Government guarantees and bank vulnerability during the Financial Crisis of 2007 – 09: Evidence from an Emerging Market

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We analyze the performance of banks in India during 2007-09 to study the impact of government guarantees on bank vulnerability to a crisis. We find that vulnerable private-sector banks performed worse than safer banks; however, the opposite was true for state-owned banks. To explain this puzzling result we analyze deposit and lending growth. Vulnerable private-sector banks experienced deposit withdrawals and shortening of deposit maturity. In contrast, vulnerable state-owned banks grew their deposit base and increased loan advances, but at cheaper rates, and especially to politically important sectors. These results are consistent with greater market discipline on private-sector banks and lack thereof on state-owned banks which can access credit cheaply despite underperforming as they have access to stronger government guarantees and forbearance.

The global financial crisis of 2007 – 09 saw the widespread use of government guarantees to protect failing banks. While these guarantees keep markets well-

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functioning during stress times, they may induce banks to take excessive risks (Cordella and Yeyati (2003), Flannery (1998), Gorton and Huang (2004) and Gropp, Vesala and Vulpes (2004)). The empirical literature on government guarantees, however, has focused until recently on the ex-ante impact of government guarantees. It still remains unclear how these guarantees distort bank behavior and outcomes during *crisis* periods. One difficulty in analyzing the impact of government guarantees is also accounting for the counterfactual, that is, how would the absence of such guarantees impact bank behavior and outcomes? India with its mix of state-owned banks or public sector banks (PSBs) and private sector banks provides one ideal setting to explore this question. While state-owned banks in India are explicitly guaranteed by the government, private sector banks are not.

We examine the impact of government guarantees on banks in India during the global financial crisis of 2007–09. We look at ex-ante heterogeneity in bank vulnerability to a market-wide shock, using a stock market-based measure of aggregate risk of a bank for the period preceding the crisis (January 2007 to December 2007). Then, separately for private sector banks and public sector banks, we analyze during the financial crisis in 2008–09 the relationship between ex-ante bank vulnerability and (i) realized stock returns; (ii) deposit flows and corresponding deposit rates; (iii) loan advances and corresponding loans rates; and, finally, (iv) loan performance in the after-math of the crisis.

As a first step to determine the role played by government guarantees, we relate ex-ante measures of bank vulnerability to realized stock performance during the crisis. Our bank vulnerability measure, Marginal Expected Shortfall (MES) — proposed by Acharya et al. (2010) — captures the tail dependence of the stock return of a financial firm on the downside of the market as a whole. It estimates,

in a given past period (say one year preceding a crisis), for the worst 5 percent days of the market or the financial sector index, the negative of the average market return of a given financial firm. The greater the MES, the more vulnerable is the firm to aggregate downturns. The question then is whether more vulnerable PSBs as measured by ex-ante MES fared better or worse than private sector banks with similar risk. We find that more vulnerable private sector banks had worse stock returns during the crisis as would be expected during crisis periods. In contrast, more vulnerable PSBs had *higher* stock returns compared to less risky PSBs.

We hypothesize that it was the presence of explicit and implicit government guarantees that helped riskier public sector banks outperform private sector banks, and examine deposit growth and maturity to investigate this hypothesis. We find that deposit base growth of banks explains the cross-sectional variation in stock performance during the crisis period. While private sector banks with higher ex-ante bank vulnerability experienced deposit contractions during the crisis, riskier PSBs managed to grow their deposits.[1] This is contrary to what a pure flight-to-quality story would suggest under which safer PSBs should have grown deposits more than riskier PSBs. To understand this, we study deposit rates and find that PSBs were likely increasing deposit rates during the crisis in order to attract these deposit flows.[2]

[1]Anecdotal evidence supports this hypothesis. Following the credit crisis and the subsequent fall of Lehman, many depositors shifted capital out of private and foreign banks and moved it to government banks. For example, Infosys (a large Indian multinational corporation) transferred nearly Rs.10 billion of deposits from ICICI to SBI just after Lehman's collapse in the third quarter of 2008 ("Deposits with SBI zoom past Lehman collapse", April 7, 2009. http:articles.economictimes.indiatimes.com2009-04-07news27639025_1_private-banks-bank-deposits-deposit-base). As direct evidence of government support during the crises period, the government issued a directive ordering public sector enterprises (firms other than banks) to move their surplus funds to public sector banks ("FM for parking of surplus funds with PSBs", Economic Times, November 11, 2008. http:articles.economictimes.indiatimes.com2008-11-11news28423229_1_sector-banks-psu-banks-surplus-funds).

[2]During this period, PSBs started raising their deposit rates in order to attract these deposits and the finance ministry directed the public sector firms from asking for competi-

One could argue that the increase in deposit base for public sector banks is good for the economy as a whole since they may be more willing to advance loans to the real economy resulting in much needed credit in times of recession. We do indeed find that riskier public sector banks increased lending during the crisis. However, PSBs increased lending in those sectors and to those firms that receive greater political backing, namely the priority sector (agriculture and small businesses) and state-owned firms. Further, PSBs did not increase their lending rates to account for the higher costs in borrowing (higher deposit rates). Furthermore, crisis time lending has an impact on subsequent loan performance. Riskier private sector banks tightened lending during the crisis and as a result had to restructure fewer loans in the period 2008 to 2015 following the crisis. In contrast riskier private sector banks tightened lending during the crisis and as a result had to restructure fewer loans in the period following the crisis. Riskier PSBs — which increased lending but not at higher loan rates — had to restructure more loans in the aftermath of the crisis.

These lending results are consistent with prior findings that bank lending for state-owned banks tends to be less responsive to macroeconomic shocks, thereby stabilizing availability of credit in the economy. Micco and Panizza (2006) find that lending behavior is smoother through business cycles for state owned banks. Their identification strategy, however, is not able to resolve which of the two channels results in this lower cyclicality in lending for state owned banks credit smoothing by the state or poor incentives and "lazy" bank managers results in this lower cyclicality in lending for state-owned banks. Sapienza (2004) finds that state owned banks in Italy lend at lower rates in Southern Italy which is

tive bids "to stop undesirable competition among banks to prevent arbitrary hikes in deposit rates" ("Deposit funds with public sector banks, PSUs told", Business Line, November 11, 2008. http:www.thehindubusinessline.comtodays-paperdeposit-funds-with-public-sector-banks-psus-toldarticle1641219.ece)

poorer, but is politically important. Lending behavior is also affected by the party to which the state-owned bank is affiliated. Our results are also consistent with Bonin, Hasan and Wachtel (2013) who look at central Europe and the former Soviet Union. They document that state-owned banks in the early 1990s experienced repeated banking crises and banks needed frequent recapitalization without any subsequent change in lending behavior. However, it was only with the advent of private and foreign sector banks that banks began to lend more prudently.

Section I presents the institutional details and time-line of the crisis in India. Section II presents our empirical hypotheses. Section III looks at the impact of government guarantees on stock performance of public and private sector banks. Section IV and Section V look respectively at the impact on deposit growth and bank lending. Section VI and Section VII study respectively loan performance and capital injections in the crisis and post-crisis period. Section VIII concludes. Robustness results are presented in Appendix C.

I. Crisis of 2008 and Institutional details

A. Crisis of 2008

In 2008, the global financial crisis hit India with the Indian stock market losing more than 60 percent of its peak valuation. Figure 1 shows that the stock market index — S&P CNX NIFTY index — declined sharply, starting January 2008. Index prices fell from a peak of 6,288 in January 2008 to 2,524 in October 2008, representing a decline of nearly 60 percent. Another market index — the BSE index — similarly fell nearly 59 percent from 20,873 in January 2008 to 8,510 in October 2008. Starting 2008, foreign institutional investors (FIIs) facing a liquidity squeeze from abroad, started pulling out capital from India. In 2008–09, FIIs withdrew nearly Rs. 43,337 crores (approximately $9-10 billion). This eventu-

ally resulted in a money market and credit squeeze which spilled over into the real economy.[3] The global slowdown also resulted in a slump in demand for exports. This impact was felt economy-wide and Indian GDP fell from 9 percent in 2007 to nearly 6.1 percent in 2008. Eventually, the government of India, fearing an even rapid deterioration of the economy, announced wide-ranging stimulus packages in 2009 that appeared to temporarily restore the economy back to its pre-2008 growth.

B. Indian Banking during the Crisis and Institutional Details

Historically, Indian banks have been wholly owned by the government. In the 1990's, after economic liberalization, the government reduced its stake and allowed private sector banks and foreign players to enter the market. The Indian financial system still has substantive public sector ownership and as of March 2009 accounted for nearly 71.9 percent of aggregate assets. The Indian Bank Nationalization Act provides an explicit guarantee that all obligations of public sector banks will be fulfilled by the Indian government in the event of a failure.

Although bank deposits are covered by deposit insurance, coverage provided by the Deposit Insurance and Credit Guarantee Corporation (DICGC) in India for bank deposits is limited. The DIGGC covers only Rs.100,000 (approximately $2000) per depositor per bank. It does not cover interbank deposits and deposits outside India. Further, the uncertainty and delay in processing deposit insurance claims make deposit insurance only partially effective.[4] Since deposit insurance is only partially effective, implicit and explicit government backing for public sector banks is also considered an important factor for deposit growth during

[3]Duvvuri Subbarao,"Impact of the Global Financial Crisis on India Collateral Damage and Response", Feb 18, 2009.http:www.rbi.org.inscriptsBS_SpeechesView.aspx?Id=410

[4]Iyer and Puri (2012) analyze a bank run at an Indian co-operative bank and find that deposit insurance is only partially effective in preventing runs. They find that even depositors within the insurance limit but with larger deposit balances are likely to run.

crises periods.

Barring a few hiccups, the Indian banking sector proved to be reasonably robust during the financial crisis of 2007–09 when fragility of the financial sector, especially in U.S. and Europe, exacerbated economic shocks into severe recessions. The relative outperformance of the Indian banking sector had been attributed by some to high government regulation which prevents banks and financial firms from taking excessive risks. As we will show below, despite the relative overall strength of Indian banks, performance of public sector banks was strikingly different from private sector banks during the crisis. We conjecture that the relative underperformance of private sector banks in the crisis despite their superior pre-crisis risk-return profile is instead attributable to the implicit and explicit sovereign backing of public sector banks. Private sector banks argued in 2007 – 09 that the deposit insurance coverage limit had remained the same while incomes had been steadily increasing in the preceding years. In fact, private sector banks believed that the sovereign guarantees that PSBs enjoy were responsible for the flight of funds from private sector banks to public sector banks during the crisis.[5]. A panel set up by the central bank (RBI) suggested raising the deposit insurance coverage to Rs.500,000 (approximately $8000).[6]

II. Empirical Analysis

A. Testable Hypothesis

In Appendix A, we motivate our empirical approach with a simple model. We hypothesize that government guarantees increase franchise values of riskier protected banks relative to unprotected banks during crises periods. Additionally, we

[5]"Pvt banks want deposit insurance cap hiked", Business Line, January 17, 2009. http:www.thehindubusinessline.inbline20090117stories2009011751460600.html

[6]"RBI panel for raising deposit insurance cover to Rs. 500000", Live Mint, Aug 3, 2011, http:www.livemint.comPoliticsN7f0UFvTrLmHCJ2KJ2YGkORBI-panel-for-raising-deposit-insurance-cover-to-Rs500000.html

derive implications for the difference in franchise values of riskier PSBs relative to safer PSBs, and relative to this difference for unprotected private sector banks.

Here we summarize the intuition for the setup and its empirical implications. In our model, banks fail only due to an idiosyncratic shock in the absence of a systemic crisis. However, in the case of an idiosyncratic shock, banks are not government guaranteed and hence there is no difference between private and public sector banks. In the event of an aggregate crisis, a private sector bank with high exposure to the crisis will lose its market share of deposits which translates into lower cashflows, which are captured by the remaining banks, namely all the public sector banks and the safer (low MES) private sector banks. While only the safe private sector banks survive an aggregate crisis unscathed, all PSBs survive regardless of their ex-ante exposure to aggregate risk as they enjoy government guarantees regardless of whether they are high or low MES.

We parameterize the split in the capture of market share from vulnerable private sector banks between safer banks (low MES private sector banks and low MES PSBs) and the risky banks (high MES PSBs) with the parameter ϕ. Intuitively, a low ϕ implies that the high MES public sector banks are able to attract a higher share of the demand for deposits from the failing private sector bank. Let ΔV^{PSB} represent the difference in value between the high MES and low MES public sector banks. ΔV^{Pvt} is analogously defined.

Our simple model which captures the differential effect of government guarantees on banks based on their vulnerability to a crisis yields the following testable predictions:

1) As the probability of the aggregate crisis increases, ΔV^{Pvt} *decreases* for private sector banks

2) As the probability of the aggregate crisis increases, ΔV^{PSB} *increases* for

public sector banks if government guarantees are strong for all PSBs, i.e., only if $\phi < 0.5$.

The intuition for the above two predictions is as follows. First, since private sector banks do not have explicit government guarantees, the riskier private sector banks will perform worse than the less risky private sector banks.

To get the second prediction we need that public sector banks have government guarantees in a crisis. Since only public sector banks are guaranteed during the crisis, there should be a flight of deposits from the private sector banks to the public sector banks. This would be consistent with a "flight-to-quality" story. However, this would not necessarily generate our empirical finding that riskier PSBs have higher deposit growth during the crisis compared to safer PSBs. For this to be true, we also need that $\phi < 0.5$. That is, risky PSBs need to actively attract deposits away from the failing risky private sector banks. This would be true if, say, riskier PSBs gamble and manage to attract deposits away from surviving banks — for example, by increasing their deposit rates — in effect, exploiting or receiving greater value from government guarantees compared to safer PSBs.

Hypotheses

We will now describe our empirical methodology. To test the hypotheses of how depositors and market investors react differently to public and private sector banks, we run the regression specifications below.

HYPOTHESIS 1: *Riskier public sector banks, i.e. banks with higher aggregate risk exposure, had higher returns during the crisis compared to less risky PSBs. Analogously, riskier private sector banks had lower returns compared to less risky private sector banks.*

To test this hypothesis, we run the following regression:

$$
\begin{aligned}
&Crisis\ Return_{i,t+1} \\
&\qquad = PSB + Pvt + \beta^{PSB}_{CrisisReturn} * MES * PSB \\
&\qquad + \beta^{Pvt}_{CrisisReturn} * MES * Pvt + \gamma^{PSB}_{CrisisReturn} * X * PSB \\
&\qquad + \gamma^{Pvt}_{CrisisReturn} * X * Pvt + e_{i,t}
\end{aligned} \tag{1}
$$

where MES is our measure of ex-ante bank vulnerability to a crisis, dummy variable Pvt is 1 if the bank is a private sector bank and PSB is 1 if the bank is a public sector bank. X includes all the control variables. We are interested in the coefficient $\beta^{PSB}_{CrisisReturn}$ and $\beta^{Pvt}_{CrisisReturn}$. From our hypothesis, we conjecture that $\beta^{PSB}_{CrisisReturn} > 0$ and $\beta^{Pvt}_{CrisisReturn} < 0$.[7]

HYPOTHESIS 2: *Higher crisis return during the crisis is related to higher deposit growth for public sector banks with higher risk exposure to a crisis but lower deposit growth for public sector banks with lower risk exposure. In contrast, riskier private sector banks have lower deposit growth compared to private sector banks with lower risk exposure.*

[7]Note this is equivalent to the following regression:

$$Crisis\ Return_{i,t+1} = \alpha + \beta_0 * PSB + \beta_1 * MES + \beta_2 * MES * PSB + \gamma_0 * X + \gamma_1 * X * PSB + e_{i,t}$$

We use the representation in Equation 1 for easy interpretation of coefficients.

To test this hypothesis we run the following regression:

$$
\begin{aligned}
&Deposit\ Growth_{i,t+1} \\
&\qquad = PSB + Pvt + \beta^{PSB}_{DepositGrowth} * MES * PSB \\
&\qquad + \beta^{Pvt}_{DepositGrowth} * MES * Pvt + \gamma^{PSB}_{DepositGrowth} * X * PSB \\
&\qquad + \gamma^{Pvt}_{DepositGrowth} * X * Pvt + e_{i,t}
\end{aligned} \tag{2}
$$

From our hypothesis, we conjecture that $\beta^{PSB}_{DepositGrowth} > 0$ and $\beta^{Pvt}_{DepositGrowth} < 0$.

B. Measure of Bank Vulnerability

We use the Marginal Expected Shortfall (MES) measure (Acharya et al. (2010)) to measure the ex-ante vulnerability of public and private sector banks to an aggregate crisis. The MES measure captures the tail dependence of the stock return of a financial firm on the market as a whole. The strength of the measure lies in its ability to predict which firms are likely to be affected the worst when a financial crisis materializes, as demonstrated by Acharya et al. (2010) in their analysis of the systemic risk of large U.S. financial institutions around the financial crisis of 2007–09.

Specifically, MES estimates the expected losses of a stock conditional on a crisis. Since extreme tail events such as a mild financial crisis happen once a decade and severe crisis such as the Great Depression or the Great Recession only once in several decades, the practical implementation of MES relies on "normal" tail events. We use the normal tail events as the worst 5 percent market outcomes at daily frequency over the pre-crisis period. In our analysis, we take the 5 percent worst days for the market returns as measured by the S&P CNX NIFTY index in any given measurement period, and then compute the negative of the average return for any given bank for these 5 percent worst days. The MES measure can

also be interpreted as the contribution of each firm to the systemic risk in the event of a crisis. As such, MES is a statistical measure but Acharya, Pedersen, Philippon and Richardson (2010a) provide a theoretical justification for it in a model where the financial sector's risk-taking has externalities on the economy whenever the sector as a whole is under-capitalized. Our results are also robust to other measures of risk (see Appendix C on robustness checks).

C. Data

We look at all publicly listed public (state-owned) and private sector banks in India. Of the 50 public and private sector banks, for which the Reserve bank of India (RBI) provides annual deposit flow data, 38 banks (excluding Industrial Development Bank of India(IDBI)) are publicly listed of which 21 are PSBs and 17 are private sector banks. Table C10 in the appendix shows the MES measures for public and private sector banks using January 2007 to December 2007 as the measurement period. It also lists pre-crisis and crisis period measurements of beta, global beta, volatility, leverage, MES and pre-crisis returns. MES as described above is the marginal expected shortfall of a stock given that the market return is below its 5^{th} percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. Beta is based on the S&P CNX NIFTY index as the market return. Global beta is based in the MSCI World Index returns. Volatility is the annualized daily volatility in the pre-crisis period from January 2007 to December 2007. Crisis period measurements included in this analysis are crisis returns and deposit growth. Crisis return is the stock return for the individual banks during the crisis period from January 2008 to February 24, 2009. RBI provides the balance sheet data reported annually for each fiscal year ending March. Hence, we calculate the deposit growth for the crisis period from

data provided by RBI for the period from 31st March, 2008 to 31st March, 2009. Growth in loan advances is also calculated for the same period using RBI data.

III. Government guarantees: Impact on Stock returns

Table C1 in the Appendix provides the summary statistics for all 38 banks (21 PSBs and 17 private sector banks) in our analysis. The significant loss of value for the bank stocks during the crisis as suggested by the average realized return of -65.5 percent indicates how trying this period was for the Indian banking industry as a whole. Average MES value measured in the pre-crisis period was 4.0 percent. What is important for our analysis is whether a ranking of firms based on the normal-time MES works well during the crisis.

Table C1 in the Appendix shows that average MES value is higher for public sector banks (4.14 percent) compared to private sector banks (3.83 percent). That is, public sector banks had on average negative 4.14 percent returns on the days the market return (S&P CNX NIFTY) was below its 5th percentile for the pre-crisis period from January 2007 to December 2007.

In Figure 3 Panel A we plot stock returns during the crisis against ex-ante bank vulnerability as measured by MES. MES is able to explain a significant proportion of realized returns for both private sector banks(R^2 of 29.70%) and PSBs (R^2 of 46.10%) during the crisis. Private sector banks with higher MES were worse hit during the market-wide downturn. Riskier PSBs, however, had higher stock returns during the crisis. In the absence of guarantees — as in the case of private sector banks — banks with higher ex-ante bank vulnerability should perform worse during the crisis. We conjecture in Hypothesis 1 that government guarantees may have helped riskier PSBs perform better during the crisis.

We next run the regression specification in Equation 1. Table 1 shows the results of this regression with *Realized Return* as the dependent variable. From

column 2, $\beta^{Pvt}_{CrisisReturn}$ indicated by the coefficient for $Pvt * MES$ is negative and significant. A 1 percent increase in MES is associated with a 6.62 percent decline in stock returns during the crisis. Riskier private sector banks performed worse than other private sector banks with lower ex ante exposure to systemic risk. In contrast β^{PSB}_{MES}, the coefficient for $PSB * MES$ interaction term, is positive and significant. A 1 percent increase in MES resulted in a 6.13 percent *increase* in stock returns for public sector banks. Contrary to the unprotected private sector banks, public sector banks with greater ex-ante bank vulnerability outperformed less risky public sector banks.

One could argue that the riskier PSBs were merely the largest banks and thus what we are capturing is merely an implicit too-big-to-fail guarantee. In column 3 we control for the size of the bank using *Log Assets*. Asset value is the quasi-market value of assets measured as the difference in book value of assets and book value of equity added to the market value of equity. *Log assets* can also be thought of as controlling for a too-big-to-fail guarantee. From column 3, we see that the larger banks performed better during the crisis. Since the coefficient on the interaction term with *Log Assets* is positive, we are assured that the negative $\beta^{PSB}_{CrisisReturn}$ cannot be driven by a too-big-to-fail guarantee for the larger PSBs.[8] The pooled regression with both MES and *Log assets* show similar results though with slightly lower magnitudes for the coefficients in both bank categories.

Columns 5–7 of Table 1 look at the impact of government guarantees on stock returns as the crisis deepened. On December 8, 2008, the government of India announced bailout packages.

[8]Since public sector banks tend to be on average larger than private sector banks (see Table C1) we cannot fully rule out that a too-big-to-fail guarantee played a role. Our model in Appendix A allows for any type of implicit or explicit guarantee. A too-big-to-fail guarantee combined with these banks aggressively going after deposits will yield the results in this paper. All we need to account for is that the riskiest banks were also not the biggest banks and the results for *Log assets* show that our results are robust to this argument.

Based on this we divide the crisis into three sub-periods: pre-bailout (January 2008 to December 8, 2008), bailout (2 week period following the announcement from December 8, 2008 to December 22, 2008), and post-bailout (December 23, 2008 to February 24, 2009). From Table 1 we see that before the bailout announcement, riskier public sector banks had higher returns whereas riskier private sector banks had lower returns, potentially because the market expected the government to step in only if a public sector bank failed. After the announcement of the bailout, however, both risky public and private sector banks had higher returns. Since the announcement of capital infusion in public sector banks coincided with the announcement of a fiscal package, the market appears to have priced in that private sector banks would also receive funding after the announcement date December 8th, 2008. This would also be true if the market believed that the fiscal package was substantial and would help the economy as a whole. Post-bailout, specifically after the two week period following the bailout announcement, the relationship reverted to "normal", that is, the coefficient for the interaction term with MES was negative for both public and private sector banks, but is significant for only PSBs.

In this section we documented the heterogeneity in crisis stock returns for private and public sector banks and that bailouts appear to play a role in driving the heterogeneity. In the next section we explore whether this heterogeneity can be more directly attributed to riskier PSBs growing their deposits at a higher rate compared to private sector banks.

IV. Impact on deposits

Our hypothesis is that riskier public sector banks had higher stock returns during the crisis since they were able to attract deposits away from private sector banks possibly, actively so — as against a passive flight-to-quality effect — by

increasing deposit rates. We first look at deposit growth and then provide evidence for deposit rates.

A. Growth in deposits

Growth in deposits for public sector banks was strikingly different from private sector banks during the crisis. While the banking sector as a whole experienced a slowdown in deposit growth, private sector banks were affected to a larger extent (see Figure 2). RBI estimates that public sector banks grew deposits by 26.9 percent during the crisis (March 2008 to March 2009) compared to 23.1 percent a year earlier. In comparison, for private sector banks deposit growth slowed from 22.3 percent to a mere 9.1 percent for the same period. The summary statistics for the 38 banks used in our analysis — excluding banks which are not publicly listed — also showed similar patterns (see Table C1).

Figure 3 Panel B relates deposit growth during the crises to ex-ante bank exposure to systemic risk as measured by MES. While riskier private sector banks had lower deposit growth, riskier public sector banks had higher deposit growth during the crisis. A flight-to-quality story can only explain deposits moving from private sector banks to public sector banks. Depositors should penalize banks with greater ex-ante bank vulnerability and move money from the riskier banks, which are likely to fail during a crisis, to banks with lower vulnerability. We conjecture (Hpothesis 2) that, instead, government backing of public sector banks distorts bank behavior during aggregate crisis. Riskier public sector banks with government guarantees attract more depositors.

To test this hypothesis we run the regression specification of Equation 2 with the dependent variable, $Deposit\ growth$, measured for the crisis period from January 2008 to February 2009 (see Table 2). For public sector banks, the coefficient for the interaction term $MES * PSB$ is positive and significant. For private sector

firms, the coefficient for the interaction term $MES * Pvt$ is negative and significant (column 1). A 1 percent increase in ex-ante bank vulnerability (MES) is associated with a 1.44 percent *increase* in deposit growth for public sector banks. A one percent increase in MES for private sector banks resulted in a 9.07 percent *decrease* in deposit growth during the crisis.

As in Section III, *Log Assets* can be thought of as controlling for asset size or a too-big-to-fail guarantee. The positive coefficients for *Log Assets* for public sector banks assures us that we are not inadvertently capturing a too-big-to-fail guarantee effect. This coefficient is insignificant for private sector banks.

The goal in this section is to also link our findings in Section III on stock performance during the crisis to deposit growth. In column 4 we explicitly test this link by looking at deposit growth against realized returns. Regression of deposit growth against realized returns shows that, in line with our hypothesis, both public and private sector banks with higher realized returns during the crisis had higher deposit growth.

Paralleling our analysis on event returns in Section III on pre-bailout, bailout and post-bailout trends, we would like to see the patterns in deposit growth as the crisis progressed. Since RBI publishes only aggregate data for deposit growth at the quarterly frequency, we analyze deposit growth as the crisis deepened only at the aggregate level. The data is for all 50 public and private sector banks in India (as opposed to the 38 publicly listed banks that are used in our analysis).

Figure 2 (bottom-right panel) shows that initially when the crisis hit India in 2008, both public and private sector banks had similar deposit growth rates (10 percent in Q1 2008). As the crisis worsened, the disparity between public and private sectors is evident. Public sector bank deposits grew by (1.7 percent, 5.5 percent, 5.2 percent) compared to a much lower growth rates of (0.0 percent,

1.0 percent, -0.3 percent) for private sector banks in (Q2, Q3, Q4) of 2008. Towards the end of the crisis both sectors posted relatively higher growth rates of 12 percent for the public sector and 8.2 percent for the private sector. This trend is consistent with our findings in Section III. In the pre-bailout period, explicit guarantees for public sector banks resulted in higher crisis returns for riskier public sector banks. Towards the end of the crisis, stock returns returned to their pre-crisis patterns as one would expect during "normal" times.

Does this flow of deposits revert back once the crisis is over? We hypothesize that the cross-sectional differences in deposit growth for public and private sector banks occurs only during an aggregate crisis, since it is only during a crisis that government guarantees become important. When the economy is doing well and the possibility of a bailout is remote, the downside protection for pubic sector banks is essentially immaterial. Thus, deposit growth for both risky public and private sector banks should show the same pattern in normal times.[9]

Columns 4–6 in Table 2 confirm this intuition. Deposit growth is for the two year period from March 2008 to March 2010. The negative coefficient for the interaction term $MES * Pvt$ for private sector banks disappears. Instead the coefficient is positive but insignificant for private sector banks and positive and significant (2.49) for public sector banks. These results point to another interesting fact: crisis time guarantees result in a permanent shift in deposits from private to public sector banks. Deposits gained by public sector banks during the crisis do not revert in the period following the crisis suggesting crisis time guarantees have long-term effects on bank health.[10]

[9] In our model in Section A, we explicitly make the assumption that government guarantees play no role in the idiosyncratic state. There is no asymmetry between public and private sector banks in this non-crisis state and government guarantees play no role.

[10] This is consistent with Iyer and Puri (2012) who find that depositors that run on the Indian bank in their analysis do not return back to the bank once the bank run is over.

B. Deposit rates

Indirect evidence

Why did depositors move deposits to the riskier public sector banks and not to the safer PSBs? Did risky public sector banks increase their deposit rates to attract deposits? Ideally, we would like to look at individual deposit-level data and see whether banks did indeed increase deposit rates during the crisis. However, since RBI does not provide this information, we exploit heterogeneity in government regulation of deposits rates across deposits of different types to test the link between deposit rates and growth in deposits. We first provide evidence exploiting this heterogeneity. We supplement this analysis by also providing evidence from average bank-level deposit rate data.

Deposits can be classified into a) demand deposits; b) savings bank deposits; and, c) term deposits. Demand deposits which account for 11 percent of all deposits are short maturity deposits and are withdrawable on demand. Saving deposits accounting for 20 percent of all deposits are a form of demand deposit and are subject to restrictions on withdrawals. Term deposits which account for the majority (69 percent) of all deposits are for a fixed period typically longer than maturity of demand deposits. One important distinction between these different types of deposits is that while banks can set deposit rates for demand deposits and term deposits, savings deposit rates are heavily government regulated. We exploit this difference in regulation between deposits to determine whether banks increased deposit rates to attract deposits.

Demand deposits grew on average at a slightly higher 7.71 percent for private sector banks compared to 7.47 percent for public sector banks (See Table C2 in Appendix). Average growth rate for term deposits was higher for PSBs (28.8 percent) compared to private sector banks (21.4 percent). This difference is con-

sistent with the thesis that depositors perceived private sector banks to be riskier and shifted deposits to the lower maturity demand deposits whereas for PSBs depositors shifted to the higher maturity term deposits, consistent with a flight to safety story.

Table 3 shows our regression results for Equation 2 for the different categories of deposits. Demand deposit growth for private sector banks is higher for banks with higher MES. This is consistent with firms/depositors shifting away from term deposits (longer maturity) deposits at riskier private banks to demand deposits (shorter maturity). On breaking down demand deposits further into interbank and corporate/retail deposits (Panel B), we see that the relationship is stronger for corporate and retail deposits and weaker for inter-bank deposits. In contrast, for PSBs the relationship between MES and demand deposit growth is weak as public sector banks did not experience a similar shortening of deposit maturity.

In Panel A, column 2 for growth in term deposits we see the familiar result — riskier public sector banks had higher deposit growth whereas riskier private sector banks had lower deposit growth. Further, this effect is driven by corporate and retail deposits (Column 4, Panel B). Interbank term deposits (Column 3, Panel B) do not show the same pattern. Troubled banks would like to borrow the most in a crisis at longer maturities e.g. by offering greater term deposit rates. Inter-bank lending tends to be at short end, and we see weaker relationship in these shorter-term maturities.

Savings bank deposits growth (Column 3, Panel A) does not exhibit the positive relation with MES for public sector banks. In fact for savings deposits, the coefficient for the $MES * PSB$ interaction term is negative and insignificant for both public and private sector banks. Since savings deposit rates are set by the

government of India, the riskier public sector banks cannot increase their deposit rates to attract deposits. Thus, the relationship for deposit growth with MES is the same for both public and private sector banks as one would expect in the absence of banks changing their deposit rates. Aggregate savings deposit growth, however, is higher for public sector banks (16.6 percent) compared to private sector banks (15.2 percent) which would be consistent with a flight-to-quality story (see Table C2 in the appendix).

Additionally, column 4 in Panel A looks at deposits within India. Banks can set deposit rates only for deposits within India whereas deposits rates for deposits outside India are regulated by the RBI. Consistent with our hypothesis, deposits for branches within India show the positive and significant coefficient for the $MES * PSB$ interaction term for PSBs and negative and significant coefficient for $MES * Pvt$ for private sector banks. For deposits outside India (not shown), this relationship does not exist.

Some direct evidence

We now turn to average bank-level deposit rate data to show that banks did indeed increase their deposit rates as the crisis progressed. We have maximum and minimum deposit rates only at the bank level and not disaggregated at the individual deposit level. Short-term deposits are term deposits with maturity less than three years and long-term deposits have maturities greater than three years. This data is not publicly available and has been provided to us by RBI for each bank at the quarterly frequency beginning only March 2008. We use the average of the maximum and minimum as the deposit rate for each bank in each quarter.

Figures C2 and C3 in the appendix provide the change in deposit rates for short-term maturities and long-term maturities for each quarter of the crisis plotted again ex-ante bank vulnerability, MES. We see an interesting trend as the

crisis progressed. Between June 2008 to September 2009, deposit rates fell for risky private sector banks and *increased* for riskier PSBs. This effect is more evident for the long-term deposits (Figure C3, top-right). It is only towards the end of the crisis that PSBs were in fact cutting deposit rates. Again, this effect is more evident for long-term maturities (Figure C3, bottom-right).[11]

Table C3 in the appendix confirms our results with formal regressions. In the regressions, we drop data points which were likely not updated. That is, we drop data points where quarter-on-quarter changes were zero. From Panel A we see that riskier private sector banks likely did not significantly change deposit rates for short-term maturities. Riskier public sector banks on the other hand decreased deposit rates in the beginning (Panel A, column 1) and towards the end of the crisis (Panel A, column 4). This is consistent with the previous section where we found that riskier PSBs did not have significant deposit growth for the short-term maturities. In Panel B (column 2), however, as the crisis deepened in Q3 2008, riskier PSBs *increased* deposit rates for long-term maturities from June 2008 to September 2008. Towards the end of the crisis, riskier PSBs started decreasing their deposit rates (Panel B, column 4) for long-term maturities too.

Our analysis in this section shows that deposits shifted from private sector banks to public sector banks in the crisis period. We also provided some direct and indirect evidence that riskier public sector banks managed to attract deposits, possibly, by increasing deposit rates.

V. Impact on bank lending

We now examine whether the increased flow of deposits into public sector banks translated into an increased flow of credit to the real economy. We find that

[11]Note, however, due to the poor quality of data, many of the changes in deposit rates are zero especially for changes between March 2008 and June 2008 and between September 2008 and December 2008.

credit did indeed grow at a higher 21.6 percent for public sector banks compared to a lower 16.2 percent for private sector banks during the crisis (see Table C1 in the Appendix).

There are several reasons why state-owned banks may not cut back on lending during crises periods. One argument is that risky public sector banks are socially maximizing and thus increase lending during crises periods and are thus helpful in maintaining credit flow in the economy during crises periods. Alternatively a "lazy banking" theory suggests that state-owned bank managers have lower incentives to lend prudently and thus react less to economy-wide shocks. In contrast, a political economy view suggests that political pressure leads to banks lending during crises but may also result in funding of inefficient investments. Both the social motive and the political motive result in greater lending and subsequently higher investment. The difference, however, is that in the former, state-owned banks invest in projects which are welfare maximizing whereas in the latter the state-owned banks invest in inefficient projects based on political motives. To see which of the above motives were responsible for increased lending by banks, we turn to the data. We examine the impact of crisis time guarantees on both the amount of lending and on bank lending rates.

A. Bank lending

Table 4, column 1 indicates that riskier public sector banks did indeed increase lending during the crisis. A 1 percent increase in ex-ante bank vulnerability as measured by MES is associated with a 1.73 percent increase in lending.

Column 2–4 show growth in bank lending across different sectors, namely, (i) advances to priority/public sector firms; (ii) advances to banks; and a catch-all category (iii) other. Priority sector includes agriculture and small businesses. Our results indicate that while risky public sector banks increased lending during the

crisis, most of this credit was directed to the priority and the public sector — both politically important sectors.[12] Column 2 shows that a 1 percent increase in ex-ante bank vulnerability, *MES*, for public sector banks leads to a 3.95 percent increase in lending. Riskier private sector banks on the other hand, did not significantly increase lending to these politically important sectors. However, the coefficient on the dummy variable *Pvt* in column 4 seems to suggest that other lending increased on average by 0.49 percent for private sector banks compared to a relatively lower 0.27 percent for public sector banks.

B. Lending rates

In Section IV we established that risky public sector banks experienced an increased inflow of deposits possibly by increasing their deposit rates. In this section, we examine whether this higher cost of funding — higher deposit rates — translated into higher lending rates on loans for public sector banks.

Table 4, Panel B shows that riskier private sector banks had significantly higher lending rates throughout the crisis period in Q1 2008, Q2 2008, Q3 2008, Q4 2008 and Q1 2009 respectively. Riskier public sector banks which raised their deposit rates and had higher borrowing costs, however, did not have similar higher lending rates. Table 4, column 5 shows that lending rates were in fact significantly *lower* for riskier PSBs in Q1 2009 as the coefficient on the interaction term for $MES * PSB$ indicates. Column 6 looks at the change in lending rates from the beginning of the crisis, Q1 2007 to the end of the crisis, Q1 2009. Riskier public sector banks decreased lending rates after the onset of the crisis.

Riskier public sector banks potentially did not care about higher deposit rates

[12]Following a fall in priority sector lending in 2007–08, the Minister of Finance Chidambaram asked state-owned banks to increase lending to priority sector ("PSB lending to priority sector dips in 07–08", Financial Express, May 10, 2008. http:www.financialexpress.comnewspsb-lending-to-priority-sector-dips-in-0708307485/1).

eating into their profit margins because in the worst case they would be bailed out by the government. But one could argue that the effect of higher deposit rates is not so severe since consumers and the real economy benefit in both cases — they get higher deposit rates, but at the same time they are not penalized with higher lending rates. We find, however, that public sector banks were lending mostly to the priority and public sectors which are of particular concern to the government. The findings in this section are consistent with the political economy view mentioned previously. While these political interests may result in increased lending, this might not necessarily be socially welfare maximizing as the politically motivated lending may result in inefficient investments. In the next section we look at the impact of this lack of market discipline on the long-term performance of loans.

VI. Loan Performance

We now look at non-performing assets (NPAs) and restructured loans in the aftermath of the crisis. RBI provides aggregate bank level data on NPAs and restructured loans reported annually during each fiscal year ending March. In India, loans are classified as NPA if a borrower misses payments for 90 days (or 180 days in some cases). Since it takes some time before loans are classified as NPAs or in some cases restructured, we look at performance of loans over a longer period, that is, from March 2008 to March 2012 (referred to as post-crisis in the exposition). We also include the crisis period March 2008 to March 2009 in our analysis since timelines to restructure or classify loans as NPAs may be much shorter (less than a year) for retail loans. We contrast crisis and post-crisis loan performance with that in the pre-crisis period from March, 2006 to March, 2008.

Figure 4 (left) shows average NPA to loan advances from March 2008 to March

2012 period. Following the crisis, the NPA to total loan advances did not increase dramatically for PSBs until 2011. NPA to loan advances ratio was relatively more stable for private sector banks throughout the period.

The left panel in Figure 5 plots average NPA to loan advances ratio from March 2008 to March 2012. The graph indicates that both riskier PSBs and private sector banks had higher NPA to loan advances following the crisis.[13]

Table 5 examines these effects in a regression analysis. *Crisis* is an indicator variable for March 2008 to March 2009. *Post* is an indicator variable for the period March 2008 to March 2012. First two columns in Table 5 indicate that there was no significant long-term effect on NPA to loan advances in the post-crisis period for public sector banks. On average, private sector banks showed a 0.77 percent reduction in the NPA to advances ratio (column 1), though there appears to be no cross-sectional heterogeneity within private sector banks with different ex-ante bank vulnerability (column 2).

The NPA reported by banks, however, may not fully capture the extent of deterioration in asset quality. It is possible that loans are restructured before even being classified as NPAs. We supplement our analysis by also looking at restructured loans. The right panel in Figure 4 shows the ratio of restructured loans to advances for public and private sector firms. For PSBs, restructuring increases from March 2008 till March 2010. There is a slight fall in restructured loans between March 2010 to March 2011, but rises again from March 2011 to March 2012. For private sector banks, restructuring of NPAs increased till March 2010, but there has been a sharp decline since then (see right panel, Figure C4 in the Appendix).

Panel B, Figure 5 plots total restructured loans between March 2009 to March

[13]The outlier, Central Bank of India has been dropped in this analysis.

2012 adjusted by advances as of the beginning of the period, March 2008. The x-axis shows ex-ante *MES* measured for the period January 2007 to December 2007 as in Section III. We see that private sector banks with greater ex-ante bank vulnerability had lower restructured loans. Regression results confirm these findings. Restructured loans increased from March 2008 to March 2012 (see columns 3–4 in Table 5). Between March 2008 to March 2012, public sector banks saw a 3.14 percent increase on average in restructured loans to advances (column 3). In comparison, private sector banks saw a lower 0.71 percent increase during the same period (column 3).[14] Column 4 shows that higher *MES* private sector banks had lower restructuring following the crisis. [15]

In Section V we saw that risky private sector banks cut back on lending and had higher lending rates during the crisis. This is reflected in lower restructured loans in the post-crisis period (March 2008 to March 2012) for private sector banks. Risky public sector banks which increased lending but did not have higher lending rates show an *increase* in the restructured loans in the crisis period (March 2008 to March 2009). These effects are mainly driven by restructuring of standard assets (column 5–8). Possibly, this may help explain why we did not see a significant increase in NPAs. Since loans were restructured by banks before they were even classified as NPAs, the NPA to advances ratio may not fully reflect the deterioration in asset quality.

[14]In Appendix C we also look at restructuring by type of loan and find that most of the restructuring effects are for standard assets, that is, loans not yet classified as non-performing assets. Additionally, we also look at performance of corporate and non-corporate restructured loans. We see that riskier private sector banks witnessed a significant lowering of non-corporate restructured loans in the post-crisis period. Riskier PSBs on the other hand, did not significantly decrease restructuring of non-corporate loans in the post-crisis period.

[15]Column 4 also shows that during the crisis higher *MES* PSBs also had higher restructuring however taking out the outlier Central Bank of India makes this coefficient insignificant.

VII. Capital Injections in Public Sector Banks

Next, we relate our results to the extent of capital support provided by the Indian government to the PSBs in the aftermath of the crisis. Since the sample of banks that received capital injections is small, we only provide a descriptive study. Evidence suggests that weaker PSBs received greater capital injections.

When the Indian government announced a number of wide-ranging stimulus plans to jumpstart the banking system, public sector banks were promised capital injections to help them maintain a CRAR (risk-adjusted capital ratio) of 12 percent. The government launched three fiscal stimulus packages during December 2008–February 2009. As part of the second stimulus package, the government recapitalized state-run banks and infused nearly Rs. 3,100 crores (approximately $0.5 billion) in 2008-09 as tier-I capital in a few public sector banks. In order to fulfill the funding gap, the government requested financing of Rs. 1,700 crores ($0.34 billion) from the World Bank in December 2008. Importantly, the timing and size of the capital injections was left up to the discretion of the government by the World Bank. Capital injections were to be determined based on public sector banks' ability to access equity markets, capital requirements for growth, and existing capital resources.[16]

Beginning December 2008 the government announced a number of capital injections for PSBs. In February 2009, the government announced capital injections in 3 PSBs, namely UCO Bank, Central Bank of India and Vijaya Bank. As part of the 2010-2011 budget, the government announced capital infusion in five PSBs namely IDBI Bank, Central Bank, Bank of Maharashtra, UCO Bank and Union Bank.

[16]See "India - First Banking Sector Support Loan Project", June 26, 2009. http://documents.worldbank.org/curated/en/2009/06/10746593/india-first-banking-sector-support-loan-project.

The amount of capital injections was determined based on PSB funding requirements and the need for a capital buffer. Thus PSBs which performed the worst during the crisis resulting in high capital depletion were more likely to receive support from the government. As of March 2009, all the banks mentioned above (except Union Bank) had Tier 1 capital less than 8 percent. The Tier 1 capital ratios for Bank of Maharashtra, Central Bank of India, UCO Bank, Union Bank of India, Vijaya Bank and IDBI Bank were at 6.1 percent, 7.0 percent, 6.5 percent, 8.2 percent, 7.7 percent and 6.8 percent, respectively. Based on the MES measure, these were also among the most vulnerable banks in our analysis. For example, IDBI had an MES of 6.67 percent, Union Bank of India had an MES 5.74 percent and Vijaya Bank had an MES of 5.27 percent. UCO had a relatively lower MES of 4.80 percent.

In summary, riskier public sector banks did receive greater ex-post government support. Such direct capital support was not provided to riskier private sector banks, consistent with our starting assumption.

VIII. Conclusion

In this paper, we attempt to explain the relatively strong performance of public sector banks in India compared to their private sector counterparts during the global financial crisis of 2007–09. While the global impact on the financial sectors had been severe, Indian financial banks were relatively more stable during the period. Much of this was credited to the public sector banks which lend stability during the crisis periods. Our analysis shows that while this may be true, public sector banks benefitted significantly from government guarantees. The state banking sector may have grown during the crisis at the expense of private banks. Measures taken by the government may have helped bolster PSBs but they also made it difficult for private sector banks to compete with them. The

resulting strength of PSBs in fact strengthened the resolve to persist with them. Our results strike a note of caution against drawing such conclusions. Examining performance of state-owned banks in an aggregate crisis relative to private sector banks that do not have as great an access to government guarantees is perhaps not a sound basis of assessing the overall attractiveness of state presence in the financial sector. At any rate, government bailouts — and investor and depositor anticipation of safety net for PSBs — seem to have deep consequences on competitive forces in the financial sector, potentially shaping their long-run form, and always stacking the odds against the flourishing of private banks.

Our findings are, in fact, consistent with the experience worldwide: financial institutions with greater access to government guarantees have survived the crisis or even expanded post-crisis while the ones without such access have failed or shrunk. A striking case in point has been the growth of the government-sponsored enterprises (Fannie Mae and Freddie Mac) and commercial banks in the United States - both sets of institutions with explicit government support and ready access to central bank emergency lending. These institutions expanded their holdings of mortgage-backed securities while investment banks and hedge funds deleveraged and sold these securities (He, Khang and Krishnamurthy (2010)). Fannie Mae and Freddie Mac were hardly the better-performing institutions in this crisis; they were in fact "guaranteed to fail" (Acharya et al. (Forthcoming)). Thus, even though access to government guarantees might be considered a source of financial stability during a crisis, justifying a greater presence of government institutions in the financial sector (or greater extent of government intervention in a crisis), our results suggest that this is likely associated with the misfortune of crowding out the private financial sector in the long run.

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Table 1—: Crisis returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Crisis Returns				Pre-bailout Returns	Bailout Returns	Post-bailout Returns
PSB	-0.63***	-0.88***	-1.79***	-1.51***	-2.11**	-0.03	-0.00
	(0.03)	(0.08)	(0.43)	(0.27)	(0.81)	(0.03)	(0.06)
Pvt	-0.69***	-0.43***	-1.22***	-0.90***	-0.16	-0.03	-0.15
	(0.03)	(0.10)	(0.16)	(0.15)	(0.30)	(0.04)	(0.09)
MES*PSB		6.13***		4.88***	25.58	2.78***	-4.78***
		(1.91)		(1.75)	(16.45)	(0.55)	(1.31)
MES*Pvt		-6.62**		-5.33**	-24.15***	3.52***	-2.45
		(2.54)		(2.25)	(8.45)	(1.09)	(2.27)
Log Assets*PSB			0.10**	0.06**			
			(0.04)	(0.02)			
Log Assets*Pvt			0.05***	0.04***			
			(0.01)	(0.01)			
N	38	38	38	38	38	38	38
Adj R-squared	0.967	0.979	0.975	0.982	0.835	0.819	0.839

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine stock performance and ex-ante bank vulnerability for public and private sector banks. Columns 1–4 show results for the dependent variable *Crisis return*. *Crisis return* is the actual stock return during the crisis calculated from 1st January, 2008 to 24th February, 2009. Ex-ante bank vulnerability is measured by *MES*. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5th- percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from 1st January, 2007 to 31st December, 2007. *Log Asset* is the natural logarithm of the book value of asset value measured as of March 31st, 2008. Columns 5–7 show results for realized returns over the crisis period broken into pre-bailout, bailout and post-bailout returns. Bank bailouts (capital infusion) were announced on December 8th, 2008. Pre-bailout return is the stock return from 7th December, 2007 to 7th December, 2008 and bailout return is calculated from 8th December to 22nd December, 2008. Post-bailout return is calculated from 23rd December to the end of the sample period, that is, 24th February, 2009. MES is calculated for the one-year period preceding the pre-bailout, bailout and post-bailout periods. Pre-bailout MES is calculated for the period 1st January, 2007 to 31st December, 2007 and bailout period MES is calculated for the period 7th December, 2007 to 8th December, 2008. Post-bailout period MES is calculated for the period 22nd December, 2007 to 22nd December, 2008. The 38 banks for which data for all variables is available were used in the overall analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table 2—: Deposit Growth

	(1)	(2)	(3)	(4)	(5)	(6)
	Deposit Growth			2 year Deposit Growth		
PSB	0.15***	-0.17	0.35***	0.15***	-0.53*	0.40***
	(0.02)	(0.15)	(0.04)	(0.02)	(0.29)	(0.07)
Pvt	0.50***	-0.42	0.89***	0.12	0.48	0.03
	(0.18)	(0.36)	(0.18)	(0.13)	(0.50)	(0.27)
MES*PSB	1.44***			2.49***		
	(0.49)			(0.60)		
MES*Pvt	-9.07*			1.27		
	(5.08)			(3.18)		
Log Assets*PSB		0.03**			0.07**	
		(0.01)			(0.03)	
Log Assets*Pvt		0.06			-0.03	
		(0.03)			(0.05)	
Crisis Returns*PSB			0.22***			0.24**
			(0.05)			(0.09)
Crisis Returns*Pvt			1.07***			-0.19
			(0.28)			(0.38)
N	38	38	38	38	38	38
Adj R-squared	0.785	0.760	0.861	0.745	0.764	0.745

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine deposit growth and ex-ante bank vulnerability for public and private sector banks. Columns 1–3 show results for the dependent variable deposit growth during the crisis period. Deposit growth is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). Deposit growth for the crisis period is measured from 31st March, 2008 to 31st March, 2009. Ex-ante bank vulnerability is measured by MES. MES is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the precrisis period from January 2007 to December 2007. Log Asset is the natural logarithm of the book value of asset value measured as of March 31st, 2008. Columns 4–6 show results for deposit growth in the long-run, that is, over a two year period from the start of the crisis. The two-year deposit growth is measured from 31st March, 2008 to 31st March, 2010. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table 3—: Deposit Growth for different types of deposits during the crisis

Panel A

	(1) Demand Deposits	(2) Term Deposits	(3) Savings Deposits	(4) Deposits in India
PSB	0.057	0.145***	0.259***	0.160***
	(0.050)	(0.051)	(0.069)	(0.022)
Pvt	-0.365	0.783***	0.287***	0.550***
	(0.223)	(0.249)	(0.092)	(0.187)
MES*PSB	0.436	3.461***	-2.254	1.743***
	(1.183)	(1.158)	(1.444)	(0.598)
MES*Pvt	11.548*	-14.866**	-3.524	-9.784*
	(6.348)	(6.589)	(2.373)	(5.255)
Number of Observations	38	38	38	38
Adj R-squared	0.326	0.757	0.780	0.791

Panel B

	(1) Interbank Demand Deposits	(2) Retail and Corporate Demand Deposits	(3) Interbank Term Deposits	(4) Retail and Corporate Term Deposits
PSB	0.111	0.056	-0.242	0.152***
	(0.141)	(0.054)	(0.675)	(0.039)
Pvt	0.421	-0.384	0.074	0.813***
	(0.544)	(0.231)	(0.740)	(0.261)
MES*PSB	-1.913	0.542	16.138	3.178***
	(4.091)	(1.273)	(13.779)	(0.975)
MES*Pvt	-1.332	11.882*	1.281	-15.817**
	(10.992)	(6.561)	(17.609)	(6.697)
N	38	38	38	38
Adj R-squared	0.074	0.319	0.092	0.740

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine deposit growth by type and ex-ante bank vulnerability for public and private sector banks. Deposits are classified based on type into demand deposits, term deposits and savings deposits. Demand deposits and term deposits can be further classified into interbank deposits and corporate/retail (non-interbank) deposits. Deposits can also be classified based on location into deposits within India. Panel A shows results for the dependent variable deposit growth in each category demand deposits, term deposits, savings and deposits within India. Panel B shows results for interbank deposits and corporate/retail (non-interbank) deposits within demand deposits and term deposits. Deposit growth for each category is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). Deposit growth for each category during the crisis period is measured from 31st March, 2008 to 31st March, 2009. Ex-ante bank vulnerability is measured by MES. MES is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the precrisis period from January 2007 to December 2007. Log Asset is the natural logarithm of the book value of asset value measured as of March 31st, 2008. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table 4—: Lending during the crisis

Panel A

	(1) Overall	(2) Priority and Public Sector	(3) Banks	(4) Others
PSB	0.144***	0.008	-0.890	0.271***
	(0.014)	(0.059)	(1.133)	(0.048)
Pvt	0.366**	0.214	-3.097	0.496**
	(0.175)	(0.162)	(2.067)	(0.237)
MES*PSB	1.727***	3.954***	8.713	-0.784
	(0.434)	(1.330)	(22.073)	(1.155)
MES*Pvt	-5.323	-2.004	76.101	-8.329
	(4.773)	(3.617)	(47.002)	(6.746)
N	38	38	38	38
Adj R-squared	0.752	0.613	-0.011	0.687

Panel B

	(1) Q1 2008	(2) Q2 2008	(3) Q3 2008	(4) Q4 2008	(5) Q1 2009	(6)
PSB	13.054***	13.278***	13.954***	13.247***	12.780***	-0.178
	(0.112)	(0.208)	(0.072)	(0.096)	(0.122)	(0.110)
Pvt	12.060***	12.887***	13.577***	13.741***	12.839***	0.752
	(0.686)	(0.696)	(0.716)	(0.673)	(0.671)	(0.561)
MES*PSB	-2.739	-6.728	1.966	-0.789	-6.203*	-10.084***
	(3.370)	(4.730)	(2.160)	(3.398)	(3.427)	(3.206)
MES*Pvt	69.072***	56.701***	60.972***	57.449***	74.479***	5.717
	(18.163)	(14.360)	(15.945)	(14.840)	(16.016)	(14.884)
N	38	38	38	38	38	38
Adj R-squared	0.999	0.998	0.999	0.999	0.999	0.796

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine advances and ex-ante bank vulnerability for public and private sector banks. Lending can be classified sector-wise into lending to the priority/public sector firms, lending to banks and other. Data for each category is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). Overall growth is for the period from 31st March, 2008 to 31st March, 2009. Panel A shows the results for growth overall and in each category against *MES*. Ex-ante bank vulnerability is measured by *MES* is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the precrisis period from January 2007 to December 2007. Panel B shows the regression results for quarterly bank prime lending rates (BPLR) against MES. Q1 2008 is the prime lending rate (PLR) for the period from January 2008 to March 2008, Q2 2008 is for the period from April 2008 to June 2008, Q3 2008 is for the period from July 2008 to September 2008, Q4 2008 is from October 2008 to December 2008 and Q1 2009 is from the period January 2009 to March 2009. Column 6 shows the change in lending rates during the crisis calculated as the difference between the lending rates in the last quarter of the crisis (March 2009) and the beginning of the crisis (December 2007). Data for lending rates is publicly available and provided by the RBI. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table 5—: Non-performing Assets and Restructured Loans

	(1) NPA and Restructurings/ Advances	(2) NPAs/ Advances	(3) Restructurings/ Advances
PSB	0.094***	0.035***	0.058***
	(0.013)	(0.0034)	(0.011)
Pvt	0.11***	0.047*	0.060***
	(0.027)	(0.025)	(0.0067)
MES * PSB	-0.12	-0.036	-0.081
	(0.29)	(0.075)	(0.23)
MES * Pvt	-0.90***	0.060	-0.96***
	(0.32)	(0.28)	(0.15)
Number of Observations	298	298	298
Adj R-squared	0.154	0.041	0.656

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine non-performing assets (NPA)/advances and restructured advances/total advances and ex-ante bank vulnerability for public and private sector banks. Column 2 shows results for the dependent variable NPA/advances. Column 3 shows results for the dependent variable for restructured loans/advances. Column 1 shows results for the dependent variable (NPA + restructured loans)/advances. Data is for the period 2008 to 2015. NPA (gross NPA), advances and restructured loans data is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). NPA (gross NPA, advances and restructured loans are as of March of each year. Ex-ante bank vulnerability is measured by *MES*. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5^{th} - percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The 38 banks for which data for all variables is available were used in this analysis.

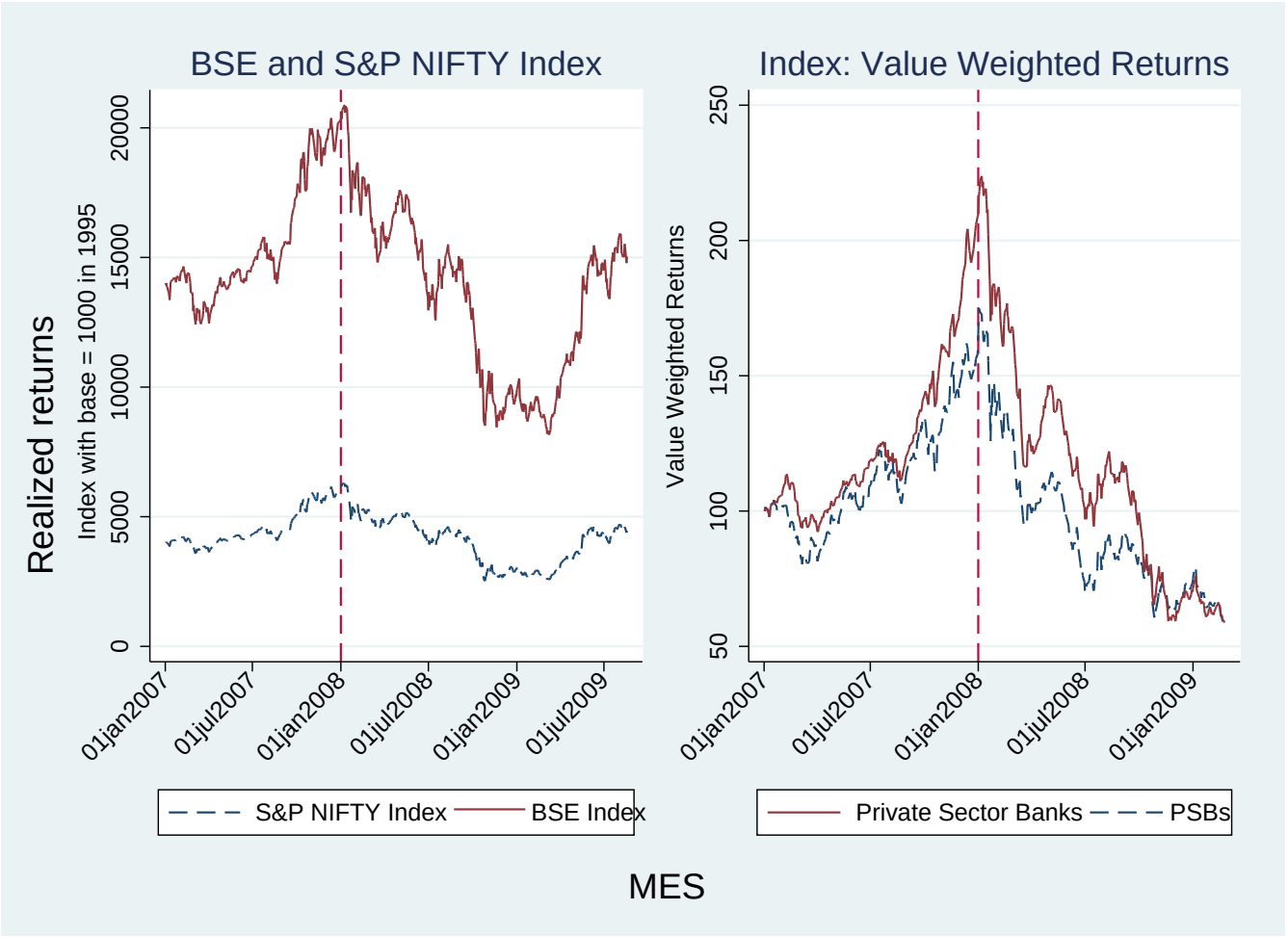


Figure 1. : Stock Index Performance

Note: The left panel shows stock index performance for the period starting January 2007 to July 2009. Two indices, S&P NIFTY and BSE SENSEX, are represented. The S&P CNX NIFTY (or NIFTY; base level of 1000 defined as of November, 1995) is a free float market capitalization index on the National Stock Exchange and consists of 50 companies. Bombay Stock Exchange Sensitive Index (BSE Sensex or Sensex) is a value-weighted index composed of 30 stocks with a base level of 100 in 1978–1979. The right panel shows the indexed value weighted returns for the private (public) sector banks used in our analysis weighted by their market capitalization. A base value of 100 as of January 2, 2007 is used. The beginning of the crisis January 2008, is indicated with a vertical dashed line.

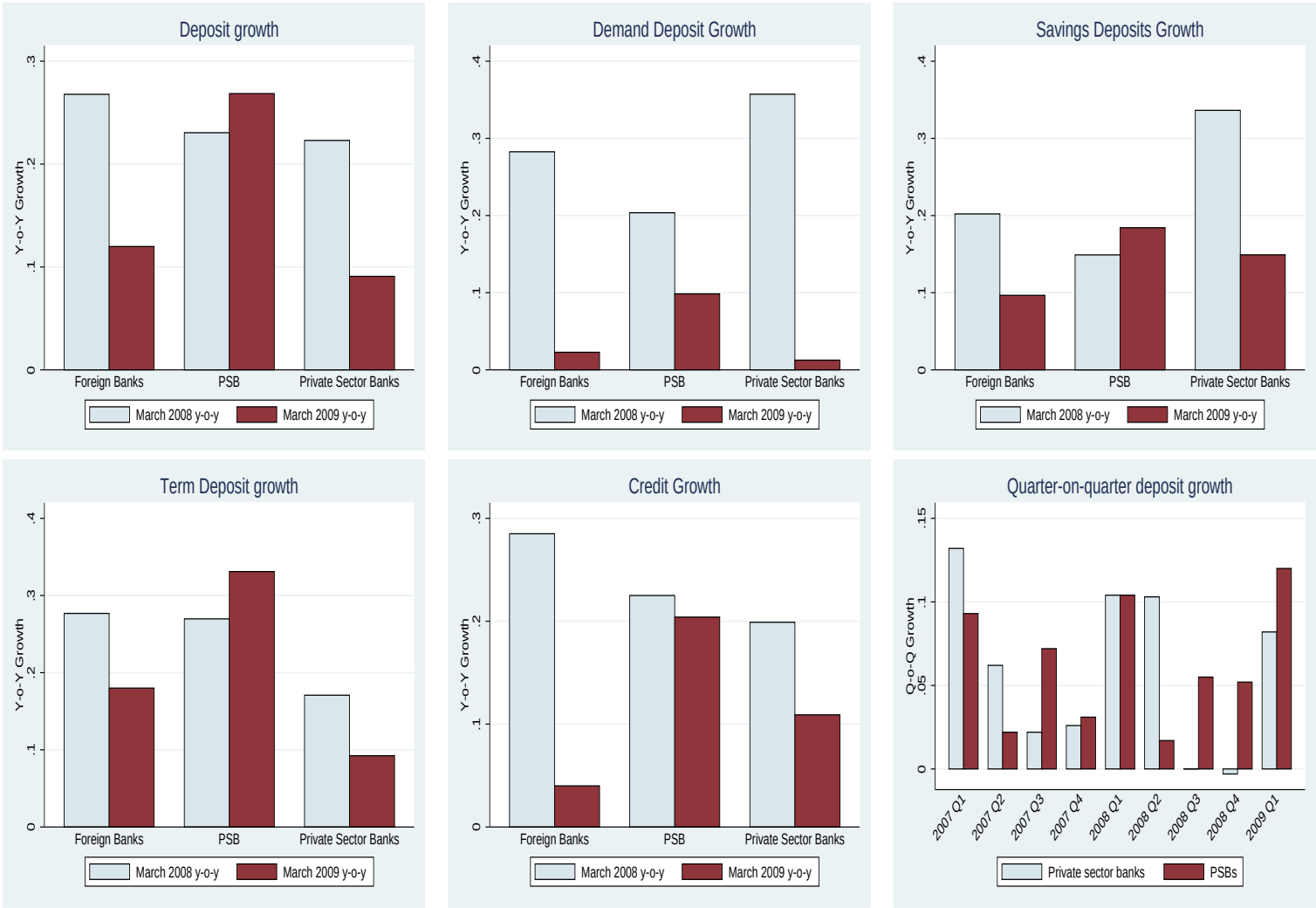
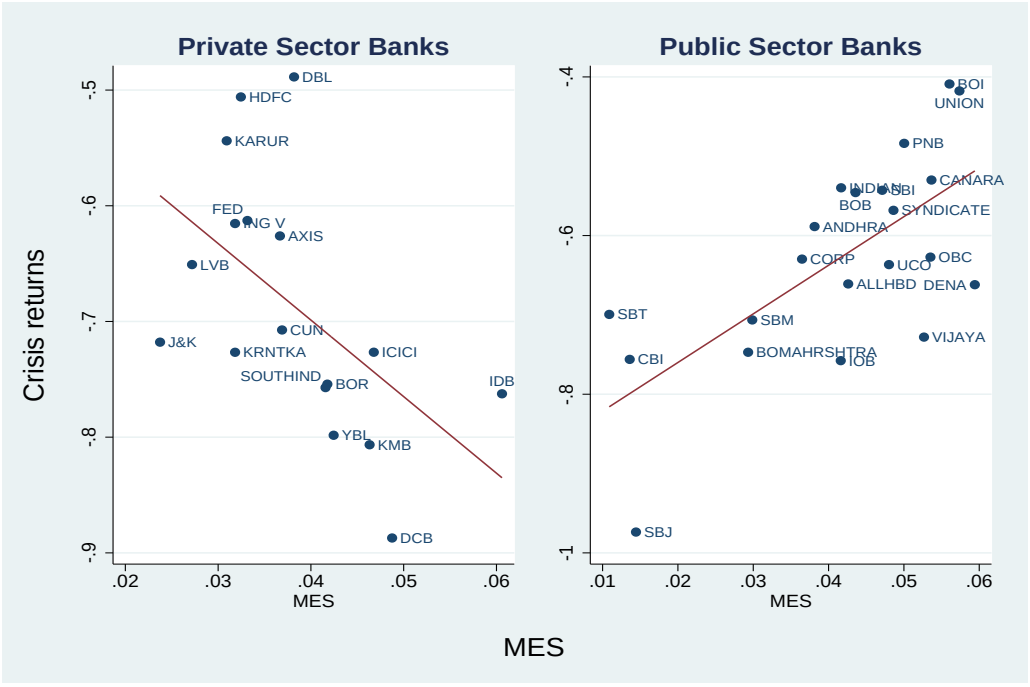


Figure 2. : Deposit and Credit Growth

Note: The figures above show the bank group-wise growth in deposits and credit for foreign banks, public sector banks and private sector banks in India. Deposits are classified into demand deposits, term deposits and savings deposits. Growth rates are year-on-year from March 28, 2008 to March 27, 2009. Data is from the Reserve Bank of India (RBI). The bottom-rightmost panel shows the quarter-on-quarter growth in overall deposits from Q1 2007 to Q1 2009.

Panel A



Panel B

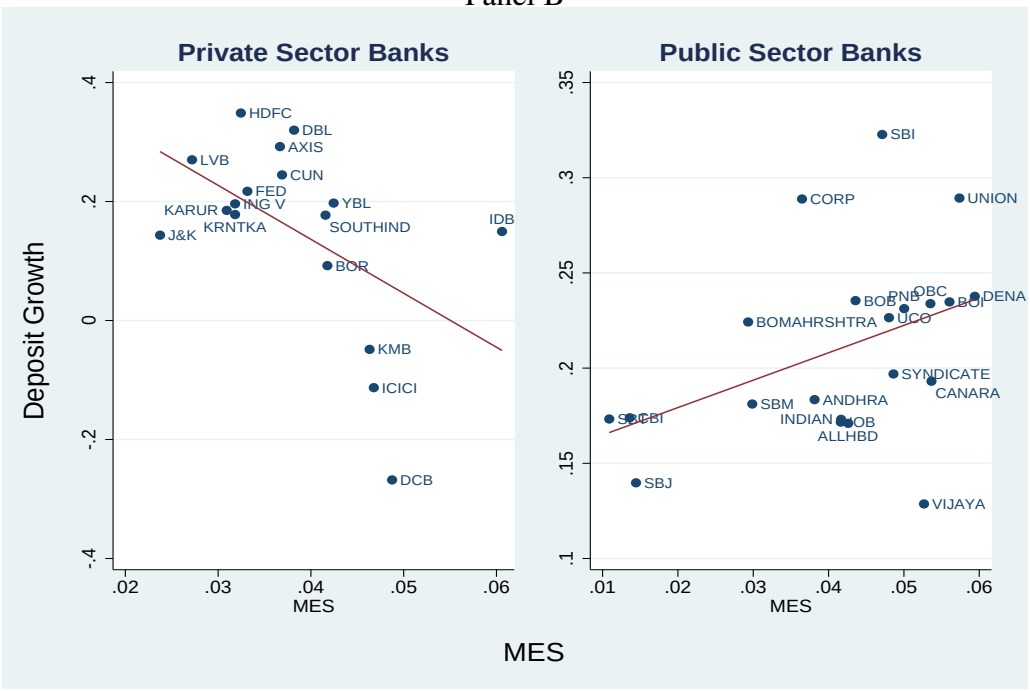


Figure 3. : Stock performance and deposit growth versus *MES*

Note: Panel A and Panel B plot crisis returns and deposit growth during the crisis respectively against MES for private and public sector banks. Crisis return is the stock return calculated from 1st January, 2008 to 1st February, 2009. Deposit growth is from March 2008 to March 2009. Ex-ante bank vulnerability is measured by *MES* which is the marginal expected shortfall of a stock given that the market return (S&P CNX NIFTY) is below its 5th- percentile during the period 1st January, 2007 to 31st December, 2007. All 38 banks for which data is available were used in the analysis.

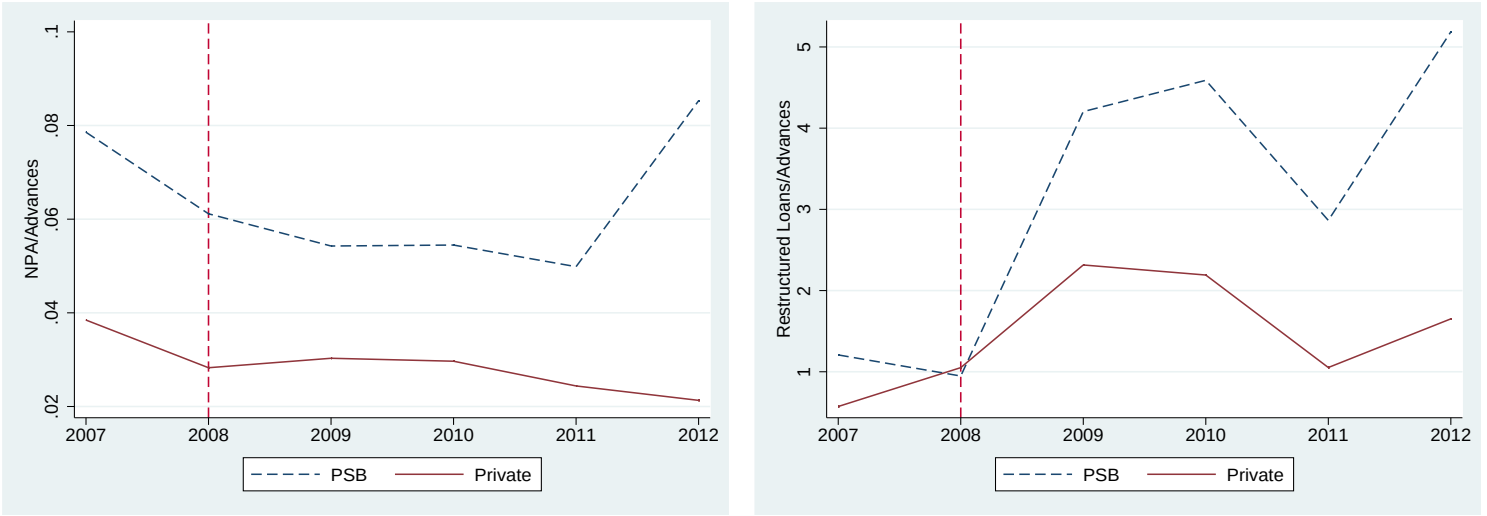
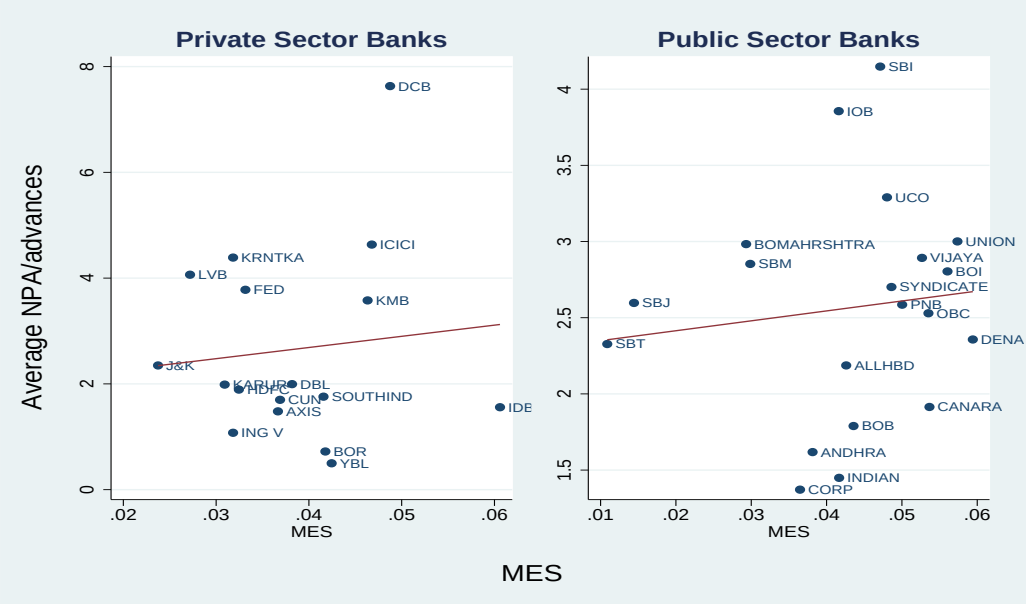


Figure 4. : NPA and Restructured loans from 2006–2012

Note: The figures show average NPA to advances (left panel) and restructured loans to advances (right panel) for the period March 2007 to March 2012 separately for public and private sector banks. NPA (gross NPA), advances and restructured loans data is publicly available for each fiscal year from the Reserve Bank of India (RBI). The 38 firms for data is available were used in this analysis.

Panel A



Panel B

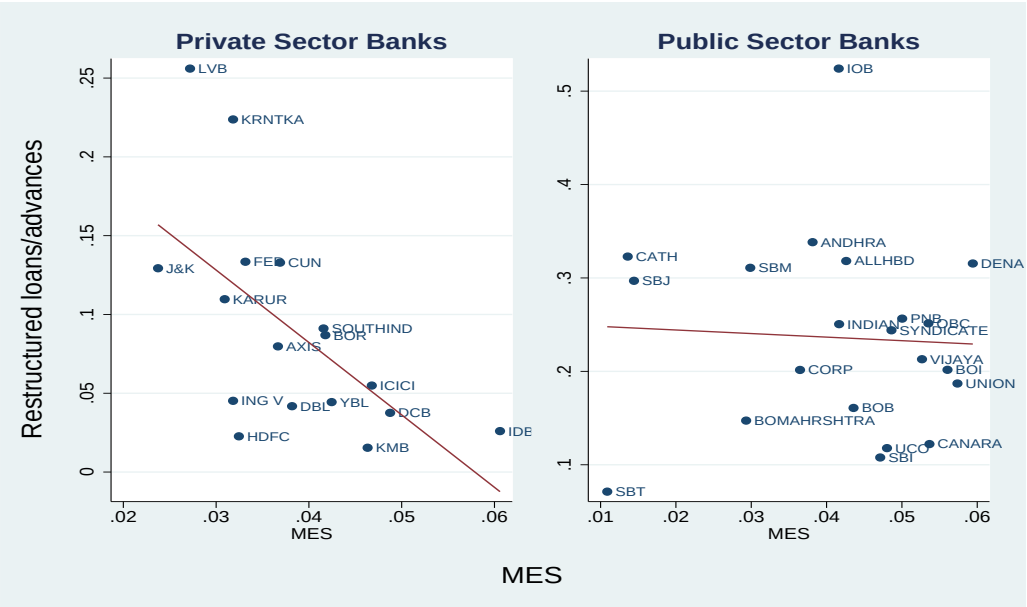


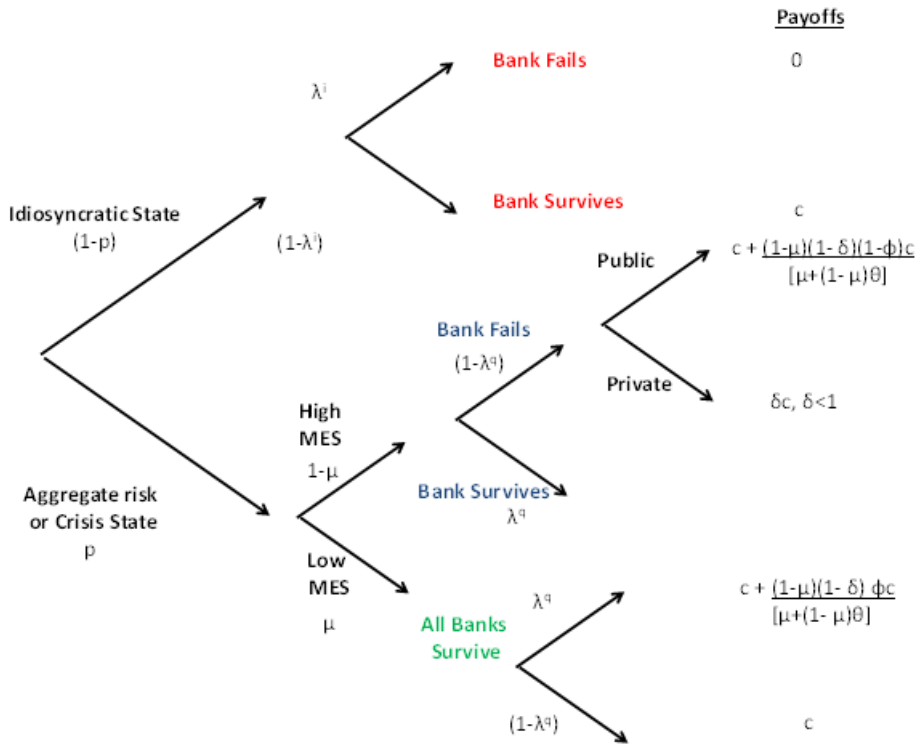
Figure 5. : NPA and Restructured loans versus *MES*

Note: The figure shows average non-performing assets (NPAs) to advances (top panel) and restructured loans to advances (bottom panel) for the period March 2008 to March 2012 separately for public and private sector banks against ex-ante measure of bank vulnerability, *MES*. The top panel shows average NPA to advances at the beginning of the each year over. The bottom panel shows total loans restructured between March 2008 to March 2012 normalized by advances as of the beginning of March 2008. Ex-ante bank vulnerability is measured by *MES* which is the marginal expected shortfall of a stock given that the market return (S&P CNX NIFTY) is below its 5^{th} - percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. The 38 banks for which data is available were used.

Appendix

A. Model

Figure C1. : Bank Payoffs in Idiosyncratic and Crisis states of nature



This section presents a simple model to motivate our empirical approach. We build a simple model to explain how government guarantees can distort behavior and outcomes for these protected banks. We then compare outcomes and behavior with banks that do not enjoy such government guarantees. To maintain consistency with our empirical hypothesis in the context of India, we shall refer to the protected banks in the model as public sector banks (PSBs) and the unprotected banks as private sector banks. In India state-owned banks or public sector banks enjoy explicit government guarantees whereas private sector banks do not

have these explicit government guarantees.

Consider the following simple model (see Figure C1). Nature selects either of two states, the idiosyncratic state or the crisis state. The idiosyncratic states occurs with a probability $(1-p)$ and a crisis state occurs with a probability p. When the idiosyncratic state occurs either of two things can happen –either the bank fails with a probability λ^i in which case it gets a payoff of 0 or it survives with a probability $(1-\lambda^i)$ in which case it gets a payoff of c. c can be thought of as the cashflows of the bank or the franchise value of the bank. In case of an idiosyncratic shock and subsequent bank failure, there is no difference between a public sector or a private sector bank. Both types of banks get a value of zero in case of a failure. The assumption is that government guarantees do not kick in the idiosyncratic state and hence there is no difference between a public and private sector banks.

Now consider the case when there is an aggregate shock. A mass $(1-\mu)$ of banks have high MES and the remaining μ banks have low MES. If a system-wide shock hits the economy, then high MES banks will fail with a high probability whereas low MES banks fail with a low probability. For simplicity, let us assume that low MES banks do not fail whereas high MES banks have some non-zero probability of failing . Let λ^q be the probability that a high MES bank fails when there is an aggregate shock and $(1-\lambda^q)$ be the probability that it survives. If a high MES bank survives then it gets the full amount c of cashflows. If it fails, however, private and public sector banks get different amounts. The crucial assumption here is that public sector banks are government guaranteed.

Let us first consider the simple case when no banks fail. Note, our simplifying assumption says that low MES banks do not fail. We need to only consider the high MES banks. With probability λ^q no high MES bank fails. In this case, all

banks receive a payoff of c similar to the idiosyncratic case.

Now consider the case when some high MES banks fail which happens with a probability $(1-\lambda^q)$. However, the presence of government guarantees for public sector banks implies that private sector banks are more adversely affected compared to public sector banks. A failing private sector banks which has no government guarantees and receives a lower cashflow of δc, where $\delta < 1$. One can also think of c as the demand for bank services. When a high MES private sector bank fails (which happens with probability λ^q), then there is a $(1-\delta)c$ of gap in demand for bank services. This demand in bank services is filled in by the surviving banks, that is, between the public sector (both high and low MES) banks and the remaining low MES private sector banks. We now introduce another parameter ϕ which controls the distribution of this excess demand between high MES PSBs and low MES banks (both PSBs and private sector banks).

Given the above setup we can calculate the franchise values for the banks in each state. This is shown in Figure C1.

We now look at some testable implications from this simple setup. Specifically, we want to relate how the ex ante bank franchise value changes as the probability of an aggregate crisis increases. Additionally, we want to relate franchise value of banks to their vulnerability as measured by MES.

Let V^{Pvt} and V^{PSB} represent the franchise value of the private sector banks and public sector banks respectively. Let ΔV^{PSB} represent the difference in franchise value between high MES PSBs and low MES PSBs.

Using the franchise values calculated above

$\Delta V^{PSB} = p\lambda^q(1-\mu)(1-\delta)(1-2\phi)c$

Note, $\Delta V^{PSB} > 0$ if and only if $(1-2\phi) > 0$, that is, $\phi < 1/2$. This tells us that only for low values of ϕ, public sector banks with high exposure to aggregate

risk (high MES) will have franchise values lower than public sector banks with lower exposure to aggregate risk (low MES).

Analogously, let us define ΔV^{Pvt} as the difference in franchise value between high and low MES private sector banks.

$\Delta V^{Pvt} = -p\lambda^{q}(1-\mu)(1-\delta)c(1+\phi)$

Differentiating the above with respect to p, $d\Delta V^{Pvt}/dp < 0$ for all values of ϕ.

This simple model helps us motivate our empirical hypothesis in Section II. $(1-\phi)$ parameterizes the amount that high MES PSBs are able to attract. We need ϕ to be less than 0.5 for franchise value of high MES PSBs to be higher than low MES PSBs. That is, high MES PSBs need to attract the excess supply of deposits created by a failed high MES private sector bank. This can occur if say the PSB is too big to fail– such as in the case of SBI and its subsidiaries or if ex-ante they gamble and manage to attract deposits their way, say, by increasing deposit rates as in the case of our results.

This yields the following hypotheses. The first hypothesis relates to how ΔV^{Pvt} and ΔV^{PSB} changes as the probability of aggregate crisis increases.

HYPOTHESIS 1: *Riskier public sector banks with higher aggregate risk exposure had higher returns during the crisis compared to less risky PSBs. Analogously, riskier private sector banks had lower returns compared to less risky private sector banks.*

However our simple model showed that the result for public sector banks is true only if $\phi < 1/2$. That is high MES PSBs were able to attract deposits their way, say, by increasing deposit rates as in the case of our results. On the other hand, for private sector banks we don't need $\phi < 1/2$.

This leads to the second hypothesis.

HYPOTHESIS 2: *Higher crisis returns during the crisis is related to higher deposit returns for public sector banks with higher risk exposure but lower deposit growth for public sector banks with lower risk exposure. Riskier private sector banks have lower deposit growth whereas private sector banks with lower risk exposure have higher deposit growth.*

B. Robustness checks

This section reports the results of some robustness checks on our analysis.

A. Placebo tests outside of the crisis

Table C6 (columns 1–3), Panel A in the appendix show the regressions for public and private sector firms with the dependent variable as the placebo "crisis" period returns corresponding to 2005, 2006 and 2007. The corresponding regressor variables are the "pre-crisis" period MES for the years 2004, 2005 and 2006. The interaction term with MES is insignificant for all periods. Thus, annual returns in the non-crisis periods, namely 2005, 2006 and 2007 are not explained by the prior year MES. Only, in times of a crisis, the government guarantees start to matter and affect private and public firm returns differently. Panel B shows similar regressions results for public and private sector firms with the dependent variable as the placebo "crisis" period deposit growth corresponding to 2005, 2006 and 2007. The corresponding regressor variables are the "pre-crisis" period MES for the years 2004, 2005 and 2006. The interaction term with MES for PSBs is insignificant for all periods, though negative and significant for private sector banks. Thus, annual deposit growth in the non-crisis periods, namely 2005, 2006 and 2007 are not explained by the prior year MES. However, in times of a crisis, the government guarantees start to and affect private and public firm returns differently as we have seen in previous results.

B. Alternative measures of risk

Table C7 in the appendix repeats tests of our basic hypothesis using other common measures of risk. The regression of event returns against beta and volatility give results similar to Section III. Regression with volatility as the risk measure yields a positive and insignificant term for public sector banks and a negative and

significant term for private sector banks similar to our results in Table 1. Regression coefficients for a two factor model containing the domestic market return and the global market return are also shown (column 1). Interaction term with beta for dependent variable event return is positive and significant for public sector firms. One might reason that private sector banks had lower returns because of higher exposure to the global markets. In order to test this hypothesis, we estimate the coefficients of beta and global beta to estimate the exposure to global markets. The beta coefficient measures sensitivity to the NSE stock market index. The global beta coefficient measures sensitivity to the MSCI World market index. The coefficient for global beta is insignificant and negative for both public and private sector banks. Thus, exposure to the global markets cannot explain the difference in behavior of public sector versus private sector banks. Regression of risk measures against deposit growth show similar results (columns 5–8). Table C7 uses a modified version of the MES and repeats the analysis. Ex-ante bank vulnerability is measured by modified MES. Modified MES is the marginal expected shortfall of a stock given that the *banking index* return is below its 5^{th} - percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. Banking sector return is for the pre-crisis period from January 2007 to December 2007 and is calculated using a price-weighted index of all banks in the analysis leaving out the bank under consideration.

C. Stability of MES ranks over time

A measure of bank vulnerability that varies substantially over time could make it difficult to determine whether banks which were more vulnerable in 2006 remained among the more vulnerable banks in 2007, from 2007 to 2008, and so on. Figure C6 in the appendix plots the MES rankings from January 2006 -December 2006 against the MES ranks from January 2007 - December 2007 confirming that

MES rankings in 2006 were reflective of which firms would be systemically important in 2007.

D. Leverage and Pre-crises returns

Leverage is measured as the ratio of the quasi-market value of assets to the market equity. It is an important predictor of returns during the crisis as shown in Acharya et al. (2010). However, we see from Table C7 that leverage was not a strong predictor of returns for banks in our analysis. Since leverage data may not be entirely reliable due infrequent and limited balance-sheet reporting by banks, we proxy for it with pre-crisis returns. The interaction term for crisis return is significant and negative for private sector banks indicating that more highly levered firms (due to greater loss of equity capitalization) performed worse during the crisis.

E. Loan Performance and restructured loans by type

In this section we look at the restructuring by type of loans. Restructuring can be done on both non-performing assets(NPAs) and on standard assets (loans not yet classified as delinquent). Since most of the loans restructured are standard assets (see left panel, Figure C4 in the Appendix), the trend for standard assets is similar to the overall trend. The restructuring of NPAs for PSBs has been steadily increasing since the beginning of the crisis. Regression results show similar results in Table C5. For public sector banks this relationship between average restructured loans to advances and *MES* is weak. This appears to be mostly driven by restructuring of standard assets. While riskier private sector banks restructured fewer standard loans and NPAs following the crisis period, riskier public sector banks had higher restructuring of NPAs (see bottom panel, Figure C5 in Appendix).

Another way to slice the restructured loans is to divide it into corporate and non-corporate loans. Columns 5–8 in Table C5show performance of corporate and non-corporate restructured loans. We see that riskier private sector banks witnessed a significant lowering of non-corporate restructured loans in the post-crisis period. Riskier PSBs on the other hand, did not have a significantly lower restructuring of non-corporate loans in the post-crisis period.

C. Institutional details

This section reports the results of some robustness checks on our analysis.

A. Placebo tests outside of the crisis

Table C6 (columns 1–3), Panel A in the appendix show the regressions for public and private sector firms with the dependent variable as the placebo "crisis" period returns corresponding to 2005, 2006 and 2007. The corresponding regressor variables are the "pre-crisis" period MES for the years 2004, 2005 and 2006. The interaction term with MES is insignificant for all periods. Thus, annual returns in the non-crisis periods, namely 2005, 2006 and 2007 are not explained by the prior year MES. Only, in times of a crisis, the government guarantees start to matter and affect private and public firm returns differently. Panel B shows similar regressions results for public and private sector firms with the dependent variable as the placebo "crisis" period deposit growth corresponding to 2005, 2006 and 2007. The corresponding regressor variables are the "pre-crisis" period MES for the years 2004, 2005 and 2006. The interaction term with MES for PSBs is insignificant for all periods, though negative and significant for private sector banks. Thus, annual deposit growth in the non-crisis periods, namely 2005, 2006 and 2007 are not explained by the prior year MES. However, in times of a crisis, the government guarantees start to and affect private and public firm returns differently as we have seen in previous results.

B. Alternative measures of risk

Table C7 in the appendix repeats tests of our basic hypothesis using other common measures of risk. The regression of event returns against beta and volatility give results similar to Section III. Regression with volatility as the risk measure yields a positive and insignificant term for public sector banks and a negative and

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Table C1—: Summary Statistics

	(1)		
	Private Sector Banks	Public Sector Banks	Total
MES	0.0383	0.0414	0.0400
	(0.00909)	(0.0144)	(0.0123)
Beta	0.807	0.895	0.856
	(0.257)	(0.309)	(0.287)
Volatility	0.204	0.197	0.200
	(0.0827)	(0.0697)	(0.0748)
Global Beta	0.667	0.730	0.702
	(0.304)	(0.342)	(0.323)
Log Assets	10.02	11.46	10.82
	(1.119)	(0.716)	(1.157)
Leverage	15.06	20.32	17.97
	(9.184)	(9.552)	(9.634)
Pre-Crisis Returns	0.116	0.0698	0.0905
	(0.0788)	(0.0415)	(0.0645)
Crisis Returns	-0.688	-0.629	-0.655
	(0.110)	(0.130)	(0.124)
Deposit Growth	0.152	0.210	0.184
	(0.160)	(0.0496)	(0.115)
2 year Deposit Growth	0.165	0.250	0.212
	(0.166)	(0.0777)	(0.130)
Advances Growth	0.162	0.216	0.192
	(0.163)	(0.0471)	(0.116)
N	17	21	38

Note: This table contains the summary statistics for *MES*, *Beta*, *Volatility*, *GlobalBeta*, *LogAssets*, *Leverage*, *Pre − Crisis Return*, *Crisis Return*, *Deposit Growth*, 2 *year Deposit Growth*, and *Advances Growth* for the 38 banks used in our analysis. Ex-ante bank vulnerability is measured by *MES*. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5th- percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from 1st January, 2007 to 31st December, 2007. *Volatility* is the annualized daily volatility in the pre-crisis period from January 2007 to December 2007. *Beta* is based on the S&P CNX NIFTY index as the market return. *Global Beta* is based in the MSCI World Index returns. *Log Asset* is the natural logarithm of the book value of asset value measured as of March 31st, 2008. *Leverage* ratio measured as of March 31, 2008 is the ratio of market equity to the quasi–market value of assets measured as (book value of assets - book value of equity + market value of equity). *Pre-crisis return* is the stock return for the period January 2007 to December 2007. *Crisis return* is the stock return during the crisis calculated from 1st January, 2008 to 24th February, 2009. *Deposit Growth* is the growth in deposits for the period March 2008 to March 2009. *Advances Growth* is the growth in advances (loans) for the period March 2008 to March 2009. The 38 banks for which data for all variables is available were used in the overall analysis.

Table C2—: Summary Statistics for deposits growth by type

	Private Sector Banks	Public Sector Banks	Total
Demand Deposits	0.0771	0.0747	0.0758
	(0.180)	(0.114)	(0.145)
Term Despoists	0.214	0.288	0.255
	(0.242)	(0.101)	(0.179)
Savings Deposits	0.152	0.166	0.160
	(0.107)	(0.0710)	(0.0881)
Deposits in India	0.176	0.232	0.207
	(0.172)	(0.0623)	(0.126)
Interbank Demand Deposits	0.370	0.0316	0.183
	(0.750)	(0.347)	(0.581)
Corporate/Retail Demand Deposits	0.0714	0.0788	0.0755
	(0.185)	(0.116)	(0.149)
Interbank term Deposits	0.123	0.425	0.290
	(0.612)	(0.931)	(0.808)
Corporate/Retail Term Deposits	0.207	0.283	0.249
	(0.255)	(0.0951)	(0.186)
N	17	21	38

Standard deviation in parentheses

Note: This table shows the descriptive statistics for growth of different types of deposits. Deposit growth for the crisis period is calculated from data provided by Reserve Bank of India (RBI) for the period from 31st March, 2008 to 31st March, 2009. Deposits are classified into (A) demand deposits, (B) term deposits and (C) savings. Deposits can also be classified based on location into deposits belonging to branches within India. Demand and term deposits are further classified into corporate/retail deposits and interbank deposits. The 38 banks for which data for all variables is available were used in this analysis.

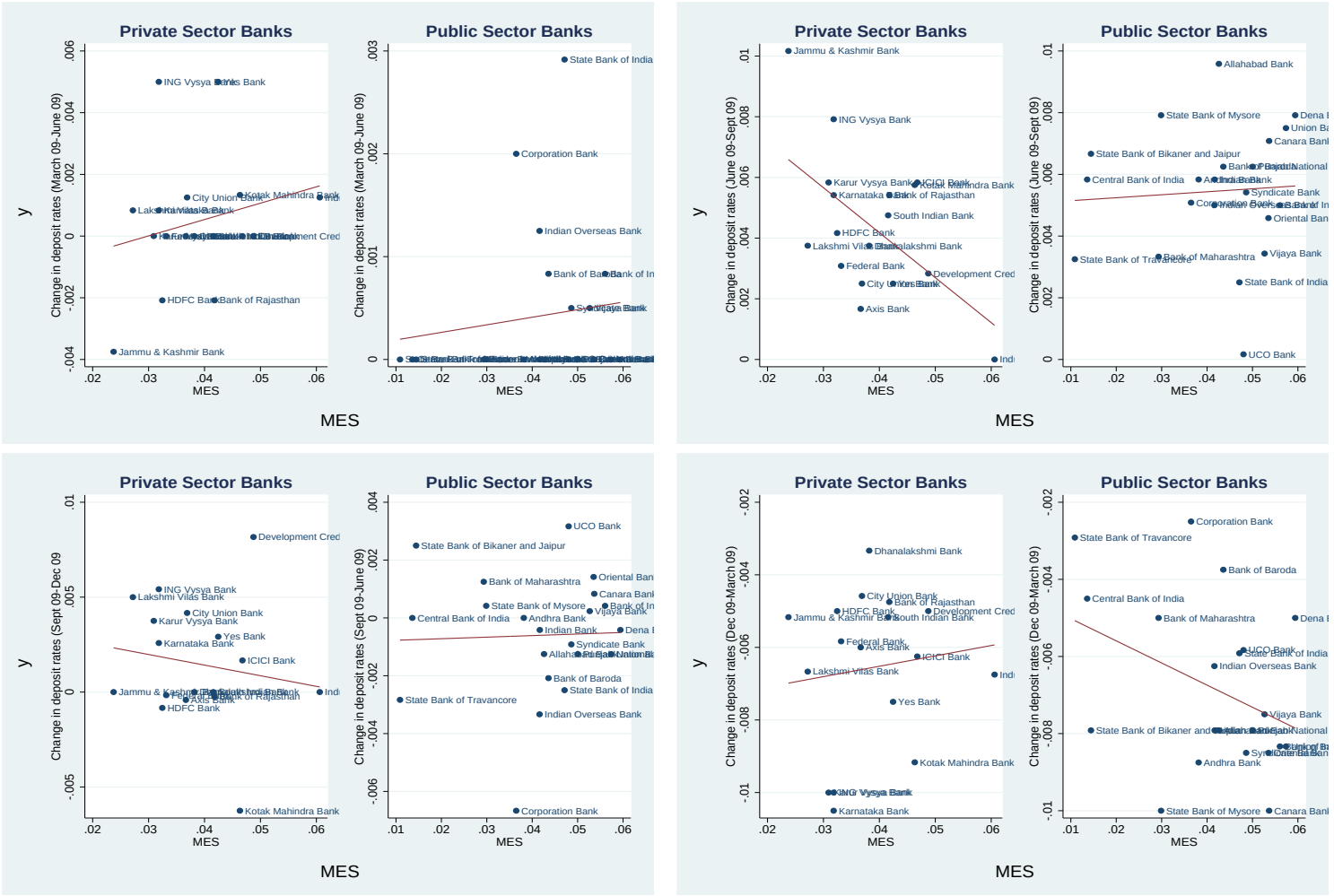


Figure C2. : Deposit Rates versus MES for short term maturities

Note: The above graphs change in deposit rates for short maturity (< 1 year) term deposits from March 2008 to June 2008, from June 2008 to September 2008, from September 2008 to December 2008 and from December 2008 to March 2009 against the ex-ante measure of bank vulnerability, *MES*. Average deposit rate for each bank is calculated as average of minimum and maximum deposit rate provided by RBI. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The 38 banks for which data for all variables is available were used in this analysis.

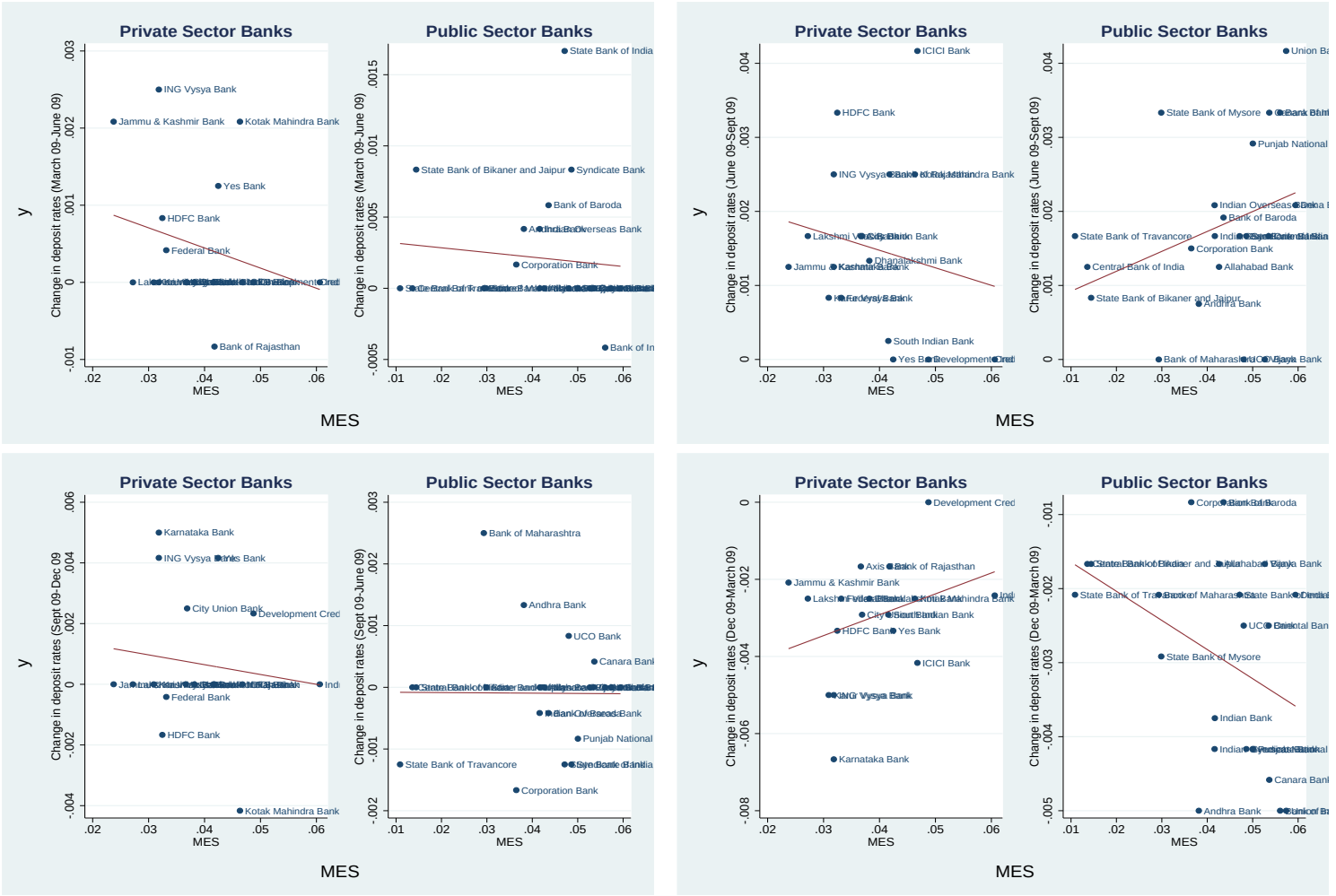


Figure C3. : Deposit Rates versus MES for long term maturities

Note: The graphs plot the change in deposit rates for long maturity (> 3 years) term deposits from March 2008 to June 2008, from June 2008 to September 2008, from September 2008 to December 2008 and from December 2008 to March 2009 against the ex-ante measure of bank vulnerability, *MES*. Average deposit rate for each bank is calculated as average of minimum and maximum deposit rate provided by RBI. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The 38 banks for which data for all variables is available were used in this analysis.

Table C3—: Deposit Rates and *MES*

Panel A

	(1)	(2)	(3)	(4)
PSB	0.59***	0.76***	-0.18	-0.67***
	(0.13)	(0.17)	(0.32)	(0.23)
Pvt	-0.30	1.34**	0.79	-1.15***
	(0.48)	(0.52)	(1.03)	(0.31)
MES * PSB	-8.69***	1.45	1.94	-8.61*
	(2.72)	(4.20)	(6.32)	(4.89)
MES * Pvt	10.97	-17.20	-13.24	4.29
	(11.15)	(13.32)	(29.96)	(7.13)
Number of Observations	17	37	32	38
Adj R-squared	0.014	0.851	0.094	0.907

Panel B

	(1)	(2)	(3)	(4)
PSB	0.29*	0.22	-0.03	-0.37**
	(0.15)	(0.15)	(0.53)	(0.15)
Pvt	0.80	-0.10	1.76	-1.32***
	(0.58)	(0.42)	(2.14)	(0.44)
MES * PSB	-3.09	9.69**	-0.69	-11.81***
	(4.94)	(3.68)	(11.26)	(4.22)
MES * Pvt	-12.18	18.27	-34.49	9.49
	(17.79)	(12.47)	(57.41)	(9.68)
Number of Observations	15	32	19	37
Adj R-squared	0.414	0.822	-0.005	0.835

Note: Panel A and Panel B show the average deposit rates against the ex-ante measure of bank vulnerability, *MES*. Columns 1–4 show the regression results for the dependent variable change in deposit rates for the short maturity ($<$ 3 years) from March 2008 to June 2008 (Column 1),from June 2008 to September 2008 (Column 2), from September 2008 to December 2008 (Column 3) and from December 2008 to March 2009 (Column 4) against the ex-ante measure of bank vulnerability, *MES*. Panel B plots the change in deposit rates for the long maturity ($>$ 3 years) from March 2008 to June 2008 (Column 1),from June 2008 to September 2008 (Column 2), from September 2008 to December 2008 (Column 3) and from December 2008 to March 2009 (Column 4) against the ex-ante measure of bank vulnerability, *MES*. Deposit rate for each bank as is the average of the the minimum and maximum deposit rate provided by the Reserve Bank of India (RBI) and is in percentage (multiplied by 100) for readability. Due to the quality of the data, we drop data with change in deposit rates equal to zero in the regressions. Ex-ante bank vulnerability is measured by *MES*. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5^{th} - percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table C4—: Summary statistics for growth in lending and lending rates

Panel A

	(1)		
	Private Sector Banks	Public Sector Banks	Total
Overall	0.162	0.216	0.192
	(0.163)	(0.0471)	(0.116)
Priority Sector and public sector firms	0.137	0.172	0.156
	(0.162)	(0.0961)	(0.129)
Banks	-0.183	-0.530	-0.374
	(1.808)	(2.148)	(1.985)
Others	0.177	0.238	0.211
	(0.205)	(0.0809)	(0.150)

Panel B

	(1)		
	Private Sector Banks	Public Sector Banks	Total
Priority Sector and public sector firms	0.137	0.172	0.156
	(0.162)	(0.0961)	(0.129)
Overall	0.162	0.216	0.192
	(0.163)	(0.0471)	(0.116)
Banks	-0.183	-0.530	-0.374
	(1.808)	(2.148)	(1.985)
Others	0.177	0.238	0.211
	(0.205)	(0.0809)	(0.150)
Lending Rate Q1 2008	14.71	12.94	13.73
	(0.898)	(0.305)	(1.091)
Lending Rate Q2 2008	15.06	13	13.92
	(0.908)	(0.326)	(1.221)
Lending Rate Q3 2008	15.91	14.04	14.88
	(0.931)	(0.143)	(1.131)
Lending Rate Q4 2008	15.94	13.21	14.43
	(0.864)	(0.277)	(1.501)
Lending Rate Q1 2009	15.69	12.52	13.94
	(0.917)	(0.284)	(1.719)
N	17	21	38

mean coefficients; sd in parentheses

Note: This table shows the descriptive statistics for growth in loans (advances) by type and lending rates. Overall growth in loans (advances) for the crisis period is calculated for the period from 31st March, 2008 to 31st March, 2009. Panel A shows growth in loans in each category, namely, growth in lending to the priority and public sector firms and growth in lending to banks. All other categories are classified under other. Panel B shows the summary statistics for lending rates. Q1 2008 is the average prime lending rate for the period from January 2008 to March 2008, Q2 2008 is from April 2008 to June 2008, Q3 2008 is from July 2008 to September 2008, Q4 2008 is from October 2008 to December 2008 and Q1 2009 is from January 2009 to March 2009. The 38 banks for which data for all variables is available were used in this analysis.

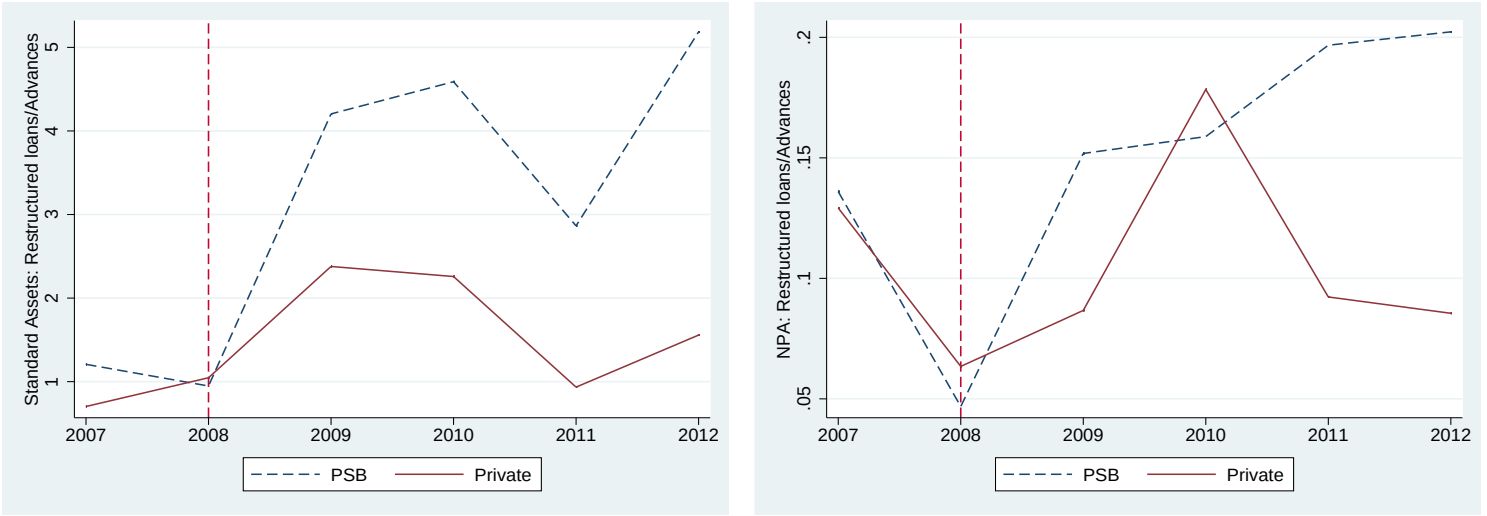
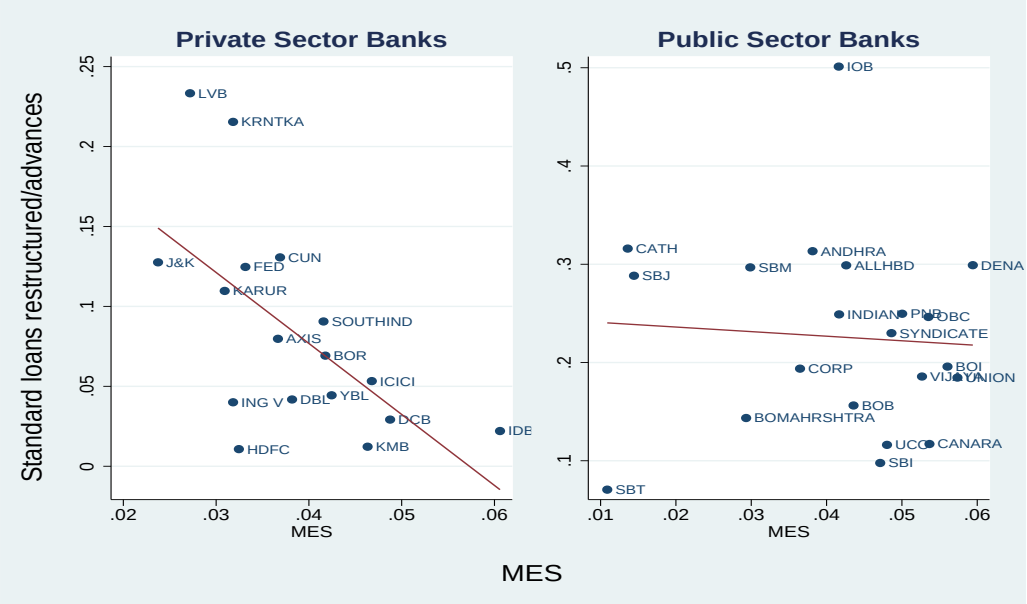


Figure C4. : Restructured loans from 2006–2012: Standard Assets and NPAs

Note: The figures show restructured loans by type of loans restructured for the period March 2007 to March 2012 separately for public and private sector banks. The left panel shows the standard assets restructured to advances and the right panel shows the Non-performing Assets (NPAs) restructured to advances. NPA (gross NPA), advances and restructured loans (all, standard assets and NPAs) data is publicly available for each fiscal year from the Reserve Bank of India (RBI). The 38 firms for which data is available were used in this analysis.

Panel A



Panel B

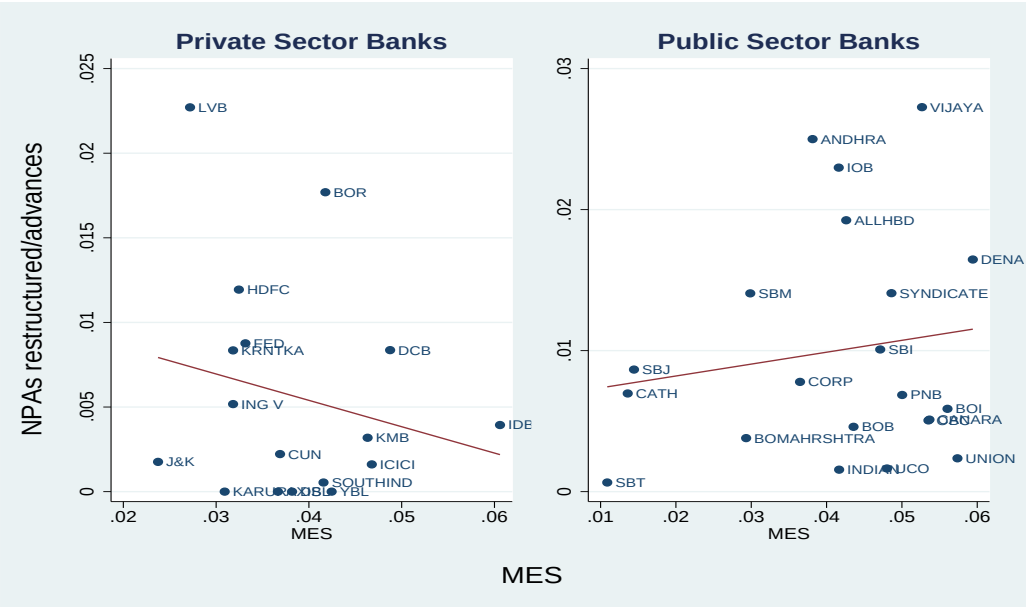


Figure C5. : Standard loans and NPAs Restructured loans versus *MES*

Note: The figure shows standard assets restructured to advances (top panel) and NPAs restructured to advances (bottom panel) for the period March 2008 to March 2012 separately for public and private sector banks against ex-ante measure of bank vulnerability, *MES*. Gross NPA and advances data is as of the end of each fiscal year from the Reserve Bank of India (RBI). RBI provides loans restructured during a fiscal year. The top panel shows average Standard assets restructured between March 2008 to March 2012 normalized by advances as of the beginning of the period, March 2008. The bottom panel shows average NPAs restructured between March 2008 to March 2012 normalized by advances as of the beginning of the period, March 2008. Ex-ante bank vulnerability is measured by *MES* which is the marginal expected shortfall of a stock given that the market return (S&P CNX NIFTY) is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. The 38 banks for which data is available were used.

Table C5—: Restructured loans and non-performing assets: By Type

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Std Restructurings/ Advances		NPAs Restructured loans/ Advances		Corporate Restructurings/ Advances		Non-corporate Restructurings/ Advances	
PSB	0.99***	1.33***	0.091***	0.044	0.18***	0.15	0.90***	1.23**
	(0.13)	(0.45)	(0.020)	(0.059)	(0.046)	(0.097)	(0.13)	(0.47)
Pvt	0.78***	1.79***	0.096**	0.070	0.13***	0.044	0.75***	1.81***
	(0.12)	(0.48)	(0.041)	(0.081)	(0.044)	(0.11)	(0.14)	(0.48)
Crisis * PSB	0.025	-1.95	-0.034	-0.16	-0.37**	-0.89*	0.36	-1.22
	(0.46)	(1.29)	(0.050)	(0.10)	(0.16)	(0.48)	(0.45)	(1.28)
Crisis * Pvt	0.83*	1.46	-0.033	-0.077	-0.27***	-0.74**	1.07**	2.12
	(0.49)	(1.41)	(0.042)	(0.14)	(0.093)	(0.33)	(0.50)	(1.47)
Post * PSB	3.04***	3.77***	0.095***	0.091	0.52***	0.61**	2.61***	3.25***
	(0.35)	(1.17)	(0.033)	(0.087)	(0.097)	(0.30)	(0.31)	(1.08)
Post * Pvt	0.69***	2.61***	0.023	0.10	0.26***	0.68**	0.45*	2.03**
	(0.25)	(0.92)	(0.052)	(0.13)	(0.089)	(0.34)	(0.25)	(0.95)
MES * PSB		-8.38		1.15		0.59		-7.82
		(8.74)		(1.28)		(2.13)		(9.38)
MES * Pvt		-26.3**		0.70		2.21		-27.9***
		(10.7)		(2.25)		(3.16)		(10.5)
Crisis * PSB * MES		47.8*		3.12		12.6		38.3
		(28.5)		(2.91)		(13.6)		(28.3)
Crisis * Pvt * MES		-16.4		1.17		12.1		-27.3
		(30.4)		(3.66)		(7.67)		(31.2)
Post * PSB * MES		-17.6		0.083		-2.16		-15.4
		(25.1)		(1.98)		(6.69)		(23.1)
Post * Pvt * MES		-50.4**		-2.08		-11.0		-41.5**
		(20.4)		(3.46)		(7.65)		(20.7)
Number of Observations	227	227	227	227	227	227	227	227
Adj R-squared	0.703	0.717	0.302	0.292	0.411	0.404	0.683	0.697

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: These regressions examine different categories of restructuring to total advances and ex-ante bank vulnerability for public and private sector banks. Both Non-performing assets (NPAs) and standard assets can be restructured. Restructured loans can also be further classified as corporate and non-corporate restructured loans. Column 1–4 show the results for standard assets and NPAs to total advances. Column 5–8 show the results for corporate and non-corporate restructured loans to total advances. Advances (loans) and restructured loans data is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). Advances (loans) are as of March of each year. The ratios are in percentages. The indicator variable *Crisis* takes a value of 1 for the period March 2008 to March 2009. *Post* takes a value of one for the period March 2008 to March 2012. Ex-ante bank vulnerability is measured by MES. MES is the marginal expected shortfall of a stock given that the market return is below its 5^{th} - percentile during the period 1^{st} January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table C6—: Placebo tests

Panel A: Event Return

	(1) 2005 versus 2004	(2) 2006 versus 2005	(3) 2007 versus 2006
PSB	0.174	-0.028	0.695***
	(0.136)	(0.137)	(0.123)
Pvt	0.378	0.464**	0.531***
	(0.256)	(0.172)	(0.124)
MES * PSB	-2.276	3.595	-3.468
	(2.066)	(5.679)	(2.507)
MES * Pvt	-6.349	-7.560	5.050
	(4.523)	(6.838)	(3.340)
Number of Observations	37	37	37
Adj R-squared	0.029	0.369	0.837

Panel B: Deposit Growth

	(1) 2005 versus 2004	(2) 2006 versus 2005	(3) 2007 versus 2006
PSB	0.007	0.110	0.563
	(0.098)	(0.080)	(0.438)
Pvt	0.563***	0.306***	0.307***
	(0.162)	(0.069)	(0.047)
MES * PSB	2.069	1.479	-5.090
	(1.695)	(5.058)	(7.167)
MES * Pvt	-6.810**	-2.941	-1.890**
	(2.607)	(2.238)	(0.923)
Number of Observations	36	37	37
Adj R-squared	0.592	0.081	0.307

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Panel A shows the regression results of the placebo tests for placebo crisis returns versus *MES*. Panel B shows the regression results of the placebo tests for placebo deposit growth versus *MES*. *MES* is the marginal expected shortfall of a stock given that the market return is below its 5^{th} - percentile during the period 1^{st} January to 31^{st} December in the placebo pre-crisis period. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January to December of the placebo pre-crisis period. Placebo crises returns are calculated from 1^{st} January to 31^{st} December of the crises period. For example, 2005 versus 2004 regression results are carried out using crisis period returns from January 1^{st} to December 31^{st}, 2005 against pre-crisis period returns calculated from January 1^{st} to December 31^{st}, 2004. Returns are similarly calculated for 2006 versus 2005 and 2007 versus 2006. Placebo deposit growth is calculated from annually from March 31^{st} of each year. For example, for the 2005 versus 2004 regression is carried out using placebo crisis period deposit growth from March 1^{st},2005 to March 31^{st}, 2006 against placebo pre-crisis period MES calculated from January 1^{st} to December 31^{st}, 2004. Deposit growth is similarly calculated for 2006 versus 2005 and 2007 versus 2006. We use the 38 banks publicly listed firms for which data is available from RBI. Standard errors are heteroskedasticity robust and shown in parenthesis.

Table C7—: Crisis Return and Deposit growth versus MES, beta, volatility, leverage and pre-crisis returns

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Crisis returns				Deposit Growth			
PSB	-0.79***	-0.94***	-0.59***	-0.59***	0.18***	0.13***	0.21***	0.21***
	(0.10)	(0.08)	(0.05)	(0.04)	(0.03)	(0.02)	(0.03)	(0.02)
Pvt	-0.56***	-0.63***	-0.66***	-0.62***	0.28***	0.28**	0.18**	0.21***
	(0.06)	(0.10)	(0.06)	(0.04)	(0.10)	(0.12)	(0.07)	(0.06)
Volatility * PSB	0.83				0.15			
	(0.52)				(0.14)			
Volatility * Pvt	-0.64**				-0.65			
	(0.25)				(0.54)			
Beta * PSB		0.45***				0.12**		
		(0.14)				(0.06)		
Beta * Pvt		0.15				-0.03		
		(0.26)				(0.35)		
Global Beta * PSB		-0.12				-0.04		
		(0.12)				(0.05)		
Global Beta * Pvt		-0.27				-0.16		
		(0.20)				(0.28)		
Leverage * PSB			-0.00				0.00	
			(0.00)				(0.00)	
Leverage * Pvt			-0.00				-0.00	
			(0.00)				(0.00)	
Pre-Crisis Returns * PSB				-0.51				0.05
				(0.48)				(0.19)
Pre-Crisis Returns * Pvt				-0.55**				-0.48
				(0.24)				(0.37)
Number of Observations	38	38	38	38	38	38	38	38
Adj R-squared	0.972	0.980	0.965	0.967	0.741	0.735	0.714	0.726

Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Results for crisis returns and deposit growth against alternative measures of risk and leverage measures are shown. Crisis return is the stock return during the crisis calculated from 1st January, 2008 to 24th February, 2009. Deposit growth is measured from 31st March, 2008 to 31st March, 2009. Beta and global beta are based on the S&P CNX NIFTY index and MSCI World Index returns respectively. Annualized daily volatility for the period January 2007–December 2007 is used. Leverage (as of March 31, 2008) is the ratio of the quasi- market value of assets measured as (book value of assets - book value of equity + market value of equity) to the market equity. Standard errors are heteroskedasticity robust and shown in parenthesis

Table C8—: Crisis Return and Deposit growth versus modified aggregate risk measure

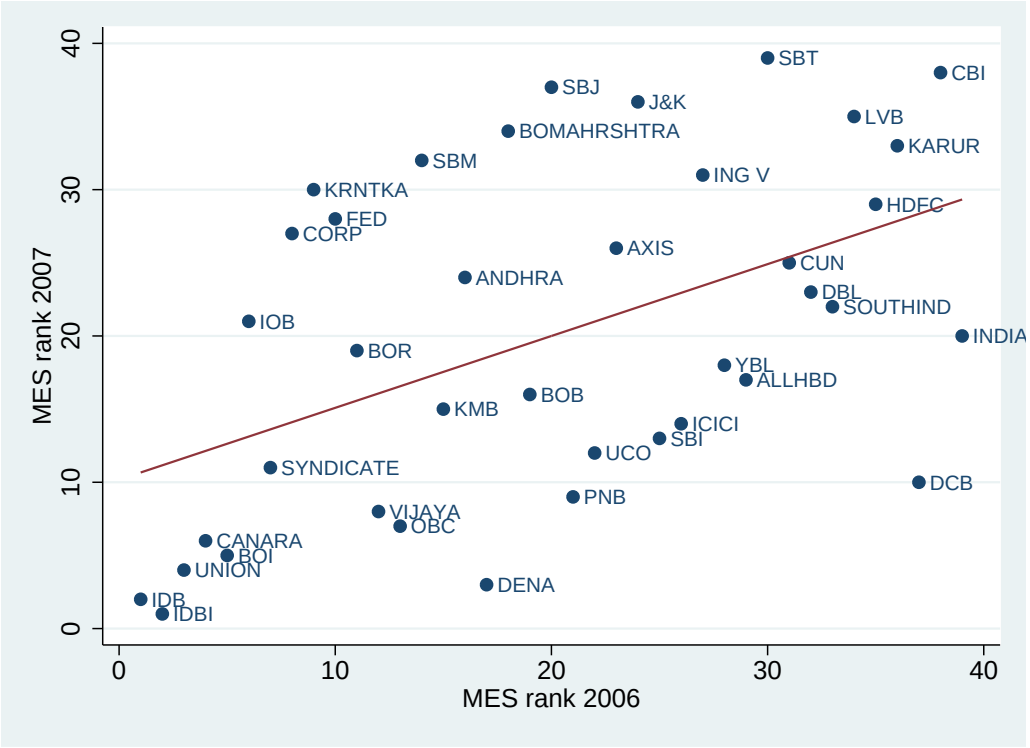
	(1)	(2)	(3)	(4)	(5)	(6)
	Event Return			Deposit Growth		
PSB	-0.88***	-1.79***	-1.56***	0.13***	-0.17	-0.10
	(0.11)	(0.43)	(0.33)	(0.03)	(0.15)	(0.16)
Pvt	-0.65***	-1.22***	-1.20***	0.22***	-0.42	-0.41
	(0.07)	(0.16)	(0.17)	(0.08)	(0.36)	(0.38)
Modified MES*PSB	7.48**		5.26	2.52***		1.79*
	(3.11)		(3.20)	(0.88)		(0.90)
Modified MES*Pvt	-1.73		-2.76	-2.85		-4.01
	(2.44)		(2.33)	(3.14)		(3.01)
Log Assets*PSB		0.10**	0.07**		0.03**	0.02
		(0.04)	(0.03)		(0.01)	(0.01)
Log Assets*Pvt		0.05***	0.06***		0.06	0.06*
		(0.01)	(0.02)		(0.03)	(0.04)
N	38	38	38	38	38	38
Adj R-squared	0.973	0.975	0.978	0.730	0.760	0.770

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Results for crisis returns and deposit growth against another alternative measures of risk is shown. Crisis return is the stock return during the crisis calculated from 1st January, 2008 to 24th February, 2009. Deposit growth is measured from 31st March, 2008 to 31st March, 2009. Leverage (as of March 31, 2008) is the ratio of the quasi- market value of assets measured as (book value of assets - book value of equity + market value of equity) to the market equity. Ex-ante bank vulnerability is measured by modified *MES*. Modified *MES* is the marginal expected shortfall of a stock given that the banking return is below its 5th - percentile during the period 1st January, 2007 to 31st December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. The banking index is calculated using a price-weighted index of all banks in the analysis leaving out the bank under consideration. The 38 banks for which data for all variables is available were used in this analysis. Standard errors are heteroskedasticity robust and shown in parenthesis.

Figure C6. : MES Rank for Jan '07–Dec '07 versus *MES* Rank for Jan '06–Dec '06



Note: The graph above shows the scatter plot of the *MES* Rank computed during the period 1st January, 2007 to 31st December, 2007 versus the *MES* Rank computed during the period from 1st January, 2006 to 31st December, 2006. *MES* for a period is the marginal expected shortfall of a stock given that the market return is below its 5th - percentile during the same period. Market return is based on the S&P CNX NIFTY. "*MES* Rank" ranks firms in descending order of *MES* values (assigns rank 1 to the firm with the largest *MES*). The 38 banks for which data was available for both periods were used in the analysis.

Table C9—: Bank data during 2007–2009

Panel A: Public Sector banks

Bank Name	Log Assets	Leverage	Beta	Volatility	Global beta	MES	Pre-crisis	Crisis	Deposit Growth	2 year Deposit Growth
State Bank of Travancore	10.69	19.41	0.33	0.13	0.02	0.01	0.08	-0.70	0.17	0.19
Central Bank of India	11.73	26.33	0.38	0.06	0.39	0.01	0.02	-0.76	0.17	0.19
State Bank of Bikaner & Jaipur	10.63	21.23	0.36	0.10	0.23	0.01	0.10	-0.97	0.14	0.15
Bank of Maharashtra	10.78	27.56	0.57	0.16	0.35	0.03	0.10	-0.75	0.22	0.25
State Bank of Mysore	10.41	15.14	0.42	0.36	-0.05	0.03	0.10	-0.71	0.18	0.20
Corporation Bank	11.11	13.36	0.90	0.21	0.86	0.04	0.02	-0.63	0.29	0.33
Andhra Bank	10.94	13.68	0.74	0.14	0.79	0.04	0.02	-0.59	0.18	0.20
Indian Overseas Bank	11.53	16.75	0.91	0.17	0.81	0.04	0.06	-0.76	0.17	0.19
Indian Bank	11.16	16.46	1.05	0.29	1.24	0.04	0.10	-0.54	0.17	0.19
Allahabad Bank	11.33	20.52	0.90	0.15	0.70	0.04	0.03	-0.66	0.17	0.19
Bank of Baroda	12.10	20.12	1.12	0.20	0.94	0.04	0.09	-0.55	0.24	0.27
State Bank of India	13.49	11.19	1.17	0.17	1.02	0.05	0.09	-0.54	0.32	0.50
UCO Bank	11.41	51.66	0.97	0.21	0.78	0.05	0.18	-0.64	0.23	0.25
Syndicate Bank	11.58	27.36	1.02	0.19	0.80	0.05	0.05	-0.57	0.20	0.22
Punjab National Bank	12.20	12.57	1.14	0.17	0.90	0.05	0.03	-0.48	0.23	0.26
Vijaya Bank	11.60	8.66	1.03	0.21	0.93	0.05	0.08	-0.73	0.13	0.34
Oriental Bank of Commerce	11.42	15.88	1.14	0.21	0.99	0.05	0.02	-0.63	0.23	0.26
Canara Bank	12.10	15.97	1.11	0.21	0.80	0.05	0.02	-0.53	0.19	0.21
Bank of India	12.09	17.58	1.39	0.31	1.01	0.06	0.08	-0.41	0.23	0.26
Union Bank of India	11.73	19.80	1.16	0.24	0.96	0.06	0.07	-0.42	0.29	0.34
Dena Bank	10.56	35.48	1.00	0.27	0.86	0.06	0.13	-0.66	0.24	0.27

Panel B: Private Sector banks

Bank Name	Log Assets	Leverage	Beta	Volatility	Global beta	MES	Precrisis	Crisis	Deposit Growth	2 year Deposit Growth
State Bank of Travancore	10.69	19.41	0.33	0.13	0.02	0.01	0.08	-0.70	0.17	0.19
Central Bank of India	11.73	26.33	0.38	0.06	0.39	0.01	0.02	-0.76	0.17	0.19
State Bank of Bikaner & Jaipur	10.63	21.23	0.36	0.10	0.23	0.01	0.10	-0.97	0.14	0.15
Bank of Maharashtra	10.78	27.56	0.57	0.16	0.35	0.03	0.10	-0.75	0.22	0.25
State Bank of Mysore	10.41	15.14	0.42	0.36	-0.05	0.03	0.10	-0.71	0.18	0.20
Corporation Bank	11.11	13.36	0.90	0.21	0.86	0.04	0.02	-0.63	0.29	0.33
Andhra Bank	10.94	13.68	0.74	0.14	0.79	0.04	0.02	-0.59	0.18	0.20
Indian Overseas Bank	11.53	16.75	0.91	0.17	0.81	0.04	0.06	-0.76	0.17	0.19
Indian Bank	11.16	16.46	1.05	0.29	1.24	0.04	0.10	-0.54	0.17	0.19
Allahabad Bank	11.33	20.52	0.90	0.15	0.70	0.04	0.03	-0.66	0.17	0.19
Bank of Baroda	12.10	20.12	1.12	0.20	0.94	0.04	0.09	-0.55	0.24	0.27
State Bank of India	13.49	11.19	1.17	0.17	1.02	0.05	0.09	-0.54	0.32	0.50
UCO Bank	11.41	51.66	0.97	0.21	0.78	0.05	0.18	-0.64	0.23	0.25
Syndicate Bank	11.58	27.36	1.02	0.19	0.80	0.05	0.05	-0.57	0.20	0.22
Punjab National Bank	12.20	12.57	1.14	0.17	0.90	0.05	0.03	-0.48	0.23	0.26
Vijaya Bank	11.60	8.66	1.03	0.21	0.93	0.05	0.08	-0.73	0.13	0.34
Oriental Bank of Commerce	11.42	15.88	1.14	0.21	0.99	0.05	0.02	-0.63	0.23	0.26
Canara Bank	12.10	15.97	1.11	0.21	0.80	0.05	0.02	-0.53	0.19	0.21
Bank of India	12.09	17.58	1.39	0.31	1.01	0.06	0.08	-0.41	0.23	0.26
Union Bank of India	11.73	19.80	1.16	0.24	0.96	0.06	0.07	-0.42	0.29	0.34
Dena Bank	10.56	35.48	1.00	0.27	0.86	0.06	0.13	-0.66	0.24	0.27

Note: This table contains the list of 38 Indian banks used in our analysis. *MES*, *Beta*, *Volatility*, *Global Beta*, *Leverage* and *Pre-Crisis Returns*, *Crisis Returns*, *Deposit Growth* and 2 *year Deposit Growth* are shown. *MES* (shown in percentage) is the marginal expected shortfall of a stock given that the market return is below its 5^{th}-percentile during the period 1st January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. *Beta* is based on the S&P CNX NIFTY index as the market return. *Global Beta* is based in the MSCI World Index returns. *Volatility* is the annualized daily volatility in the pre-crisis period from January 2007 to December 2007. *Leverage* ratio measured as of March 31, 2008 is the ratio of market equity to the quasi–market value of assets measured as (book value of assets - book value of equity + market value of equity). *Log Asset* is the natural logarithm of the book value of asset value measured as of March 31^{st}, 2008. $Pre-crisis\ return$ is the stock return for the period January 2007 to December 2007. *Crisis return* is the stock return for the period January 2008 to February 2009. *Deposit growth* for the crisis period is calculated for the period from 31^{st} March, 2008 to 31^{st} March, 2009. 2 *year Deposit growth* is calculated for the period from 31^{st} March, 2008 to 31^{st} March, 2010. The 38 banks for which both *MES* data and RBI deposit growth estimates are available were used in this analysis.

Table C10—: Agricultural Loans

	(1)	(2)	(3)
	Agri. loans to Assets		NPAs of Agri. Loans to Total NPAs
PSB	0.10***	17.36***	9.66**
	(0.01)	(1.71)	(4.54)
Pvt	-0.21	8.80***	11.32*
	(0.24)	(1.86)	(6.44)
MES * PSB	-0.37*		187.99**
	(0.19)		(94.33)
MES * Pvt	9.08		-65.99
	(7.66)		(144.72)
Crisis * PSB		-6.17***	-6.30
		(1.68)	(5.30)
Crisis * Pvt		-2.16	-2.96
		(1.48)	(5.67)
Post * PSB		0.55	3.70
		(2.14)	(5.58)
Post * Pvt		0.04	-1.85
		(2.15)	(7.31)
Crisis * PSB * MES			3.38
			(112.35)
Crisis * Pvt * MES			20.99
			(140.19)
Post * PSB * MES			-76.91
			(116.98)
Post * Pvt * MES			49.53
			(165.44)
N	38	152	152
Adj R-squared	0.341	0.787	0.789

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Column 1 contains the regression of agricultural loans to total assets against ex-ante bank vulnerability. *MES* measures the ex-ante bank volatility and is the marginal expected shortfall of a stock given that the market return is below its 5^{th}-percentile during the period 1st January, 2007 to 31^{st} December, 2007. Market return is based on the S&P CNX NIFTY for the pre-crisis period from January 2007 to December 2007. $Agriculturalloanstototalassets$ ratio measured as of March 31, 2008 is the ratio of loans to the agricultural sector to the total assets. The 38 banks for which both *MES* data and RBI deposit growth estimates are available were used in this analysis. Columns 2 to 3 contain the regression of agricultural NPAs to total NPAs. Agricultural NPAs to total NPAs is reported annually for the fiscal year ending March and is provided by the Reserve Bank of India (RBI). NPA (gross NPA)and advances is as of March of each year. The indicator variable *Crisis* takes a value of 1 for the period March 2008 to March 2009. *Post* takes a value of one for the period March 2008 to March 2012.