary Control Act, 1980.

through 2007.[12] There were a total of 1,244 bank failures during that period when we treat each bank within a holding company as a separate observation.[13]

During the sample period, we observe that the number of bank failures peaks in 1989 and dramatically drops after 1992. Indeed, during 2005 and 2006 there were no bank failures. There were 928 failures where more than 25 percent of the assets remained in the private sector, and 316 failures where the FDIC liquidated 75 percent or more of the assets. In terms of failures by resolution type, we observe in Panel A of Table 1 that out of 1,244 failures between 1986 and 2007, 237 cases (19 percent of the failures) are deposit payoffs and 1,007 cases (81 percent of the failures) are P&A transactions. Note that after the implementation of the Least Cost Test the number of Whole Bank P&A transactions declined dramatically. This occurred because when faced with acquiring all, or almost all, of the assets at a failed bank, bidders would typically offer lower bids to cover potential losses and future contingencies associated with those assets. [14]

Panel B of Table 1 compares our sample with the universe of BIF- and DIF-insured bank failures summarized in Panel A. Our sample includes 97.5 percent of the total failures (1,213 of the total 1,244) that were placed in receivership. We exclude 31 institutions for two reasons: because their resolution process was not completed by the

[12] The Financial Institution Reform and Recovery Act (FIRREA) of 1989 created the Saving Association Insurance Fund (SAIF) to replace the Federal Savings and Loan Insurance Corporation (FSLIC) as the provider of deposit insurance for thrift institutions. The SAIF was administered by the FDIC separately from its bank insurance fund, called the Bank Insurance Fund (BIF). The Federal Deposit Insurance Reform Act of 2005 merged the SAIF and BIF into one insurance fund called the Deposit Insurance Fund (DIF). The DIF covered the three failures that occurred during the 2005 to 2007 period.

[13] These failures do not include the 317 failed institutions that were insured by the Federal Savings and Loan Insurance Corporation (FSLIC), 747 failed institutions that were resolved by the Resolution Trust Corporation (RTC), and six failed institutions that were insured by the Savings Association Insurance Fund (SAIF). We exclude these institutions because our analysis relies on data from FDIC internal accounting records, which are readily available for the BIF-and DIF-insured institutions.

[14] See FDIC (1998a), pp. 87-88.

end of 2007 (accounts for all but five exclusions), or because the institutions were trust banks and were not taking deposits or making loans at the time of failure.

We make one last adjustment. In our sample, 132 of the 1,213 failures belong to eleven bank holding companies. In our analysis we consolidate these failures under their respective bank holding companies and our resulting sample size is 1,092. As shown in Panel C of Table 1, the sample includes 795 institutions where more than 25 percent of the assets remained in the private sector and 297 where more than 75 percent of the assets were liquidated by the FDIC.

**INSERT TABLE 1 HERE**

## III. Model of the Loss Rate

To test whether or not a private-sector reorganization of failed-bank assets is inherently less costly than an FDIC liquidation we model the determinants of loss on assets as follows:

$$L_i = X_i\beta + \gamma R_i + \varepsilon_i \tag{1}$$

The $L_i$ is the net loss on assets ratio of failed bank *i,* and $X_i$ is a vector of variables that determine the loss rate. The variable $R_i$ takes the value of one if the failed bank is resolved using a private-sector reorganization and zero otherwise. The difference between the cost effectiveness of these two methods is captured by the γ parameter.

However, there is an important complication with equation (1). The type of method that the resolution process yields can depend on the characteristics of the failed bank, which also influences loss on assets. The FDIC is forced to acquire and liquidate

the assets when it receives no qualifying bids from a viable bank. In these situations, the assets are typically of the worst quality. Banks specialize in making loans and taking deposits, not managing bad assets. Therefore, absent substantial concessions, a prospective bidder may not bid on loans that are either delinquent or that they expect will become delinquent. Consequently, institutions that have higher quality assets and a higher franchise value associated with their deposits are more likely to attract more bidders with the result that more assets will remain in the private sector. Therefore, it is misleading to compare loss on assets between a private-sector reorganization and a liquidation without controlling for the selection bias implicit in the resolution process. In other words, if we estimate equation (1) ignoring this relation, then we will introduce an omitted variables bias arising from unobserved differences between the two resolution methods.

To address this selection bias, we use a "treatment effects" model to estimate the outcome equation (1), which captures the effect of the resolution method on the loss on assets, and a treatment equation, which is a probit equation of the probability that the resolution process yields a private-sector reorganization. The model is:

$$R_i = \begin{cases} 1 & if \quad R_i^* > 0 \\ 0 & otherwise \end{cases} \tag{2}$$

$$R_i^* = V_i\alpha + \mu_i \tag{3}$$

In this framework, whether or not a private-sector reorganization is used, $R_i$, depends on the unobserved realization of the latent variable, $R_i^*$, which is defined in equation (3). The variables in $V_i$ can include the variables in $X_i$ from equation (1) and a

set of instruments. The error terms $\varepsilon_i$ from equation (1) and $\mu_i$ from equation (3) are assumed to be bivariate normal with a covariance matrix of:

$$\operatorname{cov}(\varepsilon_i, \mu_i) = \begin{bmatrix} \sigma^2 & \rho\sigma \\ \rho\sigma & 1 \end{bmatrix} \tag{4}$$

The probability that the resolution process yields a private-sector approach to resolve the bank failure is as follows:

$$\Pr(R_i = 1 \mid V_i) = \Phi(V_i \alpha) \tag{5}$$

where $\Phi$ is the cumulative standard normal distribution.[15]

We follow Maddala (1983) and use a two-stage estimation strategy. First we estimate the treatment equation (2) using a probit regression. From this estimation we obtain a hazard for each observation. The hazard for each observation is as follows:

$$h_i = \begin{cases} \dfrac{\phi(V_i \hat{\alpha})}{\Phi(V_i \hat{\alpha})} & \text{if } R_i = 1 \\ \dfrac{-\phi(V_i \hat{\alpha})}{1 - \Phi(V_i \hat{\alpha})} & \text{if } R_i = 0 \end{cases} \tag{6}$$

where $\phi$ is the standard normal distribution.

In the second stage, we include this hazard variable as an additional regressor and the net loss on assets equation becomes:

$$E(L_i \mid R_i) = X_i \beta + \gamma R_i + \lambda h_i \tag{7}$$

where $\lambda = \rho\sigma$. Maddala (1983) shows that this two-step estimation strategy produces consistent estimates of the variance-covariance matrix for $\varepsilon_i$ and $\mu_i$. Alternatively, equations (1) and (2) can be estimated jointly using a maximum likelihood estimate. We estimate the equations using the maximum likelihood technique as a robustness check.

[15] A different approach would focus on the cost determinants of one resolution type. In this case, the Heckman correction is appropriate as used by Barth, Bartholomew, and Bradley (1990).

In an OLS setting, the parameter $\gamma$ is biased upward if the correlation between the error terms in equations (1) and (2), ρ, is positive. We expect the correlation to be negative if the resolution process yields the private-sector reorganization when the failed-bank assets are high quality and, therefore, the net loss on assets is lower. As a consequence, the OLS estimate of γ will be biased downward.

## IV. Data and Variable Definitions

Our primary data sources are the FDIC General Ledger and the FDIC the Historical Statistics on Banking (HSOB), which publishes the cost to the deposit insurance fund of bank failures.[16] Failed-bank specific variables come from the Call Reports. Our regressions control for bank-specific, industry, and economic conditions which affect the loss on assets. Appendix A provides a description of the variables, the data sources, and the descriptive statistics.

### A. Net Loss on Assets

As indicated in Section 2, we measure loss on assets as the difference between the liquidation value of assets and the book value of assets at time of sale. In regressions, we use the net loss on assets, which is composed of a number of items. The first component of the net loss on assets is the gain and (loss) on assets. The receivership income statements on the FDIC GL records the gain (or loss) on the disposition of assets as the difference between cash collected and the book value of assets of the failed bank. We adjust this number for net income or loss from assistance agreements, net loss sharing

[16] The HSOB is available on the FDIC website (http://www4.fdic.gov/HSOB/index.asp).

expenses that arise from agreements between the receivership and acquirer, interest and fees that are earned on the assets in liquidation during the resolution process and other miscellaneous income, and the interest expense paid to the FDIC by the receivership.

The other two components of the net loss on assets are the premium paid to and the premium received from the acquirer. The premium received reflects the amount that the acquirer pays to the receivership to assume the deposits of the failed bank. We do not discount premiums and consider them paid or received at the time of failure.

We express the cash flows on a discounted basis. Discounting loss on assets is not straightforward because of data limitations. Appendix B describes the process we use for finding the discounted value of the net loss on assets (NETLOA).

We observe in Appendix A, Panel B that on average the ratio of net loss on assets to assets at failure is 21.42 percent. The net loss on assets shows considerable variation. In one extreme case, the net loss on assets constituted 93.98 percent of the assets at failure on a discounted basis. In rare cases, there are net gains on the transfer of assets to an acquirer but this gain is primarily due to premiums received from acquirers.

In previous studies (James, 1991, Bovenzi and Murton, 1988, and Brown and Epstein 1992) the average ratio of net loss on assets to assets ranges between 29 to 30 percent. These studies use loss estimates at failure and our numbers reflect discounted value loss at the end of the life of the receivership.

We can also compare our findings with those of published work on corporate bankruptcies.[17] In a recent paper, Bris, Welch, and Zhu (2006) provide estimates for

[17] Bliss and Kaufmann (2006) provide an extensive analysis of the difference between the bankruptcy codes for bank and corporate failures Extensive research exists examining the costs of corporate bankruptcies. Warner (1977), Altman (1984), Ang et al (1982), and Tashjian et al (1996) examine the cost of bankruptcy in Chapter 11 cases whereas Lawless et al (1994) and White (1984) estimate costs in Chapter 7

Chapter 7 and Chapter 11 bankruptcies for 300 bankruptcies from 1995 to 2001. In terms of losses, they show that creditors lose less under Chapter 11 than in Chapter 7 bankruptcies. They report average losses under Chapter 11 of about 30 percent. In contrast, the average loss for Chapter 7 is 70 percent under optimistic estimates. A comparison of these numbers with our estimates for the full sample (23.06 percent for private-sector reorganization and 39.59 percent for liquidations) provides some evidence for the argument that creditor losses might be smaller under the bank insolvency code.[18] We also observe that the difference in average losses between resolution methods is much larger for corporate bankruptcies than for bank failure resolutions. However, the finding that losses in a Chapter 11 bankruptcy are lower than for a Chapter 7 bankruptcy parallels our finding for the bank resolutions in the post-crisis period.

### B. Bank Specific Variables

Net loss on assets and receivership expenses are important components of the market value of the bank because they adjust the book value of equity of the failed bank to its market value. The bank specific variables we choose to explain the cross-sectional variation in NETLOA reflect the sources of value creation at banks. We classify these bank-specific variables into three categories: asset quality, franchise value, and size.

*Asset Quality:* To capture asset quality we use the level of non-performing assets (NPA) and other real estate owned (ORE) by the bank the quarter before failure as a

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bankruptcies. Pulvino (1999) compares recovery rates between Chapter 7 and Chapter 11 bankruptcies. Bris, Welch and Zhu (2006) provide a comprehensive study of costs and recoveries in Chapter 7 and Chapter 11 cases.

[18] The post-FDICIA period is closer to the sample period of Bris, Welch, and Zhu (2006). For this period, the costs are 22.79 percent and 35.65 percent of assets for bank resolution and liquidations, respectively.

percentage of assets at failure. ORE reflects real estate that the bank ends up owning as a result of foreclosure. We expect higher amounts of both NPA and ORE to be indicative of lower asset quality, which would in turn lead to a lower probability of a private-sector reorganization and higher NETLOA. Furthermore, we use income earned but not collected (EARNEDINC) to capture asset quality. Managers of distressed banks often do not write off loans that have gone bad and continue recording income from such assets. A higher value of EARNEDINC is an indicator of this behavior and therefore of lower asset quality. We include the value of this variable the quarter before failure, as a percent of total assets at failure, in the regressions.

We also add a proxy for fraud in our resolution method outcome and loss on assets equations. In a report prepared for the president and Congress in July 1993, a national commission found fraud and misconduct to be an important cause of failures in the 1980s (National Commission on Financial Institution Reform, Recovery, and Enforcement, 1993). The same report also argued that losses due to fraud constituted a significant portion of total losses. Following Thomson (1992) and Osterberg and Thomson (1995), we use loans to insiders (INSIDER) as a percentage of assets at failure as a proxy for fraud.

*Franchise Value:* The franchise value of the bank mitigates the loss on assets. We use the ratio of brokered deposits to assets at failure (BROKER) in the regressions to capture the effect of franchise value. This variable is negatively related to the franchise value—higher levels of brokered deposits indicate that a bank was not able to satisfy their funding needs with stable core deposits. Higher levels of brokered deposits can also be an indicator of high-risk low-quality assets. If a bank is undertaking high-growth business

strategies that are inherently risker, the bank may have to use brokered deposits to fund the strategy. In this respect, brokered deposits can capture the liability structure effects on resolution costs, which are shown to be significant by Schaeck (2008).

Another component of the franchise value is the branch network. A larger branch network can be an indicator of a more stable customer base and hence a higher franchise value. Furthermore, having more branches could indicate that the bank has more strategic options resulting in a higher franchise value. We include the number of the failed bank's branches as a percentage of the bank branches in that state (BRANCHRATIO).

*Size:* Empirically, it is well known that a strong negative correlation exists between bank asset size and resolution costs as a percent of assets.[19] The loss on assets can depend on the size of a bank for a number of reasons. First, there can be economies of scale in asset and liabilities marketing. The receivership can construct, market, and service asset pools more efficiently when asset size is larger. Second, the characteristics of assets at small banks are typically different from those of large banks, thus generating different liquidation costs. We use the natural logarithm of the assets at the failed bank (LOGASSET). We also include the square (LOGASSETSQ) to capture nonlinearity between asset size and the loss on assets.

### C. Industry Health

In our regressions, we split the sample into crisis and non-crisis periods to control for industry health. We create three variables to capture variation in industry health within those two periods. To capture directly the Shleifer and Vishny (1992) concept of the availability of investment capital argument we create a variable (HIGHQUAL) that is

[19] See FDIC (1998a), p. 100.

total assets in high quality institutions (CAMELS rating 1 or 2) relative to total assets in all institutions in the state and in the quarter of failure.[20] Higher levels of this variable indicate there is more investment capital in the hands of healthy banks and thus increased demand for failed bank assets by these banks and lower net loss on assets. We also create another variable (PROBLEM) that is total assets in problem institutions (CAMELS rating 4 or 5) relative to total assets in all institutions in the state and in the quarter of failure. Both HIGHQUAL and PROBLEM variables yield similar conclusions and thus we report results only for specification that uses HIGHQUAL. Finally, following McDill (2004), we use the state unemployment rate in the year of the failure (UNEMP) to control for the general economic conditions.

### D. Instruments

The bank-specific and industry health variables are included in both the resolution method and loss equations (equations (1) and (3)). We include instruments that affect the outcome of the resolution method but not the loss on assets in the estimation of equation (3). To identify such variables, we hypothesize that in addition to cost minimization, the impact on the community is an important factor in the outcome of the resolution method. The liquidation of bank assets and the paying off of depositors can have a profound impact on a community because bank failures can lead to the destruction of relationship lending and lead to a severe contraction in bank lending (Bernanke and Blinder 1992;

[20] A bank's CAMELS rating is a confidential supervisory rating that is assigned to a bank by its regulator as part of the bank's safety-and-soundness examination. The rating is an integer that ranges from 1 to 5. Here we use the composite rating which integrates ratings from six component areas: Capital adequacy, Asset quality, Management, Earnings, Liquidity, and Sensitivity to market risk. Banks rated 1 or 2 are considered to be either in excellent condition or fundamentally sound; banks rated 3 exhibit moderate to severe weaknesses but are deemed unlikely to fail; and banks rated 4 or 5 are considered to be either severely or critically unsound.

Bernanke, Gertler, and Gilchrist 1996; Ashcraft 2005). Therefore, when the FDIC designs the marketing strategy for the failed banks, it may consider implications of certain FDIC resolution methods on banking stability. Indeed, FDIC (1998b) lists the economic conditions of the institution's market area as one of the factors FDIC considers in determining the resolution structures to offer to potential bidders.[21]

Thus, as our instruments in the first-stage regressions, we use proxies that capture the adverse impact of a bank failure on the community in which the bank operates. We propose the following two variables. The first one is the logarithm of the number of private business establishments in the year of failure (LOGESTABLISH), which is compiled by the Census Bureau. In states with higher business activity, there are likely more loan relationships that would be destroyed in an FDIC liquidation. Therefore, we expect that the impact of a bank failure on the economic environment of the failed bank will be more adverse in a state with more business activity. We should note that states with higher business activity also tend to be larger states, so this variable may also be picking up size effects.

The second variable is the level of personal income in the state that the failed bank serves. Lower income communities are more dependent on banks to provide financial services to them. In contrast, higher income communities are able to obtain financial services from multiple sources. Therefore, we expect a bank failure will be more disruptive to low income communities if a bank is resolved using an FDIC liquidation. To capture this effect, we use the ratio of personal income in the state of the

[21] We should note that bidders are able to bid on any combination of assets and liabilities. They are not required to bid only on the resolution structures offered by the FDIC. These bids are deemed non-conforming, but are evaluated along with bids that conform to the structures offered by the FDIC.

failed bank to U.S. personal income in the quarter of failure (PIRATIO) in our regressions.

The FDIC may take these effects on the community into consideration when they determine the resolution structures to offer to potential bidders. The underlying assumption is that these variables are uncorrelated with loss on assets. However, this assumption can be debated. For example, banks located in low income neighborhoods might have higher franchise values due to lower labor costs. Alternatively, the loss on assets may be higher because the customer base is more vulnerable to systematic risk. In our robustness checks we tackle these questions and show that we get identification in stage one, and that when we add these variables in stage two, we observe that the variables are insignificant. Hence, the underlying assumption for our instruments has some empirical validity.

As Panel B demonstrates there is wide variation in the values of these two variables across failures. In two cases, the variables LOGESTABLISH and PIRATIO are missing because the failures occurred in the District of Columbia and Puerto Rico, which are not included in the state level data.

## V. Empirical Results

### A. Univariate Analysis

Table 2 provides the univariate analysis of our variables across resolution types and across time periods. This analysis provides some insight into both the differential cost hypothesis and the industry distress hypothesis. Recall, that if the differential cost

hypothesis is true, private-sector reorganizations have lower net loss on assets than FDIC liquidations. Panels A and B of Table 2 show that during the crisis period the mean loss ratio is 29.52 percent for FDIC liquidations and 21.09 percent for private-sector reorganizations. Similarly, in the post-crisis period the NETLOA is higher for FDIC liquidations (16.71 percent) than for private-sector reorganizations (9.06 percent). These observations support the differential cost hypothesis and refute the industry distress hypothesis. If the industry distress hypothesis were true, private-sector reorganizations would have higher net loss on assets during crisis periods. However, at this point, we cannot assess whether these differences exist because the private-sector reorganizations are inherently less costly, or if the characteristics of failed banks resolved in a private-sector reorganization differ from those of failed banks that are liquidated by the FDIC. The objective of our multivariate analysis is to disentangle these two possible effects.

**INSERT TABLE 2 HERE**

Next, we present the results of our multivariate analysis. We start with the results of the estimation of the probit regression that models the resolution method. In our second stage regressions we control for the endogenous resolution method and examine the determinants of the net losses on assets and direct expenses. We report robust standard errors and we include year fixed effects in all of the specifications.

### A. Determinants of the Resolution Method

Table 3 shows the results for the resolution method equation. In column (1) we present the results for the full sample period. In columns (2) and (3) we estimate the

model for two separate time periods—the crisis period and the more stable post-crisis period.

Our results show that factors that are proxies for the market value of equity of the failed bank are significant. Among the asset quality variables, we observe that income earned but not collected (EARNEDINC) is significant and negative in the full sample estimates, which indicates an FDIC liquidation is more likely when the bank's uncollected income is higher. However, when we look at the sub-period results we observe that this effect is more influential in the crisis period. During this period the intensity of recording income that was ultimately uncollectible was high enough that it became a significant deterrent against choosing a private-sector solution on average. In contrast, other asset quality variables, such as non-performing assets (NPA) and other real estate owned (ORE) do not appear to be significant determinants of the resolution method. INSIDER is also not significant during the crisis period but marginally significant in the post-crisis period. The positive sign of this variable creates doubts that INSIDER is a good proxy for fraud.

The variables that capture the franchise value of the failed bank prove to be significant. A high level of brokered deposits (BROKER), which is associated with a lower franchise value, increases the likelihood of an FDIC liquidation. This significant relationship holds in the sub-periods as well as during the full period. Our other measure of franchise value, the extent of the branching network (BRANCHRATIO), leads to a higher probability of a private-sector reorganization in all periods.

The size of the failed bank is not significantly related to the resolution type in any of the periods. This finding implies that any size bank in our sample has an equal chance

of being resolved by either method once we control for the quality of its assets and liabilities. Economic conditions are captured by the unemployment rate (UNEMP) which is not significant in any of the time periods. The assets in institutions rated CAMELS 1 and 2 as a percent of assets in the state (HIGHQUAL) is a proxy for the availability of the investment capital. HIGHQUAL proves to be significant. A higher level of HIGHQUAL is positively correlated with the higher likelihood of a private-sector resolution. This finding provides support for the Shleifer and Vishny (1992) argument that when more investment capital is available in the hands of healthy firms there would be increased demand for the assets of the failed firms.

Our results support our choice of instrumental variables. The results show that the instruments, LOGESTABLISH and PIRATIO, are statistically significant and have the expected signs. More business activity increases the likelihood of a private-sector reorganization. In contrast, in states where personal income is higher as a percent of national income an FDIC liquidation is more likely.

In summary, we observe that indicators of asset quality and franchise value affect the outcome of the resolution method. At the same time our instruments, which represent the impact on the community, prove to be significant which shows that the outcome of the resolution is affected by considerations for the community in which the failed bank serves. This observation can be expected during the crisis period, when the FDIC was operating under the cost test and was able to consider the impact on the community when resolving failures. However, FDICIA mandated that FDIC minimize the cost of the failure without consideration for the impact on the community. The observation that

community factors are significant during the post-FDICIA period implies cost minimization is not in conflict with the interests of the community.

**INSERT TABLE 3 HERE**

### B. Determinants of the Net Loss on Assets

Table 4 shows the results for the second stage regressions. Our focal variable is the RESMETHOD, which is a binary variable that takes the value of one if the bank is resolved using a private-sector reorganization and zero if it is resolved using an FDIC liquidation.

We first present the results for the ordinary least squares (OLS) estimates in column (1). We observe that loss on assets for the private-sector method is on average 6.178 percent lower than for the liquidation method. This finding is consistent with our univariate analysis and the prior literature, which does not address the selection bias that arises from the resolution process.

In column (2), we control for the selection bias and estimate over the full sample period. The parameter $\lambda$, which controls for the outcome of the resolution process, is significant and negative indicating that the OLS estimates of the coefficient of RESMETHOD is downward biased. Once we control for the selection bias, we find that for the full sample period RESMETHOD is positive and significant. Because the coefficient on RESMETHOD measures the difference in loss on assets between a private-sector reorganization and an FDIC liquidation, this finding provides evidence that the private-sector reorganization is not inherently less costly than a liquidation. Instead,

failed banks that are resolved by a private-sector method have characteristics that lead to higher costs. This evidence reverses the previous findings that support the differential cost hypothesis that states it is more costly for the FDIC to liquidate the failed-bank assets.

The sub-period results provide further insight. We find that the coefficient on RESMETHOD is positive and significant during the crisis period implying that loss of value in a private-sector reorganization outweighs the loss in franchise value that occurs in an FDIC liquidation. Such finding refutes the differential cost hypothesis of James (1991) and is consistent with the industry distress hypothesis of Shleifer and Vishny (1992, 2011). Our results from the post-crisis period, 1992 to 2007, provide further support for their arguments. Column (4) of Table 4 shows that the coefficient for RESMETHOD is significant and negative during this period.

Note that the parameter $\lambda$, which controls for outcome of resolution process, is not significant in the post-crisis period, which indicates that selection is not an important factor. Indeed, when we estimate the model using OLS for the post-crisis period we find that the results remain unchanged qualitatively. These findings imply that net loss on assets was lower for private-sector reorganizations than for liquidations in the post-crisis period.

Further support for the industry distress hypothesis comes from the coefficient estimates for HIGHQUAL and UNEMP. HIGHQUAL is negatively related to net loss on assets and UNEMP is positively related to net loss on assets, in the whole sample and in the crisis period. Neither variable is significant in the post-crisis period. This finding indicates that net losses on assets are greater if the industry is in distress and general

economic conditions are poor. These findings are plausible because when poor industry and economic conditions exist, it becomes increasingly difficult to find viable bidders causing the FDIC to make higher concessions when it finds one. Acharya, Bharath, and Srinivasan (2007) make similar observations for corporate bankruptcies and argue that recovery rates are lower when the industry of the failed firms is in distress.

**INSERT TABLE 4 HERE**

Turning to the remaining coefficient estimates we observe that they yield important information on the sources of value creation in banking firms. Factors that indicate a lower asset quality, such as non-performing assets, other real estate owned, and uncollected income lead to a higher net loss on assets. Insider loans (INSIDER), our proxy for fraud, significantly increase net loss on assets in all cases. Larger branching networks (BRANCHRATIO), which we use as a proxy for the ability to generate core deposits, also are associated with lower net loss on assets. In contrast, brokered deposits (BROKER) lead to a higher net loss on assets. This finding is consistent with the argument that the use of high-cost brokered deposits leads to poor asset quality choice and hence asset values upon failure are lower. Furthermore, as shown in Table 3, institutions with brokered deposits are less likely to be resolved using a private-sector reorganization. It is possible that bidders consider banks with brokered deposits to have a lower franchise value and therefore are less likely to submit a viable bid.

In terms of asset size, the net loss on assets ratio increases at a decreasing rate with asset size. We further analyze the size-effect in our robustness section below.

In Table 5, we estimate our treatment model including an indicator variable that takes the value of one if the failed bank is resolved during the crisis period and zero if it is resolved during the post-crisis period. We observe that this indicator variable, called CRISIS, is positive and significant in the probit estimation shown in column (1). The coefficient 0.604 implies a 21.57 percent higher probability that a bank would be resolved using a private-sector reorganization method during the crisis period.[22] Hence, liquidation is less likely during a crisis.

On the loss side, we observe in column (2) of Table 5 that net loss on assets are significantly higher in the crisis period once we have controlled for the resolution method used. If a failed bank that is resolved during the post-crisis period were resolved during the crisis period, the net loss as a percent of assets would have been 3.232 percentage points higher. Given that the average net loss on assets ratio is 21.42 percent, 3.232 percent appears to be economically significant.

**INSERT TABLE 5 HERE**

## VI. Robustness Checks

To check the robustness of our results we first test whether the variables used to identify the selection are not correlated with the net loss on assets. We currently use the number of business establishments in the state (LOGESTABLISH) and the ratio of personal income in the state of the failed bank to U.S. personal income (PIRATIO) as instruments to model the resolution method. The reasoning behind these instruments is

[22] The 21.57 is the marginal effect which is the discrete change in the probability when the dummy variable changes from 0 to 1 and the other variables are evaluated at their means.

that, after controlling for the resolution method, these variables are unlikely to affect the loss on assets. However, these variables can affect the attractiveness of the bank franchisee to a potential buyer, and hence the amount the buyer is willing to pay for the bank. In turn, this may affect the loss on assets. Thus, the instruments may not satisfy the exclusion restriction.

To test whether the instruments are uncorrelated with the net loss on assets we include these variables in both the resolution method equation and the loss equation. In the net loss on assets equation, the instruments LOGESTABLISH and PIRATIO are not significant, which indicates that it is reasonable to exclude the instruments from the loss equation and include the instruments in the second stage regression.

We present further robustness checks in Table 6. First, we report the maximum likelihood estimates of the treatment models on net loss on assets investigated in Table 4. Panel A of Table 6 shows the coefficient estimate of RESMETHOD. We find that, in the crisis period, private-sector reorganizations do not inherently result in a lower loss on assets. The likelihood ratio rejects the hypothesis that two error terms between equation (1) and (2) are uncorrelated, and therefore we conclude that the OLS estimates are biased.

Next, we vary the cutoff points that we use to classify the resolution as an FDIC liquidation or a private-sector reorganization. Panel B of Table 6 shows the coefficient on RESMETHOD in the treatment regression on net loss on assets. When we use a zero percent cutoff, only 74 of the institutions are considered to be resolved using an FDIC liquidation. We observe an interesting result. In this case the private-sector reorganization is significantly more expensive in the full sample and in the crisis period. However, as we define FDIC liquidations to include more institutions by changing the threshold for assets

passed, the differences gradually decline in the full sample. In contrast, we observe that private-sector reorganizations are not significantly more costly in the post-crisis period. Furthermore, as the group of private-sector reorganizations reflects a higher percentage of assets remaining in the private sector the loss on assets for private-sector reorganizations are lower, although not statistically significantly so, than FDIC liquidations in the crisis period. These results are consistent with the conclusions that we drew for our results in Table 4.

The other robustness check pertains to an alternative way to model the nonlinearity between net loss on assets and the failed banks' asset size. We assign institutions to small, medium and large size categories. Small institutions have less than $500 million in assets, medium institutions are those that have between $500 million and $1 billion in assets, and large institutions are those that have more than $1 billion in assets. Panel C in Table 6 presents the coefficients on the medium and large-size dummy variables from the net loss on assets equations where we treat small institutions as the baseline case. We observe that the coefficient for the medium-size bank dummy variable is positive and significant but for large banks it is negative in the whole sample and the crisis period. This finding implies that initially the net loss on assets increased with size but as the size gets very large it falls. The size categories were not statistically significant in the crisis period. Again, this result is consistent with those in Table 4.

As another robustness check, we lag our instruments in the resolution method regression by a year. We show the coefficient for the RESMETHOD in Panel D of Table 6. Our results prove robust to this change.

**INSERT TABLE 6 HERE**

We undertake a series of other robustness checks, which we do not report here.[23] First, we investigate whether or not grouped institutions have a different cost structure. Toward this end, we introduce a dummy variable for grouped institutions in our regressions. Alternatively, we exclude grouped institutions and estimate our regressions for this subgroup. In both cases, the resulting coefficients on RESMETHOD qualitatively remain unchanged.

We also investigate the possible effects of interstate banking legislation changes at the state level. Using the dates identified by Kroszner and Strahan (1999) we add a variable to our regression model that indicates whether a failure occurred when interstate banking was allowed by state banking regulations. The coefficient assigned to RESMETHOD remains robust to this specification.

We also investigate whether the composition of the loans of the failed bank matters. Specifically, we introduce the percentage breakdown of use the commercial, residential real estate, and construction loans (as a percent of total assets) as regressors in the first and second stage regressions. Our results pertaining to resolution method remain unchanged.

## VII. Conclusion

In this paper, we contrast James' (1991) "differential cost hypothesis" to Shleifer and Vishny's (1992, 2001) "industry distress" hypothesis to explain the cost differences between private-sector and liquidation resolution structures. We argue that to properly

[23] The results are available upon request.

compare cost structures among these resolution methods the selection bias that is inherent in private-sector resolutions needs to be properly controlled.

To sort out the cost differences, we compare the loss on assets for liquidations to the losses from selling all or a material part of the failed bank to the private-sector for reorganization. After we control for the characteristics of the failed bank that affects the outcome of the resolution process, we find that a private-sector reorganization does not result in any lower losses in the crisis period of 1986 to 1991. This finding contrasts with previous studies that argued that private-sector reorganizations result in lower costs (Bovenzi and Murton (1988), James (1991), Brown and Epstein (1992)).

This observation has further implications. Private-sector reorganizations include premium payments to the FDIC for the franchise value of the deposits they assume. However, in FDIC liquidations the franchise value is destroyed. So, private-sector reorganizations should have some cost advantage. We find that costs of private-sector reorganizations are significantly higher, which implies that the private-sector reorganization was an inherently cost-ineffective resolution method in the banking crisis period of 1986 to 1991. When we focus on the post-crisis period of 1992 to 2007, we find that private-sector reorganization are inherently more cost effective than FDIC liquidations even after we control for the selection bias embedded in the resolution process. We take these observations as supporting evidence for Shleifer and Vishny (1992, 2011). During the post-crisis period concerns about liquidity in the deposit insurance fund seldom emerged. This change allowed the FDIC more flexibility in the types of resolutions they were able to pursue. Also, the industry was relatively healthy over our sample during the post-crisis period, which resulted in a higher number of viable

bidders and more competition for failed bank assets. Both the additional flexibility afforded by high levels of liquidity and greater competition for failed-bank assets resulted in bids on failed bank assets that were advantageous to the FDIC. We should note that the post-crisis period overlaps with the period in which the enactment of FDICIA brought a new regime for bank resolutions, including a least cost test and changes to failed bank marketing strategies, which may have contributed to lower costs. Because we are unable to disentangle the two effects, we cannot attribute the cause of the finding entirely to the change in industry conditions.

We find that the net loss on assets as a ratio to assets at failure for a bank that fails during a crisis period results is 3.232 percentage points higher than if that same bank failed during a non-crisis period. Given that the average net loss on assets ratio is 21.42 percent, this finding appears to be economically significant.

These findings have implications for institutions that pose systemic risk. To date, the public policy discussion of the systemic risk premium has focused on the quantification of systemic risk to calculate an appropriate premium. Our evidence provides a quantitative support for imposing the charge. We find that a bank that fails during a crisis results in higher costs to the deposit insurance fund and other creditors than if the same bank failed during a non-crisis period. As a result, financial institutions whose failure contributes significantly to industry distress by increasing the probability of failure for non-systemic institutions also increase their loss given failure. Our results imply that, in addition to the higher probability of failure, the incremental losses imposed on the industry during crisis periods should be considered when setting the systemic risk premium.

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**Appendix A**

**Panel A: Variable Descriptions**

| Variable Name | Description | Source |
|---|---|---|
| RESMETHOD | 1 if assets passed to the acquirer is greater than 25 percent of book value of assets at failure, 0 otherwise | Failure Transactions Database, FDIC General Ledger |
| PASSRATIO | Assets passed to the acquirer as a percent of the book value of assets at failure | Failure Transactions Database, FDIC General Ledger |
| NETLOA | Net loss on assets, discounted, as a percent of assets at failure | FDIC General Ledger |
| DIRECTRATE | Direct expenses, discounted as a percent of assets at failure | FDIC General Ledger |
| NPA | Non-performing assets as a percent of book value of assets at failure | Call Report, Schedule RC-N, FDIC General Ledger |
| ORE | Owned real estate as a percent of book value of assets at failure | Call Report, Schedule RC, Line 7, FDIC General Ledger |
| EARNEDINC | Income earned but not collected, quarter before failure as a percent of asset at failure | Call Report, Schedule RC-C, Item 11, FDIC General Ledger |
| INSIDER | Loans to insiders, quarter before failure, as a percent of assets at failure | Call Report, Schedule RC-M, 1.a., FDIC General Ledger |
| BROKER | Brokered deposits, quarter before failure, as a percent of assets at failure | Call Report, Schedule RC-E, Item M1.b., FDIC General Ledger |
| BRANCHRATIO | Total number of offices operated by an institution divided by the number of branches in the state | FDIC Structure Database |
| ASSET | Total Assets, millions $ | FDIC General Ledger |
| LOGASSET | Log of total assets at failure | FDIC General Ledger |
| LOGASSETSQ | Log of total assets at failure, squared | FDIC General Ledger |
| UNEMP | Unemployment rate in the state of the failed bank in the quarter of failure, seasonally adjusted | Bureau of Labor Statistics |
| HIGHQUAL | Assets held by institutions rated CAMELS 1 or 2 as a percent of assets held by all institutions in the state and quarter of failure | Call Report, FDIC Failure Transactions Database |
| LOGESTABLISH | Log of the number of business establishments in the same state and year as the failed bank | U.S. Census Bureau |
| PIRATIO | Personal income in state of failed bank as a percent of U.S. personal income in quarter of failure | Bureau of Economic Analysis |
| CRISIS | 1 if the date of failure is before January 1, 1992, 0 otherwise | |

**Panel B: Descriptive Statistics**

Variables are in percent except RESMETHOD, LOGASSET, LOGASSETSQ, LOGESTABLISH and PREFDICIA.

| | Number | Mean | Standard Deviation | Minimum | First Quartile | Median | Third Quartile | Maximum |
|---|---|---|---|---|---|---|---|---|
| RESMETHOD | 1,092 | 0.73 | 0.45 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| PASSRATIO | 1,092 | 52.43 | 32.44 | 0.00 | 21.40 | 58.99 | 79.74 | 100.00 |
| NETLOA | 1,092 | 21.42 | 13.93 | -14.14 | 11.19 | 19.96 | 30.07 | 93.98 |
| DIRECTRATE | 1,092 | 3.53 | 2.11 | 0.09 | 2.06 | 3.44 | 4.74 | 12.70 |
| NPA | 1,092 | 14.77 | 9.89 | 0.00 | 7.99 | 13.00 | 19.24 | 71.72 |
| ORE | 1,092 | 5.51 | 5.45 | 0.00 | 1.81 | 4.32 | 7.63 | 58.68 |
| EARNEDINC | 1,092 | 1.21 | 0.84 | 0.00 | 0.68 | 0.98 | 1.45 | 6.58 |
| INSIDER | 1,086 | 1.30 | 2.58 | 0.00 | 0.02 | 0.42 | 1.63 | 41.34 |
| BROKER | 1,092 | 3.22 | 9.52 | 0.00 | 0.00 | 0.00 | 0.03 | 96.39 |
| BRANCHRATIO | 1,092 | 0.26 | 1.27 | 0.01 | 0.02 | 0.07 | 0.14 | 27.38 |
| ASSET | 1,092 | 183.70 | 1,421.20 | 1.36 | 5.90 | 24.40 | 50.60 | 32,927.50 |
| LOGASSET | 1,092 | 10.30 | 1.29 | 7.21 | 9.46 | 10.10 | 10.83 | 17.31 |
| LOGASSETSQ | 1,092 | 107.83 | 29.06 | 52.03 | 89.57 | 102.08 | 117.34 | 299.63 |
| UNEMP | 1,092 | 7.03 | 1.63 | 2.67 | 6.10 | 6.83 | 7.90 | 19.44 |
| HIGHQUAL | 1,092 | 51.91 | 21.42 | 2.35 | 36.03 | 45.97 | 66.78 | 99.84 |
| LOGESTABLISH | 1,090 | 12.08 | 0.96 | 9.56 | 11.36 | 12.02 | 12.89 | 13.57 |
| PIRATIO | 1,090 | 4.13 | 3.35 | 0.16 | 1.30 | 2.97 | 6.10 | 13.39 |
| CRISIS | 1,092 | 0.84 | 0.37 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 |

## Appendix B
## Discounting Gains and Losses

To determine the discounted value of losses, we can express the discounted value of the loss on assets ($LOA_0$) as:

$$LOA_0 = BVA_0 - \sum_{t=1}^{T} \frac{LVA_t}{(1+r_t)^t} \tag{A1}$$

where the appropriate risk-free rate is $r_t$, and $BVA_0$ is the book value of assets at time 0 and $LVA_t$ is the liquidation value of assets at time t. However, we do not have data on these values separately. Instead, we have the gain or loss on asset in each period associated with the period t assets that were liquidated ($BVA_t$ - $LVA_t$). Therefore, we can re-write equation (A1) as follows:

$$LOA_0 = \sum_{t=1}^{T} \left[ BVA_t - \frac{LVA_t}{(1+r_t)^t} \right] \tag{A2}$$

We re-arrange equation (A2) and add and subtract $\sum_{t=1}^{T} \frac{BVA_t}{(1+r_t)^t}$ to arrive at the following:

$$LOA_0 = \sum_{t=1}^{T} \frac{BVA_t - LVA_t}{(1+r_t)^t} + \sum_{t=1}^{T} \frac{((1+r)^t - 1)BVA_t}{(1+r_t)^t} \tag{A3}$$

The first term in equation (A3) is the discounted value of the accounting loss (or gain) on the assets at time *t*. The second term reflects the opportunity cost, or carrying cost, for the assets in liquidation. As we can observe, if we simply discount the gain (or loss) on assets in each period, we would underestimate the present value of the discounted losses.

Replacing the sum of the loss on assets in equation (2) with the discounted value ($LOA_0$) together with the premiums and discounted values of expenses we obtain the discounted value of resolution costs.

We use the following procedure for discounting. We match a Treasury yield curve to each failure based on the month that the bank failed and then fit a cubic spline to each yield curve to calculate a yield for each month along the yield curve. We use these smoothed yields to discount each of the monthly cash flows.

The net loss on assets (NETLOA) used in the regressions is the loss on assets (LOA) defined above adjusted for the following items:

- Premium paid to or received from the acquirer,
- Net income or loss form assistance agreements,
- Net loss sharing expenses that arise from agreements between the receivership and acquirer,
- Interest and fees that are earned on assets in liquidation during the resolution process,
- Other miscellaneous income, and
- The interest paid to the FDIC by the receivership.

**Table 1**
**Resolution Types**

Source: Failure Transactions Database and FDIC General Ledger
We exclude assistance transactions from the total number of failures.
The sample includes all BIF-Insured banks that failed between 1986 and 2007 and were inactivated before December 2004. The sample also includes three institutions that failed in or before 1991 that were still active as of 2007. The sample excludes Meriden Trust and Safe Deposit Bank and Private Bank and Trust because they did not make loans or take deposits.
FDIC=Less than 25 percent of the assets are passed to an acquirer, Private Sector=25 percent or more of the assets are passed to an acquirer
IDT=Insured Deposit Transfer;
P&A=Purchase and assumption; PA=P&A all deposits or unable to determine if all or insured deposits
PI=P&A insured deposits; PO=Payout

**Panel A: BIF and DIF Insured Failures, 1986-2007**

| | | | | Deposit Payoff | | P&A | | |
|---|---|---|---|---|---|---|---|---|
| **Year of Failure** | **Total** | **FDIC** | **Private Sector** | **IDT** | **PO** | **PA** | **PI** | **Whole Bank** |
| 1986 | 138 | 32 | 106 | 19 | 21 | 98 | 0 | 0 |
| 1987 | 184 | 48 | 136 | 40 | 11 | 115 | 0 | 18 |
| 1988 | 200 | 29 | 171 | 30 | 6 | 96 | 0 | 68 |
| 1989 | 206 | 37 | 169 | 23 | 9 | 132 | 0 | 42 |
| 1990 | 168 | 42 | 126 | 12 | 8 | 106 | 0 | 42 |
| 1991 | 124 | 37 | 87 | 17 | 4 | 80 | 0 | 23 |
| 1992 | 120 | 42 | 78 | 14 | 11 | 45 | 42 | 8 |
| 1993 | 41 | 17 | 24 | 0 | 5 | 6 | 30 | 0 |
| 1994 | 13 | 7 | 6 | 2 | 0 | 4 | 7 | 0 |
| 1995 | 6 | 3 | 3 | 1 | 0 | 0 | 5 | 0 |
| 1996 | 5 | 2 | 3 | 0 | 0 | 2 | 3 | 0 |
| 1997-2007 | 39 | 20 | 19 | 0 | 4 | 9 | 22 | 4 |
| Total | 1,244 | 316 | 928 | 158 | 79 | 693 | 109 | 205 |

**Panel B: Sample**

| | | | | Deposit Payoff | | P&A | | |
|---|---|---|---|---|---|---|---|---|
| **Year of Failure** | **Total** | **FDIC** | **Private Sector** | **IDT** | **PO** | **PA** | **PI** | **Whole Bank** |
| 1986 | 138 | 32 | 106 | 19 | 21 | 98 | 0 | 0 |
| 1987 | 184 | 48 | 136 | 40 | 11 | 115 | 0 | 18 |
| 1988 | 200 | 29 | 171 | 30 | 6 | 96 | 0 | 68 |
| 1989 | 206 | 37 | 169 | 23 | 9 | 132 | 0 | 42 |
| 1990 | 168 | 42 | 126 | 12 | 8 | 106 | 0 | 42 |
| 1991 | 123 | 36 | 87 | 17 | 3 | 80 | 0 | 23 |
| 1992 | 116 | 41 | 75 | 14 | 11 | 45 | 40 | 6 |
| 1993 | 39 | 16 | 23 | 0 | 5 | 6 | 28 | 0 |
| 1994 | 12 | 7 | 5 | 1 | 0 | 4 | 7 | 0 |
| 1995 | 6 | 3 | 3 | 1 | 0 | 0 | 5 | 0 |
| 1996 | 4 | 2 | 2 | 0 | 0 | 2 | 2 | 0 |
| 1997-2007 | 17 | 5 | 12 | 0 | 0 | 7 | 7 | 3 |
| Total Sample | 1,213 | 298 | 915 | 157 | 74 | 691 | 89 | 202 |
| Sample as a Percent | 97.5% | 94.3% | 98.6% | 99.4% | 93.7% | 99.7% | 81.7% | 98.5% |

**Panel C: Grouped Sample**

| | | | | Deposit Payoff | | P&A | | |
|---|---|---|---|---|---|---|---|---|
| **Year of Failure** | **Total** | **FDIC** | **Private Sector** | **IDT** | **PO** | **PA** | **PI** | **Whole Bank** |
| 1986 | 138 | 32 | 106 | 19 | 21 | 98 | 0 | 0 |
| 1987 | 184 | 48 | 136 | 40 | 11 | 115 | 0 | 18 |
| 1988 | 160 | 29 | 131 | 30 | 6 | 56 | 0 | 68 |
| 1989 | 164 | 37 | 127 | 22 | 9 | 91 | 0 | 42 |
| 1990 | 160 | 41 | 119 | 12 | 8 | 98 | 0 | 42 |
| 1991 | 113 | 36 | 77 | 17 | 3 | 70 | 0 | 23 |
| 1992 | 95 | 41 | 54 | 14 | 11 | 32 | 32 | 6 |
| 1993 | 39 | 16 | 23 | 0 | 5 | 6 | 28 | 0 |
| 1994 | 12 | 7 | 5 | 1 | 0 | 4 | 7 | 0 |
| 1995 | 6 | 3 | 3 | 1 | 0 | 0 | 5 | 0 |
| 1996 | 4 | 2 | 2 | 0 | 0 | 2 | 2 | 0 |
| 1997-2007 | 17 | 5 | 12 | 0 | 0 | 7 | 7 | 3 |
| Total Sample | 1,092 | 297 | 795 | 156 | 74 | 579 | 81 | 202 |

**Table 2**

**Univariate Analysis**

*=Significantly different from Post-Crisis at the 90 percent confidence level; **=95 percent confidence level; ***=99 percent confidence level.

+=Significantly different from Private Sector Reorganization at the 90 percent confidence level; ++=95 percent confidence level; +++=99 percent confidence level;

Variables are in percent except LOGASSET, LOGASSETSQ, LOGESTABLISH.

**Panel A: Crisis, FDIC Liquidation**

| | Number | Mean | | Median | |
|---|---|---|---|---|---|
| NETLOA | 223 | 29.52 *** | +++ | 28.77 *** | +++ |
| PASSRATIO | 223 | 9.06 | +++ | 8.06 | +++ |
| NPA | 223 | 15.73 * | | 13.54 * | |
| ORE | 223 | 5.83 | | 4.09 | |
| EARNEDINC | 223 | 1.47 *** | +++ | 1.17 *** | ++ |
| INSIDER | 222 | 1.48 *** | | 0.70 *** | |
| BROKER | 223 | 4.87 | +++ | 0.00 | ++ |
| ASSET | 223 | 68.85 ** | | 22.00 *** | |
| LOGASSET | 223 | 10.16 *** | | 10.00 *** | |
| LOGASSETSQ | 223 | 104.90 *** | | 99.98 *** | |
| UNEMP | 223 | 6.90 *** | | 6.77 *** | |
| HIGHQUAL | 223 | 47.34 *** | + | 41.17 *** | ++ |
| LOGESTABLISH | 223 | 12.03 *** | | 12.00 | |
| BRANCHRATIO | 223 | 0.17 | | 0.07 | |
| PIRATIO | 223 | 4.02 *** | | 2.85 | |

**Panel B: Crisis, Private Sector Reorganization**

| | Number | Mean | Median |
|---|---|---|---|
| NETLOA | 696 | 21.09 *** | 20.01 *** |
| PASSRATIO | 696 | 69.26 ** | 69.56 |
| NPA | 696 | 15.20 *** | 13.82 *** |
| ORE | 696 | 5.39 | 4.40 |
| EARNEDINC | 696 | 1.24 *** | 1.03 *** |
| INSIDER | 692 | 1.41 *** | 0.45 |
| BROKER | 696 | 2.78 | 0.00 |
| ASSET | 696 | 205.30 | 21.55 *** |
| LOGASSET | 696 | 10.21 *** | 9.98 *** |
| LOGASSETSQ | 696 | 105.80 ** | 99.57 *** |
| UNEMP | 696 | 6.95 | 6.70 *** |
| HIGHQUAL | 696 | 49.85 *** | 45.43 *** |
| LOGESTABLISH | 695 | 12.03 * | 12.01 |
| BRANCHRATIO | 696 | 0.29 | 0.07 ** |
| PIRATIO | 695 | 3.76 *** | 2.98 |

**Panel C: Post-Crisis, FDIC Liquidation**

| | Number | Mean | | Median | |
|---|---|---|---|---|---|
| NETLOA | 74 | 16.71 | +++ | 15.30 | +++ |
| PASSRATIO | 74 | 8.75 | +++ | 8.15 | +++ |
| NPA | 74 | 13.17 | + | 11.03 | +++ |
| ORE | 74 | 6.07 | | 4.39 | |
| EARNEDINC | 74 | 0.79 | | 0.69 | ++ |
| INSIDER | 74 | 0.61 | | 0.05 | + |
| BROKER | 74 | 4.64 | ++ | 0.00 | |
| ASSET | 74 | 141.60 | | 51.24 | ++ |
| LOGASSET | 74 | 11.01 | | 10.84 | ++ |
| LOGASSETSQ | 74 | 122.60 | | 117.60 | ++ |
| UNEMP | 74 | 8.10 | +++ | 8.48 | +++ |
| HIGHQUAL | 74 | 61.10 | ++ | 62.40 | ++ |
| LOGESTABLISH | 73 | 12.49 | + | 12.56 | |
| BRANCHRATIO | 74 | 0.14 | | 0.07 | |
| PIRATIO | 73 | 6.96 | +++ | 4.80 | |

**Panel D: Post-Crisis, Private Sector Reorganization**

| | Number | Mean | Median |
|---|---|---|---|
| NETLOA | 99 | 9.06 | 8.74 |
| PASSRATIO | 99 | 64.50 | 63.17 |
| NPA | 99 | 10.78 | 8.92 |
| ORE | 99 | 5.19 | 4.25 |
| EARNEDINC | 99 | 0.75 | 0.57 |
| INSIDER | 98 | 0.69 | 0.22 |
| BROKER | 99 | 1.56 | 0.00 |
| ASSET | 99 | 321.30 | 33.28 |
| LOGASSET | 99 | 10.75 | 10.41 |
| LOGASSETSQ | 99 | 118.10 | 108.40 |
| UNEMP | 99 | 7.11 | 7.43 |
| HIGHQUAL | 99 | 69.86 | 71.09 |
| LOGESTABLISH | 99 | 12.21 | 11.97 |
| BRANCHRATIO | 99 | 0.34 | 0.08 |
| PIRATIO | 99 | 4.91 | 2.77 |

## Table 3
## Resolution Method Choice

Probit regression with robust standard errors. The dependent variable is 1 if the amount of assets passed is greater than or equal to 25 percent of the book value of assets at failure and 0 otherwise.
The coefficients of the probit regression are reported and the absolute value of the t-statistics are in parentheses.
Dummies for the year of failure are included in the regression but the coefficients are not reported here.
* Indicates can reject the null hypothesis that the coefficient is zero at the 90th percent confidence interval.
**=95th percent confidence interval; ***=99th percent confidence interval.

| | | Crisis | Post-Crisis |
|---|---|---|---|
| | (1) | (2) | (3) |
| NPA | -0.001 | 0.000 | -0.001 |
| | (0.14) | (0.09) | (0.09) |
| ORE | -0.010 | -0.011 | -0.011 |
| | (1.19) | (1.22) | (0.52) |
| EARNEDINC | -0.248*** | -0.251*** | -0.208 |
| | (4.04) | (4.01) | (1.07) |
| INSIDER | 0.004 | 0.001 | 0.196* |
| | (0.25) | (0.06) | (1.72) |
| BROKER | -0.014*** | -0.012** | -0.031* |
| | (3.04) | (2.52) | (1.66) |
| BRANCHRATIO | 0.288* | 0.215* | 2.830*** |
| | (1.96) | (1.85) | (3.01) |
| LOGASSET | 0.541 | 0.742* | 0.186 |
| | (1.44) | (1.92) | (0.14) |
| LOGASSETSQ | -0.026 | -0.033* | -0.024 |
| | (1.51) | (1.91) | (0.38) |
| UNEMP | -0.034 | -0.023 | -0.147 |
| | (1.01) | (0.63) | (1.07) |
| HIGHQUAL | 0.768*** | 0.614** | 1.184* |
| | (3.03) | (2.17) | (1.69) |
| LOGESTABLISH | 0.526*** | 0.450*** | 0.876** |
| | (4.59) | (3.28) | (2.38) |
| PIRATIO | -0.155*** | -0.137*** | -0.152** |
| | (5.00) | (3.38) | (2.02) |
| Constant | -8.516*** | -8.339*** | -9.681 |
| | (3.16) | (3.08) | (1.04) |
| Number of Obs. | 1,084 | 914 | 170 |
| Pseudo-R Squared | 0.083 | 0.052 | 0.213 |

**Table 4**
**Net Loss on Assets**

Column (1) presents OLS regression results with robust standard errors. The dependent variable is the net loss on assets as a percent of total assets at failure (NETLOA).
The coefficients of the OLS regression are reported and the absolute value of the t-statistics are in parentheses.
Dummies for the year of failure are included but the coefficients are not reported here.
* Indicates can reject the null hypothesis that the coefficient is zero at the 90th percent confidence interval.
**=95th percent confidence interval; ***=99th percent confidence interval.

| | OLS | Treatment | Crisis | Post-Crisis |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| RESMETHOD | -6.178*** | 9.977** | 15.939* | -9.544** |
| | (7.16) | (2.02) | (1.94) | (2.05) |
| NPA | 0.226*** | 0.226*** | 0.231*** | 0.222*** |
| | (6.03) | (6.03) | (5.52) | (4.30) |
| ORE | 0.496*** | 0.533*** | 0.586*** | 0.342*** |
| | (8.91) | (7.11) | (6.21) | (2.58) |
| EARNEDINC | 3.820*** | 5.063*** | 5.885*** | 1.276 |
| | (6.69) | (7.71) | (6.52) | (1.21) |
| INSIDER | 0.466*** | 0.402*** | 0.399** | 1.477** |
| | (3.67) | (2.60) | (2.22) | (2.13) |
| BROKER | 0.213*** | 0.294*** | 0.303*** | 0.196** |
| | (3.11) | (5.99) | (4.83) | (2.09) |
| BRANCHRATIO | -1.233*** | -1.834*** | -1.983*** | -0.985 |
| | (2.59) | (3.60) | (3.10) | (1.07) |
| LOGASSET | 6.686** | 4.560 | 2.300 | 5.290 |
| | (2.52) | (1.44) | (0.55) | (1.05) |
| LOGASSETSQ | -0.269** | -0.176 | -0.061 | -0.268 |
| | (2.32) | (1.24) | (0.33) | (1.22) |
| UNEMP | 1.520*** | 1.742*** | 1.789*** | -0.086 |
| | (5.40) | (5.67) | (4.80) | (0.13) |
| HIGHQUAL | -0.115*** | -0.147*** | -0.157*** | -0.050 |
| | (5.34) | (5.97) | (5.13) | (1.22) |
| Constant | -17.715 | -15.783 | -28.276 | 5.145 |
| | (1.18) | (0.82) | (1.30) | (0.17) |
| Lambda | | -9.796*** | -13.559*** | 2.902 |
| | | (3.34) | (2.83) | (1.01) |
| Number of Obs. | 1,086 | 1,085 | 914 | 171 |
| Adjusted R-Squared | 0.432 | | | |
| Wald Statistic | | 627.339 | 358.205 | 146.731 |

## Table 5
## Resolution Method and Net Loss on Assets

The coefficients of the OLS regression are reported and the absolute value of the t-statistics are in parentheses.
* Indicates can reject the null hypothesis that the coefficient is zero at the 90th percent confidence interval.
**=95th percent confidence interval; ***=99th percent confidence interval.

| | Probit<br>Resolution Method<br>(1) | Treatment<br>Net Loss on Assets<br>(2) | OLS<br>Net Loss on Assets<br>(3) |
|---|---|---|---|
| RESMETHOD | | 12.624** | -5.701*** |
| | | (2.46) | (6.58) |
| NPA | 0.000 | 0.236*** | 0.234*** |
| | (0.03) | (5.36) | (6.59) |
| ORE | -0.011 | 0.577*** | 0.234*** |
| | (1.34) | (7.37) | (6.59) |
| EARNEDINC | -0.208*** | 4.966*** | 3.774*** |
| | (3.77) | (7.94) | (7.43) |
| INSIDER | 0.005 | 0.419** | 0.490*** |
| | (0.33) | (2.56) | (3.50) |
| BROKER | -0.014*** | 0.323*** | 0.232*** |
| | (3.11) | (6.29) | (3.21) |
| BRANCHRATIO | 0.268** | -1.976*** | -1.323*** |
| | (1.96) | (3.67) | (2.88) |
| LOGASSET | 0.423 | 3.800 | 5.609** |
| | (1.18) | (1.15) | (2.27) |
| LOGASSETSQ | -0.020 | -0.152 | -0.237** |
| | (1.28) | (1.02) | (2.19) |
| UNEMP | -0.012 | 1.486*** | 1.301*** |
| | (0.42) | (5.26) | (5.73) |
| HIGHQUAL | 0.820*** | -14.768*** | -11.241*** |
| | (3.59) | (6.25) | (5.53) |
| LOGESTABLISH | 0.519*** | | |
| | (4.75) | | |
| PIRATIO | -0.156*** | | |
| | (5.29) | | |
| CRISIS | 0.604*** | 3.232* | 7.731*** |
| | (4.62) | (1.81) | (7.39) |
| Constant | -7.618*** | -29.822* | 7.731*** |
| | (3.14) | (1.65) | (7.39) |
| Lambda | | -11.141*** | |
| | | (3.66) | |
| Number of Obs. | 1,085 | 1,085 | 1,086 |
| Adjusted R-Squared | | | 0.405 |
| Pseudo R-Squared | 0.072 | | |
| Wald Statistic | | 515.772 | |

## Table 6
## Robustness Checks

The null hypothesis for the likelihood ratio (LR) test in Panel A is that the two equations are independent.
In Panel B the reported coefficients are on RESMETHOD and the absolute value of the t-statistic is in parentheses.
All regressions includes time dummies, with the exception of those in Panel C.

* Indicates can reject the null hypothesis that the coefficient is zero at the 90th percent confidence interval. **=95th percent confidence interval; ***=99th percent confidence interval.

| | Treatment | Crisis | Post-Crisis |
|---|---|---|---|
| | (1) | (2) | (3) |
| **Panel A: Maximum Likelihood Estimates for Net Loss on Assets** | | | |
| RESMETHOD | -0.822 | -2.168 | -15.063*** |
| Lambda | -3.373 | -2.907 | 6.328 |
| LR Test | 3.86* | 2.07 | 9.07*** |
| **Panel B: Cutoff Points on Assets Passed** | | | |
| 0% | 19.716*** | 13.281* | -3.078 |
| | (3.97) | (1.93) | (0.79) |
| 10% | 18.493*** | 20.088** | -5.865 |
| | (3.42) | (2.41) | (1.14) |
| 50% | 11.955*** | 18.477* | -5.438 |
| | (2.70) | (1.96) | (1.18) |
| **Panel C: Size Cutoffs** | | | |
| Medium | 4.172** | 5.662*** | -3.161 |
| | (2.48) | (2.62) | (1.40) |
| Large | -2.818 | -1.797 | -3.318 |
| | (1.10) | (0.52) | (1.05) |
| **Panel D: Lagged Instruments** | | | |
| RESMETHOD | 9.334* | 14.785* | -9.482** |
| | (1.93) | (1.87) | (2.03) |